

# Health Care Philosophies and Ethics (HC)

***HC1: Analyze how Western, Indigenous, traditional, complementary and alternative approaches to health care contribute to a holistic perspective (e.g., mental, emotional, physical and spiritual) of health.***

- a. Identify how humanity's beliefs about health, wellness, illness, disease, and treatment have changed over time.
- b. Discuss the importance of and difficulties in defining terms such as Western, Indigenous, and traditional, complementary, and alternative approaches to health care within a current global context.
- c. Assess how health, wellness, illness, disease, and treatment (e.g., Circle of Life disharmony of body energies, being symptom free, and healthy lifestyle choices) are addressed in Western, Indigenous, and traditional, complementary, and alternative approaches to health care.
- d. Investigate the intended results of using natural products (e.g., herbs, vitamins, minerals, probiotics, and essential oils) and mind and body practices (e.g., acupuncture, various massage therapies, yoga, spinal manipulation, relaxation techniques, meditation, and movement therapies) and other complementary and/or alternative approaches to health care.
- e. Examine the significance of rituals; place based ceremonies, plants, and traditional herbs in Indigenous and traditional approaches to health care.
- f. Describe the role of clinical based studies (e.g., randomized, blind, double-blind, and placebo) in understanding Western approaches to health care.
- g. Provide examples of ways in which one or more of the approaches to health care might be implemented together to support the health and wellbeing of an individual.

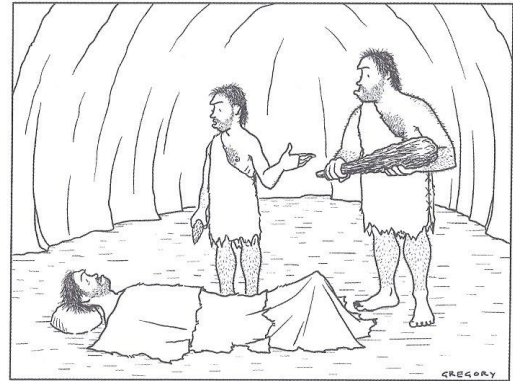
***HC2: Examine how personal and societal beliefs impact ethical decisions regarding health care.***

- a. Pose questions about ethical dilemmas within health care.
- b. Understand the core ethical questions to be considered when making health care decisions:
  - i. What can be done for the patient? (intervention technologies)
  - ii. Does the patient understand the options? (informed consent)
  - iii. What does the patient want? (autonomy)
  - iv. What are the benefits? (beneficence)
  - v. Will it harm the patient? (non-maleficence)
  - vi. Are the patient's requests fair and able to be satisfied? (justice)
  - vii. Are the costs involved fair to society? (economic consequences)

- c. Analyze a health care issue (e.g., case study, interview and current events) with respect to the core ethical questions.
- d. Contrast how procedures to prevent illness, such as immunizations, vitamin supplements, physical activity, nutrition and prayer, might be viewed from the perspective of Western, Indigenous, traditional, complementary, and alternative approaches to health care.
- e. Examine ethical considerations related to various treatments (e.g., chemotherapy, radiation, acupuncture, sweat lodge, blood transfusions, and hirudotherapy) that might be prescribed in Western, Indigenous, and traditional, complementary, and alternative approaches to health care.
- f. Examine individual, community and cultural beliefs regarding issues related to life and death such as home birthing, blood transfusions, contraception, abortions, organ donation, autopsies, euthanasia, cremation and burials.
- g. Discuss ethical considerations and perspectives related to issues such as the use of cadavers in professional studies, dissection and raising animals for the purpose of dissection, and public exhibits of plastinated organs and bodies, all of which could provide increased scientific understanding of human anatomy.
- h. Understand a patient's rights in Saskatchewan and in Canada with regards to health care decisions such as developing an advance care directive, refusal of treatment, informed consent, and the role of a proxy or substitute decision-maker.
- i. Discuss ethical considerations (e.g., personal beliefs, informed consent, the roles of institutional review boards and regulatory agencies) of why an individual may choose to participate in a clinical study of a new biomedical intervention (e.g., vaccine, drug, treatment, device, or process).
- j. Debate a decision related to ethics in health care from the viewpoint of individuals who hold different belief systems.

## **Evolution of Medicine**

*Medicine was developed to  
combat the problem of  
disease and wounds*



*"I'll be performing the operation, and this is the anesthiologist."*

### **Medicine Through Time**

- **Prehistoric Medicine** – 5000 – 3000 BC - health, herbs, spirits, trephining, aborigines
- **Ancient Egypt** – 3000 – 1000 BC - gods, mummies, no dissection
- **Ancient Greece** – 1000 – 500 BC - Asclepios, Hippocrates, Hippocratic oath, Four Humours
- **Romans** – 500BC – 400 AD - Public health, army, Galen
- **Dark Ages** – 400 – 1100 – no new learning, faith and superstition, monasteries
- **Middle Ages** – 1100 – 1400 – medical schools, Four Humours, planets, herbs, Black death, public health
- **Renaissance and Reformation** – 1500-1700 – new ideas, science, Royal Society, printing, Paracelsus, Great Plague, Vesalius, Pare, Harvey
- **Enlightenment** - 1800s – Jenner, Nightingale, Germ Theory, Pasteur, Koch, anaesthetics - Simpson, antiseptics - Lister,
- **Industrial revolution** – Chadwick, cholera, Snow
- **Twentieth Century** – Penicillin – Fleming, Florey and Chain, blood groups and transfusions, X-rays, transplants

### **Prehistoric Medicine (5000 – 3000 BC)**

Prehistoric people were hunter-gatherers. They lived in small groups and constantly moved around the country seeking out the best conditions for shelter and food supplies. In order to explain the many things in the world they could not otherwise understand, they **believed in spirits**.

Primitive people were **superstitious** & believed illness was caused by:

- invasion of evil spirits
- supernatural forces

First physicians were witch doctors who treated illness with ceremonies.

Herbs and plants were used as medicine. For example:

- Foxglove plants leaves were chewed to strengthen & slow heart
- Nowadays, it's given by pills, IV, or injections

**Trepanation:** A hole was cut into the skull to release demons

Trepanning is one of the oldest recorded surgical procedures and has been documented worldwide.

Although trepanning was used over many time periods, the procedure was first used in the Stone Age.

What are some of the possible complications of this treatment?



### **Ancient Egyptian Medicine (3000 – 1000 BC)**

Like prehistoric man, some of the beliefs of the Egyptians were based on myths and legend. However, their knowledge was also based on an increasing knowledge of the human anatomy and plain common sense.

In Ancient Egypt, the treatment of illnesses was no longer carried out only by magicians and medicine men. We have evidence that people existed who were referred to physicians and doctors.

Almost all of our knowledge about Ancient Egyptian medical knowledge comes from the discoveries of papyrus documents. It is from these documents that we know that the Ancient Egyptians still believed that the supernatural caused some disease.

When there was no obvious reason for an illness, many Ancient Egypt doctors and priests believed that disease was caused by spiritual beings. When no-one could explain why someone had a disease, spells and magical potions were used to drive out the spirits.

**Embalming/Mummification:** is a process in which the skin and flesh of a corpse can be preserved. The process can occur either naturally, or it can be intentional.

The process of embalming a body led to increased understanding of anatomy and diseases. It was done by special priests, not a doctor priest. Gauzes were used to wrap bodies, much like the surgical gauze that is used today. Strong antiseptics kept bodies from decaying



**Leeches:** Leeches would be used for bloodletting (draining human blood). The process does not hurt because their saliva contains a natural anesthetic. Their saliva also contains a blood thinner, a vasodilator, and an agent that prevents bacteria from infecting the wound.

### **Ancient Greece (1000 – 500 BC)**

Ancient Greece played an important part in medical history. Gods dominated the lives of the Greeks. Natural occurrences were explained away by using gods. This, however, did not occur in medicine where Ancient Greek physicians tried to find a natural explanation as to why someone got ill and died.

However, not all Ancient Greeks turned to physicians when ill. Many still turned to the gods. Many turned to the god Asclepios for help. Places called asclepeia were built for those in poor health. These were like temples and here people came to bathe, sleep and meditate. The asclepeias were run by priests. Patients to asclepeias were encouraged to sleep as it was believed that during sleep they would be visited by Asclepios and his two daughters, Panacea and Hygeia. A visit by these three was expected to cure all ailments.

### **Hippocrates**

The most famous of all Ancient Greek doctors was Hippocrates. Hippocrates was a Greek physician born around 460BC. He strongly believed that there had to be a physical cause for all illnesses and rejected ideas that illness was due to superstition or evil spirits. He developed the theory of the four humours to explain illnesses.

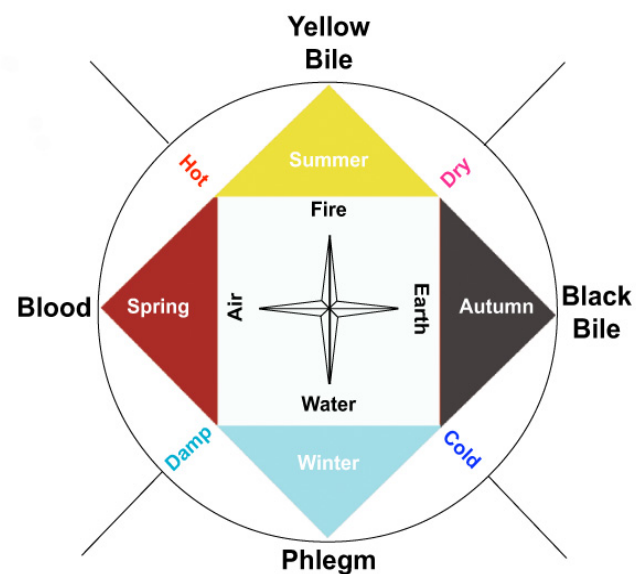
Hippocrates spent much time observing the body and was the first physician to accurately describe the symptoms of pneumonia and epilepsy in children. He also noted, through his observations, that some people were able to get over illnesses quicker than others and was the first physician to believe that thoughts, feelings and ideas came from the brain not from the heart.

The Hippocratic Collection is a group of books that were used for centuries. They were written over a period of 150 years. The books contain detailed lists of symptoms and treatments and were used for hundreds of years.

Hippocrates believed in a holistic approach to medicine - that the body should be treated as a whole rather than separate parts and travelled throughout Greece practising his medicine. Later he established a medical school on the island of Cos.

*Why is Hippocrates an important figure in medicine?*

Hippocrates spent much time thinking about the role of the medical practitioner – what his duties and responsibilities towards his patients should be.



*The Four Humours (Fluids) of Ancient Greece  
and their relationship with  
the Four Elements  
the Four Temperaments  
and  
the Four Seasons*

Hippocrates believed that those practicing medicine and surgery should be classified separately from philosophers (thinkers) and cosmologists (those who study the universe).

### **The Hippocratic Oath**

The Hippocratic Oath sets out the moral responsibilities of a physician. It is still used today in a modified form. The main points of the oath:

1. The student of medicine and physician will be true to his teacher and his profession.
2. The physician will only practice medicine for the benefit of the sick and not for any criminal or illegal purposes.
3. That the physician will keep secret things that he is told by his patient.

### **Romans Medicine (500BC – 400 AD)**

The Ancient Romans, like the Ancient Greeks and Ancient Egyptians, made a huge input into medicine and health, though their input was mainly concerned with public health schemes. Though the Roman 'discoveries' may not have been in the field of pure medicine, poor hygiene by people was a constant source of disease, so any improvement in public health was to have a major impact on society.

The Romans learned a great deal from the Ancient Greeks. They used the ideas of the Greeks but they did not simply copy them. Greek ideas they found impractical they ignored and it seems that the Romans were keener on things that would lead to the direct improvement of the quality of life of the people in their huge empire.

### **The Romans and Public Health:**

The Romans were great believers in a healthy mind equaling a healthy body. There was a belief that if you kept fit, you would be more able to combat an illness. Rather than spend money on a doctor, many Romans spent money on keeping fit.

The Romans did believe that illnesses had a natural cause and that bad health could be caused by bad water and sewage, hence their desire to improve the public health system in the Roman Empire so that everyone in their empire benefited – not just the rich. Those who worked for the Romans needed good health as did their soldiers.

In this sense, the Romans were the first civilization to introduce a program of public health for everyone regardless of wealth.

### **Aqueducts**

Romans realized that disease was connected to filth, bad water, and poor sanitation. They built sewers for waste, and aqueducts to deliver clean water. They created laws to keep streets clean and eliminate garbage. The first hospitals were also established.





**Claudius Galen**

Galen was a physician, writer and philosopher who became the most famous doctor in the Roman Empire and whose theories dominated European medicine for 1,500 years.

Galen was the originator of the experimental method in medical investigation, and throughout his life dissected animals in his quest to understand how the body functions. Some of his anatomical and physiological observations were accurate - for example, he proved that urine was formed in the kidney as opposed to the bladder which was common belief. His most important discovery was that arteries carry blood although he did not discover circulation.

Claudius Galen is credited with assigning the terms scoliosis, kyphosis, and lordosis to the disorder. He experimented with chest binders and jackets in an effort to correct curvature of the spine and believed that repeated exercise of the rib cage musculature through such methods as loud singing and respiratory exercises could correct some of the distortion.

**Dark Ages (400 – 1100)**

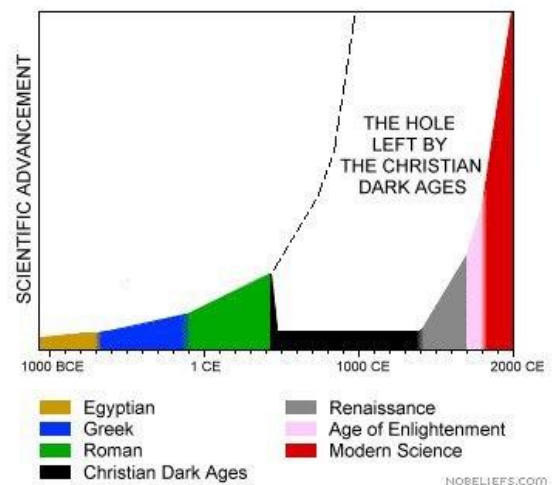
Under constant attack from barbarian tribes the Romans had been forced to pull its armies back to defend Rome. The Roman Empire had fallen.

As the Romans left, many of their practices fell into disuse. People returned to a tribal existence and the Romans knowledge of public health was no longer used.

**Faith and Superstition**

Alcohol and opium were used to numb the senses during operations and for pain relief. Other popular remedies included mandrake and hemlock. Mandrake was used for pain relief, wounds, gout, insomnia and for love potions. Cures using hemlock were problematic because the plant changes according to weather and age and the remedy would often cause more problems including death.

The church taught people that illness and disease was a punishment from God and that they needed to pray to be cured. The soul was considered more important than the body. Medical treatments and bodily cleanliness were of little importance.

**Monasteries**

St. Benedict, founder of the Benedictine monks believed that the cure of the sick was one of the most important duties of monks. During the dark ages, monasteries were the only hospitals in Europe. Patients were cared for in the hospitals until they recovered or died. Their fate was God's will. Prayer and/or pilgrimages to holy shrines were considered the best methods of affecting a cure.

**Middle Ages (1100 – 1400)**

During the Dark Ages (AD400-1100) there was little progress in medicine in Europe. As Europe moved into the middle ages, however, this began to change.

**Doctors in the Middle Ages**

In 900 the first European medical school in Europe was established. Others followed. The works of Galen and other ancient writers were rediscovered and taught. By the late Middle Ages physicians could only practice medicine if they had trained at one of the medical schools. The church oversaw medical training. The ideas of Galen were encouraged because they fitted in with religious ideas.

Knowledge of anatomy was gained by studying books and through dissection of dead bodies.

Physicians were bound by the Hippocratic Oath.

Women were not allowed to go to university or to become physicians. Women did, however, continue to give day to day care of the sick and continued to act as midwives.

**Causes of illness**

Many physicians believed that illness was due to common sense reasons (bad smells etc.), imbalance of the four humours, position of the sun and planets, punishment from God, or poisonous fumes.

**Treatments**

Physicians would often study a patient's urine and/or use astrology before deciding on a suitable treatment. Due to belief in maintaining the balance of the four humours, bleeding was a very common treatment.

Surgery was not taught at universities, surgeons learnt surgery by watching an established surgeon.

Physicians often worked as army doctors, treating those injured during the many wars of this period.

Herbal concoctions such as hemlock, mandrake, wine or opium were used for pain relief. Herbal remedies were widely used for many everyday illnesses. Preparation of herbs improved due to the improvement in equipment made by scholars interested in alchemy (trying to turn cheap metals into gold).

**Hospitals**

The Catholic Church taught that it was a religious duty to care for the sick, but it was not until the twelfth century that the church provided medical schools. Of the hospitals that were in existence, only 10% actually provided medical care. They were called hospitals because they provided hospitality (housing, food and clothing) for the needy. Monks and nuns cared for people in hospitals. Physicians were rarely seen in hospitals, they treated kings, nobles and wealthy merchants, not ordinary people.

**Renaissance and Reformation (1500-1700)**

The Renaissance was a great period of intellectual growth and artistic development in Europe. As part of that scientists and thinkers began to shake loose from the traditional views that governed medicine in both the east and the west. The focus of treatments



was no longer a divinely ordained natural balance. Knowledge advanced through the scientific method—conducting experiments, collecting observations, reaching conclusions. Information was disseminated by means of an important new technology—printing. The roots of scientific medicine were set.

Surgery was practiced mostly by barbers, who used the same tools for both trades. It remained a pretty primitive and extraordinarily painful business in this era. Controversy continued over wound management—was pus good or bad? **Cauterization**, the burning of a wound to close it, remained the main way to stop bleeding. Most surgeons learned their skills on the battlefield, and the introduction of gunpowder, guns, and cannons made that a much messier place.

The scientific method is applied to medicine.

In 1543, **Andreas Vesalius** (1514-1564) published an exquisitely illustrated anatomy text. With knowledge based on extensive dissection of human cadavers, he presented the first largely accurate description of the human body.

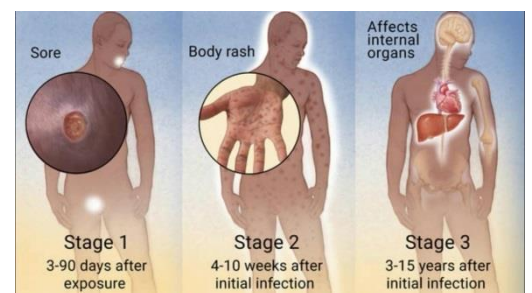
**Ambroise Paré** (1510-1590), began to instill some order. He translated some of Vesalius's work into French to make the new anatomical knowledge available to the battlefield surgeons. With extensive battlefield experience himself, he sewed wounds closed rather than cauterizing them to stop the bleeding during amputations. He replaced the boiling oil used to cauterize gunshot wounds with a salve of egg yolk, oil of roses, and turpentine. His treatments were not only more effective but much more humane than those previously used.

Another major figure of this era was **Paracelsus (1493-1541)**, a Swiss alchemist and physician. He believed that specific diseases resulted from specific outside agents and thus called for specific remedies. He pioneered the use of mineral and chemical remedies, including mercury for the treatment of syphilis.

**Syphilis:** The first written records of an outbreak of syphilis in Europe occurred in 1494 or 1495 in Naples, Italy, during a French invasion.

#### Characteristics:

- highly contagious disease spread primarily by sexual activity
- Occasionally, the disease can be passed to another person through prolonged kissing or close bodily contact
- Spread from sores, but the vast majority sores go unrecognized.
- Syphilis is caused by the bacteria *Treponema pallidum*.



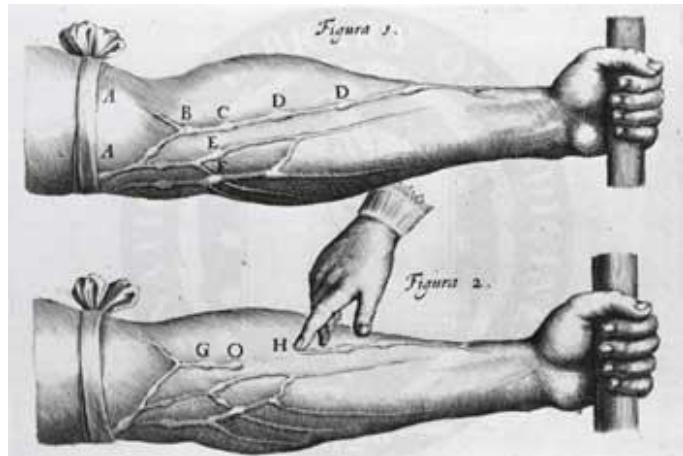
**Stage 1 - Early or Primary:** one or more sores that resemble large round bug bites and are often hard and painless. They occur between 10-90 days (average three weeks) after exposure. Even without treatment they heal without a scar within six weeks.

**Stage 2 - Secondary:** last one to three months and begins within six weeks to six months after exposure. People with secondary syphilis experience a rosy "copper penny" rash typically on the palms of the hands and soles of the feet. Like primary syphilis, secondary syphilis will resolve without treatment.

**Stage 3 - Tertiary:** If the infection isn't treated, it may then progress to a stage characterized by severe problems with the heart, brain, and nerves that can result in paralysis, blindness, dementia, deafness, impotence, and even death if it's not treated.

### **William Harvey (1578-1657)**

During the 17th and 18th centuries, scientific and medical knowledge advanced at an extraordinary pace. Many of Galen's misconceptions were finally overturned. The Englishman William Harvey accurately described the circulation of blood in the body, confirming the findings of earlier scholars. He added the critical experimental finding that blood is "pumped" around the body by the heart.



It was **Anton van Leeuwenhoek (1632-1723)**, a Dutch draper and scientist, and one of the pioneers of microscopy who in 1666 became the first man to make and use a real microscope. The invention of the microscope allowed doctors to see disease-causing organisms.

The **Great Plague** (1665–66) was the last major epidemic of the bubonic plague. Plague is an acute, severe infectious disease caused by the bacterium *Yersinia pestis*. The bacterium is found in fleas and wild rodents such as rats, squirrels, chipmunks or prairie dogs. Plague is a zoonotic disease, which means it can be transmitted to humans through animals, most often through the bites of fleas or through direct contact with infected animal tissue.

An **Enema** cleans up the colon and induces bowel movements. The first record mentioning a colon therapy is an Egyptian medical document discovered by Ebers, dated as early as 1500 B.C. The process of enema requires liquid that is forced with a low pressure into the rectum through anus. Enemas have been in practice from ancient time and helped to cure a lot of disorders like constipation, poisoning, acute headache, flu, common cold, meningitis, measles and a lot more.

### **Industrial Revolution (1760-1830)**

Prior to the Industrial Revolution, manufacturing was often done in people's homes, using hand tools or basic machines. Industrialization marked a shift to powered, special-purpose machinery, factories and mass production. While industrialization brought about an increased volume and variety of manufactured goods and an improved standard of living for some, it also resulted in often grim employment and living conditions for the poor and working classes resulting in poor health due to overcrowding and poor sanitation.

**Edward Jenner** (1749-1823) is alongside the likes of Joseph Lister, Robert Koch and Louis Pasteur in medical history. Edward Jenner's great gift to the world was his vaccination for smallpox. This disease was greatly feared at the time as it killed one in three of those who caught it and badly disfigured those who were lucky enough to survive catching it.

In 1854 the English physician **John Snow** (1813-1858) traced the source of a cholera outbreak in London to water contaminated by sewage. His detailed study was a key event in the history of both public health and epidemiology.

### **Enlightenment (1800s)**

The 18th century, known as the Age of Enlightenment, was an era of progress in many respects. The desire to find a single an explanation for "life, the universe, and everything" had not disappeared. Some thinkers attributed the workings of the body to newly discovered laws of physics, while others looked to the laws of chemistry.

In the 19th century medical practice finally began to change. At this same time, scientists and physicians made the discoveries that truly revolutionized medicine. Improvements in the microscope made possible more detailed studies of tissues, a field called histology. This led to the new science of cells, called cytology. These studies paved the way for the major theories and practical developments that formed the basis of medicine as we know it today.

**Edwin Chadwick** (1800-1890) is associated with public health improvements during the era of Queen Victoria. Edwin Chadwick used his position to persuade the government to invest in public health ventures and he must be credited with being Britain's premier pioneer in public health reform.

### **Cell Theory**

**Robert Hooke** saw and named cells in the early 17th century, when he viewed dead plant cells. In the 19th century the work of three German scientists, Theodore Schwann (1810-82), Matthias Jakob Schleiden (1804-81), and above all, Rudolf Virchow (1821-1902), led to the development of cell theory.

The Cell Theory states:

1. all living things are composed of cells
2. cells are the basic unit of structure and function in living things
3. cells are produced from other cells.

Using cell theory, Virchow was able to explain biological processes such as fertilization and growth. He also demonstrated that changes in cells cause diseases such as cancer. Cell theory is one of the cornerstones of modern medicine.

### **Germ Theory**

The other cornerstone was the development of germ theory. Even in the peak of humoral medicine (using the For Humors Theory), there were healers who recognized that some diseases were spread by contagion.

In general, most scientists believed that disease-causing germs arose from spontaneous generation, just as creatures such as flies, worms, and other small animals appeared to arise spontaneously from decaying matter.

A theory from the Greeks had a very strong influence throughout the 19th century. This theory was based on the idea that diseases such as the plague and cholera were caused by foul-smelling miasmas (air containing particles of rotting matter). The theory that such air was poisonous seemed believable because it associated disease with poor sanitation, and the importance of hygiene was recognized early.

The British nursing pioneer, **Florence Nightingale** (1820-1910) firmly believed that miasmas caused disease. By then, however, studies were well under way that finally put to rest both these misconceptions. In addition to vastly improving the sanitary conditions of hospitals, Nightingale created a number of patient services that contributed to improving the quality of their hospital stay.

**Louis Pasteur** (1822-1895) conducted the experiments that overturned the idea that life could be spontaneously generated. He demonstrated that there are microorganisms everywhere, including in the air. He further demonstrated that they were the source of

the chemical process by which milk soured. The process he developed that heats milk (and other liquids) to kill the microbes bears his name: «pasteurization». When adopted, pasteurization ensured that milk stopped to be a source of tuberculosis and other diseases.

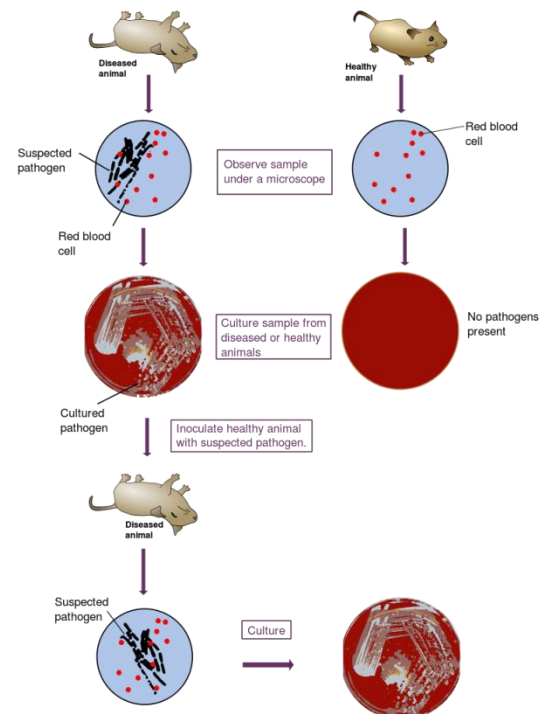
Pasteur believed passionately that microorganisms were responsible for infectious diseases in humans and animals and for their transmission among them. And he developed effective vaccines against anthrax and rabies by harvesting tissue from animals that had died from these diseases.

**Joseph Lister** (1827-1912) made the link between lack of cleanliness in hospitals and deaths after operations. In 1865, Lister read about the work done by Louis Pasteur on how wine was soured. Lister believed that it was microbes carried in the air that caused diseases to be spread in hospitals. People who had been operated on were especially vulnerable as their bodies were weak and their skin had been cut open so that germs could get into the body with more ease. For this reason, he is known as the “Father of Antiseptic Surgery”.

It was the work of a German doctor, **Robert Koch** (1843-1910), which finally validated the germ theory of disease. He identified the specific bacteria that caused anthrax, tuberculosis, and cholera. He developed a set of rules (Koch's postulates) for determining whether a microorganism is the source of a disease in a person rather than simply being present. The science of bacteriology was born.

Koch's postulates are:

1. The bacteria must be present in every case of the disease.
2. The bacteria must be isolated from the host with the disease and grown in pure culture.
3. The specific disease must be reproduced when a pure culture of the bacteria is inoculated into a healthy susceptible host.
4. The bacteria must be recoverable from the experimentally infected host.



### Anesthesia and Antiseptics

Before the 19th century operations were horrific procedures, and most patients died from post-operative shock, infection, or loss of blood.

In the middle of the 19th century other discoveries finally made extensive surgery practical. Until then surgical options had been limited by the pain of operating on a person who was awake, and the danger of infection after the operation.

In the 1840s several American dentists pioneered the use first of nitrous oxide and then ether as anesthetics. The latter was soon adopted in Europe for surgical purposes, finally allowing surgeons time to perform long and delicate surgeries.

In 1847 James Simpson (1811-1870) discovered anaesthetic properties of chloroform.

## Twentieth Century (1900s)

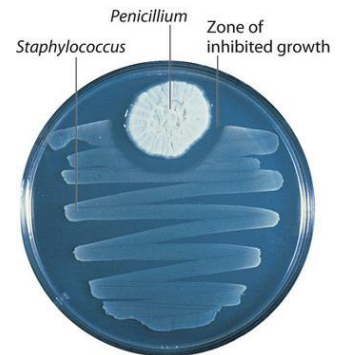
The pace of medical advances quickened in the 20th century. Breakthroughs came in biology, chemistry, physiology, pharmacology, and technology, often in overlapping ways. New understanding of diseases brought new treatments and cures for many of these conditions. However, even as most of the killer epidemic diseases were conquered, new diseases emerged, such as AIDS. During the 20th century, life spans increased in most parts of the world and some diseases that had appeared to have been conquered by drug treatments, such as tuberculosis, developed resistance.

### **Drugs to treat sicknesses**

Toward the end of the 19th century the study of herbal, chemical, and mineral remedies transformed into the science of pharmacology. Plant drugs such as opium underwent systematic chemical analysis. Researchers learned how to synthesize these drugs. By the 20th century the pharmaceutical industry marketed laboratory products.

In the 1920s **Alexander Fleming (1881-1955)** found a mold growing on some bacterial samples in his laboratory. In fact, the mold killed his samples. He discovered the most powerful of all antibiotics: **penicillin**.

During World War II a team of researchers led by **Australian Howard Florey (1898-1968)** used Alexander Fleming's research and tested the new drug on injured soldiers. It proved that penicillin was effective against anthrax, tetanus, and syphilis and was the first drug that worked against pneumonia. Many new drugs followed in the 1950s, including cortisone (steroid hormone that reduced inflammation and suppressed the immune system response).



Viruses were thought to be invisible until the invention of the electron microscope in the 1940s, but they were eventually identified as the cause of a host of diseases. These include not only smallpox, but also influenza, the common cold, chickenpox, polio, and more recently, AIDS. They are also thought to play a major role in cancer.

Although antibiotics did not work against viral diseases, antiviral vaccines did. Two of the most important were the vaccines against smallpox and polio.

Polio, chiefly a disease of childhood, causes paralysis. Two American scientists, **Jonas Salk (1914-95)** and **Albert Sabin (1906-93)**, developed different versions of a **polio vaccine**, which were introduced in the mid-1950s. Both were used, with great success. Polio was mostly eradicated by the end of the 20th century.

Other antiviral vaccines include those for measles, chickenpox, and influenza. Vaccines against human papillomavirus (a cause of cervical cancer) and shingles (a relative of chickenpox caused by herpes) became available in 2006. Efforts to develop a vaccine against malaria, ebola and AIDS have so far been unsuccessful.

The first **antiviral drug**, acyclovir, appeared in the 1970s for use against some forms of herpes. Antiretroviral drugs were developed in the 1980s to combat AIDS. Viruses mutate so quickly, however, that developing antiviral (and antiretroviral) agents has proved very difficult.

### **Blood groups and transfusions**

In 1901, **Karl Landsteiner (1868-1943)** was awarded the Nobel Prize in Physiology or Medicine in 1930 for discovering human blood groups making blood transfusions safer. Mixing blood from two individuals can lead to blood clumping or agglutination. The clumped red cells can crack and cause toxic reactions. This can have fatal consequences. Karl Landsteiner discovered that blood clumping was an immunological reaction which occurs when the receiver of a blood transfusion has antibodies against the donor blood cells.



### X-Rays

Modern medicine and technology seem inseparable. The discovery of X-rays by German physicist **Wilhelm Conrad Roentgen (1845-1923)** in 1895 made it possible to look at internal organs of the body. This made it easier to diagnose broken bones, cancer, and other diseases. X-rays, of course, are a form of radiation, which is dangerous to the body. Radiologists learned to use the lowest doses possible in imaging. They also learned to use targeted X-rays and other forms of radiation to destroy unwanted cells. Thus radiation has become a standard treatment for cancer.



### Transplants

In 1912, transplant pioneer **Alexis Carrell (1873-1944)** received the Nobel Prize for his work in the field. He had developed methods for connecting blood vessels and conducted successful kidney transplants on dogs. He later worked with aviator Charles Lindbergh to invent a device for keeping organs viable outside the body, a precursor to the artificial heart.

In 1960, British immunologist **Peter Medawar (1915-1987)**, who had studied immunosuppression's role in transplant failures, received the Nobel Prize for his discovery of acquired immune tolerance. Soon after, anti-rejection drugs enabled patients to receive organs from non-identical donors.

In the 1960's the first successful lung, pancreas and liver transplants took place. Also, **Christiaan Barnard's (1922-2001)** performed the **first open heart transplant**. In 2014 such operations are common, but in the late 1960's operations on the heart were rarely performed because of the risk of death and heart transplants were unheard of.

### Other advancements

After WWII, many advances were made in the management of pregnancy and childbirth. This included the ability to induce labour and the use of epidurals to ease difficult pregnancies. The chance of infant survival also improved as medical knowledge developed. The greater use of scans after 1945 also helped to detect problems earlier.

Major advances were also made in birth control. By the 1960's, the contraceptive pill was widely available, as was the IUD (Intrauterine device).

Many very significant medical advances were also made after 1945. One of the most important was the **discovery of DNA by Wilkins, Crick and Watson**. These three were also helped by the work done by **Rosalind Franklin**. DNA is the substance that makes life. This has in turn allowed the study of disease caused by defective genes such as in cystic fibrosis and Down's Syndrome. In recent years, researchers have been able to identify specific genes that are responsible for specific diseases.

The use of ultrasound and magnetic resonance since 1945 has also made it easier to diagnose disease. Ultrasound was developed for looking at unborn babies. Magnetic Resonance Imaging (MRI) can be used to detect diseases without the use of radiation making it less harmful to the patient. Three-dimensional CAT scans can also be used. Less use of radiation the better as some patients can be harmed by exposure to large doses of radiation.





Name: \_\_\_\_\_ Date: \_\_\_\_\_

HSci20: HC1 Philosophies

**Historical Evolution**

## Historical Timelines

Historical Era	"Healers"	Overall Contributions	Location of Care
Prehistoric Medicine (5000-3000BC)			
Ancient Egypt (3000-1000BC)			
Ancient Greece (1000-500BC)			
Ancient Rome (500BC-400AD)			
Dark Ages (400-1100)			

Name: \_\_\_\_\_ Date: \_\_\_\_\_

HSci20: HC1 Philosophies

**Historical Evolution**

## **Historical Timelines (cont'd)**

<b>Historical Era</b>	<b>"Healers"</b>	<b>Overall Contributions</b>	<b>Location of Care</b>
<b>Middle Ages (1100-1400)</b>			
<b>Renaissance &amp; Reformation (1500-1700's)</b>			
<b>Industrial Revolution (1750-1825)</b>			
<b>Enlightenment (1800's)</b>			
<b>20<sup>th</sup> Century (1900's)</b>			

## Medical Technology Milestones

**1668 Microscope** - Dr. Antony Van Leeuwenhoek, a Dutch draper and scientist, and one of the pioneers of microscopy who in the late 17th century became the first man to make and use a real microscope.

**1798 Vaccination** - Edward Jenner invents the world's first vaccine against the deadly disease called smallpox

**Dec. 31, 1815 Stethoscope** - René Laënnec, a French physician, invented the stethoscope, a trumpet-shaped wooden tube, to examine a woman whose heart he could not hear by pressing his ear to her chest.

**Dec. 31, 1841 Anesthesia** - Dr. Crawford W. Long performed the first operation using diethyl ether as an anesthetic. He pressed an ether-soaked towel against the patient's face to put him to sleep, then removed one of two tumors from his neck. He billed the patient \$2, itemizing the cost of the ether as well as the operation.

**1862 Pasteurization** - The process is named after Louis Pasteur. He was the first person to learn how to do it successfully. The first pasteurization was done by Louis Pasteur and Claude Bernard on April 20, 1862. It is a process of heating food, which is usually a liquid, to a specific temperature for a predefined length of time and then immediately cooling it after it is removed from the heat. This process slows spoilage caused by microbial growth in the food.

**1865 Antiseptic** - Joseph Lister was instrumental in developing practical applications of the germ theory of disease with respect to sanitation in medical settings and aseptic surgical techniques—partly through the use of carbolic acid (phenol) as an antiseptic.

**1873 Compound Microscope Resolution** - Ernst Abbe worked out the solution to the blurry compound microscope problem in the 1870's. He determined the physical laws that govern the collection of light by an objective and maximized this collection by using water and oil immersion lenses. (viewing of pathogens)

**Dec. 31, 1874 Brain Waves** - Using a galvanometer, the British scientist Richard Caton noted electrical impulses from the brains of animals, laying down the principles that would lead to the development of the electroencephalogram, or EEG.

**1895 X-Ray** - Wilhelm Conrad Röntgen, a German physicist, discovered the X-ray, an invention so remarkable that many did not believe the first reports of its use. The New York Times referred to it mockingly as Dr. Röntgen's "alleged discovery of how to photograph the invisible."

**1903 Electrocardiogram** - Dr. Willem Einthoven of the Netherlands invented the first practical electrocardiogram. The original weighed 600 pounds had a water cooling system for its gigantic electromagnets and needed five operators. In 1924 he received the Nobel Prize in Physiology or Medicine for his invention.

**1910 Laparoscopy** - Dr. Hans Christian Jacobaeus, a Swedish internist, performed the first laparoscopy on a human. He punctured the abdominal walls of 17 patients, using cocaine as a local anesthetic, and removed fluid from their abdomens. After removing the fluid, he examined the cavities with a cystoscope.

**1924 Electroencephalogram** - Dr. Hans Berger of Germany recorded the first human electroencephalogram, or EEG. His assertion that the brain's electrical impulses could be recorded was generally met with derision, and five years passed before Dr. Berger published his technique for recording the electrical activity of the human brain from the surface of the head.

**1931 Electron Microscope** - The invention of the electron microscope by Max Knoll and Ernst Ruska at the Berlin Technische Hochschule in 1931 finally overcame the barrier to higher resolution that had been imposed by the limitations of visible light. The electron microscope allowed us to view viruses, pathogens of many human diseases

**1936 Pacemaker** - Dr. Albert S. Hyman demonstrated a heart pacemaker. The device was about 10 inches long and weighed less than a pound; it supplied the heart with a current with adjustable voltage. The device, Dr. Hyman said, had been used in seven cases, although the results were good in only two of them.

**1943 Dialysis** - Willem J. Kolff, a Dutch physician, built the first dialysis machine, working with tin cans and parts from washing machines during the Nazi occupation of the Netherlands. Although his first few attempts were failures, Dr. Kolff did finally develop a useful machine in the 1950s while working with colleagues at the Cleveland Clinic.

**1947 Cardiac Defibrillation** - A Cleveland cardiovascular surgeon, Claude Beck, successfully defibrillated the heart of a 14-year-old boy during cardiac surgery, bringing an apparently dead person back to life. Although the principle of defibrillation had been known for decades, this was probably its first successful clinical application.

**1952 Mechanical Heart** - Henry Opitok, 41, was operated on using an artificial heart, the Dorrill GMR heart machine, manufactured by General Motors and generally considered the first mechanical heart. The surgeon, Dr. Forest Dewey Dorrill, successfully repaired the patient's mitral valve, and Mr. Opitok lived until 1981.

**1952 Magnetic Resonance** - The Nobel Prize in Physics was awarded to Felix Bloch and Edward Mills Purcell for their work in developing nuclear magnetic resonance, the principle behind M.R.I. machines.

**1953 Heart-Lung Bypass** - Dr. John Heysham Gibbon used his new invention, the heart-lung bypass machine, for the first time in open-heart surgery, supporting a patient's heart and lung functions for about half the time of the surgery. It was the culmination of his decades of work in developing the machine.

**1954 Kidney Transplant** - In the first successful kidney transplant, after at least nine failures, a team of surgeons at Peter Bent Brigham Hospital in Boston transplanted a kidney from a 24-year-old man to his twin brother. The recipient lived 11 years more, and in 1990 the lead surgeon, Dr. Joseph E. Murray, won the Nobel Prize in Medicine or Physiology.

**1958 Pacemaker** - Dr. Seymour Furman, a cardiologist at Montefiore Hospital in the Bronx, succeeded in extending a patient's life by more than two months using a cardiac pacemaker, a large machine to which the patient was attached by a 50-foot extension cord. By the next year, portable versions of the machine were in use.

**Fetal Ultrasound** - Dr. Edward Hon of Yale reported using a Doppler monitor on a woman's abdomen to detect fetal heartbeat. Ultrasound's principles had been known for more than a century (a Swedish physicist, Christian Andreas Doppler, gave his name to the phenomenon in 1842), but this was its first use in prenatal care.

**1961 Minimally Invasive Surgery** - Dr. Thomas J. Fogarty came up with the idea for the balloon embolectomy catheter for removing blood clots, and used it on a patient six weeks later. It was the first minimally invasive surgery technique.

**1963 Artificial Heart** - Paul Winchell, the ventriloquist and inventor, patented the first artificial heart, developed in collaboration with Dr. Henry J. Heimlich, later famous for the Heimlich maneuver.

**Liver Transplant** - The first human liver transplant was performed by Dr. Thomas E. Starzl. The patient, a 3-year-old child, rapidly bled to death.

**1965 Portable Defibrillator** - Dr. Frank Pantridge installed the first portable defibrillator in an ambulance in Belfast, Northern Ireland. It weighed 150 pounds and was powered by car batteries.

**Commercial Ultrasound** - Walter Erich Krause of the Siemens Corporation filed a patent for the first practical commercial ultrasound machine. According to the patent, his machine could be "used for practical ultra-sonic-optical examination to achieve a lifelike reproduction of the body part under examination."

**1967 Heart Transplant** - Dr. Christiaan Barnard, performed first human heart transplant. The patient, a 53-year-old man, died 18 days later.

**1971 CT Scanner** - The first commercial CT scanner, developed by Dr. Godfrey Hounsfield, was used on a patient in London. Dr. Hounsfield shared the 1979 Nobel Prize in Physiology or Medicine for his invention.

**1973 Insulin Pump** - An inventor and entrepreneur, Dean L. Kamen, patented the first insulin pump. He became perhaps even better known for a later invention, the Segway transporter.

**1978 M.R.I.** - Dr. Raymond V. Damadian announced that he had patented a technique using nuclear magnetic resonance to distinguish between normal and cancerous tissue. In 2003, two other researchers won a Nobel Prize for further discoveries.

**1989 Synthetic Blood** - The first synthetic blood, Fluosol-DA, was approved for human use. It was withdrawn from the market in 1994. The search for a blood substitute goes on, and there is none in use in clinical practice.

**1992 DNA Sequencing** - Dr. Leroy E. Hood patents his invention of the automated DNA sequencing technique. The patent is owned by the California Institute of Technology.

**Imaging Thought** - A paper in the journal Magnetic Resonance Medicine by a group of researchers at the Medical College of Wisconsin announced the first use of functional magnetic resonance imaging to detect brain blood flow in conjunction with a human mental activity.

**2000 Human Genome** - The first draft of the human genome was announced. Three years later, it was declared complete three years later.

**2004 Adaptive Artificial Knee** - The Rheo knee, a plastic prosthetic joint that adapts to a user's walking style and changes in terrain, was produced by the Ossur Corporation.

**2006 Artificial Liver** - Mr. Colin McGucklin and Dr. Nico Forraz of Newcastle University developed a liver grown from stem cells. The size of a small coin, it was not an organ that could be implanted in a human.

**[Where to from here?](#) (Check out the link)**

- Augmented reality
- Google brain
- Recreational cyborgs
- Medical 3D printing
- Gamifying behavior change
- New emergent diseases
- Real time diagnostics & data
- Holographic data input
- Digestible & wearable sensors
- Multi-functional radiology machines
- Genomics
- Patient empowerment



**[And even more here!](#) (Check out the link)**

Miss Foley

HSci20: HC1 Philosophies

**Medical Technology**

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## Cultural Perspectives

Culture	Health Concepts	Cause of Illness	Traditional Healers	Methods of Treatment	Response to Pain
<b>South African</b>	<ul style="list-style-type: none"> <li>• Maintain harmony of body, spirit and mind</li> <li>• Harmony with nature</li> <li>• Illness can be prevented by diet, rest and cleanliness</li> </ul>	<ul style="list-style-type: none"> <li>• Supernatural cause</li> <li>• Spiritual and demons</li> <li>• Punishment from God</li> <li>• Conflict or disharmony in life</li> </ul>	<ul style="list-style-type: none"> <li>• Root Doctor</li> <li>• Folk Practitioner (commonly known as "mother" healer, spiritualist)</li> </ul>	<ul style="list-style-type: none"> <li>• Restore harmony</li> <li>• Prayer or meditation</li> <li>• Herbs, roots, poultices and oils</li> <li>• Religious rituals</li> <li>• Charms, talismans and amulets</li> </ul>	<ul style="list-style-type: none"> <li>• Tolerating pain is a sign of strength</li> <li>• Some may express pain</li> </ul>
<b>Asian</b>	<ul style="list-style-type: none"> <li>• Health is a state of physical and spiritual harmony with nature</li> <li>• Balance of two energy forces: yin(cold) and yang (hot)</li> </ul>	<ul style="list-style-type: none"> <li>• Imbalance between yin and yang</li> <li>• *Supernatural forces such as God, evil spirits or ancestral spirits</li> <li>• Unhealthy environment</li> </ul>	<ul style="list-style-type: none"> <li>• Herbalist</li> <li>• Physician</li> <li>• Shaman healer (physician-priest)</li> </ul>	<ul style="list-style-type: none"> <li>• Cold remedies if yang is overpowering and hot remedies if yin is overpowering</li> <li>• Herbal remedies</li> <li>• Acupuncture and acupressure</li> <li>• Energy to restore balance between yin and yang</li> </ul>	<ul style="list-style-type: none"> <li>• Pain must be accepted and endured silently</li> <li>• Displaying pain in public brings disgrace</li> <li>• May refuse pain medication</li> </ul>
<b>European</b>	<ul style="list-style-type: none"> <li>• Health can be maintained by diet, rest and exercise</li> <li>• Immunizations and preventive practices help maintain health</li> <li>• Good health is a personal responsibility</li> </ul>	<ul style="list-style-type: none"> <li>• Outside sources such as germs, pollutants or contaminants</li> <li>• Punishment for sins</li> <li>• Lack of cleanliness</li> <li>• Self-abuse (drugs, alcohol, tobacco)</li> </ul>	<ul style="list-style-type: none"> <li>• Physician</li> <li>• Nurse</li> </ul>	<ul style="list-style-type: none"> <li>• Medications and surgery</li> <li>• Diet and exercise</li> <li>• Home remedies and self-care for mild illnesses</li> <li>• Prayer and religious rituals</li> </ul>	<ul style="list-style-type: none"> <li>• Some express pain loudly and emotionally</li> <li>• Others value self-control in response to pain</li> <li>• Pain can be helped by medications</li> </ul>

## Cultural Perspectives (cont'd)

Culture	Health Concepts	Cause of Illness	Traditional Healers	Methods of Treatment	Response to Pain
<b>Hispanic</b>	<ul style="list-style-type: none"> <li>• Health is a reward from God</li> <li>• Health is good luck</li> <li>• Balance between "hot" and "cold" forces</li> </ul>	<ul style="list-style-type: none"> <li>• Punishment from God for sins</li> <li>• Susto (fright), malojo (evil eye), or envidia (envy)</li> <li>• Imbalance between hot and cold</li> </ul>	<ul style="list-style-type: none"> <li>• Native healers (Curandero, Espiritualista, Yerbero, or herbalist, Brujo)</li> </ul>	<ul style="list-style-type: none"> <li>• Hot and cold remedies to restore balance</li> <li>• Prayers, medals, candles and religious rituals</li> <li>• Herbal remedies, especially teas</li> <li>• Massage</li> <li>• Anointing with oil</li> <li>• Wearing an Azabache (black stone) to ward off the evil eye</li> </ul>	<ul style="list-style-type: none"> <li>• Many will express pain verbally and accept treatment</li> <li>• Other feel pain is a part of life and must be endured</li> </ul>
<b>Middle Eastern</b>	<ul style="list-style-type: none"> <li>• Health is caused by spiritual causes</li> <li>• Cleanliness essential for health</li> <li>• Male individuals dominate and make decisions on health care</li> </ul>	<ul style="list-style-type: none"> <li>• Spiritual causes</li> <li>• Punishment for sins</li> <li>• Evil spirits or evil "eye"</li> </ul>	<ul style="list-style-type: none"> <li>• Traditional healers</li> <li>• Physician</li> </ul>	<ul style="list-style-type: none"> <li>• Meditation</li> <li>• Charms and amulets</li> <li>• Medications and surgery</li> <li>• Male health professionals prohibited from touching or examining female patients</li> </ul>	<ul style="list-style-type: none"> <li>• Tolerating pain is a sign of strength</li> <li>• Self-inflicted pain is used as a sign of grief</li> </ul>
<b>First Nations</b>	<ul style="list-style-type: none"> <li>• Health is harmony between man and nature</li> <li>• Balance among body, mind and spirit</li> <li>• Spiritual powers control body's harmony</li> </ul>	<ul style="list-style-type: none"> <li>• Supernatural forces and evil spirits</li> <li>• Violation of a taboo</li> <li>• Imbalance between man and nature</li> </ul>	<ul style="list-style-type: none"> <li>• Medicine Man</li> <li>• Shaman</li> </ul>	<ul style="list-style-type: none"> <li>• Rituals, charms and masks</li> <li>• Prayer and meditation to restore harmony and nature</li> <li>• Plants and herbs</li> <li>• Medicine bag or bundle filled with herbs and blessed by medicine man</li> </ul>	<ul style="list-style-type: none"> <li>• Pain is a normal part of life and tolerance of pain signifies strength and power</li> </ul>

## Health Care Approaches Defined

**Complementary Medicine** is alternative medicine used together with conventional medical treatment, in a belief not confirmed using the scientific method that it "complements" (improves the efficacy of) the treatment. CAM is the abbreviation for **complementary and alternative medicine**. Integrative medicine (or integrative health) is the combination of the practices and methods of alternative medicine with conventional medicine.

**Traditional Medicine** (also known as **indigenous** medicine) comprises knowledge systems that developed over generations within various societies before the era of modern medicine. The World Health Organization (WHO) defines traditional medicine as:

"Traditional medicine is the sum total of the knowledge, skills, and practices based on the theories, beliefs, and experiences indigenous to different cultures, whether explicable or not, used in the maintenance of health as well as in the prevention, diagnosis, improvement or treatment of physical and mental illness."

In some Asian and African countries, up to 80% of the population relies on traditional medicine for their primary health care needs. *When adopted outside of its traditional culture, traditional medicine is often called complementary and alternative (CAM) medicine.*

The WHO also notes, though, that "inappropriate use of traditional medicines or practices can have negative or dangerous effects" and that "further research is needed to ascertain the efficacy and safety" of several of the practices and medicinal plants used by traditional medicine systems. Core disciplines which study traditional medicine include herbalism, ethno medicine, ethno botany, and medical anthropology.

Traditional medicine may include formalized aspects of folk medicine, i.e. longstanding remedies passed on and practiced by lay people. Practices known as traditional medicines include Ayurveda, Siddha medicine, Unani, ancient Iranian medicine, Irani, Islamic medicine, traditional Vietnamese medicine, traditional Chinese medicine, traditional Korean medicine, acupuncture, Muti, Ifá, traditional African medicine, and many other forms of healing practices.

**Alternative medicine** is any practice that is put forward as having the healing effects of medicine, but does not originate from evidence gathered using the scientific method, is not part of biomedicine or is contradicted by scientific evidence or established science. It consists of a wide range of health care practices, products and therapies, ranging from known or experienced effective and biologically plausible but not well tested, to being directly contradicted by evidence and science, or even harmful or toxic. Examples include new and traditional medicine practices such as homeopathy, naturopathy, chiropractic, energy medicine, various forms of acupuncture, traditional Chinese medicine, Ayurvedic medicine, and Christian faith healing. The treatments are those that are not part of the science-based healthcare system, and are not clearly backed by scientific evidence.

Alternative medical diagnoses and treatments are not included as science-based treatments that are taught in western medical schools, and are not used in medical practice where treatments are based on what is established using the scientific method. Regulation and licensing of alternative medicine and health care providers varies from country to country, and state to state.

**Western Medicine** is a term sometimes used to describe evidence-based medicine, which, for various historical reasons, emerged from "Western" civilization (i.e. countries originally populated by or settled by Europeans), though it is now practiced throughout the world. It involves the use of pharmacologically active agents or physical interventions to treat or suppress symptoms or pathophysiologic processes of diseases or conditions. Additionally the epistemological virtues of particular aspects of clinical trial methodology have been examined, mostly notably the special place that is given to randomization, the notion of a blind experiment and the use of a placebo control.

Limitations of western medicine include dealing with: fiber myalgia, chronic pain, lower back pain, cancer, who gets an organ transplant, long waiting lists, creating superbugs, less strengthening of natural immunity, and potential awful side effects.

## Health Care Approaches Summary

Health Perspective	Definition	Strengths	Challenges
Complementary Medicine			
Traditional Medicine			
Alternative Medicine			
Western Medicine			

## The Secret Path Video: Gord Downie Shares Chanie Wenjack's Story



### STATEMENT BY GORD DOWNIE

Ogoki Post, Ontario - September 9, 2016

Mike Downie introduced me to Chanie Wenjack; he gave me the story from Ian Adam's Maclean's magazine story dating back to February 6, 1967, "The Lonely Death of Charlie Wenjack." Chanie was a young boy who died on October 22, 1966, walking the railroad tracks, trying to escape from the Cecilia Jeffrey Indian Residential School to walk home. Chanie's home was 400 miles away. He didn't know that. He didn't know where it was, nor know how to find it, but, like so many kids - more than anyone will be able to imagine - he tried. I never knew Chanie, the child his teachers misnamed Charlie, but I will always love him.

Chanie haunts me. His story is Canada's story. This is about Canada. We are not the country we thought we were. History will be re-written. We are all accountable, but this begins in the late 1800s and goes to 1996. "White" Canada knew - on somebody's purpose - nothing about this. We weren't taught it; it was hardly ever mentioned.

All of those Governments, and all of those Churches, for all of those years, misused themselves. They hurt many children. They broke up many families. They erased entire communities. It will take seven generations to fix this. Seven. Seven is not arbitrary. This is far from over. Things up north have never been harder. Canada is not Canada. We are not the country we think we are.

I am trying in this small way to help spread what Murray Sinclair said, "This is not an aboriginal problem. This is a Canadian problem. Because at the same time that aboriginal people were being demeaned in the schools and their culture and language were being taken away from them and they were being told that they were inferior, they were pagans, that they were heathens and savages and that they were unworthy of being respected — that very same message was being given to the non-aboriginal children in the public schools as well...They need to know that history includes them." (Murray Sinclair, *Ottawa Citizen*, May 24, 2015)

I have always wondered why, even as a kid, I never thought of Canada as a country - It's not a popular thought; you keep it to yourself - I never wrote of it as so. The next hundred years are going to be painful as we come to know Chanie Wenjack and thousands like him - as we find out about ourselves, about all of us - but only when we do can we truly call ourselves, "Canada."

*"Do we want to live in a haunted house the rest of our lives?" - Joseph Boyden*

**Proceeds from the sale of *Secret Path* will go to The Gord Downie Secret Path Fund for Truth and Reconciliation via The National Centre for Truth and Reconciliation at The University of Manitoba.**

### Raven Symbolism

Mischievous and curious, the Raven is the cultural focus of the Native Northwest Coast People. He symbolizes creation, knowledge, prestige as well as the complexity of nature and the subtlety of truth. He also symbolizes the unknown and is there to show that every person sees the world in a different way as another. The Raven was often called upon to clarify truths in visions, as the wise elders knew that what the eye sees is not always the truth. Many of the original peoples of the Pacific Northwest Coast refer to him as a god, and it is believed by some that messages from the creator or the cosmos are buried in the wings of the Raven only to be released to the families most deserving of his knowledge. The Raven is a long distance healer and is known as the "keeper of secrets," he helps us in our lives by exposing the truth of kept secrets that could potentially harm us, in doing so he helps us back to good health. The Raven was only ever feared if misused.

## The Secret Path Lyrics

1. The Stranger
2. Swing Set
3. Seven Matches
4. I Will Not Be Struck
5. Son
6. Secret Path
7. Don't Let This Touch You
8. Haunt Them, Haunt Them, Haunt Them
9. The Only Place to Be
10. Here, Here and Here



### The Stranger

I am the Stranger  
 You can't see me  
 I am the Stranger  
 Do you know what I mean  
 I navigate the mud  
 I walk above the path  
 Jumping to the right  
 And then I jump to the left  
 On a Secret Path  
 The one that nobody knows  
 And I'm moving fast  
 On the path nobody knows

And what I'm feeling  
 Is anyone's guess  
 What is in my head  
 And what's in my chest  
 I'm not gonna stop  
 I'm just catching my breath  
 They're not gonna stop  
 Please. Just let me catch my  
 breath

I am the Stranger  
 You can't see me  
 I am the Stranger  
 Do you know what I mean?

That is not my dad  
 My dad is not a wild man  
 Doesn't even drink  
 My Daddy's not a wild man  
 On a Secret Path  
 The one that nobody knows  
 And I'm moving fast  
 On the path nobody knows  
 I am the Stranger x 4

### Swing Set

We were at  
 The swing set  
 'Now?' I asked  
 'Not yet.' You said  
 Turnin round, round in my  
 seat  
 Chains chiming over my  
 head  
 When the tension is  
 complete  
 And there is no way out of it  
 'Now?'  
 'Not yet.'  
 'Now?'  
 'Not yet.'  
 Over the rise on the lawn  
 Someone dragging someone  
 The kid looking me in the eye  
 Teacher not looking at  
 anyone  
 'Now?'  
 'Now! Yes!'  
 'Now?'  
 'Now! Yes!'

I looked behind me only  
 once  
 Didn't see nobody chasin' us  
 Just my swing dancing in the  
 sun  
 Dancing wildly where it was  
 'Now.'  
 'Now, yes.'  
 'Now.'  
 'Now, yes.'  
 Now, yes x 4

### Seven Matches

She gave me matches  
 Seven wooden matches  
 She put them into a small, slim  
 glass jar  
 With a screw-top lid

I fingered that jar  
 I put it in my pocket  
 She said, 'Can't go into the  
 woods without them'  
 I smiled at her and left

And I kept them dry  
 And as long as there were six  
 I'd be fine  
 As long as there were five  
 Matches in that jar  
 Mile after mile  
 On the chick-chick chick-  
 chick sound of the matches  
 On the memory of her smile

I kept them dry  
 And as long as there were  
 five  
 I'd be fine  
 As long as there were four  
 Matches in a jar  
 With a screw-top lid  
 I know she did not mean to  
 hurt my feelings  
 But that's what she did

And I kept them dry  
 And as long as there were  
 three  
 I'd be fine  
 As long as there were two  
 Matches in that jar



## The Secret Path Lyrics (cont'd)

### I Will Not Be Struck

In this earth-like world  
 In this earth-like world  
 Before they arrived  
 Under this sun-like star  
 Under the sun-like star  
 They civilized  
 Run along the river  
 On the Secret Path  
 I will not be struck  
 I'm not going back  
 I can see my father's face  
 Warming his feet by the  
 stove  
 We used to have each  
 other  
 Now we only have ourselves

Then I put my ear  
 Then I put my ear  
 Right against the rail  
 So what I couldn't hear  
 What I couldn't hear  
 I would feel  
 Run along the river  
 On the Secret Path  
 I will not be struck  
 I'm not going back  
 I been staring into space  
 Forever or else  
 Enter the wilderness  
 And we only have ourselves

### Son

You know that they just can't  
 re-sist  
 No man could make them  
 feel ner-vous  
 And they put zero into-it  
 And their country doesn't  
 ex-ist

Son. When you dance  
 I'll be on your shoulder and  
 you'll feel it

Son. When you dance  
 I'll be on your shoulder and  
 you'll feel it  
 And when something stirs in  
 your heart  
 A feeling so strong and  
 intense  
 When something occurs in  
 your heart  
 And there isn't a next  
 sentence

Son. When you dance  
 I'll be on your shoulder and  
 you'll feel it

Even as the world convulses  
 Don't stop wishing what you  
 wish  
 Even as the world convulses  
 Even as the world convulses  
 Don't stop wishing the things  
 you wish  
 Don't stop wishing what you  
 wish

And when something stirs in  
 your heart  
 A feeling so strong and  
 intense  
 When something occurs in  
 your heart  
 And there isn't a next  
 sentence

### Secret Path

Freezing rain  
 And ice pellets  
 Walking home  
 I'm covered in it  
 Walking home  
 Along the tracks  
 Secret Path  
 Did you say, 'Secret Path?'

Pale blue  
 Doesn't do what they said  
 it'd do  
 It's just a jacket  
 It's a windbreaker  
 It's not a jean jacket  
 It's - they call it a windbreaker

Walking home  
 Along the tracks  
 'Secret Path'  
 He said, 'Secret Path'  
 I am soaked  
 To the skin  
 There's never been  
 A colder rain than this one  
 I'm in

Pale blue  
 Doesn't do what they said it'd  
 do  
 It's not my jacket  
 It's a windbreaker  
 It's not my jean jacket  
 It's just a windbreaker  
 And the fuck-off rocks  
 Along the tracks  
 Secret Path  
 There's no 'Secret Path'

And the freezing rain  
 And the ice pellets  
 Coat the rail  
 So I can't even tightrope it

## The Secret Path Lyrics (cont'd)

### Don't Let This Touch You

Don't let this touch you  
 Don't let this touch you  
 PAUSE  
 Words are birds  
 Words are snow  
 Words whisper  
 Words don't make the rain  
 go  
 Wilderness  
 Can't be done  
 Unfinished  
 Can't be done  
 Don't let it touch you  
 Don't let this touch you

Words are blanks  
 Words are ghosts  
 Words are god  
 Words don't make the rain  
 go  
 I'm confused  
 By freedom  
 What do you do?  
 With freedom?

I heard them in the dark  
 Heard the things they do  
 I heard the heavy whispers  
 Whispering, 'don't let this  
 touch you'  
 HOW-HOW x4  
 Don't let this touch you  
 Don't  
 Don't let it touch you  
 Don't

His glowing face  
 By the stove  
 His orange face  
 Daddy, make the rain go

### Haunt Them, Haunt Them, Haunt Them

I think I'm in despair  
 The wind is in the trees  
 Basically, just waiting for  
 something to come along and  
 eat me

Is this future's gate?  
 Where my dreams retreat?  
 And all my memories are just  
 memories of memories?

And a-folded in a dream  
 Pitch-black and glowing blue  
 A raven saying, 'I know a way  
 that I can help you'  
 Oh-oh, I stared into his eyes  
 I saw my pale last days  
 Said, 'What you can't escape,  
 you gotta embrace.'  
 Ah-oh, I know a way to get  
 back  
 This don't have to end  
 A way to get back  
 And haunt them. Haunt them.  
 Haunt them

Then he wished me plain  
 As he flew away  
 Said I'd see him coming on that  
 pale last day  
 And he wished me plain  
 Ordinary death  
 Said he'd be back after I  
 escaped it  
 oh  
 I've seen how they are  
 How they'd all sell their souls  
 In little bits and pieces, til they  
 get old  
 They don't make a dent  
 In indifference  
 We'll haunt them. Haunt them.  
 Haunt them.

But I want to go back  
 If this is the end  
 I want to go back  
 Not to 'haunt them, haunt  
 them, haunt them.' x 4

### The Only Place To Be

Bah-huh-uh

I'll just close my eyes. I'll just  
 catch my breath  
 This is the only place to be  
 I've got lots of time, my whole  
 life ahead  
 This is the only place to be

It's an earth-like world  
 It's cold and real  
 With a sun-like star  
 You can feel  
 I am for the wolf, pitch-black  
 and yellow eyes  
 This is the only place to be  
 For the raven arriving first to  
 get my eyes  
 This is the only place to be  
 And I'm for the poor sun,  
 always against the mindless  
 night  
 This is the only place to be  
 And I'm for the wind, in the  
 pale blue sky  
 This is the only place to be  
 On this earth-like world  
 It's cold and real  
 And with a sun-like star  
 You can feel

I'll just close my eyes  
 I'll just catch my breath  
 This is the only place to be

### Here, Here And Here

I feel  
 Here. here and here

I hurt  
 Here, here and here

I live  
 Here, here and here

I died  
 Here. Here and here

You sign  
 Here. Here and here

Here  
 Here. Here and here x 2

Here. And Here x 4

## **First Nations Medicine and Healing Practices**

Sources: University of Ottawa Medicine [http://www.med.uottawa.ca/sim/data/Aboriginal\\_Medicine\\_e.htm](http://www.med.uottawa.ca/sim/data/Aboriginal_Medicine_e.htm)  
Journal of Transcultural Nursing, Vol. 17 No. 3, July 2006 251-260

Every treatment has a cultural component. Western medicine is founded on science, but we must recognize that this holds no inherent guarantee of quality or efficacy. We teach the importance of evidence-based medicine, but there are many therapies for which we have not yet accumulated evidence of effectiveness, so should you dismiss all therapies that are not yet proven? One suggestion is to proceed with an open but enquiring mind - be sceptical (i.e. question things), but not cynical (i.e. dismiss ideas and find fault with them).

The culture of Western medicine places diagnosis as a central goal, whereas other approaches, including Aboriginal medicine, see it as less central and pay more attention to finding a safe environment in which the patient may recover. For conditions such as mental disorders, this latter approach may prove more effective than struggling to attach a label to the disorder.

Here are some back-ground notes intended to make you aware of some common Aboriginal healing practices that you may hear mentioned by Aboriginal patients you treat. You should at least have a general understanding of what these involve.

- Aboriginal medicine contains innumerable folk remedies based on plants, many of which have formed the basis for pharmaceutical treatments that we use routinely in Western medicine
- Traditional approaches to healing are holistic and consider mind, body and spirit. Medicine is distinguished from healing, which goes beyond mere treatment of sickness. As Donald Warne points out, it is somewhat ironic that modern physicians say they provide health care when they really treat diseases. (Warne D: Traditional perspectives on child and family health. Paediatric Child Health 2005;10:542)
- The healing relationship is based on a series of virtues: respect; humility; compassion; honesty; truth, sharing, hospitality and divine love.
- Traditional Aboriginal care recognizes many more routes to healing than does Western medicine. Seven routes are commonly mentioned: Talking, Crying, Laughing, Dancing, Sweating, Yawning, and Yelling (giving vent to your feelings, not yelling at someone!)
- Much traditional healing centers around group ceremonies, including prayers, the sharing of a meal, the use of traditional medicines and practices such as sweat lodges. Healing also involves feeling part of a shared culture, of being outdoors and in connection with the land and with nature. The Cree of James Bay, for example, emphasize the interconnections of people and animals; hunters feel respect and love for the animals; a feast is a communal way to express this respect. The traditional lifestyle naturally encourages healthy eating and exercise. (The biophilia hypothesis and eco-psychology hold that humans have an instinct to connect emotionally with nature and that dissociation from nature has caused disease and social pathologies). This has led to the idea of land-based healing programs that seek to put people back in touch with nature.

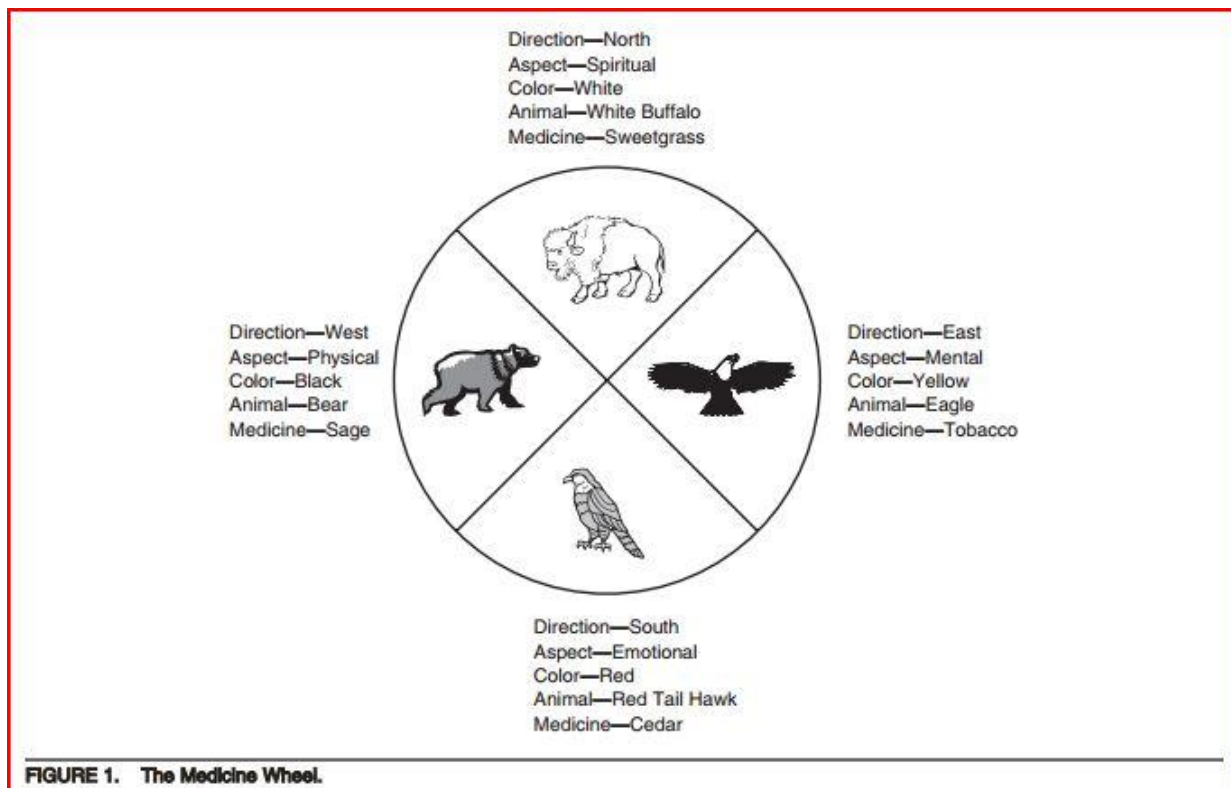
### The Medicine Wheel

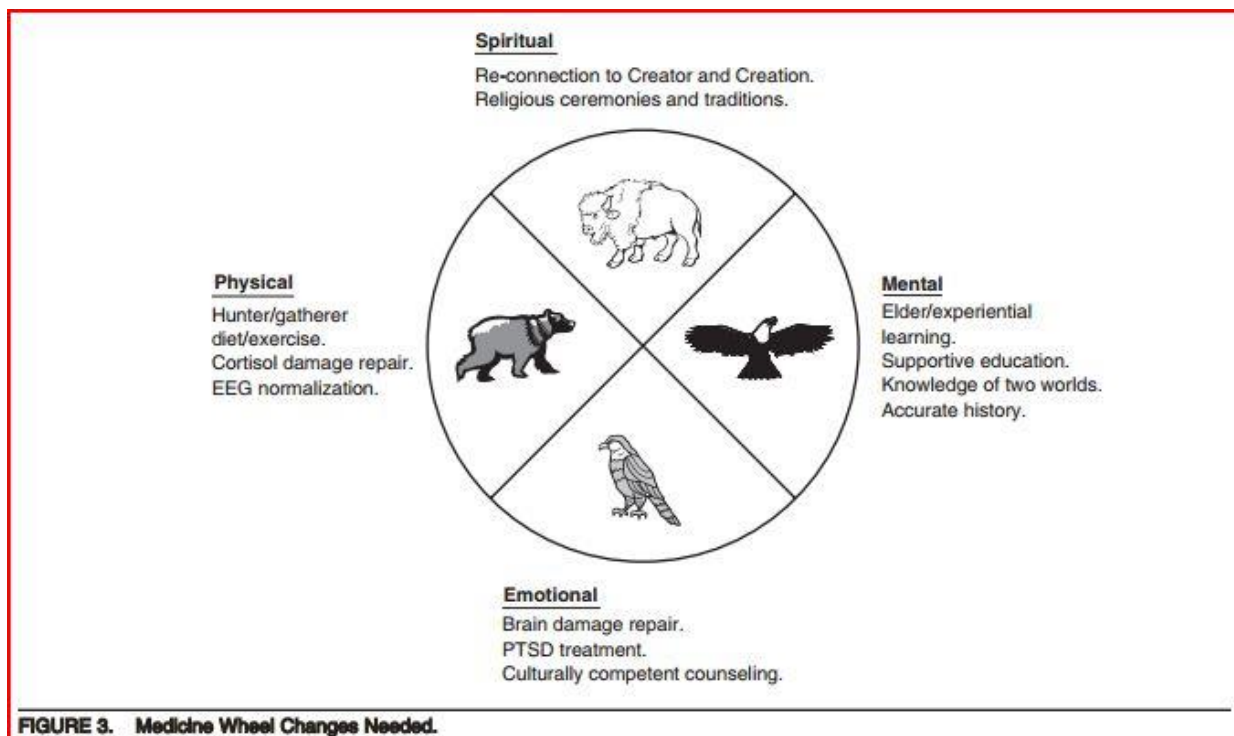
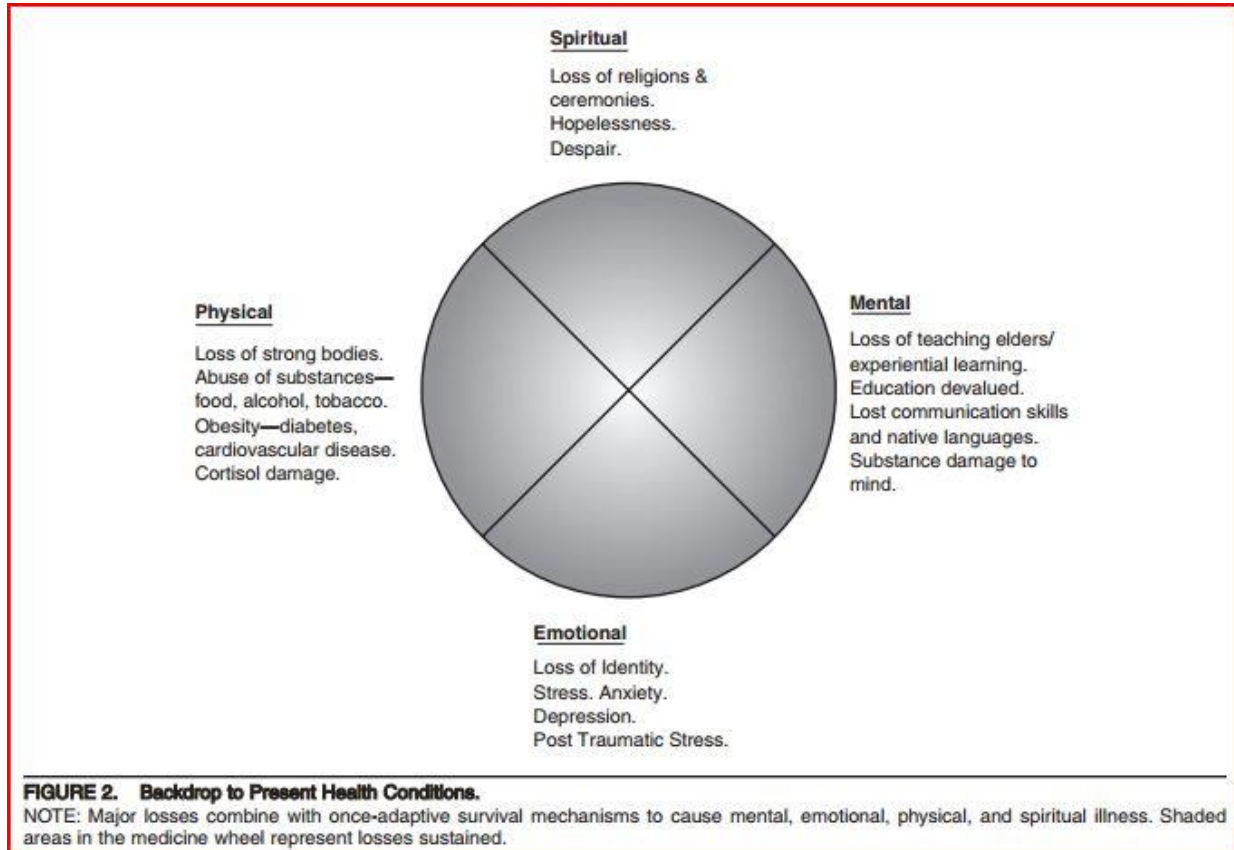
The medicine wheel symbolizes the interconnection of all life, the various cycles of nature, and how life represents a circular journey. The *number four* is sacred to the many Aboriginal peoples of North America and can represent many things: the four seasons, the four parts of a person (physical, mental, emotional and spiritual); the four kingdoms (animal, mineral, plant and human); the four sacred medicines (sweet grass, tobacco, cedar and sage).

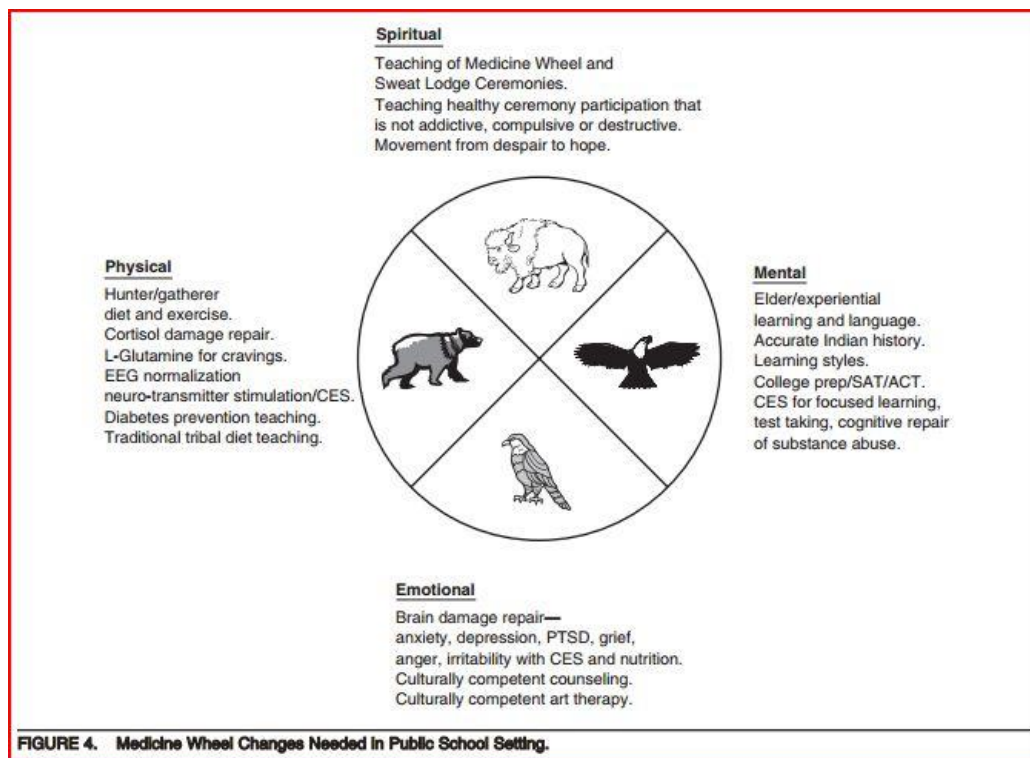
**Hence, you may see the medicine wheel presented in several different ways:**

1. The four points of the compass, each with a guiding spirit, symbolize stages in the life journey. The East, direction of the daily birth of the sun, represents a person's birth and early years. The South relates to childhood and intellectual growth. The West symbolizes adulthood and introspection, while the North represents the old age, wisdom and the spiritual aspects of life. The center of the wheel is symbolic of Mother Earth and the Creator, and their role in the beginning and continuation of life.
2. The four points can also represent the balance between mental (East), spiritual (North), physical (West) and emotional (South) aspects of health.
3. The wheel can also represent values and decisions. Here, values (drawn in the East, where the sun rises) influence decisions taken in the mental realm (drawn in the North, at the top). Then, decisions are implemented in the physical realm (West), and actions produce reactions in the emotional realm (South). Finally, these reactions provide feedback into the value system, completing the circle of value - action - evaluation.
4. The quadrants of the wheel are often colored red, yellow, black, white or green.

For a traditional healer, an imbalance (e.g., the loss of traditional values, perhaps resulting from experiences in residential schools) may affect health decisions (e.g., leading to alcoholism).







## The Four Sacred Medicines

**Sweetgrass** (the North) is used by almost all Aboriginal peoples in North America for deep, powerful ritual cleansing. It symbolizes the hair of Mother Earth. For this reason it is often braided, each section carrying meaning – mind, body spirit, and as we braid, it is wrapped as one. When Sweetgrass is walked on, it bends but does not break. Hence, it has been associated with virtue: an injustice can be returned by a kindness, by bending, not breaking.

**Tobacco** (the East) is held as a sacred plant by most First Nations peoples. Tobacco connects us to the spirit world; it absorbs prayers and carries them to the spirit world. Tobacco can also be used to thank the Creator for his gifts: if you enjoyed good weather, you could leave some tobacco on the ground, and say thank you for the gift. Tobacco is generally not smoked, except on special ceremonial occasions. Going to ceremonies you would offer tobacco to the Elder leading those ceremonies along with an honoring gift. This announces your intention and the Elders may ask your intentions with this offering.

**Cedar** (the South) is used for purification and (taken as a tea) to attract positive energy, feelings, emotions and for balance. Its vitamin C content helped prevent scurvy when fruits and vegetables were unavailable during the winter months. Cedar is used in sweat lodge and fasting ceremonies for protection, cedar branches cover the floor of many sweat lodges and some people make a circle of cedar when they are fasting. It is a guardian spirit and chases away the bad spirits.

**Sage** (the West) is a woman's medicine, conferring strength, wisdom, and clarity of purpose. It is a powerful purifying medicine that drives away negative energies. Sage is for releasing what is troubling the mind and for removing negative energy, it is used for cleansing homes and sacred items. Sage can be found braided and hung in people's homes, perhaps tied with a ribbon in one of the colors of the medicine wheel. The threefold braid represents body, mind and spirit.



## **Rituals & Place-Based Ceremonies**

**Smudging** (a.k.a. a 'smudge') is smoke used for ritual cleansing. Smudging is a ceremony traditionally practiced by some Aboriginal cultures to purify or cleanse negative energy, feelings or thoughts from a place or a person. Sacred medicines such as cedar, sage, sweetgrass or tobacco are burned in an abalone shell. The shell represents water, the first of four elements of life; the medicines represent gifts from mother earth and the burning represents fire, the next two elements. The person puts their hands in the smoke and carries it to their body, especially to areas that need spiritual healing (mind, heart, body). The smoke represents air, the final element. Perhaps the smell of the burning medicines stimulates the brain to produce beta-endorphins and promote healing processes.

**Healing Circles** are meetings held to heal physical, emotional and spiritual wounds. A symbolic object, often an eagle feather, may be given to a person who wishes to speak, and then it is passed around the circle in sequence to others who wish to speak. Shamans may conduct the ceremony.

**Sweat Lodge** (a.k.a. Purification Lodge) is a ceremonial sauna used for healing and cleansing. It made of a wooden framework covered by blankets or skins, usually igloo-shaped, about 1.5 meters high and large enough for eight people to sit in a circle on the ground. Hot stones are placed in a shallow hole in the center of the lodge. A medicine man pours water on the stones to produce steam and participants may spend an hour sweating in the lodge. The lodge combines the four elements of fire, water, air and earth. Ceremonies include offerings, prayers, and reverence. At times, excessive exposure to the heat of the lodge may have health effects; also toxins can be released if grasses that have been exposed to pesticides are placed on the rocks.

**Sun Dance** (a.k.a. Rain Dance, Thirst Dance, Medicine Dance) is a ritual that celebrates the harmony between man and nature, and spiritual dedication. Originally practiced at the summer solstice, the sun dance represents continuity between life, death, and regeneration. The symbolism often involved the buffalo, on which Plains Indian groups depended, so deserving reverence, but which they also had to kill. Four days before the ceremony, the dancers prepare by purifying themselves, at times in a sweat lodge, by meditating and collecting ceremonial items of dress to use in the sun dance. The sun dance itself takes another four days, and generally involves drumming, singing, and dancing, but also fasting and, in some cases, self-inflicted pain. This symbolized rebirth and often involved piercing the skin and attaching cords that the person had to tear out. This element led governments to suppress the sun dance around 1880, but it has been re-introduced.

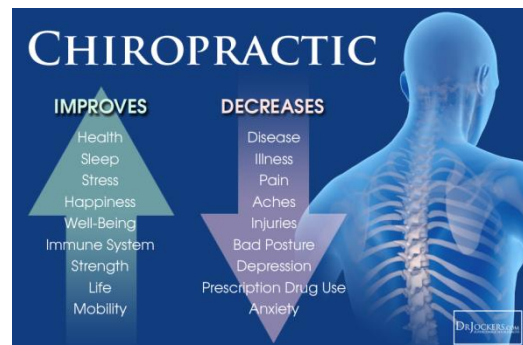
**Pipe Ceremony** is where the pipe is used individually and in groups for prayer and ceremonial purposes. Participants gather in a circle. A braid of sweetgrass is burned to purify the area and those present, to make a sacred place for the spirits to visit. Tobacco or kinnickinnick, a traditional mixture of bearberry and wild herbs or red willow shavings, is smoked so that prayers can be made to the Great Spirit or requests made of the spirits. The pipe may also be smoked to open other meetings or ceremonies. When not in use, the bowl and stem are separated and carried by one individual, the pipe holder.

**Potlach** is a ceremonial feast among northwest Pacific coast Native peoples held to celebrate major family events such as a marriage or birth. The host distributes gifts according to the status of each guest; reinforcing the perceived hierarchical relations between groups. At times the gift-giving became competitive, the host giving away personal possessions in anticipation that others would reciprocate in their turn. Such largesse enhanced the host's prestige. Missionaries encouraged government to outlaw the potlach around 1885; it is now common.

## CAM = Complementary and Alternative Medicine

**Chiropractic** is a form of alternative medicine that emphasizes diagnosis, treatment and prevention of mechanical disorders of the musculoskeletal system, especially the spine, under the belief that these disorders affect general health via the nervous system. Many chiropractors reject being characterized as complementary and alternative medicine (CAM). It is a healthcare profession, and although chiropractors have many similarities to primary care providers, they are more similar to a medical specialty like dentistry or podiatry. The main chiropractic treatment technique involves manual therapy, especially manipulation of the spine, other joints, and soft tissues; treatment may also include exercises and health and lifestyle counseling. Traditional chiropractic assumes that a vertebral subluxation or spinal joint dysfunction interferes with the body's function and its innate intelligence.

Chiropractic is well established in the U.S., Canada and Australia. It overlaps with other manual-therapy professions, including massage therapy, osteopathy, and physical therapy. Back and neck pain are the specialties of chiropractic but many chiropractors treat ailments other than musculoskeletal issues. Most who seek chiropractic care do so for low back pain.



**Herbalism** ("herbology" or "herbal medicine") is use of plants for medicinal purposes, and the study of such use. Plants have been the basis for medical treatments through much of human history, and such traditional medicine is still widely practiced today. Modern medicine recognizes herbalism as a form of alternative medicine, as the practice of herbalism is not strictly based on evidence gathered using the scientific method. Modern medicine does, however, make use of many plant-derived compounds as the basis for evidence-tested pharmaceutical drugs, and phytotherapy works to apply modern standards of effectiveness testing to herbs and medicines that are derived from natural sources. The scope of herbal medicine is sometimes extended to include fungal and bee products, as well as minerals, shells and certain animal parts. The World Health Organization (WHO) estimates that 80 percent of the population of Asian and African countries presently use herbal medicine for some aspect of primary health care. Pharmaceuticals are prohibitively expensive for most of the world's population, half of which lives on less than \$2 U.S. per day. In comparison, herbal medicines can be grown from seed or gathered from nature for little or no cost.

Many of the pharmaceuticals currently available to physicians have a long history of use as herbal remedies, including opium, aspirin, digitalis, and quinine. According to the World Health Organization, approximately 25% of modern drugs used in the United States have been derived from plants. At least 7,000 medical compounds in the modern pharmacopoeia are derived from plants. Among the 120 active compounds currently isolated from the higher plants and widely used in modern medicine today, 80 percent show a positive correlation between their modern therapeutic use and the traditional use of the plants from which they are derived.



**Naturopathy, or naturopathic medicine,** is a form of alternative medicine based on a belief in vitalism, which posits that a special energy called "vital energy" or "vital force" guides bodily processes such as metabolism, reproduction, growth, and adaptation. Naturopathy favors a holistic approach with non-invasive treatment and generally avoids the use of surgery and drugs. Practitioners of naturopathy often prefer methods of treatment that are not compatible with evidence-based medicine, and in doing so sometimes reject the tenets of biomedicine and modern science.

The term "naturopathy" is derived from Latin and Greek, and literally translates as "nature disease". Modern naturopathy grew out of the Natural Cure movement of Europe. The term was coined in 1895 by John Scheel and popularized by Benedict Lust, the "father of U.S. naturopathy". Beginning in the 1970s, there was a revival of interest in the United States and Canada, in conjunction with the holistic health movement. Today, naturopathy is primarily practiced in the United States and Canada. Naturopathy comprises many different treatment modalities, including nutritional and herbal medicine, lifestyle advice, counseling, flower essence, homeopathy and remedial massage.



Naturopaths aim to prevent illness through stress reduction and changes to diet and lifestyle, often rejecting the methods of evidence based medicine. Naturopaths do not generally recommend vaccines and antibiotics, based in part on the early views that shaped the profession, and they may provide alternative remedies even in cases where evidence-based medicine has been shown effective.

**Homeopathy** is a system of alternative medicine created in 1796 by Samuel Hahnemann based on his doctrine of "like cures like": a substance that prevents the symptoms of a disease in healthy people will cure similar symptoms in sick people. Homeopathy is considered a pseudoscience, and its remedies have been found to be no more effective than placebos.

Diseases have spiritual, as well as physical causes. Hahnemann believed the underlying causes of disease were phenomena that he termed miasms, and that homeopathic remedies addressed these. Medicines may cure symptoms, but the underlying imputed miasm still remains, and deep-seated ailments can be corrected only by removing the deeper disturbance of the vital force. The remedies are prepared by repeatedly diluting a chosen substance in alcohol or distilled water. Claims: dilution increases potency.

The postulated mechanisms of action of homeopathic remedies are both scientifically implausible and not physically possible. Although some clinical trials produce positive results, systematic reviews reveal that this is because of chance, flawed research methods, and reporting bias. Continued homeopathic practice, despite the evidence that it does not work,



has been criticized as unethical because it increases the suffering of patients by discouraging the use of real medicine, with the World Health Organization warning against using homeopathy to try to treat severe diseases such as HIV and malaria. The continued practice, despite a lack of evidence of efficacy, has led to homeopathy being characterized within the scientific and medical communities as nonsense, quackery, or a sham.



**Acupuncture** is the stimulation of specific acupoints along the skin of the body involving various methods such as penetration by thin needles or the application of heat, pressure, or laser light. Traditional acupuncture involves needle insertion, moxibustion, and cupping therapy. It is a form of complementary and alternative medicine and a key component of traditional Chinese medicine (TCM). According to TCM, stimulating specific acupuncture points corrects imbalances in the flow of qi through channels known as meridians. Acupuncture aims to treat a range of conditions, though is most commonly used for pain relief.

Acupuncture has been the subject of active scientific research, both in regard to its basis and therapeutic effectiveness, since the late 20th century. Any evidence on the effectiveness of acupuncture is "variable and inconsistent" for all conditions. Some of the research results suggest acupuncture can alleviate pain but others consistently suggest that acupuncture's effects are mainly due to placebo. A systematic review of systematic reviews highlighted recent high-quality randomized controlled trials which found that for reducing pain, real acupuncture was no better than sham acupuncture. It remains unclear whether acupuncture reduces pain independent of a psychological impact of the needling ritual.

Acupuncture is generally safe when done using clean technique and single use needles. When properly delivered, it has a low rate of mostly minor adverse effects. However since serious adverse events continue to be reported, it is recommended that acupuncturists be trained sufficiently to reduce the risk.

Acupuncture is currently used widely throughout China and many other countries, including the United States & Canada.

**YOUR BODY ON ACUPUNCTURE**

Who would have guessed that a tiny needle (or 12) could be such a boon to your well-being? Here are **10 research-backed ways the ancient practice of acupuncture improves your health** from head to toe.

- Head** 20 sessions of electroacupuncture (where a small electric current is applied to the needles) within 4 weeks reduced the number of monthly migraines.
- Nose** For seasonal allergy sufferers, 12 acupuncture sessions reduced symptoms and allowed people to use antihistamines less often.
- Throat** 10 sessions over the course of a month treated acid reflux disease and soothed heartburn better than upping meds, possibly by regulating acid secretion and speeding digestion.
- Mood** Once weekly acupuncture sessions can treat depression within 3 months (comparable to results from counseling) likely because it regulates happy-making neurotransmitters in your brain.
- Heart** Regular sessions can decrease markers of stress and lower blood pressure.
- Immune System** Well-placed needles can boost the activity of immune cells that seek out and destroy infections.
- Sleep** acupuncture revs up the production of neurotransmitters associated with relaxation and sleep, helping insomnia sufferers sleep better.
- Back** 5 weeks of twice-weekly needling was found to relieve lower back discomfort for up to 6 months.
- Menopause** Acupuncture can ease the frequency and severity of hot flashes for up to 3 months after treatment, possibly by helping regulate body temperature.
- Weight** Acupuncture helped obese adults shed up to 9 pounds over a span of 2-weeks to 4-months.

**Prevention**

**Massage Therapy** is the manipulation of superficial and deeper layers of muscle and connective tissue using various techniques, to enhance function, aid in the healing process, decrease muscle reflex activity, inhibit motor-neuron excitability, promote relaxation and well-being. Massage involves working and acting on the body with pressure – structured, unstructured, stationary, or moving – tension, motion, or vibration, done manually or with mechanical aids. Target tissues may include muscles, tendons, ligaments, fascia, skin, joints, or other connective tissue, as well as lymphatic vessels, or organs of the gastrointestinal system. Massage can be applied with the hands, fingers, elbows, knees, forearm, or feet.

The main professionals that provide therapeutic massage are massage therapists, athletic trainers, physical therapists and practitioners of many traditional Chinese and other eastern medicines. Massage practitioners work in a variety of medical settings and may travel to private residences or businesses.

Contraindications to massage include deep vein thrombosis, bleeding disorders or taking blood thinners such as Warfarin, damaged blood vessels, weakened bones from cancer, osteoporosis, or fractures, bruising, and fever. Anyone suffering from these conditions should not use massage therapy.



**Aromatherapy** is a form of alternative medicine that uses volatile plant materials, known as essential oils, and other aromatic compounds for the purpose of altering a person's mind, mood, cognitive function or health. Other stated uses include pain and anxiety reduction, enhancement of energy and short-term memory, relaxation, hair loss prevention, and reduction of eczema-induced itching.

Two basic mechanisms are offered to explain the purported effects. One is the influence of aroma on the brain, especially the limbic system through the olfactory system. The other is the direct pharmacological effects of the essential oils. While precise knowledge of the synergy between the body and aromatic oils is often claimed by aromatherapists, the efficacy of aromatherapy remains unproven. However, some preliminary clinical studies of aromatherapy in combination with other techniques show positive effects. Aromatherapy does not cure conditions, but it is suggested that it helps the body to find a natural way to cure itself and improve immune response.

Some essential oils such as tea tree have demonstrated anti-microbial effects, but there is still a lack of clinical evidence demonstrating efficacy against bacterial, fungal, or viral infections. Evidence for the efficacy of aromatherapy in treating medical conditions remains poor, with a particular lack of studies employing rigorous methodology, but some evidence exists that essential oils may have great therapeutic potential.





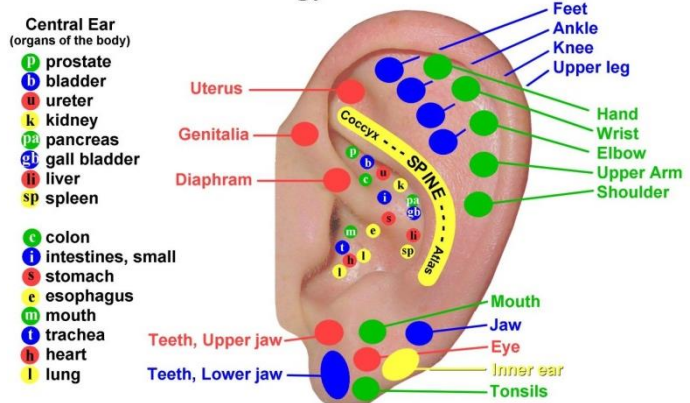
**Reflexology, or zone therapy,** is an alternative medicine involving the physical act of applying pressure to the feet, hands, or ears with specific thumb, finger, and hand techniques without the use of oil or lotion. It is based on what reflexologists claim to be a system of zones and reflex areas that they say reflect an image of the body on the feet and hands, with the premise that such work affects a physical change to the body.

Through application of pressure on these reflexes without the use of tools, crèmes or lotions, the feet being the primary area of application, reflexology relieves tension, improves circulation and helps promote the natural function of the related areas of the body.

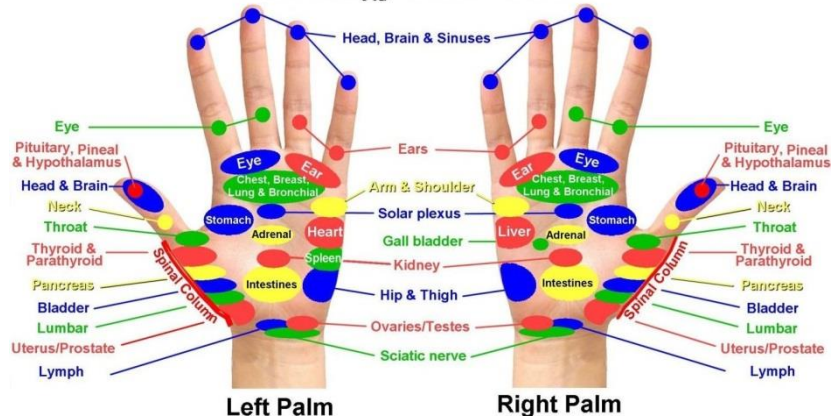
Reflexologists position that the blockage of an energy field, invisible life force, or Qi, can prevent healing. Another tenet of reflexology is the belief that practitioners can relieve stress and pain in other parts of the body through the manipulation of the feet. One claimed explanation is that the pressure received in the feet may send signals that 'balance' the nervous system or release chemicals such as endorphins that reduce stress and pain.

Reflexology's claim to manipulate energy (Qi) has been highly controversial, as there is no scientific evidence for the existence of life energy (Qi), 'energy balance', 'crystalline structures,' or 'pathways' in the body. There is no consensus among reflexologists on how reflexology is supposed to work; a unifying theme is the idea that areas on the foot correspond to areas of the body, and that by manipulating these one can improve health through one's Qi. Reflexologists divide the body into ten equal vertical zones, five on the right and five on the left. Concerns have been raised by medical professionals that treating potentially serious illnesses with reflexology, which has no proven efficacy, could delay the seeking of appropriate medical treatment.

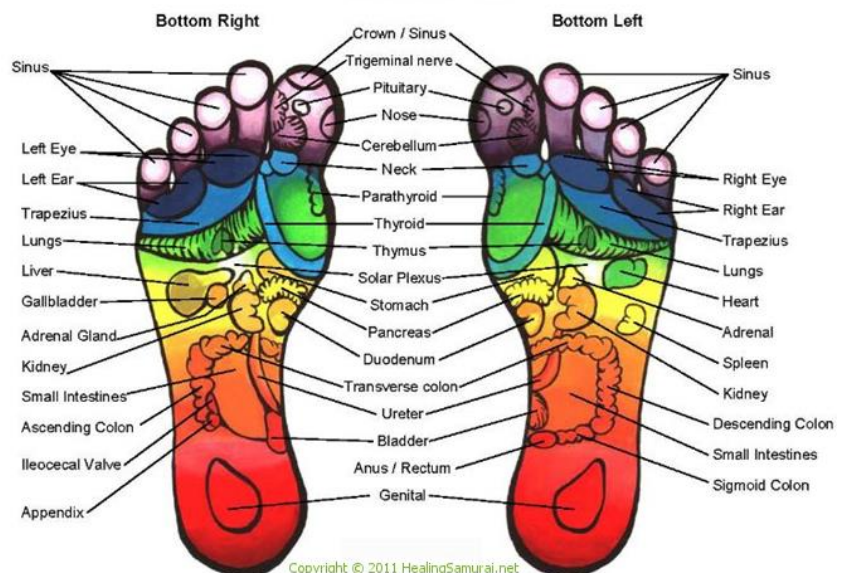
**Reflexology Ear Chart**



**Reflexology Hand Chart**



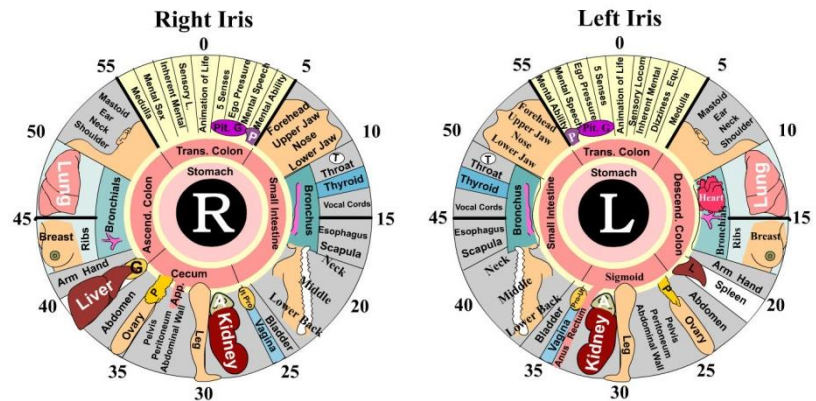
**Foot Reflex Chart**



**Iridology** (also known as **iridodiagnosis** or **iridiagnosis**) is an alternative medicine technique whose proponents claim that patterns, colors, and other characteristics of the iris can be examined to determine information about a patient's systemic health. Practitioners match their observations to iris charts, which divide the iris into zones that correspond to specific parts of the human body. Iridologists see the eyes as "windows" into the body's state of health.

Iridologists believe they can use the charts to distinguish between healthy systems and organs in the body and those that are overactive, inflamed, or distressed. Iridologists believe this information demonstrates a patient's susceptibility towards certain illnesses, reflects past medical problems, or predicts later health problems.

As opposed to evidence-based medicine, Iridology is not supported by quality research studies and is widely considered pseudoscience. Iris texture is a phenotype feature which develops during gestation and remains without significant change after birth. The stability of iris structures is the foundation of the biometric technology which uses iris recognition for identification purposes.



**T'ai chi or tai chi** in English is an internal Chinese martial art practiced for both its defense training and its health benefits. It is also typically practiced for a variety of other personal reasons: its hard and soft martial art technique, demonstration competitions, and longevity. T'ai chi's health training and meditation techniques concentrate on relieving the physical effects of stress on the body and mind.

A comprehensive overview of all the existing systematic reviews of t'ai chi ch'uan's health effects, found that as of 2011, "the evidence is conclusively or tentatively positive for fall prevention, general healthcare in older people, improving balance and enhancing psychological health"; the overview's authors thus recommended t'ai chi ch'uan to older people for its various physical and psychological benefits. There was no conclusive evidence of benefit for any of the other conditions researched, including Parkinson's disease, diabetes, cancer and arthritis.



**Yoga** as exercise or alternative medicine is a modern phenomenon which has been influenced by the ancient Indian practice of hatha yoga. It involves holding stretches as a kind of low-impact physical exercise, and is often used for therapeutic purposes. Yoga in this sense often occurs in a class and may involve meditation, imagery, breath work and music.

Both the meditative and the exercise components of hatha yoga have been researched for both specific and non-specific health benefits. Hatha yoga has been studied as an intervention for many conditions, including back pain, stress, and depression. In general, it can help improve quality of life, but does not treat disease.



A **dietary supplement** is intended to provide nutrients that may otherwise not be consumed in sufficient quantities. Supplements as generally understood include vitamins, minerals, fiber, fatty acids, or amino acids, among other substances. U.S. authorities define dietary supplements as foods, while elsewhere they may be classified as drugs or other products.

There are more than 50,000 dietary supplements available. More than half of the Canadian adult population (53% - 55%) consumes dietary supplements with most common ones being multivitamins. These products are not intended to prevent or treat any disease and in some circumstances are dangerous when not taken properly. For those who fail to consume a balanced diet, certain supplements "may have value."

Most supplements should be avoided, and usually people should not eat micronutrients except people with clearly shown deficiency because many are a waste of money with many popular vitamins having high levels of fillers and being composed of insoluble forms of the vitamins and minerals. Some vitamins are fat soluble so they are not absorbed unless eaten with lipids. Most excess vitamins are eliminated by the body, making expensive urine. People should first consult a doctor before taking supplements. An exception is vitamin D, which is recommended in northern hemisphere countries due to weak sunlight.

**Placebo-controlled studies** are a way of testing a medical therapy in which, in addition to a group of subjects that receives the treatment to be evaluated, a separate control group receives a sham "placebo" treatment which is specifically designed to have no real effect. Placebos are most commonly used in blinded trials, where subjects do not know whether they are receiving real or placebo treatment. Often, there is also a further "natural history" group that does not receive any treatment at all.

The purpose of the placebo group is to account for the placebo effect, that is, effects from treatment that do not depend on the treatment itself. Such factors include knowing one is receiving a treatment, attention from health care professionals, and the expectations of a treatment's effectiveness by those running the research study. Without a placebo group to compare against, it is not possible to know whether the treatment itself had any effect.

Patients frequently show improvement even when given a sham or "fake" treatment. Such intentionally inert placebo treatments can take many forms, such as a pill containing only sugar, a surgery where nothing efficacious is actually done (just an incision and sometimes some minor touching or handling of the underlying structures), or a medical device (such as an ultrasound machine) that is not actually turned on. Also, due to the body's natural healing ability and statistical effects such as regression to the mean, many patients will get better even when given no treatment at all. Thus, the relevant question when assessing a treatment is not "does the treatment work?" but "does the treatment work better than a placebo treatment or no treatment at all?" As one early clinical trial researcher wrote, "the first object of a therapeutic trial is to discover whether the patients who receive the treatment under investigation are cured more rapidly, more completely or more frequently, than they would have been without it." More broadly, the aim of a clinical trial is to determine what treatments, delivered in what circumstances, to which patients, in what conditions, are the most effective.

Therefore, the use of placebos is a standard control component of most clinical trials, which attempt to make some sort of quantitative assessment of the efficacy of medicinal drugs or treatments. Such a test or clinical trial is called a placebo-controlled study, and its control is of the negative type. A study, whose control is a previously tested treatment, rather than no treatment, is called a positive-control study, because its control is of the positive type.

Government regulatory agencies approve new drugs only after tests establish not only that patients respond to them, but also that their effect is greater than that of a placebo (by way of affecting more patients, by affecting responders more strongly, or both). As a result, "placebo-controlled studies often are designed in such a way that disadvantages the placebo condition".

**Home birthing** in developed countries is attended or an unattended childbirth in a non-clinical setting, typically using natural childbirth methods, that takes place in a residence rather than in a hospital or a birth center, and usually attended by a midwife or lay attendant with experience in managing home births. Home birth was, until the advent of modern medicine, the de facto method of delivery. Since the beginning of the 20th century, home birth rates have drastically fallen in most developed countries, generally to less than 1% of all births. Infant and mother mortality rates have also dropped drastically over the same time period.

Women with access to high-quality medical care may choose home birth because they prefer the intimacy of a home and family-centered experience or desire to avoid a medically-centered experience typical of a hospital. Professionals attending home births can be obstetricians, certified or uncertified midwives, and doulas. In developing countries, where women may not be able to afford medical care or it may not be accessible to them, a home birth may be the only option available, and the woman may or may not be assisted by a professional attendant of any kind.

Multiple studies have been performed concerning the safety of home births for both the child and the mother; as standard practices, licensing requirements, and access to emergency hospital care differs between regions it can be difficult to compare studies across national borders. A 2014 US survey of medical studies found that perinatal mortality rates were triple that of hospital births, and a US nation-wide study over 13 million births on a 3-year span (2007-2010) found that births at home were roughly 10 times as likely to be stillborn (14 times in first-born babies) and almost four times as likely to have neonatal seizures or serious neurological dysfunction when compared to babies born in hospitals, while a 2007 UK survey found that perinatal mortality rates were only slightly higher in that country than planned hospital births for low-risk pregnancies. Both baby's and mother's higher mortalities are associated with the inability to timely assist mothers with emergency procedures in case of complications during labor.

**Blood transfusion** is generally the process of receiving blood products into one's circulation intravenously. Transfusions are used for various medical conditions to replace lost components of the blood. Early transfusions used whole blood, but modern medical practice commonly uses only components of the blood, such as red blood cells, white blood cells, plasma, clotting factors, and platelets.

Units of packed red blood cells are typically only recommended when either a patient's hemoglobin level falls below 10 g/dL or hematocrit falls below 30%; recently, this 'trigger' level has been decreased to 7-8 g/dL, as a more restrictive strategy has been shown to have better patient outcomes. This is in part due to the increasing evidence that there are cases where patients have worse outcomes when transfused. One may consider transfusion for people with symptoms of cardiovascular disease such as chest pain or shortness of breath. Globally around 85 million units of red blood cells are transfused in a given year

Objections to blood transfusions may arise for personal, medical, or religious reasons. For example, Jehovah's Witnesses object to blood transfusion primarily on religious grounds—they believe that blood is sacred, as the Bible says "abstain from blood" (Acts 15:28,29). They have also highlighted complications associated with transfusion.

**Organ donation** is the donation of biological tissue or an organ of the human body, from a living or dead person to a living recipient in need of a transplantation. Transplantable organs and tissues are removed in a surgical procedure following a determination, based on the donor's medical and social history, of which are suitable for transplantation. While views of organ donation are positive there is a large gap between the numbers of registered donors compared to those awaiting organ donations on a global level.

Certain groups, like the Roma (gypsies), oppose organ donation on religious grounds, but most of the world's religions support donation as a charitable act of great benefit to the community. Issues surrounding patient autonomy, living wills, and guardianship make it nearly impossible for involuntary organ donation to occur.

Further, cloning is still a controversial topic, especially considering the possibility for an entire person to be brought into being with the express purpose of being destroyed for organ procurement. While the benefit of such a cloned organ would be a zero-percent chance of transplant rejection, the ethical issues involved with creating and killing a clone may outweigh these benefits. However, it may be possible in the future to use cloned stem-cells to grow a new organ without creating a new human being.

A relatively new field of transplantation has reinvigorated the debate. **Xenotransplantation**, or the transfer of animal (usually pig) organs into human bodies, promises to eliminate many of the ethical issues, while creating many of its own. While xenotransplantation promises to increase the supply of organs considerably, the threat of organ transplant rejection and the risk of xenozoonosis (animal diseases becoming human diseases), coupled with general anathema to the idea, decreases the functionality of the technique. Some animal rights groups oppose the sacrifice of an animal for organ donation and have launched campaigns to ban them.

While most first-world nations have a legal system of oversight for organ transplantation, the fact remains that demand far outstrips supply. Consequently, there has arisen a black market trend often referred to as transplant tourism. The issues are weighty and controversial. On the one hand are those who contend that those who can afford to buy organs are exploiting those who are desperate enough to sell their organs. Many suggest this can result in a growing inequality of status between the rich and the poor. On the other hand are those who contend that the desperate should be allowed to sell their organs and that preventing them from doing so is merely contributing to their status as being impoverished.

**An autopsy — also known as a post-mortem examination, necropsy (particularly as to non-human bodies), autopsia cadaverum, or obduction** — is a highly specialized surgical procedure that consists of a thorough examination of a corpse to determine the cause and manner of death and to evaluate any disease or injury that may be present. It is usually performed by a specialized medical doctor called a pathologist.

Some religions including Judaism and Islam usually discourage the performing of autopsies on their adherents. They outright object, because bodily intrusion violates beliefs about the sanctity of keeping the human body complete. Organizations such as Zaka in Israel and Misaskim in the USA generally guide families how to ensure that an unnecessary autopsy is not made.

**Refusal of medical assistance** is the term for when a patient refuses any or all parts of medical treatment. Informed refusal is linked to the informed consent process, as a patient has a right to consent, but also may choose to refuse.

The individual needs to be in possession of the relevant facts as well as of his reasoning faculties, such as not being intellectually disabled or mentally ill and without an impairment of judgment at the time of refusing. Such impairments might include illness, intoxication, drunkenness, using drugs, insufficient sleep, and other health problems. In cases where an individual is considered unable to give informed refusal, another person (guardian) may be authorized to give consent on their behalf. The pregnant patient represents a specific dilemma in the field of informed refusal as her action may result in harm or death to the fetus. Ethicists disagree on how to handle this situation.

Christian Science is a set of beliefs and practices that include sickness is an illusion that can be corrected by prayer alone, believing that reality is purely spiritual and the material world an illusion. This includes the view that disease is a mental rather than physical disorder, that there is

no death, and that the sick should be treated, not by medicine, but by a form of prayer that seeks to correct the beliefs responsible for the illusion of ill health.

The church does not require that Christian Scientists avoid all medicine – adherents use dentists, optometrists, obstetricians, physicians for broken bones, and vaccination when required by law – but maintains that Christian Science prayer is most effective when not combined with medical care. The avoidance of medical treatment was blamed for the deaths of several adherents and their children; parents and others were prosecuted for manslaughter or neglect and in a few cases convicted.

**Euthanasia** refers to the practice of intentionally ending a life in order to relieve pain and suffering. In some countries there is a divisive public controversy over the moral, ethical, and legal issues of euthanasia. Those who are against euthanasia may argue for the sanctity of life, while proponents of euthanasia rights emphasize alleviating suffering, bodily integrity, self-determination, and personal autonomy. Jurisdictions where euthanasia or assisted suicide is legal include the Netherlands, Belgium, Luxembourg, Switzerland, Estonia, Albania, the US states of Washington, Oregon and Montana, and, starting in 2015, the Canadian Province of Quebec.

The difficulty of justifying euthanasia when faced with the notion of the subject's "right to life". Euthanasia may be classified according to whether a person gives informed consent into three types: voluntary, non-voluntary and involuntary.

There is a debate within the medical and bioethics literature about whether or not the non-voluntary (and by extension, involuntary) killing of patients can be regarded as euthanasia, irrespective of intent or the patient's circumstances. However, others see consent as essential: Euthanasia has to be voluntary, and that "involuntary euthanasia is, as such, a great wrong".

When the patient brings about his or her own death with the assistance of a physician, the term assisted suicide is often used instead. Assisted suicide is legal in Switzerland and the U.S. states of Oregon, Washington and Montana. The "right to die" is often understood to mean that a person with a terminal illness should be allowed to commit suicide or assisted suicide or to decline life-prolonging treatment, where a disease would otherwise prolong their suffering to an identical result. The question of who, if anyone, should be empowered to make these decisions is often central to debate. The right to die is sometimes associated with the idea that one's body and one's life are one's own, to dispose of as one sees fit. However, a legitimate state interest in preventing irrational suicides is sometimes argued. A debate exists within bioethics over whether the right to die is universal, only applies under certain circumstances—such as terminal illness, or if it exists at all.

Hinduism accepts the right to die for those who are tormented by terminal diseases or those who have no desire, ambition or no responsibilities remaining; and allows death through the non-violent practice of fasting to the point of starvation (Prayopavesa). Jainism has a similar practice named Santhara. Other religious views on suicide vary in their tolerance, and include denial of the right as well as condemnation of the act. In the Catholic faith, suicide is considered a grave sin. Japanese health insurance will even pay out to families of suicides because it is a traditionally honorable way to die.

Withholding or withdrawing life-sustaining treatments with patient consent (voluntary) is almost unanimously considered, at least in the United States, to be legal. The use of pain medication in order to relieve suffering, even if it hastens death, has been held as legal in several court decisions.

Some governments around the world have legalized voluntary euthanasia but generally it remains as a criminal homicide. In the Netherlands and Belgium, where euthanasia has been legalized, it still remains homicide although it is not prosecuted and not punishable if the perpetrator (the doctor) meets certain legal exceptions.

Miss Foley

HSci20: HC1 Philosophies

**CAMedicine**

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Name: \_\_\_\_\_ Date: \_\_\_\_\_

HSci20: HC1 Philosophies

**CAMedicine**

## CAM Summary Chart

Health Perspective	Definition	Strengths	Challenges
Chiropractic			
Naturopathy			
Homeopathy			
Dietary supplements			
Acupuncture			
Massage Therapy			
Aromatherapy			
Reflexology			
Iridology			

Name: \_\_\_\_\_ Date: \_\_\_\_\_

HSci20: HC1 Philosophies

**CAMedicine**

## **CAM Summary Chart (cont'd)**

<b>Health Perspective</b>	<b>Definition</b>	<b>Strengths</b>	<b>Challenges</b>
Tai Chi			
Yoga			
Placebo Studies			
Home Birthing			
Blood Transfusions			
Organ Donations			
Autopsies			
Refusal of Treatment			
Euthanasia			



## Clinical-Trial Studies =

**A trial with human participants that seeks to answer specific questions about a type of medical intervention**

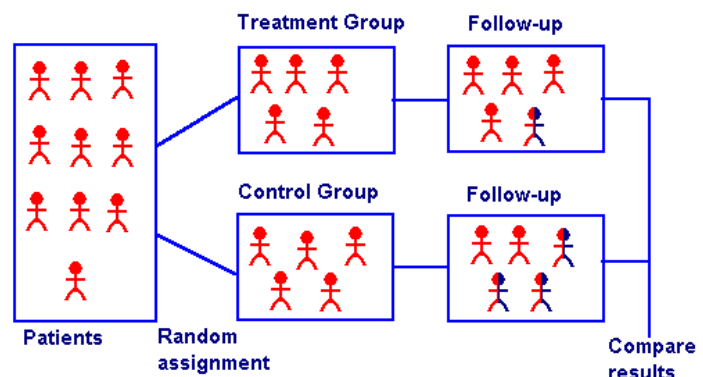
### Randomized Studies =

*a type of experimental study where people are randomly assigned to either a control or intervention group.*

Something is done to the intervention group (they are given drugs, educational seminars, counseling, etc.), while the control group is left alone or given a placebo. After the intervention, scientists see if outcomes are different between the two groups.

Although the two terms are often used interchangeably, strictly speaking not every randomized trial is a randomized controlled trial. For a randomized trial to be a randomized controlled trial it has to have a control group that receives no drug or intervention. If the two groups are both assigned to different interventions, then purists do not always consider it to be "controlled" trial. Sometimes the standard treatment is given to the control group.

When trying to determine if a drug or intervention is effective at treating or preventing a disease, a **randomized controlled trial** is often considered to be the **gold standard**. That is because with a randomized trial you can actually get a good idea of causation. In a randomized controlled trial, the only thing different between two groups is whether they received the drug. Therefore, if people who got the drug had better outcomes, there's a reasonable chance that the drug caused the outcomes. In other types of studies, subtle but important differences are harder to control.



Even though a randomized controlled trial might be considered the "best" way to study a problem, such studies are not always practical or ethical. Randomized controlled trials may also, sometimes, simply not be an appropriate way to address a given problem.

It's important to remember that just because a study isn't a randomized controlled trial doesn't mean it's a bad study or a useless study. Instead, every study must be judged on its own merits to see how much weight its results should be given. Not even all randomized controlled trials are well designed.

### Examples of Randomized Controlled Trials

During a randomized controlled trial of an HIV vaccine, they might start with a group of 1000 people, 500 would receive the vaccine while 500 would receive a placebo shot, and then scientists would see how many people in each group became HIV positive over time.

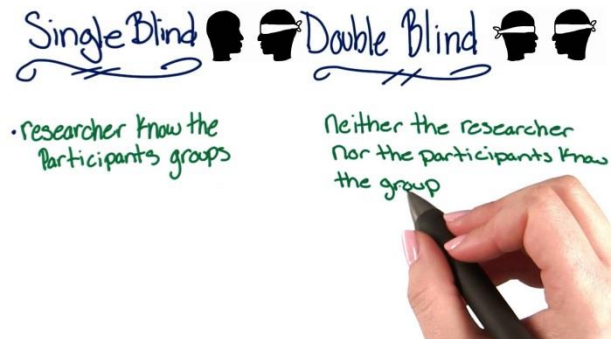
A randomized controlled trial of treatment as prevention (TaSP) might give the HIV positive person in a serodiscordant couple early HIV treatment. Then the control group would receive standard treatment (waiting to start cART, recommending condoms). Such studies were used to show that TaSP is an effective way to reduce sexual transmission of HIV.

## Single-Blind Studies =

The groups being studied, including the control, are NOT aware of the group in which they are placed; only the researchers know.

## Double-Blind Studies =

Neither the patients NOR the researchers know who is getting a placebo and who is getting the treatment.



A **double-blind study** is utilized to prevent bias in research results due to demand characteristics or the placebo effect. This can be contrasted with a single-blind study in which the experimenters are aware of which participants are receiving the treatment while the participants remain unaware.

In such studies, researchers may use what is known as a **placebo**. The placebo pill is given to participants who are randomly assigned to the control group. A control group is a subset of participants who are not exposed to any levels of the independent variable. This group serves as a baseline to determine if exposure to the independent variable had any significant effects. Those randomly assigned to the experimental group are given the treatment in question. Data collected from both groups is then compared to determine if the treatment had some impact on the dependent variable.

All participants in the study will take a pill, but only some of them will receive the real drug under investigation. The rest of the subjects will receive the inactive placebo. The double-blind procedure helps minimize possible effects of experimenter bias.

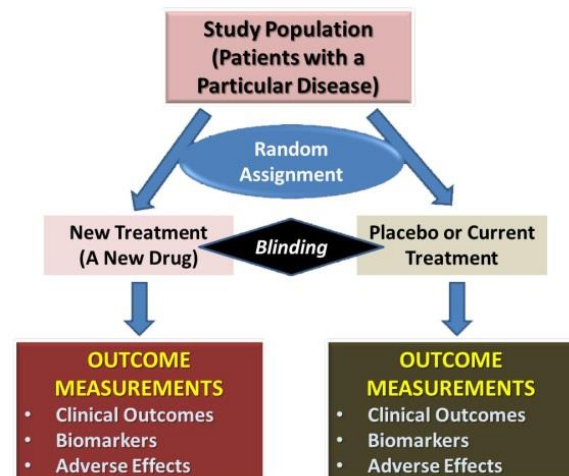
### An Example of a Double-Blind Study

Imagine that researchers want to determine if consuming energy bars before a demanding athletic event lead to an improvement in performance. The researchers might begin by forming a pool of participants that are fairly equivalent regarding athletic ability. Some participants are randomly assigned to a control group while others are randomly assigned to the experimental group.

Participants are then asked to eat an energy bar. All of the bars are packaged the same, but some are sports bars while others are simply bar-shaped brownies. The real energy bars contain high levels of protein and vitamins, while the placebo bars do not.

Because this is a double-blind study, neither the participants nor the experimenters know who is consuming the real energy bars and who is consuming the placebo bars.

The participants then complete a predetermined athletic task and researchers collect data performance. Once all the data has been obtained, researchers can then compare the results of each group and determine if the independent variable had any impact on the dependent variable.



## Placebo = "I Will Please" in Latin

*an inactive substance or procedure used as a control.*

## Placebo Effect =

*the placebo effect is the measurable, observable, or perceived improvement in a health condition that is not attributable to an actual medical treatment.*

When a patient is given a known inactive substance (e.g., sugar pill, distilled water, or saline solution) rather than a substance or device having true medical value, **they may improve merely because their expectation to do so is strong.**

To eliminate the effect of positive thinking on clinical trials, researchers often run blind, placebo-controlled studies whereby the patient is unaware if they are given the placebo or the actual treatment. The first known double-blind placebo-controlled trial was done in 1907. The FDA doesn't require that a drug study include a placebo control group, however, placebo-controlled trials have long been the standard.

Whether it is achieved consciously, subconsciously, or unconsciously, a good result that is not due to the actual treatment or drug itself is attributed to the placebo effect. In clinical trials, the **placebo is called the control or sham treatment.**

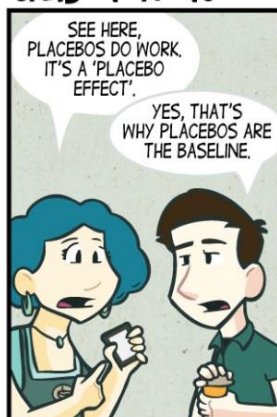
### Using The Placebo Effect To Your Advantage

We're a long way from fully understanding the placebo effect. But here are some things you can do (and think), based on what researchers have discovered so far:

1. **Make sure you're getting the support you need from your doctor.** Placebo effect research has shown how important a supportive doctor-patient relationship can be. If you're not getting the support and attention you need, consider switching doctors.
2. **Recognize that it might be "in your head" — but there's nothing wrong with that.** Behind the subjective experience of feeling better (and worse) are objective changes in brain chemistry that we've only started to understand.
3. **Find treatments you can believe in...** Expectations that an intervention will have some benefit increase the chances that it will.
4. **...but keep your healthy skepticism.** Quacks and charlatans can exploit the placebo effect to peddle treatments that are useless, and even harmful, if for no other reason than they keep people from getting treatment that is directly effective.

### CARBON DATING

A COMIC STRIP ABOUT SCIENCE, PSEUDOSCIENCE, & GEEKY RELATIONSHIPS



WRITTEN BY @CARBONKYLE



ART BY @ELISAWIKEY



CARBONCOMIC.COM

Miss Foley

HSci20: HC1 Philosophies

**Western Medicine**

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Name: \_\_\_\_\_ Date: \_\_\_\_\_

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**Western Medicine**

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## **Design Your Own Clinical Trial**

Using the following steps of the scientific method, design a randomized controlled clinical trial to test a topic of your choosing:

Question:

Hypothesis:

Materials:

Procedure:

☐ Single-Blind

☐ Double-Blind

## HSci20: HC1 Philosophies

## Investigation

Choose to investigate one of the following Contemporary and Alternative Medicines (CAM) or Traditional Medicine listed below...indicate by circling which you've chosen:

- Herbs
- Vitamins
- Minerals
- Probiotics
- Essential Oils
- Others?

- Acupuncture
- Massage Therapies
- Yoga
- Reiki
- Spinal Manipulation
- Relaxation Techniques
- Meditation
- Movement Therapies
- Others?

Medicine Wheel  
Sweetgrass  
Tobacco  
Cedar  
Sage  
Traditional Medicinal Plants  
Smudging  
Healing Circles  
Sweat lodges  
Sun Dance  
Pipe Ceremony  
Potlach  
Others?

a. Intended Results & Health Benefits -

b. Education/Training required -

c. Cost associated -

d. Accessibility in our community and in the province -

# Biomedical Ethics

## Autonomy

- The patient has the right to choose to receive or refuse treatment.
- **Informed consent** – The person must understand what they're consenting to, and the risks and benefits of the action.
  - This is a relatively new idea. Even 60 years ago, doctors were trained to only give patients information that was absolutely necessary.
  - Not always possible. When would this not be possible?
    - ✓ Not in a sound mental state
    - ✓ Usually informed consent passes to a close relative in this case.
    - ✓ Sometimes, if no relatives are available, we must use the principle of beneficence.

## Beneficence and Non-Maleficence

- Always act in the patient's best interest and never do harm.
- This may seem like common sense, but these two usually work together.
- Many beneficial procedures involve doing some harm.

## Justice

- Fairness and Equality
- How do we decide who gets access to scarce health resources?
- Who decides what is ethical?

## 4 Questions To Always Ask:

1. What is the ethical question?
2. What are the relevant facts?
3. Who or what will be affected by the outcome?
4. What are the relevant ethical considerations? Such as:
  - Respect for persons
  - Harms and benefits
  - Fairness
  - Authenticity
  - Responsibility



## **Case Studies - Difficult Choices**

Source: Modified from its original version found in *Doing It Right: A Practical Guide to Ethics for Medical Trainees and Physicians* by Philip C. Herbert

Read through the true case presented below. Decide whether Mr. Grouch should be artificially fed.

### **Case 1: Quality of Life**

A 76-year old man (Mr. Grouch) with advanced dementia requiring 24-hour nursing care has now stopped eating and has developed a cough. The quality of his life has markedly diminished in the past few years; he has largely been bedridden and incontinent. While not evidently in physical pain, Mr. Grouch is totally confused and often agitated and seems fearful of his surroundings. Should he be artificially fed? (Hébert, 1995, p. 178)

Now that you have made your decision, explain how you came to the decision you did:

Ethics is about right and wrong and the reasons that we give for our choices and actions. This is clearly central to Health Science, since doing the right thing for patients--minimizing suffering and treating illness--contains a large moral component. Ethics should help clarify and present alternatives when you are faced with a difficult decision within the Health Science field. When it comes to ethical problems and dilemmas, you should first of all be able to recognize them and be able to analyze them carefully; keeping in mind the **three core ethical principles**:

1. What does the patient want? **(Autonomy)**
2. What can be done for the patient and what are the harms and benefits? **(Beneficence and Non-Maleficence)**
3. Are the patient's requests fair and able to be satisfied? **(Justice)**

A 7-step procedure for resolving ethical dilemmas has been proposed by Philip C. Hébert; this is not a moral set of rules, but is "good enough for our purposes" (1995, p. 15).

1. **Recognize that a case raises an important ethical problem.** Ethical problems arise when there is a conflict of values and when there are different ways of proceeding. It is important to be as knowledgeable as possible about the case.
2. **Identify the problem that needs to be solved.** Once the problem is precisely identified, you will be better able to decide what resources you need to handle the problem.
3. **Determine reasonable alternative courses of action.** These options need not be exhaustive, but they should be clearly distinct.
4. **Consider each option in relation to the three fundamental ethical principles.** None of these principles is always paramount, but in certain situations, one may trump another.
5. **Decide of a resolution to the problem.** Your conclusion may be disputed, so you should be able to say why you think it is the best one.
6. **Consider your position critically.**
  - Are there circumstances under which you would advocate a different course of action? Could your decision be formulated into a general principle?
  - Consider your emotions, conscience and the opinion of others.
  - Would you make the same choice if your decision were made public?
7. **Do the right thing!**

## **Case 2: A Starving Patient with Anorexia: To Feed or Not to Feed?**

A 22-year old woman with an 8-year history of severe anorexia nervosa (an illness of self-starvation), is brought into the emergency room in cardiovascular collapse. She is extremely emaciated, weighing less than 60 pounds, and is virtually unresponsive. She receives a bolus of intravenous glucose and perks up long enough to pull out her intravenous line.

The patient has been admitted numerous times in her starved state and has spent most of her previous eight years in hospital. All corrective therapy has so far failed, and she has been considered one of the most difficult patients by various hospitals. On previous admissions, she has been force fed. Her resistance to this has required restraints and caused major disruptions on the ward. She has not consistently expressed a wish to die, although she told her family doctor that she wished her suffering would end soon and requested no forced feedings in the future. She is unhappy with her weight (she thinks she is overweight) and does not feel that her refusal of food endangers her life.

What should be done on this admission? Suppose the peripheral intravenous line cannot be re-started. Would it be reasonable to provide her nutrition through a gastrostomy tube (a tube in the stomach through a small incision in the abdominal wall) and restrain her against her will until she gains weight? (Hébert, 1995, p. 21)

1. The Case:

2. The Problem:

3. The Alternatives:

4. The Key Considerations:

- *Autonomy:*

- *Beneficence & Non-Maleficence:*

	Force Feed	Not Force Feed
Benefits		
Harms		

- *Justice:*

- *Context:*

5. The Resolution:

6. Critical Considerations:

7. Action Required:

### **Case 3: Cultural Influence**

Mrs. S. is a 53-year old female patient hospitalized for weight loss and anemia. She is found to have inoperable colonic cancer. She speaks no English.

Her family requests that you not tell her the true diagnosis. They say that in their culture, patients are not told bad news. They feel that such news will be too stressful for her and that they will be able to look after her needs better if she does not know. Despite many discussions with them, they remain adamant in their views. What should you do? (Hébert, 1995, p. 76)

### **Case 4: Prior Wishes**

A 54-year old woman presents to the emergency room in a coma from a drug over-dose. She needs to be intubated and put on a ventilator as her level of consciousness is declining and she will not be able to breathe on her own. She has a written advance directive that says she does not want to be ventilated. Her family says this has been her expressed wish since a motor vehicle accident three years ago left her a quadriplegic. Should she be intubated despite such advance instructions? (Hébert, 1995, p. 33)

### **Case 5: Secrets**

A 20-year old female student has recently become your patient. She has been well other than undergoing surgery as a young teen for what she was told were 'diseased reproductive organs'. She knows little else about the surgery.

When you receive her medical records, a letter from her pediatrician informs you that she is, in fact, genetically a male and has androgen insensitivity syndrome. (A disorder of gonadal dysgenesis; patients usually have an XY genotype with inguinal testes and a female phenotype. The testes are removed to prevent the risk of gonadal cancer.) The patient's family and her physicians decided not to tell the patient of her 'true sex', feeling it would do her no good and possibly cause great psychological trauma. The letter urges all future caregivers not to tell her. What, if anything, should you say to this patient? (Hébert, 1995, p. 70)

## Informed Consent To Treatment

- Throughout Canada, before health care professionals may treat a client, they must require the **informed consent of the client**. The health care professional must determine whether the person is **capable of giving consent to treatment**.
- The individual's capacity to give consent can change. One day they may be capable, the next, incapable. If a person becomes incapable (**unable to understand the nature of an intervention**), the issue of consent must be readdressed.

Consent **MUST** be both Informed and Voluntary.

Informed Consent is based on the patient understanding:

1. **the treatment or procedure**
  2. **the nature and purpose of the proposed treatment**
  3. **risks, side effects, benefits and expected outcomes**
  4. **implications of refusing recommended treatment**
  5. **be made aware of alternatives (if any) to the proposed treatment so client has choices**
- Health care professionals have an obligation to use language that is at an appropriate level and to discuss the information when the client is not stressed or unhappy (may require second explanations of the intervention when the client is in a calm frame of mind)

### Voluntary Consent:

Clients must not feel compelled to make a decision for fear of criticism, nor must they feel pressured toward any particular decision by the information provider or anyone else.

- At times only a fine line exists between coercing (i.e., bullying) and making a recommendation especially when the health care professional feels strongly that the client should consent to a treatment, and the client is leaning toward refusing it.

According to the Supreme Court of Canada, it is the basic right of every capable person to decide which medical interventions he or she will accept or refuse. It shows respect for the client and the person's right to autonomy; it also improves client compliance with treatment regimes.

Every province has its own legislation regarding informed consent. Health care providers are encouraged to obtain written consent for all medical services even minor medical services like immunizations.



### Written Consent:

- Major medical interventions require signed, written consent as confirmation that the appropriate process for obtaining consent was followed and that the client has agreed to the intervention.
- Client must understand the intervention along with the risks and benefits
- Most forms must be signed by the client, dated and witnessed (the definition of a witness varies in different areas)
- For minor or major surgeries, physicians or registered nurse will usually witness the consent
- The witness must be sure the client understands what they are signing. If there is doubt, there must be further explanation and clarification.
- Most hospitals have a list of volunteer interpreters should the need arise, but interpreters who can deliver health-related information clearly and accurately are not always available. Often family members translate and what is presumed to be "informed consent" may not be.

### Oral Consent:

- Given by spoken word over the phone or in person and is as equally binding as written consent
- At times, someone other than the client offers consent to surgery
- Two people must validate that consent has been given
- Written consent is still preferred for complex treatments

### Implied Consent:

- Consent assumed by the client's actions, such as seeking out the care of a health care professional or failure to resist or protest. More and more health care professionals are requesting written consent even for treatments within a health clinic (e.g., receiving immunizations at the clinic).
- By allowing themselves to be admitted into a hospital, clients imply their consent to certain interventions (e.g., allowing the nurse to give them a bath or take vital signs). However, where possible oral consent should be obtained. "Is it okay if I change your dressing in a little while?" \*Refusal to treatment will be documented with reasons provided\*

### Who Can Give Consent:

- The person receiving intervention most often gives consent for treatment
- If the person is incapable of providing consent (e.g., is unconscious or not mentally competent), the person's legal representative or next of kin assumes the responsibility.
- The person who has **power of attorney** (A legal document naming a specific person or persons to act on behalf of another in matters concerning personal care, personal estate or both) may take on this duty.
- If no power of attorney is present, most provinces and territories will allow a spouse (legal or common law) or another family member to legally provide consent. In some locations, there is a designated order depending on the availability of particular relatives – typically, a spouse will have control before a mother and father who have control before a sibling, then aunts and uncles and so on.



- In most regions, there is no specific age defining a **minor** (a person under the age of majority in a particular province or territory) when it comes to providing independent consent to treatment or to requesting treatment without a parent's knowledge.
  - As long as the minor fully understands the treatment (along with risks and benefits), he or she can make an informed decision about accepting or rejecting treatment, and health care professionals **MUST** respect his or her wishes.
  - When a minor's consent is accepted, the minor is referred to as a *mature minor*. Frequently, a minor's consent to treatment is made along with the parents.
  - *Emancipated minors* – those married, living on their own, or showing independence from parents in some way – may also consent to medical care.
  - When required, either parent with legal custody of the minor (or legally appointed guardian) can provide consent to treatment.

**\*\***In the view of the courts, if the children are too young to hold and express beliefs or understand the consequences of receiving or not receiving treatment, courts will uphold requests made to intervene on the child's behalf.

### **Informed Consent Questions**

1. What are the three types of consent that are accepted?
2. What two conditions must be met in order for consent to be binding?
3. What is the minor referred to when he/she exercises the right to consent to treatment and it is accepted?
4. What five conditions must be met in order for consent to be considered *informed*?
5. Give at least three reasons why consent needs to be *voluntary* by the client.
6. What is the most preferred method of consent and why?
7. What are the three things that must appear on a written consent document?

8. How many people must witness oral consent?
9. What does it mean to have *implied consent*? Give an example of *implied consent*.
10. Who most often is the one to give consent?
11. Why would a person be unable to give consent in their own treatment? What happens if they are unable to provide consent?
12. Most regions have an order of next of kin. Who is the first to provide consent? Second? Third? Fourth?
13. How old does a person have to be in order to refuse treatment? Could a one year old child refuse a vaccination? Explain.
14. What does it mean to be an *emancipated minor*? And how does this affect this person's right to consent to treatment?

**\*\*FOR THE FOLLOWING QUESTIONS (#1-4), answer on a separate sheet of paper with your answers NEATLY handwritten to be handed in.**

1. In early 2007, a Jehovah's Witness woman gave birth to sextuplets in BC. Two infants died at birth, and physicians at the hospital determined that more would die unless they received blood transfusions. The parents adamantly refused the procedure.
  - a. Research this incident and describe the final outcome.
    - (i) From the parent's perspective, why would you not agree to the blood transfusions?
    - (ii) As a doctor, what would be your argument to giving the infants blood transfusions?
  - b. Provide clear arguments for each side and describe your own personal opinion on whether the correct decision was made.
2. Mary reads through the form the nurse has brought her which is a consent form for what she had discussed with her doctor - a hysterectomy. The surgery listed on the form is a "pan-hysterectomy". Mary looks at the word and says, "I'm not sure what that means, but I'm sure it's all right. The doctor said he was going to take out my uterus." Research these terms.
  - a. If you were Mary's witness, what would you tell her?
3. Jennifer has terminal cancer. She asks the doctor, "What is really best for me? You have more knowledge and experience."
  - a. What criteria of consent is Jennifer trying to meet by asking questions? How do you know?
4. What if Jennifer said, "Dr., I am not sure I want the chemotherapy? You sound almost angry with my decision. I know you think I should have it....I'm confused."
  - a. What is the problem in this situation?
  - b. What criteria of consent is the doctor not meeting for Jennifer?
  - c. What could be reasons why Jennifer may choose not to go through with chemotherapy?
  - d. As her witness, what would you recommend her to do? Why?

## **Informed Consent To Treatment**

Throughout Canada, before health care professionals may treat a client, he or she requires the \_\_\_\_\_ . The health care professional must determine whether the person is \_\_\_\_\_ .

The individual's capacity to give consent can change.

If a person becomes incapable ( \_\_\_\_\_ ),  
the issue of consent \_\_\_\_\_ .

Consent \_\_\_\_\_ be both \_\_\_\_\_ and \_\_\_\_\_ .

**Informed Consent** is based on the patient understanding:

- 1) \_\_\_\_\_
- 2) \_\_\_\_\_
- 3) \_\_\_\_\_
- 4) \_\_\_\_\_
- 5) \_\_\_\_\_

\*Health care professionals have an obligation \_\_\_\_\_  
and to \_\_\_\_\_

(may require second explanations of the intervention when the client is in a calm frame of mind).

### **Voluntary Consent:**

Clients \_\_\_\_\_ ,  
nor must they feel \_\_\_\_\_  
by the \_\_\_\_\_ or anyone else.

At times only a fine line exists between \_\_\_\_\_ (i.e., \_\_\_\_\_ )  
and making a recommendation especially when the \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

According to the \_\_\_\_\_, it is the basic right of every capable person to \_\_\_\_\_.

It shows \_\_\_\_\_ and \_\_\_\_\_; it also improves client compliance with treatment regimes.

\_\_\_\_\_ has its own legislation regarding informed consent. Health care providers are \_\_\_\_\_.

## **Types of Consent:**

### **Written Consent:**

- Major medical interventions require signed, written consent as \_\_\_\_\_ and that the client has \_\_\_\_\_.
- Client must \_\_\_\_\_ along with the \_\_\_\_\_.
- Most forms must be \_\_\_\_\_, \_\_\_\_\_ and \_\_\_\_\_ (the definition of a witness varies in different areas).
- For minor or major surgeries, \_\_\_\_\_ will usually witness the consent.
- The \_\_\_\_\_ must be sure the client understands what they are signing. If there is doubt, there must be \_\_\_\_\_.
- Most hospitals have a list of \_\_\_\_\_ should the need arise, but interpreters who can deliver health-related information clearly and accurately are not always available. Often family members translate and what is \_\_\_\_\_.

### **Oral Consent:**

- Given by \_\_\_\_\_ or \_\_\_\_\_ and is as \_\_\_\_\_.
- At times, someone other than the client offers consent to surgery.
- \_\_\_\_\_ must \_\_\_\_\_ that consent has been given.
- \_\_\_\_\_ is still preferred for complex treatments.

**Implied Consent:**

- Consent assumed \_\_\_\_\_, such as seeking out the care of a health care professional or \_\_\_\_\_. More and more health care professionals are requesting written consent even for treatments within a health clinic (e.g., receiving immunizations at the clinic).
- By allowing themselves \_\_\_\_\_, clients imply their consent to certain interventions (e.g., \_\_\_\_\_). However, where possible \_\_\_\_\_ should be obtained. "Is it okay if I change your dressing in a little while?"

\*Refusal to treatment are recorded on health records with reasons for refusal provided by the client\*

**Who Can Give Consent:**

- The \_\_\_\_\_ most often gives consent for treatment
- If the person is \_\_\_\_\_ of providing consent (e.g. \_\_\_\_\_), the \_\_\_\_\_ or \_\_\_\_\_ assumes the responsibility.
- The person who has \_\_\_\_\_ (A legal document naming a specific person or persons to act on behalf of another in matters concerning personal care, personal estate or both) may take on this duty.
- If no power of attorney is present, most provinces and territories will allow a \_\_\_\_\_ (\_\_\_\_\_) or another family member to provide consent legally. In some locations, there is a designated order depending on the availability of particular relatives – typically, a \_\_\_\_\_ will have control before a \_\_\_\_\_ who have control before a \_\_\_\_\_ then \_\_\_\_\_ and so on.
- In most regions, there is \_\_\_\_\_ (a person under the age of majority in a particular province or territory) when it comes to providing independent consent to treatment or to requesting treatment without a parent's knowledge.
  - As long as the minor \_\_\_\_\_ (along with risks and benefits), he or she can make an \_\_\_\_\_, \_\_\_\_\_ and health care professionals \_\_\_\_\_.
  - When a minor's consent is accepted, the minor is referred to as a \_\_\_\_\_. Frequently, a minor's consent to treatment is made \_\_\_\_\_.
  - \_\_\_\_\_ – those \_\_\_\_\_,

\_\_\_\_\_, or showing independence from parents in some way – may also \_\_\_\_\_.

- When required, either parent with legal custody of the minor (or legally appointed guardian) can provide consent to treatment.

\*\*In the view of the courts, if the children are \_\_\_\_\_

\_\_\_\_\_, courts will

\_\_\_\_\_made to intervene on the child's behalf.

**Informed Consent Questions** \*To be used as a study tool – not hand in.

1. What are the three types of consent that are accepted?
2. What two conditions must be met in order for consent to be binding?
3. What is the minor referred to when he/she exercises the right to consent to treatment and it is accepted?
4. What five conditions must be met in order for consent to be considered *informed*?
5. Give at least three reasons why consent needs to be *voluntary* by the client.
6. What is the most preferred method of consent and why?
7. What are the three things that must appear on a written consent document?
8. How many people must witness oral consent?
9. What does it mean to have *implied consent*? Give an example of *implied consent*.
10. Who most often is the one to give consent?

11. Why would a person be unable to give consent in their own treatment? What happens if they are unable to provide consent?
12. Most regions have an order of next of kin. Who is the first to provide consent? Second? Third? Fourth?
13. How old does a person have to be in order to refuse treatment? Could a one year old child refuse a vaccination? Explain.
14. What does it mean to be an *emancipated minor*? And how does this affect this person's right to consent to treatment?

**\*\*FOR THE FOLLOWING QUESTIONS (#1-4), answer on a separate sheet of paper with your answers NEATLY handwritten to be handed in.**

1. In early 2007, a Jehovah's Witness woman gave birth to sextuplets in BC. Two infants died at birth, and physicians at the hospital determined that more would die unless they received blood transfusions. The parents adamantly refused the procedure.
  - a. Research this incident and describe the final outcome.
    - (i) From the parent's perspective, why would you not agree to the blood transfusions?
    - (ii) As a doctor, what would be your argument to giving the infants blood transfusions?
  - b. Provide clear arguments for each side and describe your own personal opinion on whether the correct decision was made.
2. Mary reads through the form the nurse has brought her which is a consent form for what she had discussed with her doctor - a hysterectomy. The surgery listed on the form is a "pan-hysterectomy". Mary looks at the word and says, "I'm not sure what that means, but I'm sure it's all right. The doctor said he was going to take out my uterus." Research these terms.
  - b. If you were Mary's witness, what would you tell her?
3. Jennifer has terminal cancer. She asks the doctor, "What is really best for me? You have more knowledge and experience."
  - b. What criteria of consent is Jennifer trying to meet by asking questions? How do you know?
4. What if Jennifer said, "Dr., I am not sure I want the chemotherapy? You sound almost angry with my decision. I know you think I should have it....I'm confused."
  - e. What is the problem in this situation?
  - f. What criteria of consent is the doctor not meeting for Jennifer?
  - g. What could be some reasons why Jennifer may choose not to go through with chemotherapy?
  - h. As her witness, what would you recommend her to do? Why?

Name: \_\_\_\_\_ Date: \_\_\_\_\_

HSci20: HC2 Bioethics

**Informed Consent**

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## Application: Informed Consent Scenarios

**\*\*FOR THE FOLLOWING QUESTIONS (#1-4), answer on a separate sheet of paper with your answers NEATLY handwritten to be handed in.**

1. In early 2007, a Jehovah's Witness woman gave birth to sextuplets in BC. Two infants died at birth, and physicians at the hospital determined that more would die unless they received blood transfusions. The parents adamantly refused the procedure.
  - a. Research this incident and describe the final outcome.
    - (i) From the parent's perspective, why would you not agree to the blood transfusions?
    - (ii) As a doctor, what would be your argument to giving the infants blood transfusions?
  - b. Provide clear arguments for each side and describe your own personal opinion on whether the correct decision was made.
2. Mary reads through the form the nurse has brought her which is a consent form for what she had discussed with her doctor - a hysterectomy. The surgery listed on the form is a "pan-hysterectomy". Mary looks at the word and says, "I'm not sure what that means, but I'm sure it's all right. The doctor said he was going to take out my uterus." Research these terms.
  - a. If you were Mary's witness, what would you tell her?
3. Jennifer has terminal cancer. She asks the doctor, "What is really best for me? You have more knowledge and experience."
  - a. What criteria of consent is Jennifer trying to meet by asking questions? How do you know?
4. In #3, what if Jennifer said, "*Dr., I am not sure I want the chemotherapy? You sound almost angry with my decision. I know you think I should have it....I'm confused.*"
  - a. What is the problem in this situation?
  - b. What criteria of consent is the doctor not meeting for Jennifer?
  - c. What could be some reasons why Jennifer may choose not to go through with chemotherapy?
  - d. As her witness, what would you recommend her to do? Why?



RELIGION	BELIEFS ABOUT BIRTH	BELIEFS ABOUT DEATH	HEALTH CARE BELIEFS	SPECIAL SYMBOLS, BOOKS, RELIGIOUS PRACTICES
<b>Judaism (Orthodox)</b>	No infant baptism. Male circumcision performed on 8th day after birth by Mohel (circumcisor), child's father or Jewish physician	Person should never die alone. Body is ritually cleaned after death. May bury dead before sundown on the day of death and usually within 24 hours. Autopsy only when required by law. Organ donation only after consultation with rabbi. Cremation forbidden.	May refuse surgical procedure or diagnostic tests on Sabbath or holy days. Family may want surgically removed body parts for burial. Ritual handwashing upon awakening and prior to eating.	Lord God Jehovah is one. Sabbath is sunset Friday to sunset Saturday. Sabbath is devoted to prayer, study, and rest. Torah is basis of religion (five books of Moses). Rabbi is spiritual leader. Cantor often leads prayer services, performs marriages, and conducts funerals. Star of David is symbol of Judaism. Fast (no food or drink) during some holy days. Men may wear kippah or yarmulke (small cap) and a tallith (prayer shawl)
<b>Lutheran *(Christian)</b>	Infant baptism by sprinkling (may be performed by any baptized Christian in an emergency)	No last rites. Autopsy and organ donation allowed. Cremation permitted.	Communion often administered by clergy to sick or prior to surgery.	Bible is the holy book. Rite of communion important. Use cross as symbol
<b>Methodist (United)*(Christian)</b>	Infant baptism	No last rites. Organ donations are encouraged. Cremation permitted.	May request communion before surgery or while ill.	Bible is holy book. Rite of Communion important. Religion is a matter of personal belief and provides a guide for living. Use cross as symbol.
<b>Mormon (Latter Day Saints)</b>	Infant blessed by clergy in church as soon as possible after birth. Baptism at 8 years of age.	May want church elders present at death. No last rites. Autopsy and organ donation is individual's decision. Cremation discouraged.	May believe in divine healing with "laying on of hands" by church elders. Anointing with oil can promote healing.	mormon refers to the four holy books: <i>The Bible, The Book of Mormon, The Doctrine and Covenants</i> , and <i>Pearl of Great Price</i> . Special undergarment may be worn to symbolize dedication to God and should not be removed unless necessary. Fast on first Sunday of each month. Avoid medications containing alcohol or caffeine.
<b>Presbyterian *(Christian)</b>	Infant baptism	No last rites. Autopsy and organ donation permitted. Cremation permitted.	Prayer and counselling an important part of healing. May request communion while ill or before surgery.	Bible is holy book. Rite of Communion important. Salvation is a gift from God. Use cross as symbol.
<b>Roman Catholic *(Christian)</b>	Infant baptism mandatory. Baptism necessary for salvation (any baptized Christian may perform an emergency baptism)	Sacrament of the Sick (last rites) performed by priest. Autopsy and organ donation permitted. Cremation permitted.	Sacrament of the Sick and anointing with oil. Life is sacred: abortion and contraceptive use prohibited. Believe embryos are human beings and should not be destroyed or used for research.	Bible is holy book. Rite of Holy Eucharist (Communion) important. May use prayer books, crucifix, rosary beads, religious medals, pictures and statues of saints. Confession used as a rite for forgiveness of sins. Use cross as symbol.
<b>Russian Orthodox *(Christian)</b>	Infant baptism by priest.	Last rites by ordained priest mandatory. Arms of deceased are crossed. Autopsy only if required by law. Organ donations not encouraged. Cremation prohibited.	Holy Unction and anointing body with oil used for healing. Will accept most medical treatments but believe in divine healing.	Bible is holy book. Rite of Communion important. May wear a cross necklace that should not be removed unless absolutely necessary. Use cross as symbol.
<b>Seventh Day Adventists *(Christian)</b>	No infant baptism (baptize individuals when they reach the age of accountability.)	No last rites. Autopsy only when required by law. Organ donation is an individual decision.	May avoid over the counter medications and caffeine. May anoint body with oil. Use prayer for healing. Some believe only in divine healing. Will accept required immunizations.	Literal acceptance of Holy Bible. Rite of Communion important. Sabbath worship is sunset on Friday to sunset on Saturday.

RELIGION	BELIEFS ABOUT BIRTH	BELIEFS ABOUT DEATH	HEALTH CARE BELIEFS	SPECIAL SYMBOLS, BOOKS, RELIGIOUS PRACTICES
<b>Baptist</b> *(Christian)	No infant baptism. Baptism after person reaches age of understanding	Clergy provides prayer and counseling to patient and family. Autopsy, organ donation and cremation are an individual's choice. No last rites	Oppose abortion. Some believe in the power of "laying of hands". May respond passively to medical treatment, believing that illness is "God's will". Physician is instrument for God's intervention	Bible is the holy book. Rite of Communion is important. Baptism by full immersion in water after a person reaches an age of understanding and accepts Jesus Christ. Some use cross as symbol
<b>Buddhism</b>	No infant baptism but have infant presentation to dedicate child to Buddha	Believe in reincarnation. Desire calm environment and limited touching during the process of death. Buddhist priest must be present at death. Last rites chanted at bedside immediately after death. Autopsy and organ donation are controversial but usually regarded as an individual's choice. Cremation is common	Suffering is an inevitable part of life. Illness is the result of negative Karma (a person's acts and their ethical consequences). Cleanliness is important to maintain health.	Belief in Buddha, the "enlightened one". Tipitaka, three collections of writings are Buddhist canon. Nirvana, the state of greater inner freedom, is the goal of existence. Emphasize practice and personal enlightenment rather than doctrine or study of scripture. May use pictures or statues of Buddha as religious symbols. Some wear mala beads around the left wrist that may be removed if absolutely necessary
<b>Christian Scientist</b> (*Christian)	No infant baptism	No last rites. Autopsy only when required by law. Organ donation discouraged but can be an individual's decision	Illness can be eliminated through prayer and spiritual understanding. May not use medicine or surgical procedures. May refuse blood transfusions. Will accept legally mandated immunizations	Bible is the holy book. Rite of Communion is important. <i>Science and Health</i> by Mary Baker Eddy is basic textbook of Christian Science. Prayer and Faith will maintain health and prevent disease.
<b>Episcopal</b> *(Christian)	Infant baptism (may be performed by anyone in an emergency)	Some observe last rites by priest. Autopsy and organ donation encouraged. Cremation is an individual's choice	May use Holy Unction or anointing of the sick with oil as a healing sacrament	Bible is the holy book. Rite of Communion important. Book of Common Prayer. Use cross as the symbol
<b>Hinduism</b>	No ritual at birth. Naming ceremony is performed 10-11 days after birth to obtain blessings from gods and goddesses	Believe in reincarnation as humans, animals or even plants. Ultimate goal is freedom from the cycle of rebirth and death. Priest ties thread around the neck or wrist of the deceased and may pour water in the mouth. Only family and friends may touch and wash the body. Autopsy and organ donation discouraged but regarded as individual's decision. Cremation preferred	Some believe illness is punishment for sins. Some believe in faith healing. Will accept most medical interventions. Abortion and birth control are discouraged	Bedas, four books, are the sacred scripture. Bhrama is principal source of universe and center of all things. All forms of nature and life are sacred. Person's Karma is determined by accumulated merits and demerits that result from all the actions the soul has committed in the past life or lives. Cows are sacred and feeding a cow is an act of worship. May use symbols such as statues of various gods, flat stones, incense or sandalwood.
<b>Islam (Muslim)</b>	Believe that first words an infant should hear at birth are "There is no God but Allah, and Mohammed is His prophet."	Family must be with dying person. Dying person must confess sins and ask forgiveness. Only family touches or washes body after death. Body is turned toward Mecca after death. Autopsy only when required by law. Organ donation is permitted if the donor consents in writing. Cremation not permitted	Illness is an atonement for sins. May face city of Mecca (southeast direction if in Canada) five times a day to pray to Allah. Ritual washing before and after prayer. Must take medications with right hand since left hand is considered dirty.	Allah is supreme deity. Mohammed, founder of Islam, is chief prophet. Holy Day of Worship is sunset Thursday to sunset Friday. Koran is holy book of Islam (do not touch or place anything on top). Prayer rug is sacred. Fast during daylight hours in month of Ramadan and during other religious holidays. May wear item with words from Koran on arm, neck, or waist; do not remove or allow item to get wet. An Imam is a Muslim preacher and teacher.
<b>Jehovah's Witness</b> *(Christian)	No infant baptism. Baptism by immersion done when child accepts beliefs	No last rites. Autopsy only when required by law. Organ donation discouraged but can be an individual's choice. All organs and tissues must be drained of blood before transplantation. Cremation permitted.	Prohibited from receiving blood or blood products. Elders of the church will pray and read scriptures to promote healing. Medications accepted if not derived from blood products.	Name for God is Jehovah. Bible is the holy book: New World Bible. Rite of Communion important. Church elders provide guidance. Each witness is a minister who must spread the group's teachings. Acknowledge allegiance only to kingdom of Jesus Christ and refuse allegiance to any government

Name: \_\_\_\_\_ Date: \_\_\_\_\_

HSci20: HC2 Bioethics

**Death Defined**

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## **5<sup>th</sup> Estate: Dead Enough Questions (45:12)**

Name: \_\_\_\_\_ Date: \_\_\_\_\_

HSci20: HC2 Bioethics

**Death Defined**

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## Saskatchewan Organ and Tissue Donation

The need for organs and tissue for transplants far outweighs the available supply. Becoming an organ or tissue donor is one way you can help alleviate this need, and it may be a decision that's right for you. There are two ways to donate: living donation and deceased donation. Before any choice is made, it's important to talk to your family about your decision to donate.

### Living Donation

You can be a living donor by providing a non-vital organ or tissue to a family member or another person in need. Living donation includes:

- **Amniotic membrane** - Donated after elective C-section deliveries, it is used in a number of eye surgery procedures.
- **Bone** - Most donated bone comes from hip replacement surgeries. Many surgical procedures require bone grafts. Bone aids in healing and strengthens and improves function.
- **Kidney** - About 40-50 per cent of kidney transplants in Saskatchewan are made possible through living donors.
- **Liver** - In living-donor transplants, surgeons remove a portion of a donor's liver.

### Deceased Donation

Deceased donation happens when organs and tissue are available for transplant after someone has died. Deceased donation includes:

- |                        |           |                       |
|------------------------|-----------|-----------------------|
| • Bone                 | • Lungs   | • Pancreas            |
| • Cornea               | • Liver   | • Skin                |
| • Heart & heart valves | • Kidneys | • Tendons & ligaments |

Organ and tissue donation is anonymous. However, the Saskatchewan Transplant Program does offer donors and recipients the opportunity to correspond in writing through de-identified letters delivered and received through the program.

### Fast Facts

- One organ donor can save up to eight lives, and one tissue donor can improve the lives of more than 75 people.
- The first transplant in Saskatchewan, a kidney, took place just over 50 years ago on December 10, 1963.
- Over 800 kidney transplants have been performed in our province since 1963.
- Currently, about 90 people are waiting for a kidney transplant in Saskatchewan and a similar number are waiting for corneas.
- Approximately, 25 to 30 organ transplants take place each year in our province.
- In 2013, there were six multi-organ donors and 44 cornea donors in Saskatchewan.
- The oldest person to be an organ donor (kidney) in Canada was 92 years old.
- The red organ/tissue donor sticker on a SK Health Services card confirms a person's wishes for donation. **Stickers are available by calling the Saskatchewan Transplant Program at 1-306-655-5054 in Saskatoon.** In SK, organ/tissue will not be donated without your family or next-of-kin's consent. Talk to your family about your decision to donate.



**Source:** Saskatoon Health Region: About Organ & Tissue Donation and Saskatchewan Transplant Program  
[https://www.saskatoonhealthregion.ca/locations\\_services/Services/organ-tissue-donation/Pages/About.aspx](https://www.saskatoonhealthregion.ca/locations_services/Services/organ-tissue-donation/Pages/About.aspx)



# Saskatchewan Transplant Program

The Saskatchewan Transplant Program was established in 1989 to facilitate organ and tissue donation and transplantation for Saskatchewan residents. The transplant team includes physicians, surgeons, nurses, social workers, pharmacists and many other healthcare providers who offer services in both Saskatoon Health Region and Regina Qu'Appelle Health Region.

Through the program, individuals can donate or receive amniotic membrane, bone, corneas and kidneys (from both living and deceased donors), as well as ligaments and tendons. When patients need a heart, lung, liver or pancreas transplant, they are placed on the National Organ Wait List (a feature of the Canadian Transplant Registry), which is maintained by Canadian Blood Services. The Wait List allows for organs other than kidneys to be shared between provinces for patients in urgent need of a transplant.

When an organ becomes available, the Saskatchewan Transplant Program works with its affiliates across the country to assist Saskatchewan patients who are being assessed for, or have received, a heart, lung, liver or pancreas transplant. Coordinators are available to answer your questions about organ and tissue donation and transplantation 24 hours a day 7 days a week. Call switchboard at 1-306-655-8000 and ask for the organ and tissue donor coordinator on call.

The Saskatchewan Transplant Program operates two organ and tissue banks: the Tissue and Bone Bank and the Lions Eye Bank of Saskatchewan.



**Tissue and Bone Bank** - This team obtains:

- Bone from living and deceased donors
- Heart valves from deceased donors, in cooperation with Alberta Health Services
- Amniotic membrane from elective C-section deliveries.

**Lions Eye Bank of Saskatchewan** - This team obtains corneas from deceased donors for use in sight restoring corneal transplant surgery.

## Resources

Click on the links below to learn more about organ and tissue donation.

[Canadian Blood Services](#)

[Canadian Society of Transplantation](#)

[Canadian Transplant Association](#)

[The Kidney Foundation of Canada](#)

[The Transplant Journey Guide Book](#)

**Source:** Saskatoon Health Region: About Organ & Tissue Donation and Saskatchewan Transplant Program  
[https://www.saskatoonhealthregion.ca/locations\\_services/Services/organ-tissue-donation/Pages/About.aspx](https://www.saskatoonhealthregion.ca/locations_services/Services/organ-tissue-donation/Pages/About.aspx)

# **An Ethical Case Study: Vaccination Debate**

## **Day 1: Ethics Research Notes**

Start your research with the provided information. Read the article and watch the two videos hyperlinked at the end of the article. Take notes as you research. Feel free to use the provided rubric to help you set up your Research notes as it will be how they are assessed. Your personal Research Notes will be handed in following the debate.

## **Day 2: Ethics Research Notes & Debate Format**

Obtain a copy of the Debate Format from your teacher. You will declare your position...for (PRO) or against (CON). You will then combine your research to prepare your position and counter argument/rebuttal statements for the debate.

Expand your research preparing to contribute to the debate fully. You are welcome to use the hyperlinks in the provided article and are encouraged to expand your research further. Add any new information found to your research notes. Be sure to build support, think of possible counter arguments, and prepare possible rebuttals for your position.

## **Day 3: Debate**

Debate will follow the provided classroom debate format; taking approximately 40 minutes. Be sure to ***hand in your individual Research Notes following the debate.***

## **A Few Important Thoughts**

Be sure to cite your information if you research any information outside of what has been given as well as any information you use from the 3 sources given to you. You can do this using the website [www.easybib.com](http://www.easybib.com).

This is to be completed individually, and if any form of plagiarism occurs you will initially be given a grade of 0, until you submit your own intellectual work with proper citations. Be sure to use information from the sources you look up as well as what is given but give credit where credit is due.

## **An Ethical Case Study: Vaccination Debate**

The past year has seen confirmed outbreaks of measles across in British Columbia, Alberta, Saskatchewan and Ontario.

[Measles](#) is highly contagious, and can lead to serious complications and death for children under the age of five. It is [strongly recommended](#) by the Public Health Agency of Canada that children are [routinely vaccinated](#) against measles through two doses of the MMR (measles-mumps-rubella) vaccine.

While vaccines protect the individuals who have been vaccinated, they can also help protect a community from the spread of infectious diseases when over a certain threshold of the population has been vaccinated. This concept is known as '[herd immunity](#)', and provides protection for those who are not yet vaccinated.

[The routine vaccination schedule](#) varies among provinces and territories, with children receiving vaccinations from the age of about 2 months up until six years.

However, not all children are vaccinated. Some have [medical conditions](#), such as allergies to some vaccine components or immune disorders. However there are growing numbers of parents choosing not to vaccinate their children for ideological or religious reasons.

[A 2010 Ontario study found](#) that the rate of students with exemptions for school entry vaccination is less than 2 percent, although it noted rising rates of non-medical exemptions amongst children born since 1998. This was the year that the Lancet published a (now refuted) study linking the MMR vaccine to autism. Although the study was based on fraudulent data, it received widespread media attention and publicity, and is [described](#) as sparking "an international crisis of confidence in the safety of the MMR vaccine"

### **Only Three Canadian Provinces Have Mandatory School Entry Vaccination Laws**

Schools are a particularly important setting where infectious diseases can be passed among children.

In Canada only [Ontario](#), Manitoba and [New Brunswick](#) have legislation that [mandates children be vaccinated in order to attend school](#). The [Ontario](#) and [New Brunswick](#) legislation, both of which have been in place since 1982, are quite extensive and require school children to be vaccinated against diseases like diphtheria, tetanus, polio, pertussis (whooping cough), measles, rubella, mumps, varicella (chicken pox) and meningococcal disease. The [Manitoba](#) legislation only requires school children be vaccinated against measles.

However, in each province with mandatory school entry laws there are exemption clauses for children who are not vaccinated due to medical, religious or ideological reasons. To opt out, parents must sign and notarize an affidavit with a statement of these beliefs. Statements of medical exemptions must be provided to schools by a physician or nurse practitioner.

Judy MacDonald, Medical Officer of Health for Calgary notes that Alberta has no legislation in place to mandate that children show proof of vaccination to enter school. However, she



highlights that the province's [Public Health Act](#) requires that in an outbreak "the Medical Officer of Health must exclude children at schools if they aren't immune to measles [have not received the measles vaccine]."

The Alberta approach is in line with the [Public Health Agency of Canada's guidelines](#) around managing a measles outbreak. The guideline states that during a measles outbreak, those who refuse or cannot receive the MMR vaccine "may be excluded from childcare facilities, schools and post-secondary educational institutions at the discretion of the Medical Office of Health." This exclusion period is meant to quarantine the non-vaccinated child and to reduce the chances that she or he will catch or transmit the infection to others.

However, given recent measles outbreaks there has been debate – and [demand](#) from some parents – that school entry vaccination requirements should be put in place in those provinces and territories that do not have them.

Kumanan Wilson, a general internist and Chair in Public Health Policy at the Ottawa Hospital Research Institute, notes that there tend to be two groups of parents who are choosing not to vaccinate their children.

The first are those who have a belief strongly opposing vaccinations, and who will seek out exemptions to the mandatory requirements. He says that the second group is best described as 'vaccine hesitant' parents who either "delayed or forgot about their children's vaccination" and suggests that it is among these parents "where mandatory policies can have an influence."

### **'Vaccine Hesitancy' Among Canadian Parents**

A 2011 [report](#) to the Canadian Public Health Agency of Canada surveyed parents' attitudes towards vaccines. It found that while nine in ten parents believe childhood vaccinations in general are effective and important for their child's health, 35% expressed concerns about the safety of vaccines and half of parents reported speaking to a health care provider regarding their worries about vaccination.

In 2013, the [Canadian Pediatric Society released guidelines](#) to help clinicians have evidence-based conversations with parents who are hesitant or have safety concerns about vaccines.

A Healthy Debate series published in September 2012 noted that these concerns have [translated into decreasing vaccination rates for Canadian children](#) with public health officials finding communicating the benefits of vaccines to parents a challenge. The series also highlighted that there are [significant information gaps](#) about vaccination rates, and outbreaks of vaccine-preventable infectious diseases in Canada.

Catherine Mah, a pediatrician and Assistant Professor at the University of Toronto Dalla Lana School of Public Health says that "more surveillance data breaking down the populations who are not getting vaccinated, or opting out of vaccination policies would be helpful for prevention and planning." She notes that in the United States there is a centrally coordinated national [immunization registry](#) through the US Centre for Disease Control that tracks vaccination data of children across the country.

Experts have highlighted that unlike Canada, all American states have laws (with some variation around specific vaccinations) that mandate children entering school to provide proof of vaccinations. However, studies have shown that there has also been an increase in non-medical exemptions from vaccination requirements in the United States.

In spite of growing exemption rates – seen among populations with strong ideological or religious beliefs – Wilson still sees these laws as an effective tool, in particular for vaccine hesitant parents, or those who forgot or neglected to vaccinate their children according to the schedule. He notes that for some, the mandatory school entry vaccination policies can be “a fail safe mechanism for those who fell through the cracks.”

### **Can exclusion policies effectively contain outbreaks?**

Wilson also questions the value of exclusion policies in curbing the spread of infectious diseases. He says that for measles in particular “which is among the most infectious of the vaccine preventable diseases, it is too little too late, and by the time children are taken out of the school they would have already spread the disease.”

There are significant logistical challenges associated with enforcing exclusion policies and accessing documentation during an outbreak to demonstrate that children have received the two doses of the MMR vaccine. Judy MacDonald says that trying to ascertain proof of vaccination for all students in a school is “very labour intensive and time sensitive.”

Mah highlights that when an outbreak occurs, and responsibility to manage outbreaks and enforce exclusion policies is “decentralized to local authorities such as public health units” as is the case in Alberta, strong communication is needed to coordinate and manage the situation.

In Alberta there has been a great deal of media and public attention around the recent measles outbreak with regular updates on the location of measles cases and outbreaks.

Raphael Sharon, an Edmonton pediatrician notes that he speaks to parents “everyday about the safety and efficacy of these vaccines.” He suggests that growing public concern and conversation about measles has influenced parents who are vaccine hesitant. He suggests that “because of the measles outbreak, more parents are bringing in their kids to get vaccinated.”

Concerns about the ability of exclusion policies to contain outbreaks have motivated some parents to call on provincial governments to add mandatory vaccine legislation.

### **The Ethics Of Mandatory Vaccinations For Children**

In British Columbia, a group of parents have received media attention for starting a petition calling on Premier Christy Clark to introduce mandatory school entry vaccination requirements.

The petition argues that “as of right now schools do not ask if your child is vaccinated. Which means they have no idea how many are covered in their school ...If they have this information they will know if someone is putting everyone (including their own child) at risk by ignoring the policy to stay home during an outbreak.”

Perry Kendall, the Chief Medical Officer of Health in BC has been [quoted in the media](#) that while he “supports the intentions of the petition” he does not believe that “making vaccinations mandatory is a way to achieve that aim.” Kendall notes that outbreaks in BC have been concentrated amongst certain congregations of anti-vaccination religious [communities](#), and that these communities would be best served by education around the benefits of vaccination, rather than mandatory laws.

Healthy Debate has covered the issues of the [ethics](#) and [politics](#) of mandatory vaccinations for health care workers. In the case of children, there are challenging and value-based issues related to who has the right to decide whether children should be vaccinated – parents or the state.

Parents who are hesitant about vaccinations are often “trying to balance a decision between perceived risks of harm of a vaccine, and the risks of the actual disease” says Mah. She notes, however that this “very personal set of choices does influence other people's children.”

[Studies](#) have found that children with non-medical exemptions are at increased risk of acquiring and transmitting vaccine preventable diseases. Measles outbreaks tend to occur in [schools with more unvaccinated children](#), and unvaccinated children are [35 times more likely](#) to contract measles as their vaccinated peers.

Kumanan Wilson says “there is no easy answer here and you have to respect an individual's rights – however, when it is in relation to children, and other children are being put at risk, that is when tension arises.”

“Vaccination is a moral and social obligation on all of us so that we can protect those who can't” says Raphael Sharon. When speaking to parents about vaccinating their children, he stresses that “not vaccinating doesn't just pose potential health risks to your child, but also to those who can't defend themselves from infectious diseases – in particular children under 12 months who haven't yet received the MMR vaccine, and immunocompromised patients of any age. These vulnerable people count on the so-called herd immunity for protection.”

## **Video links:**

<https://www.youtube.com/watch?v=-5WTaLnDPY4> → Jenny McCarthy on Larry King Live

<https://www.youtube.com/watch?v=Rzxr9FeZf1g> → The Science of Anti-Vaccination

## **Classroom Debate**<sup>1</sup>

The classroom debates are exercises designed to allow you to strengthen your skills in the areas of leadership, interpersonal influence, teambuilding, group problem solving, and oral presentation.

### **Debate Format**

(Time Required: 40-45 minutes)

6 minute Position Presentation – PRO  6 minute Position Presentation - CON	<u>Position</u> – What position/plan of action do you take or propose?  <u>Inherency</u> – Why do you think it isn't already this way?  <u>Harms</u> – What are the problems with the current situation or opposition's position?  <u>Solvency</u> – What are reasons why you could solve it or what are advantages to your position being right?
<b>5 minute Work Period</b>	
4 minute Rebuttal – PRO 4 minute Rebuttal - CON	Address any issues presented by the opposition Present predicted counter arguments Prove opposition's position brings more problems than solutions
<b>3 minute Work Period</b>	
2 minute Response – PRO 2 minute Response - CON	Explain again (extend) why your position is a better idea Respond to all negative arguments as to why it is a bad idea Overview: "If you only remember three things...the most important three things are..."
<b>1 minute Work Period</b>	
2 minute Position Summary – PRO or CON  2 minute Position Summary – PRO or CON	What is your position or plan? Why is it a good idea?  Why is the world better off aligning with your position? Refute any negative statements presented in the rebuttal
<b>5 minute Tallying of Ballots/Announcement of Winner</b>	

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## **DEBATE BALLOT**

Debate _____	Class _____
Name of Evaluator _____	Date _____

1	2	3	4	5
Poor	Fair	Average	Good	Excellent

**PRO**

**CON**

### **6 Minute Position Presentation**

Rating = ____ Comments:          	Rating = ____ Comments:          
--------------------------------------------------------------------	--------------------------------------------------------------------

**\*\*\*\*\* 5 Minute Work Period \*\*\*\*\***

### **4 Minute Rebuttal**

Rating = ____ Comments:          	Rating = ____ Comments:          
--------------------------------------------------------------------	--------------------------------------------------------------------

**\*\*\*\*\* 3 Minute Work Period \*\*\*\*\***

Continued on Reverse ----->

**2 Minute Response**

Rating = ____ Comments:	Rating = ____ Comments:
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\*\*\*\*\* 1 Minute Work Period \*\*\*\*\*

**2 Minute Position Summary**

Rating = ____ Comments:	Rating = ____ Comments:
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[      ] Total Points

[      ] Total Points

Circle Winner Below:

**PRO**

**CON**

General Comments:

Signature of Evaluator: \_\_\_\_\_

## Human Body (HB)

### ***HB1: Analyze the anatomy and physiology of a healthy human.***

- a. Examine First Nations, Métis, and other holistic perspectives of the human body.
- b. Describe the anatomy (structure) and physiology (function) of all human body systems (i.e., cardiovascular, endocrine, lymphatic, digestive, urinary, muscular, nervous, respiratory, reproductive, integumentary, and skeletal).
- c. Identify the normal value or range for the common vital signs (e.g., heart rate, blood pressure, temperature, O<sub>2</sub> saturation and respiratory rate).
- d. Demonstrate the scientific use of anatomical terminology, including directional terms, body planes, body regions, and body cavities, to locate anatomical features.
- e. Investigate the anatomical locations of organs in mammals such as pigs, rats, or cats through dissection or virtual simulation.
- f. Design and carry out an investigation to examine baseline values used for assessing health such as heart rate, O<sub>2</sub> saturation, blood pressure, temperature, and respiratory rate.
- g. Discuss the interrelationships between the ABO and Rh blood group systems, an individual's blood type, and blood donor compatibilities.
- h. Investigate benefits of normal flora in the body (e.g., swab skin and examine results).
- i. Research advances in scientific understanding of the anatomy and physiology of humans.

***HB2: Investigate various pathologies and ailments and their effects on cells, tissues, organs, and systems of a healthy human.***

- a. Differentiate among the ways in which medical practitioners and the public describe pathologies using terms such as disease, illness, ailment, disorder, infection, medical condition, syndrome, and abnormal condition.
- b. Examine how the interrelationship between a person's lifestyle and the human immune system affect how the body responds to pathogens (e.g., risky behaviors, poor hygiene, auto-immune, immunocompromised, innate, and adaptive immunity).
- c. Research the symptoms, possible causes, stages, scope (e.g., cells, tissues, organs and/or systems) and prevention of a pathology that affects one or more body systems.
- d. Create a representation (e.g., illness narrative, journal, timeline, story, video, or diorama) of the progression of pathology from the perspective of a real or hypothetical individual, including impacts on their lifestyle.
- e. Outline the history of a disease or illness and its causes, including societal and cultural perspectives.
- f. Compare prepared slides or digital images of healthy and diseased tissues to identify how pathologies affect cells.
- g. Compare how bacteria (e.g., Salmonella, Streptococcus, and Escherichia coli) and viruses (e.g., common cold, influenza, and herpes) differ in how they are transmitted, their impact on the human body, and how each is treated.



## What Do You Know...The Human Body

The human body is an amazing machine that works to keep you alive 24/7. This machine is made up of multiple parts that can be organized into 11 major body systems. You can see a list of these systems in the table below.

1. Based on your background knowledge, complete the table below. For each body system, list as many of the organs in that system as you can then record the function of the system in maintaining your overall health.

System	Important Organs	Function
<i>Circulatory</i>		
<i>Digestive</i>		
<i>Endocrine</i>		
<i>Excretory</i>		
<i>Integumentary</i>		

System	Important Organs	Function
<i>Lymphatic/ Immune</i>		
<i>Muscular</i>		
<i>Nervous</i>		
<i>Reproductive</i>		
<i>Respiratory</i>		
<i>Skeletal</i>		

2. Use the information presented in the video The Human Body Systems: The 11 Champions ([https://www.youtube.com/watch?v=gEUu-A2wfSE&src\\_vid=nnjmrrQ6xOs&feature=iv&annotation\\_id=annotation\\_443279253](https://www.youtube.com/watch?v=gEUu-A2wfSE&src_vid=nnjmrrQ6xOs&feature=iv&annotation_id=annotation_443279253)) to help you add to your table. Check your answers with your teacher once you think your table is done.

## Anatomical Terms

All terms describing the anatomy of organisms assume that the body is in the **classic anatomical position**. For the human, that means standing, facing the viewer. The hands are held down along the side of the trunk, with the palms facing forward. It is often useful to show a figure of a sectioned human body or organ. A **section** refers to a part cut in a plane. A **body plane** is a geometrical concept referring to an imagined flat surface.



**Sagittal Plane** – extends from front to back and top to bottom, dividing the body into left and right portions. A *mid-sagittal (medial) plane* refers to a sagittal plane that divides the body into exactly equal left and right portions.

**Frontal Plane** – extends from right to left and top to bottom, dividing the body into front and back portions.

**Transverse Plane** – extends from right to left at waist level, dividing the body into top and bottom portions.

Directional Term	Definition	Example of usage
Left	To the left of the subject's body	The stomach is to the left of the liver.
Right	To the right of the subject's body	The right kidney is damaged.
Lateral	Toward side; away from midline of body	The eyes are lateral to the nose.
Medial	Toward midline of body; away from side	The eyes are medial to the ears.
Anterior	Toward the front of the body	The nose is on anterior of the head.
Posterior	Toward the back (rear) of the body	The heel is posterior to the toes.
Superior	Above, or towards head	The shoulders are superior to hips
Inferior	Below, or towards feet	The stomach is inferior to the heart.
Dorsal	Along (or toward) vertebral surface of body	Her scar is along the dorsal surface.
Ventral	Along (toward) the belly surface of the body	The navel is on the ventral surface.
Proximal	Portions of limbs closer to body	This joint is proximal to the toe nail.
Distal	Parts and locations further from your body	The hand is distal to the elbow.

### Main Body Cavities = Dorsal (Cranial & Spinal) & Ventral (All Others)

**Cranial** – within the cranium/skull

**Spinal** – within the vertebral column

**Thoracic** – within the rib cage

**Abdominal** – within the abdomen; from the diaphragm to rim of pelvic bones

**Pelvic** – within the pelvis; from pelvic rim to the floor of the trunk

## Surface Regions

There are hundreds of terms that describe specific locations on the surface of the human body. These names are useful for identifying not only surface features but also underlying muscles, bones, nerves, and blood vessels.

- **Abdominal** – area overlying the abdominal cavity.
- **Acromial** – the point of the shoulder.

- **Antebrachial** – forearm

- **Axillary** – armpit

- **Brachial** – upper arm

- **Buccal** – cheek

- **Carpal** – wrist

- **Celiac** – abdomen

- **Cephalic** – head

- **Cervical** – neck

- **Costal** – ribs

- **Coxal** – hips

- **Crural** – leg

- **Cubital** – elbow

- **Digital** – finger

- **Dorsal** – back

- **Femoral** – thigh

- **Frontal** – forehead

- **Genital** – reproductive organs

- **Gluteal** – buttocks

- **Inguinal** – groin

- **Lumbar** – the region of the lower back between the ribs and the pelvis

- **Mammary** – breast

- **Mental** – chin

- **Nasal** – nose

- **Occipital** – the lower posterior region of the head.

- **Oral** – mouth

- **Orbital** – eye cavity

- **Otic** – ear

- **Palmar** – palm of the hand

- **Patellar** – knee

- **Pectoral** – chest

- **Pedal** – foot

- **Pelvic** – pelvis

- **Perineal** – the region between the anus and the external reproductive organs

- **Plantar** – sole of the foot

- **Popliteal** – area behind the knee

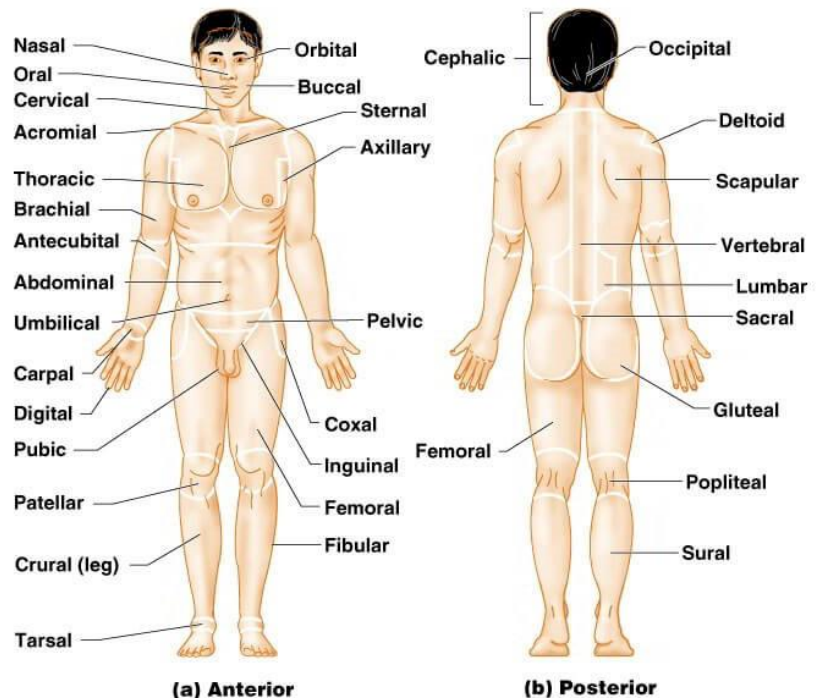
- **Sacral** – posterior region between the hipbones

- **Sternal** – middle of the thorax, anteriorly.

- **Tarsal** – instep of the foot

- **Umbilical** – navel

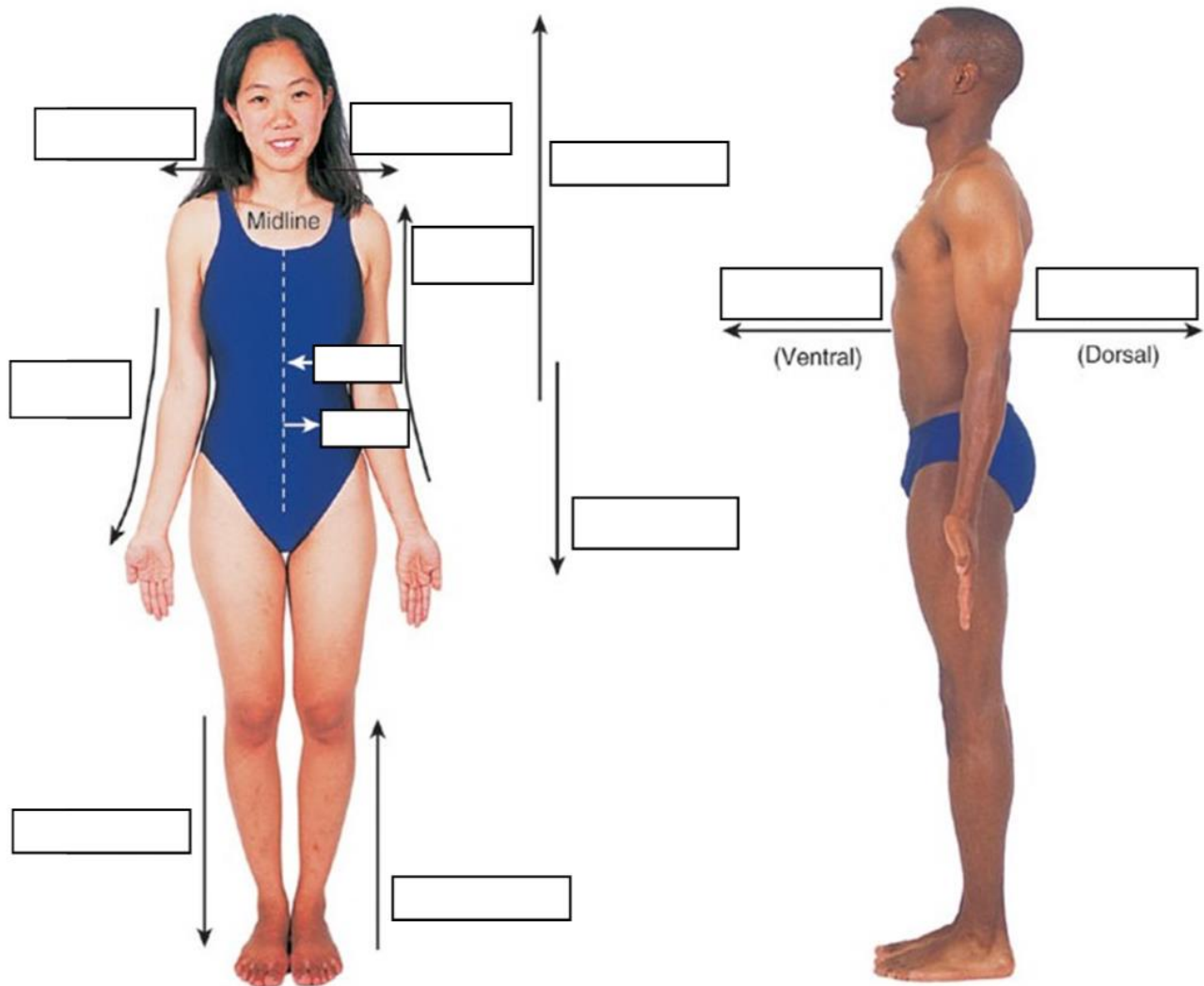
- **Vertebral** – spinal column



## Did You Know...Anatomical Terms

Zoologists, anatomists and various health care professionals use anatomical and directional terms every day. Understanding these terms will be useful in coming units when we learn about each of the 11 human body systems and the organs (and the locations of the organs) that make them up.

Use the information presented in the video (<https://www.youtube.com/watch?v=kvHWnJwBkmo>) to fill in the diagrams below. Use the word lists to help you if needed. Please note, if a word is listed twice in the word list that means it needs to be used twice.



### Word List

**Superior**

**Inferior**

**Anterior**

**Posterior**

**Distal**

**Proximal**

**Distal**

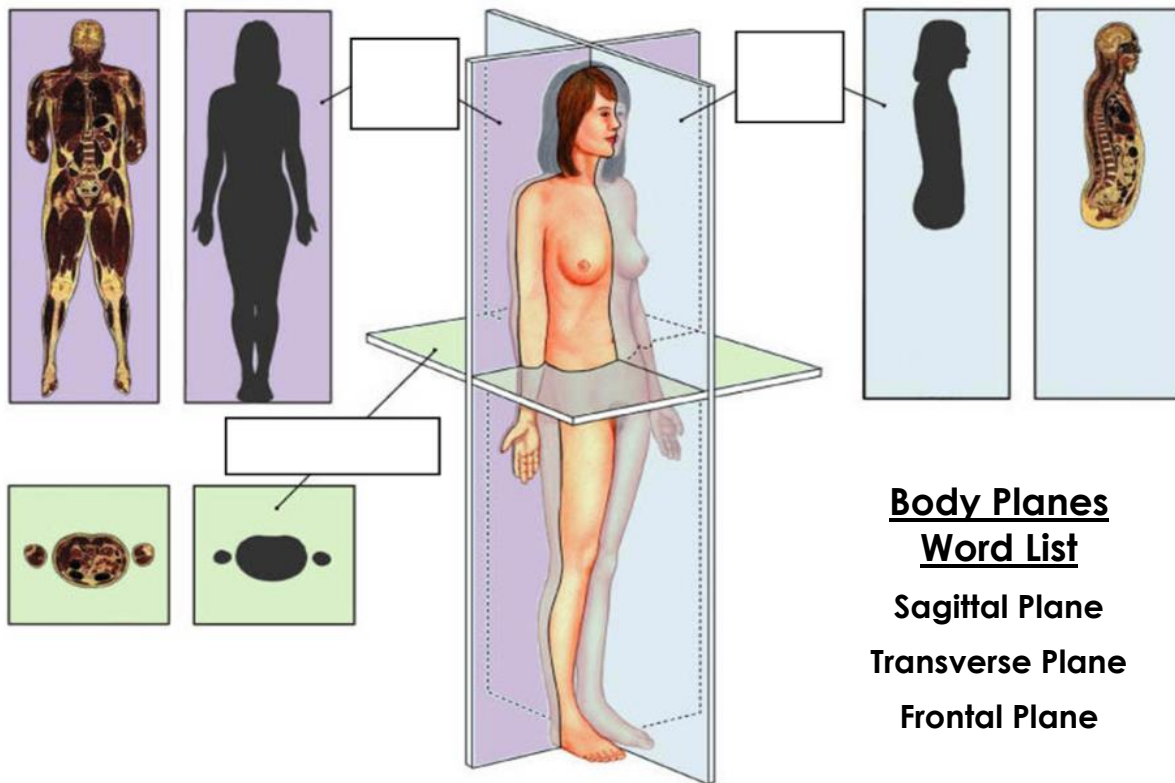
**Proximal**

**Left**

**Right**

**Medial**

**Lateral**



**Body Planes**

**Word List**

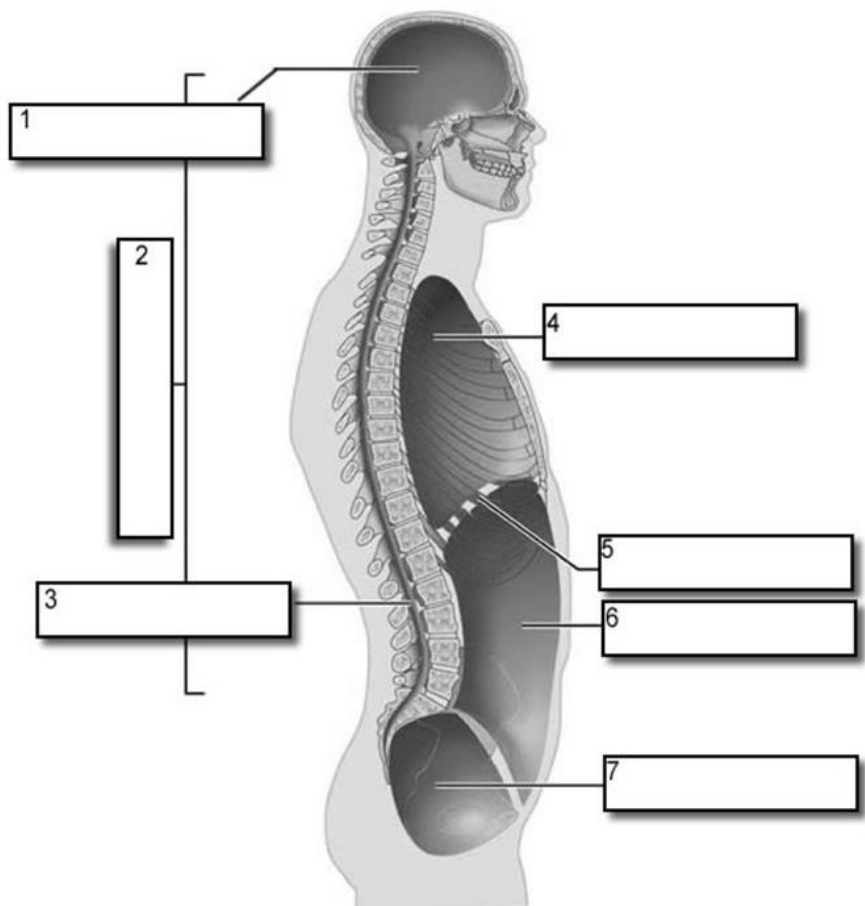
Sagittal Plane  
Transverse Plane  
Frontal Plane

**Body Cavities**

**Word List**

Diaphragm (#5)

Pelvic  
Cranial  
Dorsal  
Thoracic  
Abdominal  
Spinal



## Practice What You Know... Banana Dissection

### Background Information:

Various healthcare professionals use anatomical and directional terms every day. Understanding these terms will be useful in coming units when we learn about each of human body system and the organs (and the locations of the organs) important in each system.

### Purpose:

During this activity you will use your knowledge of directional terms to "dissect" a banana and create a banana split.

*Note: It is important to keep in mind that the procedure assumes your banana is in its anatomical position. The anatomical position for a banana is with the stem at the top and the "spinal curvature" pointing to the back as it is facing you.*



**Materials:** banana, plastic knife, paper plate, vanilla ice cream, various ice cream toppings, permanent marker

### Procedure:

1. Carefully lay your banana onto the paper plate. Lay the banana in its anatomical position with the anterior side facing you.
2. Use the permanent marker to draw eyes and a mouth on the **ANTERIOR** cranial (head) region and a belly button in the abdominal (stomach) region of the banana.
3. Turn the banana around to the **POSTERIOR** and draw butt cheeks on the **INFERIOR** region.
4. On the two lateral sides of the specimen in the appropriate **SUPERIOR** cranial region draw ears onto the specimen.
5. Do an external physical examination of your specimen. In the space below, write down any observations you have about the state of your specimen (include at least 3). Be sure to be as specific as possible in your description. Look for abnormalities, such as "wounds" or "scars" from injuries or surgeries.

*Example: Near the specimen's anterior cranial region there are two bruises or brown spots approximately 2 cm in diameter.*

6. Return your specimen to its anatomical position. Carefully make a **TRANSVERSE CUT** about 5 cm **INFERIOR** to the top of the "head" at the **SUPERIOR** portion of the abdominal region of your specimen. The inside of the banana can now be seen in what we call a cross-section view.
7. *Cont'd next page*



## **Banana Dissection** (cont'd)

*You now have two sections: the cranial section and the abdominopelvic section.*

8. Using the cranial section created in step 6, carefully make a **FRONTAL CUT**. The result of this cut is now referred to a longitudinal view.
9. Using the abdominopelvic section from step 6, make a **SAGITTAL CUT**. This also creates a longitudinal view.
10. Remove the dermis (skin) from the cranial region and place the sections on the **LATERAL** portion of the plate in a supine (facing up) position.
11. Remove the dermis from the abdominopelvic region and make as many **TRANSVERSE CUTS** through both pieces as possible. Place these sections on the **MEDIAL** portion of the plate.
12. Place two scoops of ice cream on the **MEDIAL** section of the plate on top of the abdominopelvic pieces.
13. On top of the ice cream add a bit of whipped cream.
14. On top of the entire dessert, drizzle chocolate sauce.
15. Sprinkle nuts or candy **TRANSVERSELY** on the dessert.
16. After showing your dissection to your teacher, you may eat your dessert.

*Procedure adapted from Adina Coles of Sun West School Division*

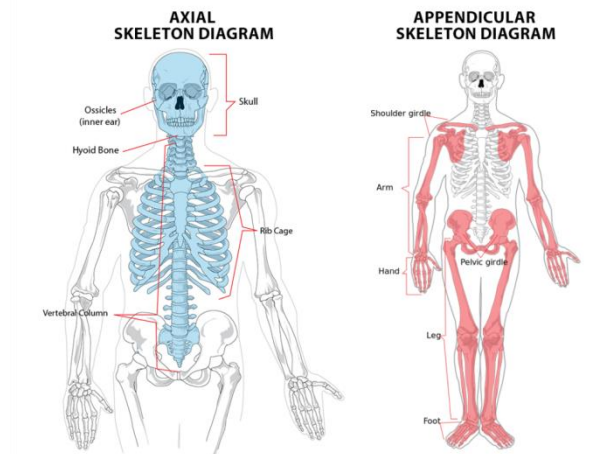
## Skeletal System

The skeletal system in an adult body is made up of **206 individual bones**. Each bone is a complex living organ that is made up of many cells, protein fibers, and minerals. These bones are arranged into two major divisions: the axial skeleton (left) and the appendicular skeleton (right). The **axial skeleton** runs along the body's midline axis and is made up of 80 bones in the following regions:

- Cranium (skull)
- Hyoid
- Auditory ossicles
- Ribs
- Sternum
- Vertebral column

The **appendicular skeleton** is made up of 126 bones in the following regions:

- Upper limbs
- Lower limbs
- Pelvic girdle
- Pectoral (shoulder) girdle



## Types of Bones

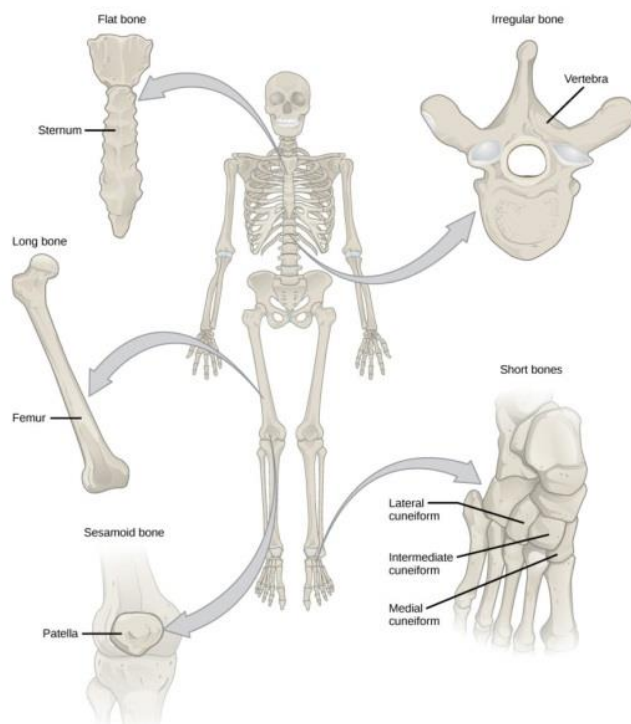
**Long** – are found in the arms and legs. Examples of long bones include the femur, tibia, fibula, metatarsals, and phalanges.

**Short** – are found in the wrists and ankles. The carpal bones of the wrist and the tarsal bones of the foot are examples of short bones.

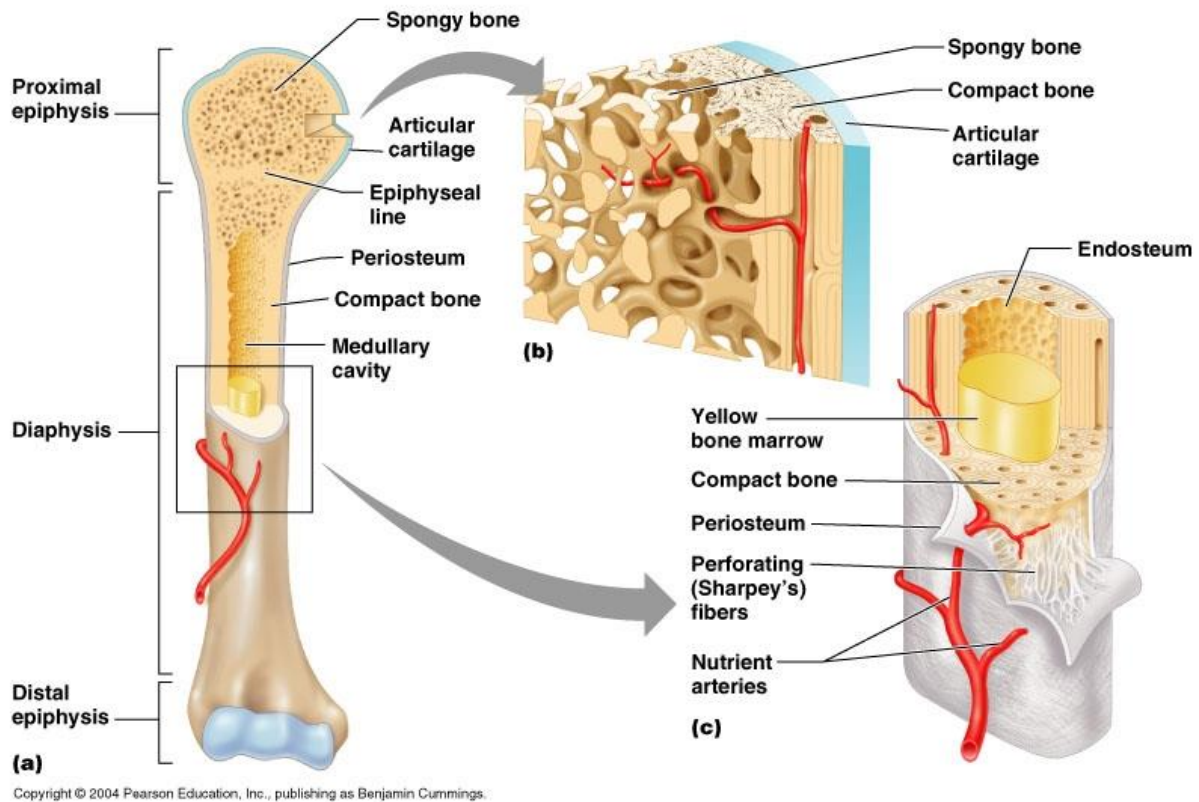
**Flat** – as the name implies, are flat. The frontal, parietal, and occipital bones of the cranium - along with the ribs and hip bones - are all examples of flat bones.

**Irregular** - have a shape that does not fit the pattern of the long, short, or flat bones. The vertebrae, sacrum, and coccyx of the spine—as well as the sphenoid, ethmoid, and zygomatic bones of the skull—are all irregular bones.

**Sesamoid** - are formed after birth inside of tendons that run across joints. Sesamoid bones grow to protect the tendon from stresses and strains at the joint and can help to give a mechanical advantage to muscles pulling on the tendon. The patella and the pisiform bone of the carpals are the only sesamoid bones that are counted as part of the 206 bones of the body. Other sesamoid bones can form in the joints of the hands and feet, but are not present in all people.



## Anatomy of a Long Bone

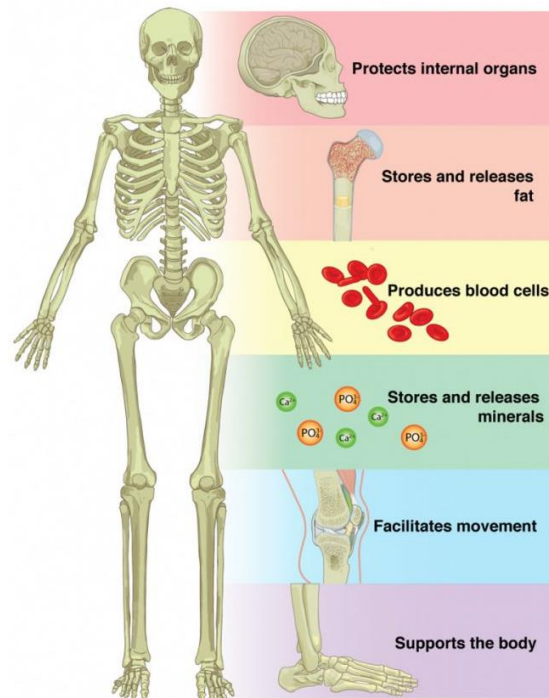


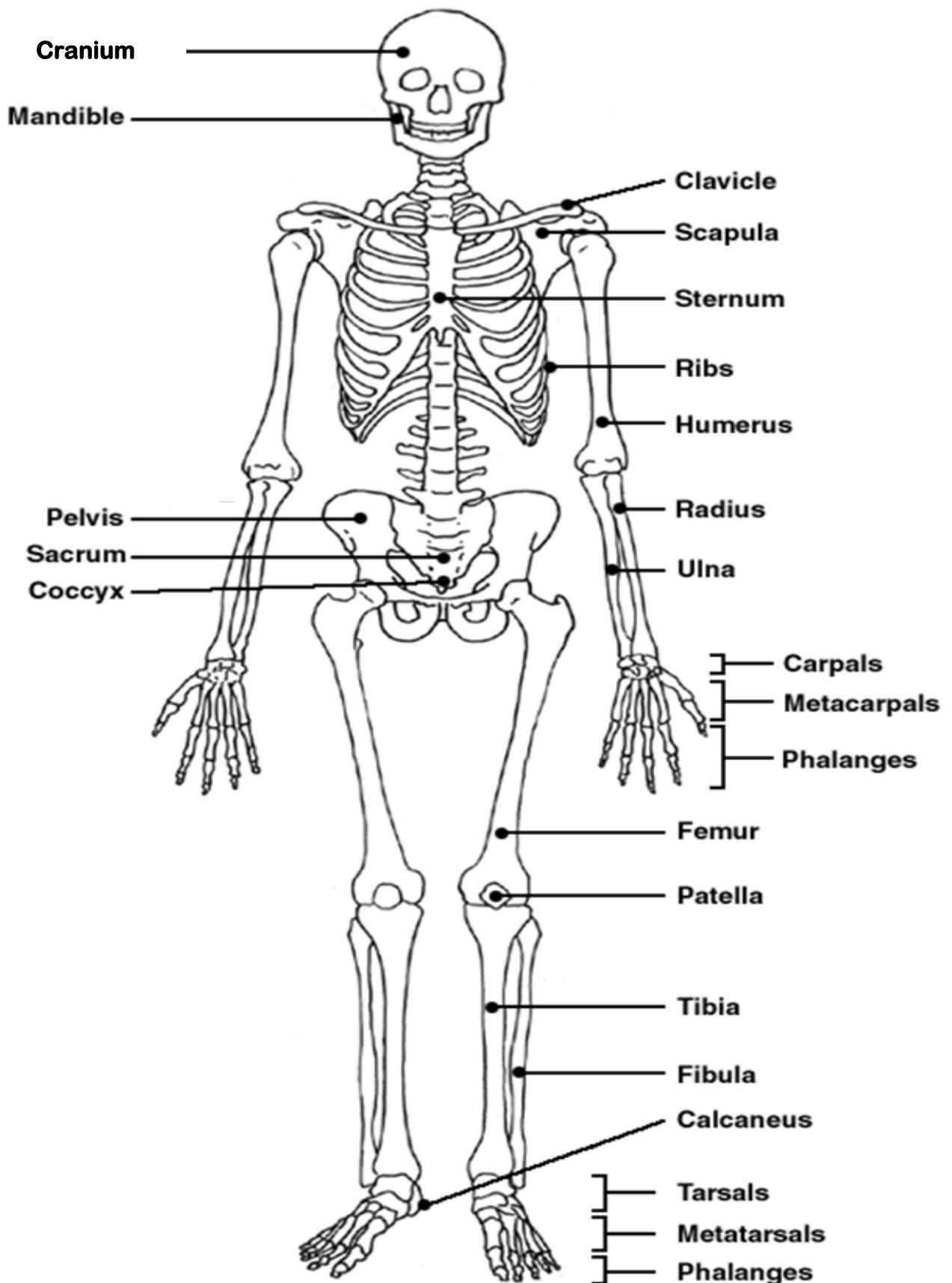
FINISH ADDING IN BONE PARTS DEFINITIONS!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!

## The Functions of the Skeleton

Bones are very strong. In fact, in a lab test, the tibia bone – located in the lower leg – was able to support 900 kg without breaking! The skeleton has many important roles. Four important functions of the human skeleton are:

1. **Support & Movement** – The skeletal system's primary function is to form a solid framework that supports the body's organs and anchors the skeletal muscles. The bones of the skeletal system act as attachment points for the skeletal muscles of the body. Almost every skeletal muscle works by pulling two or more bones either closer together or further apart. Joints act as pivot points for the movement of the bones. The regions of each bone where muscles attach to the bone grow larger and stronger to support the additional force of the muscle. In addition, the overall mass and thickness of a bone increase when it is under a lot of stress from lifting weights or supporting body weight.
2. **Protection** – The skeleton is the body's armor. The bones of the axial skeleton act as a hard shell to protect the internal organs from damage caused by external forces. For example, your skull protects your brain and your rib cage protects your heart and lungs.
3. **Blood Cell Factory** – Our bone marrow creates our blood cells. Red bone marrow produces red and white blood cells in a process known as hematopoiesis. Red bone marrow is found in the hollow space inside of bones known as the medullary cavity. Children tend to have more red bone marrow compared to their body size than adults do, due to their body's constant growth and development. The amount of red bone marrow drops off at the end of puberty, replaced by yellow bone marrow.
4. **Warehouse Storage** – The skeletal system stores many different types of essential substances to facilitate growth and repair of the body. Bones store minerals such as calcium, magnesium and phosphate, which are essential for bone formation. The skeletal system's cell matrix acts as our calcium bank by storing and releasing calcium ions into the blood as needed (in response to hormones). Proper levels of calcium ions in the blood are essential to the proper function of the nervous and muscular systems. Bone cells also release osteocalcin, a hormone that helps regulate blood sugar and fat deposition. The yellow bone marrow inside of our hollow long bones is used to store energy in the form of lipids (fats). Finally, red bone marrow stores some iron in the form of the molecule ferritin and uses this iron to form hemoglobin in red blood cells.
5. **Growth and Development** - The skeleton begins to form early in fetal development as a flexible skeleton made of hyaline cartilage and dense irregular fibrous connective tissue. These tissues act as a soft, growing framework and placeholder for the bony skeleton that will replace them. As development progresses, blood vessels begin to grow into the soft fetal skeleton, bringing stem cells and nutrients for bone growth. Osseous (bone) tissue slowly replaces the cartilage and fibrous tissue in a process called *calcification*. The calcified areas spread out from their blood vessels replacing the old tissues until they reach the border of another bony area. Calcification hardens bones and helps create the dense bony material that protects the internal organs. At birth, the skeleton of a newborn has more than 300 bones; as a person ages, these bones grow together and fuse into larger bones, leaving adults with only 206 bones.





## **Joints & Joint Actions**

FINISH ADDING IN JOINTS & JOINT ACTIONS!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!

Miss Foley

HSci20: HB1 Anatomy/Physiology

**Skeletal System**

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## The Muscular System

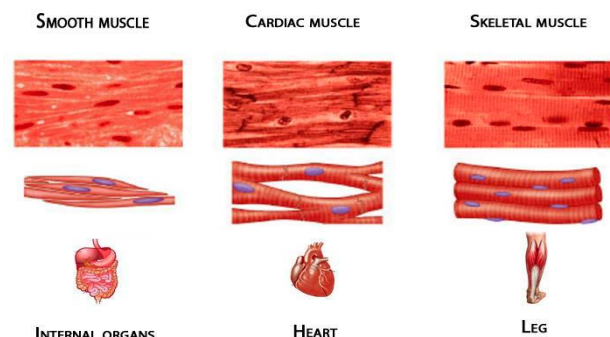
The muscular system is responsible for the movement of the human body. Attached to the bones of the skeletal system are about **700 muscles** that make up roughly half of a person's body weight. **Each of these muscles is a discrete organ constructed of four parts: skeletal muscle tissue, blood vessels, tendons and nerves.** Muscle tissue is also found inside of the heart, digestive organs and blood vessels. The main function of the muscular system is **movement**, but muscles do more than just allow us to run. Muscles are the only tissue in the body that has the ability to contract and therefore move the other parts of the body. However, muscles also **maintain body posture, move substances throughout our internal organs and work to keep you warm by generating heat.**

### Muscle Types

There are three types of muscle tissue: smooth, cardiac, and skeletal.

**1. Smooth Muscle** - Smooth muscle is found inside of organs like the stomach, intestines, and blood vessels. The weakest of all muscle tissues, smooth muscle makes organs contract to move substances through the organ. Because smooth muscle is controlled by the unconscious part of the brain, it is known as **involuntary muscle**—it cannot be directly controlled by the conscious mind. The term “smooth muscle” is used to describe this tissue type because it has a very smooth, uniform appearance when viewed under a microscope. This smooth appearance starkly contrasts with the banded appearance of cardiac and skeletal muscles.

**2. Cardiac Muscle** - Found only in the heart, cardiac muscle is responsible for pumping blood throughout the body. Cardiac muscle tissue cannot be controlled consciously, so it is an **involuntary muscle**. While hormones and signals from the brain adjust the rate of contraction, cardiac muscle stimulates itself to contract. The **natural pacemaker** of the heart is made of cardiac muscle tissue that stimulates other cardiac muscle cells to contract. Because of its self-stimulation, cardiac muscle is considered auto rhythmic or intrinsically controlled.



**3. Skeletal Muscle** - Skeletal muscle is the **only voluntary muscle** tissue in the human body—it is controlled consciously. Every physical action that a person consciously performs (e.g. speaking, walking or writing) requires skeletal muscle. Skeletal muscle derives its name from the fact that these muscles always connect to the skeleton in at least one place. The function of skeletal muscle is to contract to move parts of the body closer to the bone that the muscle is attached to. Most skeletal muscles are attached to two bones across a joint, so the muscle serves to move parts of those bones closer to each other.

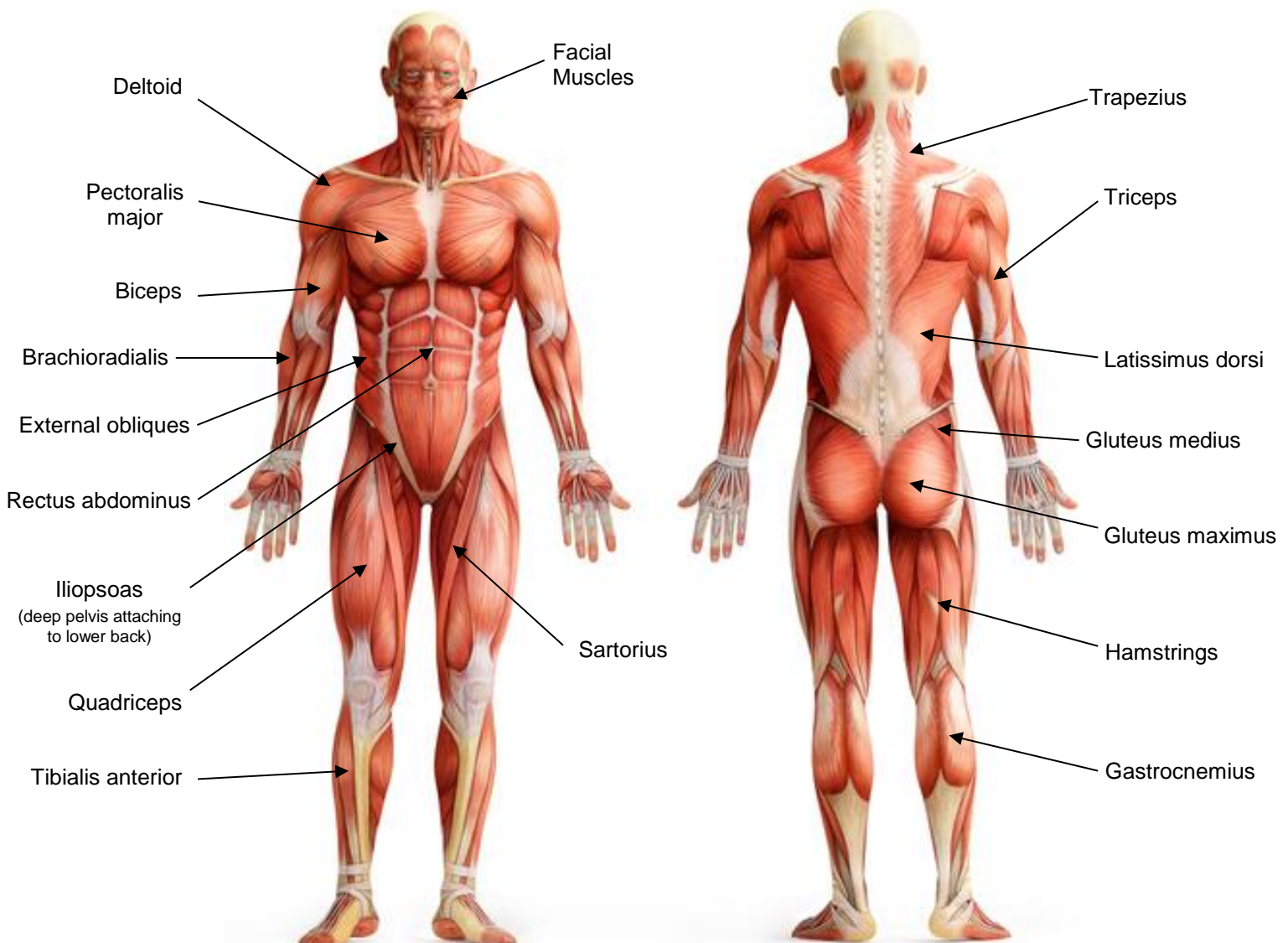
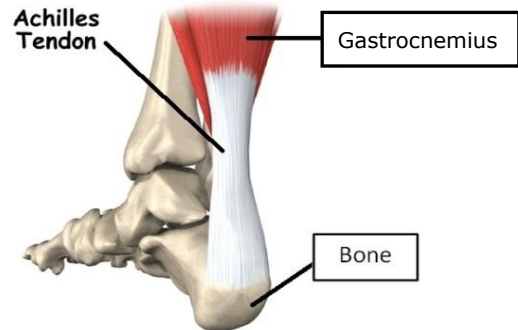


Most skeletal muscles are attached to two bones through tendons. **Tendons** are tough bands of dense regular connective tissue whose strong fibers firmly **attach muscles to bones**. Tendons are under extreme stress when muscles pull on them, so they are very strong and are woven into the coverings of both muscles and bones.

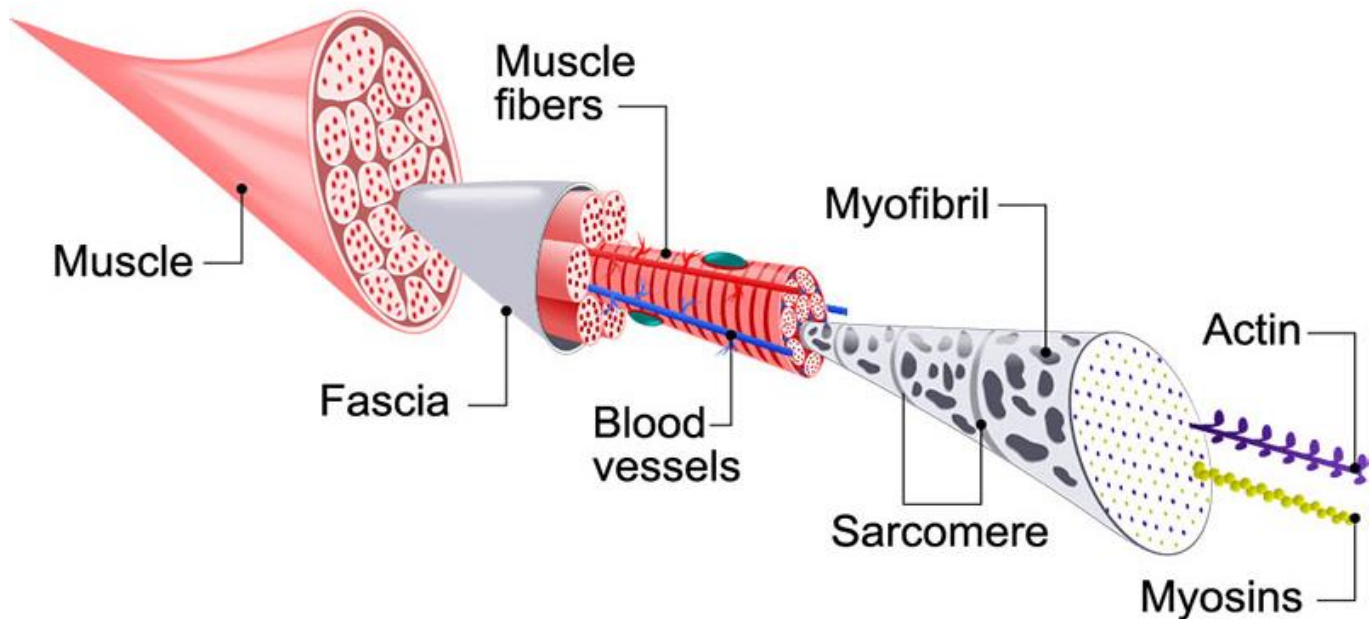
**Muscles move by working in pairs: one muscle contracts and gets shorter (*flexor*), while another relaxes and stretches out (*extensor*).** This

contraction pulls on tendons and moves bones closer to each other. One of the bones is pulled towards the other bone, which remains stationary. The stationary bone acts as a lever for the moving bone. The place on the stationary bone that is connected via tendons to the muscle is called the **origin**. The place on the

moving bone that is connected to the muscle via tendons is called the **insertion**. Sometimes, muscles are named based upon their connections to these bones.



## **The Composition of Skeletal Muscles: Bundles Within Bundles Within Bundles**



### **Muscles in Action: The Sliding Filament Theory**

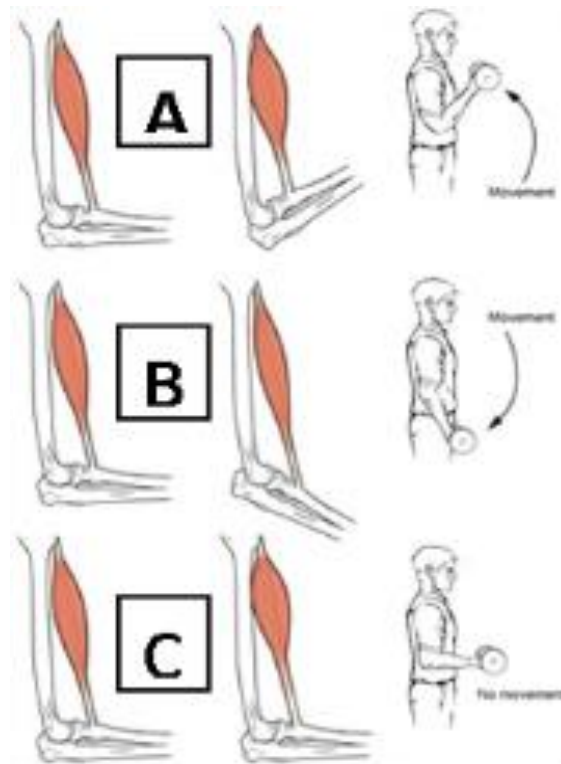
Muscles work through a process called contraction. Muscle contraction is a result of the filaments deep within the muscle fibre sliding over each other. This process occurs simultaneously across the entire muscle fibre and, as a result, the entire muscle fibre contracts. This process is known as the Sliding Filament Theory.

#### **How a Muscle Contracts & Relaxes:**

1. Calcium levels increase in the muscle belly.
2. Electrical impulse comes from brain (regular contractions) or spinal column (reflex)
3. The signal travels along the nerve to the muscle site (the neuromuscular junction) and attempts to jump the gap.
4. A chemical reaction takes place deep within the muscle fibre (many times over) affecting the entire muscle group.
5. This reaction causes the protein filaments (myosin & actin) to "slide and catch" over each other in a ratchet-like fashion.
6. The muscle is contracting.
7. Steps 1-4 repeat reversely.
8. These reversed reactions cause the protein filaments (myosin & actin) to "release" sliding back over each other to rest in NEARLY their starting position, but always just slightly shorter than.
9. The muscle is now relaxing.

### Types of Muscle Contractions

1. **Concentric** – occur when your muscle shortens while working. Concentric contractions have a tendency to be “lifting” actions.
2. **Eccentric** – occur when your muscle lengthens while working. Eccentric contractions have a tendency to be “lowering” actions.
3. **Isometric** – occurs when a muscle force is equal to the resistance resulting in the muscle NOT changing length.



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## HSci20: HB1 Anatomy

## Muscular System Lab

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### Introduction:

Have you ever wondered why you're always told to "warm up" before you play sports? Or why is it easier to "pull" a muscle if your muscles are cold? How about the decreased performance that comes with muscle fatigue – do you really suck more if your muscles are tired? We're going to figure out the answers to these questions in today's lab.

### Purpose:

In this experiment you will first observe the characteristics of muscle contraction and then will investigate the effects of two factors - temperature and fatigue - on the action of your muscles

### Materials Needed:

- Tray of ice water
- A narrow strip of paper that fits around your arm
- Stress ball, or wrist-grip workout device
- Stop watches

### Procedure:

#### Part A: Muscle Action

1. Place your fingers along the angle of your jaw just in front of your ear. Grit your teeth and observe what happens to the hardness of the muscles in your cheek.

Observations:

2. With the thumb and little finger of one hand, span the opposite arm's biceps (front muscle of the upper arm) from the elbow to as close to the shoulder as possible. Bend the arm and observe the change in the length of the muscle.

Observations:

3. Wrap a strip of paper around your upper arm and mark the circumference of your arm on the paper. Clench your fist tightly and mark the new circumference on the paper. Observe what happens to the circumference of the muscle.

Observations:

#### Part B: Effect of Temperature on Muscle Action

1. Count the number of times you can make a fist in 20 seconds. Have your partner use the stopwatch to time you. Start with your hand completely outstretched and make a tight fist each time. Do it as rapidly as you can. Record the count in a chart as shown in Chart #1

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## Muscular System Lab

2. Now submerge your hand in a tray of water to which ice has been added so that the temperature is near the freezing point. Leave your hand in the water for one full minute. Have your partner use the stopwatch to time you.
3. Remove your hand and immediately count how many **forceful fists** you can make in 20 seconds. Record the data in a chart as shown in Chart #1.

**Chart # 1: Effect of temperature on muscle action**

Temperature	Number of Fists
Normal	
Ice Water	

### Part C: Effect of Fatigue on Muscle Action

1. Count how many times you can tightly squeeze a stress ball (or wrist grip workout device) in your hand in 20 seconds. Have your partner use a stopwatch to time you. Record the count in a chart as shown in Chart #2.
2. Repeat the squeezing nine more times and record results. **Do not rest between trials.**

**Chart # 2: Effect of fatigue on muscle action**

Trial Number	Number of Squeezes in 20 Seconds
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

### Conclusion Questions: What did you learn today?

1. (From Part A: Muscle Action) What are the three changes you observed in a muscle while it is working (contracted)?
2. (From Part B: Temperature) What effect did the cold temperature have on the action of your hand muscles? Explain thoroughly.
3. (From Part C: Fatigue) What effect did fatigue have on the action of your hand muscles? Explain thoroughly.

## Nervous System

Understanding how the human brain works gives us an insight into what makes us human. If an animal has a backbone it also has a brain. Elephants, dogs, lizards, and even fish, have brains. But none of these creatures demonstrate the same capacity for learning, language, and emotions as you do, being a part of the human species.

How do you remember the way home? Why do you keep breathing, even when you are sleeping? Where do dreams come from? Why do you love certain foods and hate others? Your brain is in charge of all of these things and a lot more.

The five senses are one way that our brains allow information from the outside world into your body for processing. Writers often use their senses to compare things because this is a concept that many people easily relate to. Look at the examples below, then finish each sentence that follows by using a sense comparison.

### Examples:

The juicy orange tasted like a burst of sunshine.

The apartment smelled like a pigpen.

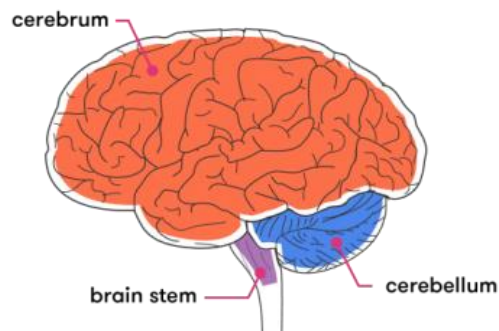
1. A spring garden smells like \_\_\_\_\_.

2. Fresh-baked bread tastes like \_\_\_\_\_.

3. A cute puppy looks like \_\_\_\_\_.

4. A crying baby sounds like \_\_\_\_\_.

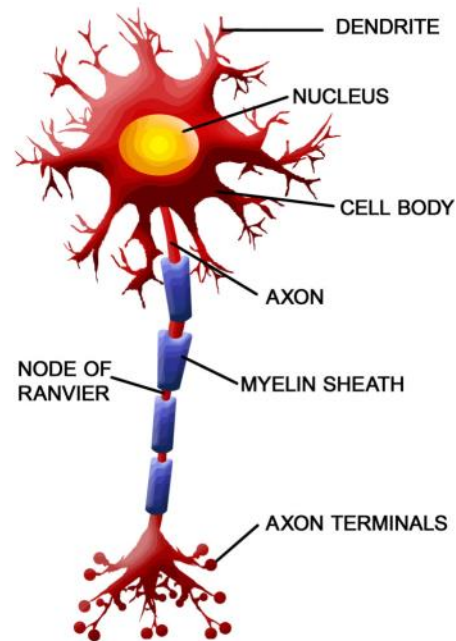
5. A cat's fur feels like \_\_\_\_\_.



In completing the above activity, you were using many parts of your brain. To think about your answers, you were using your cerebrum. Your brain was then able to tell your hand to move because of your spinal cord and brainstem. To write down your answers, you relied on your cerebellum for coordination and fine motor skills. Your brain is nothing special to look at--a wrinkle object about the size of a cantaloupe--but it consists of a complex and intricately tangled mass of nerve cells, called **neurons**.

Neurons are the basic units that make up your brain and nervous system. They are specialized cells that act like telegraph wires carrying messages in the form of **electrochemical impulses** throughout the body. These impulses travel very quickly: it takes about a hundredth of a second for a pain in your little toe to register in your brain. This is quite remarkable, given that the impulse travels a complex path through many neurons and across the gaps (synapses) between neurons to reach its destination. It is estimated that the adult human brain contains over 100 billion neurons alone.

Each neuron is made up of a **cell body** with a nucleus containing the genetic material. From the cell body extend **dendrites**, acting like antennae to receive signals from other nerve cells. Each neuron has a single **axon** that shoots out from its cell body and sends the signal to another neuron, muscle or gland by releasing chemicals from the **axon terminals**. The **myelin sheath** is a fatty covering on the axon that

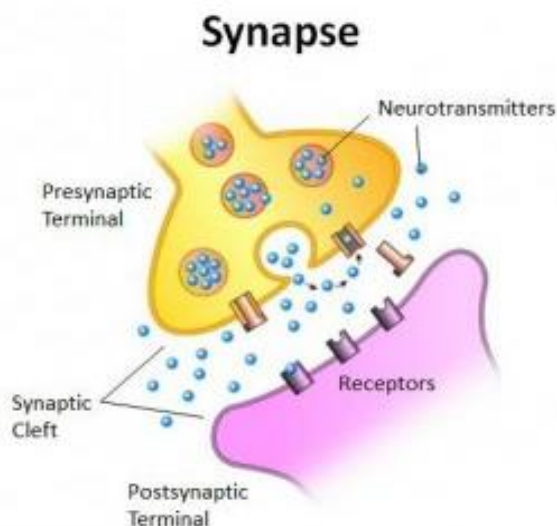


speeds up the rate of transmission of the nervous impulse. The **Nodes of Ranvier** are where depolarization of the membrane actually occurs as the **action potential** or nervous impulse travels along. Axons in your body may measure up to a meter long!!

Once the impulse has moved from the dendrites → axon → axon terminals it will pass to another nerve cell, muscle or gland. There is always a *tiny* space, however, between a neuron and the neuron, muscle or gland that it 'communicates' with. This space is

called the **synapse**. Information is sent across the synapse from by chemicals called **neurotransmitters**. These chemicals reach the next neuron, muscle or gland to send the message. Drugs can numb sensation and paralyze nerves by interfering with the messages sent along the neuron, or by affecting the chemical balance of neurotransmitters at the synapse.

The **spinal cord** relays information between the brain and the rest of the body. It is protected by bone in a cavity within your vertebral column. It also controls reflexes below the head, like pulling your hand away when you touch a hot stove.



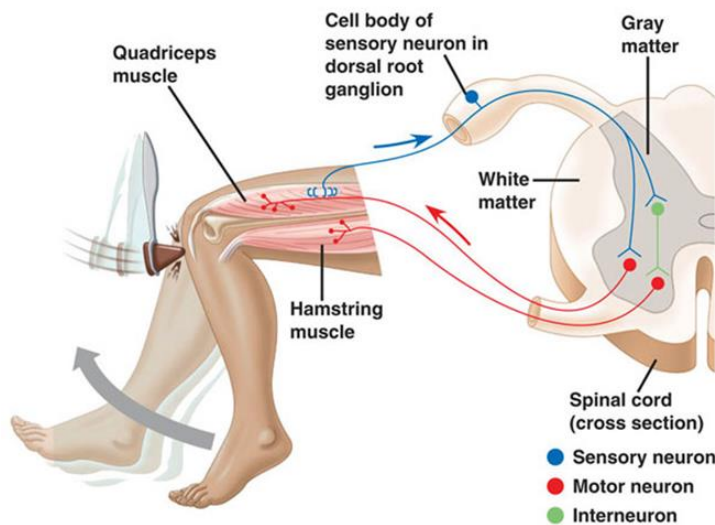


## Reflexes

Ducking your head out of the way is a **reaction**. A reaction is a **somatic (or voluntary) response** to a stimulus. This decision involves the brain and requires the brain to interpret incoming information and choose what your response will be. A reaction is the deliberate or voluntary changing of the body's position in response to a stimulus. Reactions may also be very quick and of short duration, but they aren't always.

### Reaction = an somatic, voluntary response to a stimuli

Closing your eyes automatically is a **reflex**. A reflex is an **autonomic (or involuntary) response** to a stimulus that helps to protect the body from injury. Reflexes are very rapid and of short duration since they do not rely upon the brain for "decision making". This entire "decision" occurs in the spinal cord or brainstem.

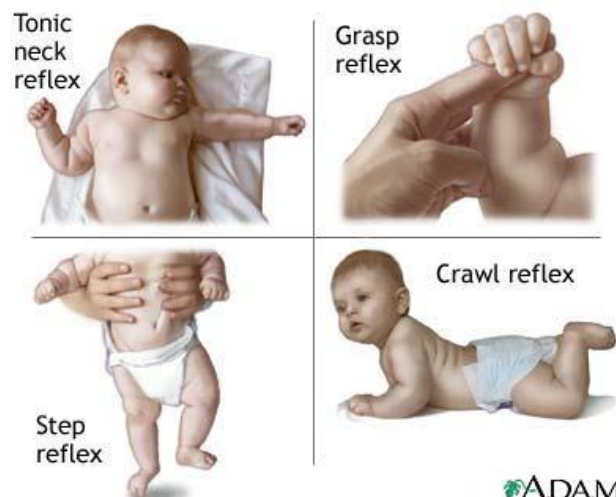


### Reflex = an autonomic, involuntary response to a stimuli

Other types of reflexes happen all the time. In fact, your last visit to the doctor probably involved one. When struck just below the knee with a small hammer, your lower leg "kicks" up to protect the ligaments, tendons and muscles. If you pick up

something very hot, you may drop it to prevent a serious burn or a doctor. The knee-jerk reflex and the reflex that changes the size of the pupil are used by doctors to check the condition of the nervous system. All of these are examples of reflexes.

Many normal **body functions** are controlled by **reflexes such as blinking, sneezing, coughing, breathing movements, heartbeat & peristalsis**. Many reflexes are used for developmental stages and then lost once no longer needed while others stay around for life because they are still serving a function/purpose.





Miss Foley

HSci20: HB1 Anatomy/Physiology

**Nervous System**

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HSci20: HB1 Anatomy

Complete the following questions using the Essential Atlas of Physiology textbook (pages 54-61) and the provided Nervous System PowerPoint notes:

1. Draw and label the parts of a neuron.
2. Explain how nerve impulses are transmitted.
3. List & define the three (3) types of nerves.
4. List & define the two (2) main parts of the human nervous system.

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## HSci20: HB1 Anatomy

## Nervous System

5. Complete the chart.

<u>Brain Part</u>	<u>Main Jobs/Functions</u>
Cerebrum	
Cerebellum	
Medulla Oblongata	
Thalamus	
Hypothalamus	
Pons	

6. List & define the two (2) main parts of the Peripheral Nervous System.

7. a) What is role/function does the Sympathetic Nervous system play?

b) What role/function does the Parasympathetic Nervous system play?

8. Define reflex.

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## HSci20: HB1 Anatomy/Physiology **Nervous System Lab**

### Practice What You Know... Reflexes vs. Reactions Lab

**Purpose:** The purpose of this lab is to investigate the difference between a reflex and a reaction.

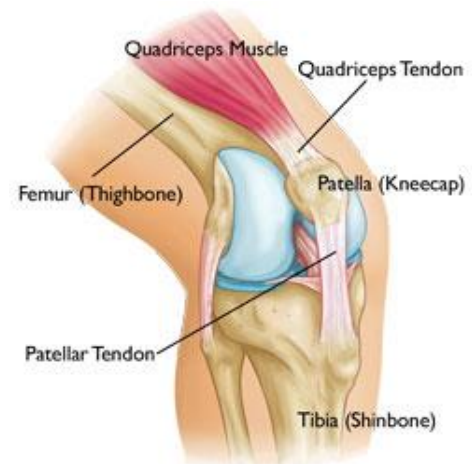
**Materials:** ruler, transparency paper (overhead paper), scrap paper, pen cap

### Procedure:

#### **PART I: Reflexes**

##### **Patellar or Knee Jerk Reflex**

1. The subject is to sit on the edge of the lab table with the legs able to swing freely. One partner will be the subject first and the other partner the experimenter, then you'll switch.
2. Once the legs are relaxed and swing freely, the tester should use the side of their hand to "tap" the subject just below the patella (kneecap). Be sure you are hitting the patellar tendon (the tendon that connects the patella to the tibia; see the image to the right) and not the surrounding bone. What happened? Be specific. Record your results in the data table.
3. Now have the person sit with their leg straight out. Tap the knee in the same place. Observe and record your results in the data table.
4. Switch places with your partner and repeat steps 1-3. Record the data for both partners in your data table.



##### **Papillary Reflex**

5. Have the subject close his or her eyes for one minute (no peeking). After one minute, stare into the subject's eyes and tell him/her to open his/her eyes. Observe and record what happens to the pupils in the data table.
6. After the subject has been tested switch places and repeat with the partner.

**\*\*Note:** If you do not see a response, have the test subject complete the same activity in a dark room then turn on a light and have the subject open their eyes.

##### **Babinski's Response**

7. Have the subject remove one shoe and sock. Have the subject sit on the lab table with his/her foot extending just over the edge. Using a pen cap, the experimenter is to scratch the subject's foot in one smooth stroke motion from heel to toe. Describe the response in the toes in your data table.
8. After the subject has been tested switch places and repeat with the other partner.

##### **Blink Reflex**

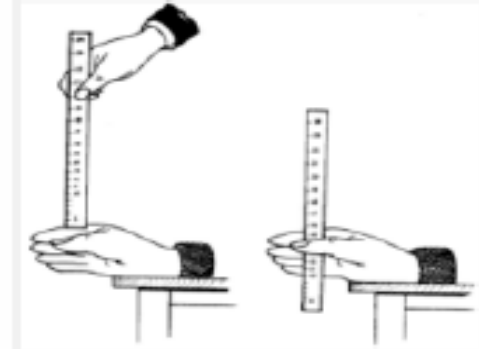
1. Have the subject hold a sheet of clear plastic (transparency) in front of their face. Crumple up a small piece of scrap paper and toss it toward their eyes. Observe what happens and record your data.
2. After the subject has been tested switch places and repeat with the other partner.

Name: \_\_\_\_\_ Date: \_\_\_\_\_

## HSci20: HB1 Anatomy/Physiology **Nervous System Lab**

### **Part II: Reaction Time**

1. Have the subject sit comfortably with their forearm resting on a desk and their hand extended over the edge of the desk with their index finger and thumb about two inches apart. Hold a ruler at the 30 cm end and have the "zero" (0 cm) mark lined up between your partner's finger and thumb so the subject can see the ruler (see image to the right).
2. Without warning, release the ruler and have them grasp it as quickly as they can. Record the distance the ruler traveled to where the thumb meets the ruler. Repeat the trial three more times and record your data.
3. Switch roles and repeat steps 1 and 2.
4. Determine the average distance that the ruler fell for all of the trials. Using that **average**, calculate the TIME it took for you to react and grab the ruler using the equation below. A sample calculation is provided below to show you how to set up the equation and substitute your values.



$$t = \sqrt{(2d/a)}$$

Where...

t = reaction time

d = average distance of fall

a = acceleration due to gravity = 980 cm/s<sup>2</sup>

$$\sqrt{\frac{2 \cdot 10 \text{ cm}}{981 \text{ cm/sec}^2}}$$

*SUPPOSE I RECORDED A MEASUREMENT OF 10 CM.*

$$1) \sqrt{\frac{20 \text{ cm}}{981 \text{ cm/sec}^2}}$$

*I START BY MULTIPLYING THE NUMERATOR. THIS EQUALS 20 CM. I WILL DIVIDE 20 BY 981 SO THE CM UNIT CANCELS OUT LEAVING ME WITH SEC SQUARED.*

$$2) \sqrt{0.02038736 \text{ sec}^2}$$

*I TAKE THE SQUARE ROOT OF THE NUMBER WHICH CANCELS OUT THE EXPONENT, GIVING ME THE UNIT OF SECONDS. PERFECT.*

$$3) = 0.1427 \text{ sec}$$

$$(0.14 \text{ sec})$$

*I ROUND MY ANSWER TO 0.14 SECONDS. THIS MEANS THAT THE RULER FELL 10 CM IN 0.14 SECONDS UNTILL I CAUGHT IT THEREFORE I HAD A REACTION TIME OF 0.14 SEC.*

Name: \_\_\_\_\_ Date: \_\_\_\_\_

## HSci20: HB1 Anatomy/Physiology **Nervous System Lab**

### Observations:

**Table 1: Various Reflex Responses**

Stimulus	My Response	Partner's Response
Knee Tap (bent leg)		
Knee Tap (straight leg)		
Pupillary Reflex		
Babinski's response		
Blink Reflex		

**Table 2: Reaction Distance**

Trial	Distance (cm) of Fall	
	Mine	Partner's
1		
2		
3		
4		
Average		

**Table 3: F-16 Fighter Pilot Potential?**

To be a fighter pilot you must have very fast reactions – travelling at speeds of over 2500 km per hour (twice the speed of sound) means about 700m every second! So splits of a second can make all the difference, you blink your eyes and you've moved an incredible 140m! Could you respond to outside events with minimal delay and take appropriate action?

Reaction Time (milliseconds)	Rating	Comment
0-49	Ultra-Fast	A clairvoyant catcher... are you cheating?!
50-130	Superb	Impressive, do you play computer games? Next stop, F16!
131-175	Excellent	Well done, are you a text messenger?
176-200	Good	Keep trying, you're not top gun yet!
201-240	Average	Not bad – but you're just Joe Average.
241-250	Fair	You'd get faster if it were money instead of a ruler!
250+	Slow	...ouch! Did the ruler hit your foot? Keep trying!

**Remember...**Milliseconds are one thousandth of a second.

#### This means that:

One second (s) = 1000 milliseconds (ms)  
Half of a second (0.5s) = 500 ms

A quarter of a second (0.25s) = 250 ms  
One tenth of a second (0.1s) = 100 ms

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## HSci20: HB1 Anatomy/Physiology

## Nervous System Lab

### Discussion Questions:

1. In the space below calculate your average reaction time and your partner's average reaction time. Show your work, including the formula, substitution of values and units for each. Compare your reaction time to Table 3 for fighter pilot potential.

Mine:

Partner's:



*Figure 1: A lot to contend with, without 9g on top of it! The F-16 flight controls.*

2. What differences did you notice between your reaction time and your partner's reaction time? Why do you think you observed the differences you did?
3. How does the patellar reflex protect us? Why doesn't the patellar reflex happen when your leg is straight?
4. When your pupils constrict in response to light, is this a somatic or autonomic reflex? How do you know?
5. Why is the blinking response effective? What kind of job would you have where you used this reflex quite often?
6. Name three sports or occupations where having a fast reaction time is important.
7. Give three examples of things that could slow down your reaction time or reflexes.
8. Using your knowledge of the nervous system, explain why a reaction is slower than a reflex.

Name: \_\_\_\_\_ Date: \_\_\_\_\_

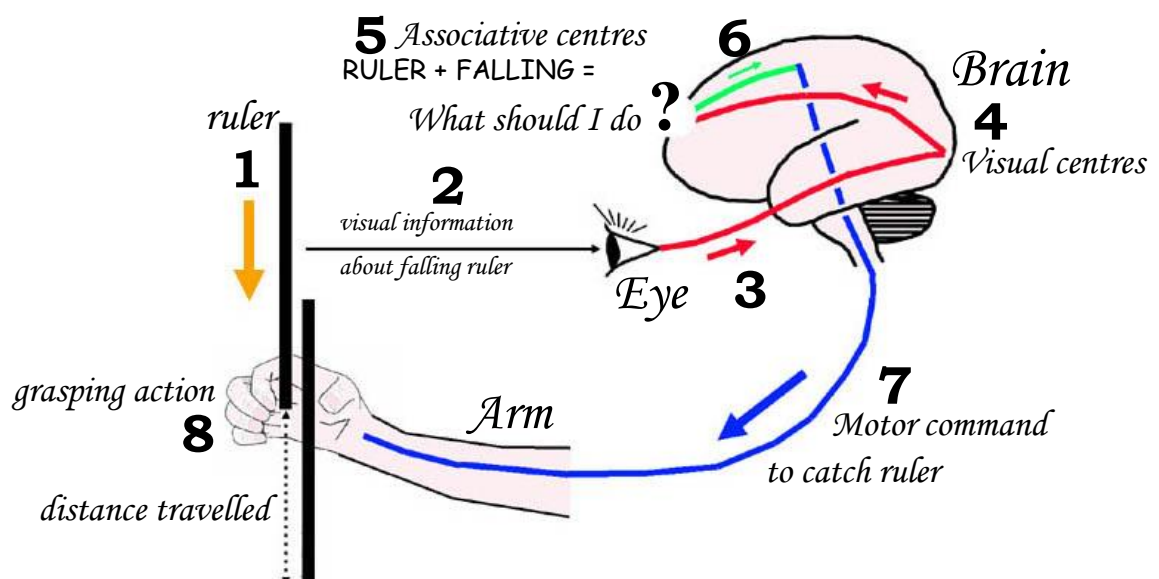
## THE FIGHTER PILOT CHALLENGE

To be a fighter pilot you must have very fast reactions – travelling at speeds of over 2500 km per hour (twice the speed of sound) means about 700m every second! So splits of a second can make all the difference, you blink your eyes and you've moved an incredible 140m! Could you respond to outside events with minimal delay and take appropriate action?

This experiment tests your reaction time...the time it takes to react to catch a falling ruler. The test requires two people...[ruler test demo video](#).

### The Science Of Catching A Ruler:

The experiment tests how long it takes the brain to translate visual information (falling ruler) into your voluntary (or conscious) motor commands and actions (grasping finger movements) that lead to the ruler being caught. The shorter the time, the faster your reactions...that's if you were paying attention in the first place! Indeed practice specifically affects the 'associative centres' in the brain, so that you can respond faster to what's happening in your visual world. The flow of information along the 'visual' and 'motor' nerve pathways is relatively constant even with lots of practice. It all comes down to 'attention' or '...being on the ball!'



### Procedure:

1. Get a 30 cm ruler.
2. One person holds the ruler near the 30cm mark and lets it hang vertically.
3. The other person places their thumb and index finger either side of the 0cm mark ready to catch it when it falls - their fingers shouldn't touch the ruler.
4. Without warning the person holding the ruler lets go and the subject tries to catch the ruler as soon as possible. [Hint: To prevent guessing, vary the time before letting go of the ruler].
5. The level (in cm) just above the subject's first finger where the ruler was caught is recorded.
6. The same person is tested 5 times and then calculate the mean average of their results (add all five numbers together and then divide by five).
7. Now swap over and test your partner.



Name: \_\_\_\_\_ Date: \_\_\_\_\_

## HSci20: HB1 Anatomy

## Nervous System Lab

### How Did You Do?

From the table below, the 'mean catch distance' on the ruler can be converted into a 'mean reaction time' in milliseconds (Remember: 1 millisecond is one thousandth of a second).

Distance-Reaction Time Conversion Table			
Catch Distance (cm)	Reaction Time (milliseconds)	Catch Distance (cm)	Reaction Time (milliseconds)
1	50	16	180
2	60	17	190
3	70	18	190
4	80	19	200
5	90	20	200
6	100	21	210
7	120	22	210
8	130	23	220
9	140	24	220
10	140	25	230
11	150	26	230
12	160	27	230
13	160	28	240
14	170	29	240
15	170	30	250

### Reaction Time Rating:

So what does your reaction time mean - are you fast enough for an F-16? Highlight your result.

Reaction Time (milliseconds)	Rating	Comment
0-49	Ultra-Fast	A clairvoyant catcher... are you cheating?!
50-130	Superb	Impressive, do you play computer games? Next stop, F16!
131-175	Excellent	Well done, are you a text messenger?
176-200	Good	Keep trying, you're not top gun yet!
201-240	Average	Not bad – but you're just Joe Average.
241-250	Fair	You'd get faster if it were money instead of a ruler!
250+	Slow	...ouch! Did the ruler hit your foot? Keep trying!

**Remember...**Milliseconds are one thousandth of a second.

This means that:

- One second (s) = 1000 milliseconds (ms)
- Half of a second (0.5s) = 500 ms
- A quarter of a second (0.25s) = 250 ms
- One tenth of a second (0.1s) = 100 ms

Name: \_\_\_\_\_ Date: \_\_\_\_\_

## HSci20: HB1 Anatomy

## Nervous System Lab

### How Did You Do?

After you've tested yourself, why not experiment further. Here's a few suggestions, do reaction times vary:

Scenario	Prediction	Actual/Result
Different Ages (children versus adults)		
Dominant Hand vs Non-Dominant Hand		
Tired vs Alert		
Men vs Women		
Depending on Mood		
After Alcoholic Drink		

### Could You Fly The Plane As Well?

#### A Final Thought:

Can you imagine doing several tasks together, each requiring fast reaction times with high precision, whilst at the same time concentrating on steering a jet plane - for example as part of an aerobatic team at the Paris air show?



**A lot to contend with, without 9g on top: The F-16 flight controls.**

Image: Lockheed Martin

Name: \_\_\_\_\_ Date: \_\_\_\_\_

HSci20: HB1 Anatomy

**Nervous System Lab**

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Powerpoint Finish!!!!!!

Name: \_\_\_\_\_ Date: \_\_\_\_\_

HSci20: HB1 Anatomy

**Circulatory System**

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1. List two (2) types of circulation systems.
  
2. List the three (3) functions of blood.
  
3. List the four (4) parts of blood.
  
4. List the four (4) main parts of the human circulation system.
  
5. List & define the two (2) types of human circulation.
  
6. What are the two (2) phases of breathing?
  
7. List the three (3) main parts of a nephron.
  
8. What is the role/function of the liver?

Name: \_\_\_\_\_ Date: \_\_\_\_\_

## HSci20: HB1 Anatomy

## Circulatory System

---

9. Using the color legend (red=oxygenated blood; blue=deoxygenated blood) and arrows to show the direction of blood flow, correctly draw & label the following parts of the human circulation system:

Lungs

arterioles

aorta

veins

capillaries

capillary bed

artery

venules

right atrium

right ventricle

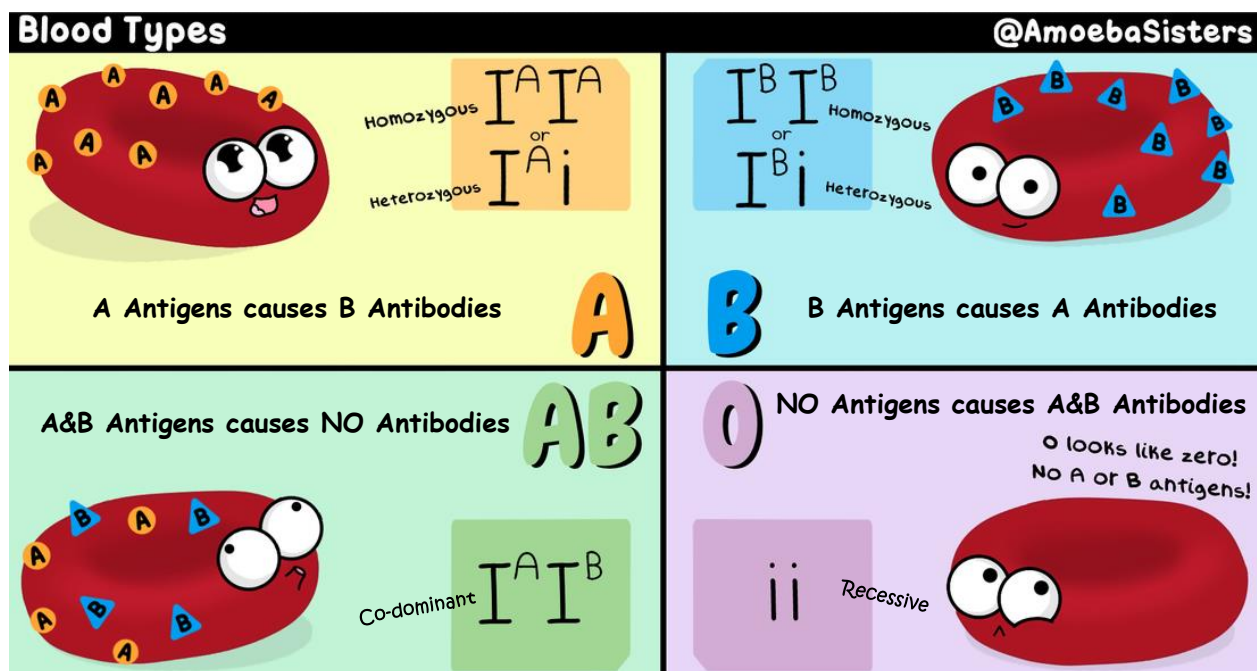
left atrium

left ventricle

## What's Your Type?

In some ways, every person's blood is the same. But, when analyzed under a microscope, distinct differences are visible. In the early 20<sup>th</sup> century, an Austrian scientist named Karl Landsteiner classified blood according to these differences. He was awarded the Nobel Prize for his achievements.

Landsteiner observed two distinct chemical molecules present on the surface of the red blood cells. He labeled one molecule "A" and the other molecule "B". We now know these molecules as being "A" and "B" antigens. If the red blood cell had only "A" antigens on it, that blood was called **Type A**. If the red blood cell had only "B" antigens on it, that blood was called **Type B**. If the red blood cell had a mixture of both "A" and "B" antigens, that blood was called **Type AB**. If the blood had neither "A" or "B" antigens, that blood was called **Type O**.



If two blood types are mixed together, the blood cells may begin to clump together in the blood vessels, causing a potentially fatal situation. Therefore, it is important that blood types be matched before blood transfusions take place. In an emergency, **Type O blood is known as the Universal Donor** and can be given because it is most likely to be accepted by all blood types. However, there is still a small risk involved if the Rh factors don't completely match. **Type AB blood is known as the Universal Recipient** as it can receive all blood types.

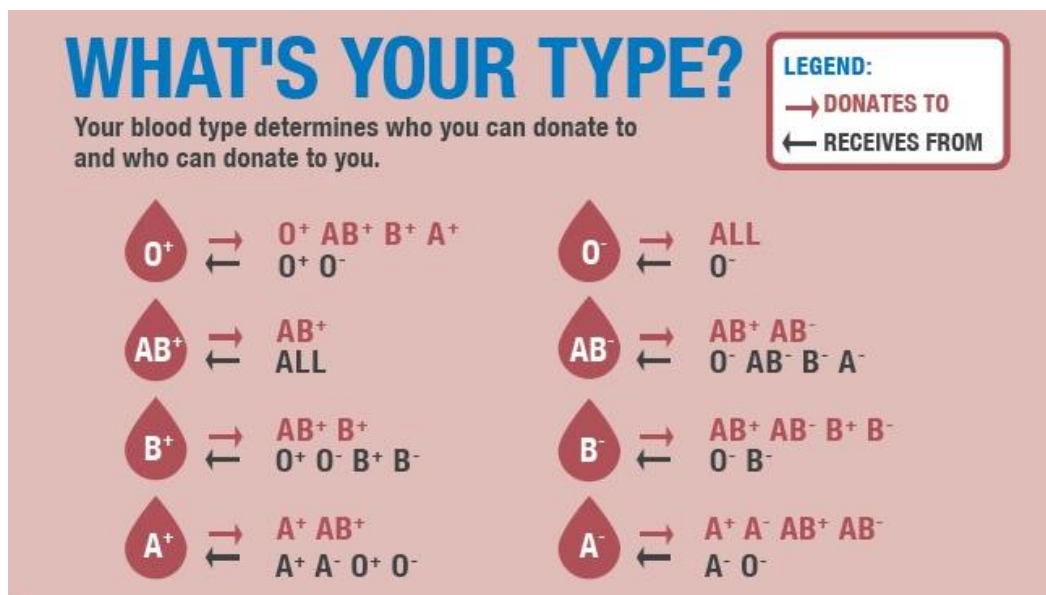
## Are You Positive or Negative?

Scientists sometimes study Rhesus monkeys to learn more about human anatomy because there are certain similarities between the two species. While studying Rhesus monkeys, a certain blood protein was discovered. This protein is also present in the blood of some people. Other people, however, do not have this protein. The presence of the protein, or lack of it, is referred to as the **Rh (for Rhesus) factor**.

If your blood does contain the protein, your blood is said to be **Rh positive (Rh+)**. If your blood does not contain the protein, your blood is said to be **Rh negative (Rh-)**.

This Rh factor is connected to your blood type. For example, your blood may be AB+ which means that you have Type AB blood with a positive Rh factor. Or you might have O- blood which means that you have Type O blood with a negative Rh factor.

It is particularly important for expectant mothers to know their blood's Rh factor. Great **pre-natal** care will include **Rh screening around 26 weeks**. Occasionally, a baby will inherit an Rh positive blood type from its father while the mother has an Rh negative blood type. The mother's immune system identifies the baby's blood as foreign and starts attacking the fetus. The baby's life could be in great danger if the mother's Rh negative blood attacks the baby's Rh positive blood. If this happens, an exchange transfusion may save the baby's life. The baby's blood can be exchanged for new blood that matches the mother's.



**Type O =**  
"Universal Donor"

**Type AB**  
=  
"Universal Recipient"



Name: \_\_\_\_\_ Date: \_\_\_\_\_

## HSci20: HB1 Circulatory System **Blood Typing Game**

### **Nobel Prize** **Educational Games:** **Blood Typing &** **Transfusions**

*Using the link below,  
play up to three rounds of the  
Quick Start-Random Blood  
Typing Game before handing  
in at the end of class.*

*Be sure to record your results.*

*✓ = saved on 1<sup>st</sup> attempt*

*X = harmed on 1<sup>st</sup> attempt*

*The game is designed so that  
you cannot completely kill a  
patient. You must problem  
solve the correct solution  
before moving on to help  
your next patient.*

<https://www.nobelprize.org/educational/medicine/bloodtypinggame>

<b><u>Trial Round</u></b>			
<b>Patients</b>	<b>Saved</b>	<b>Harmed</b>	<b>Ratio of Saved to Harmed</b>
1			
2			
3			
4			
5			
6			
7			
8			
9			

<b><u>Round 1</u></b>			
<b>Patients</b>	<b>Saved</b>	<b>Harmed</b>	<b>Ratio of Saved to Harmed</b>
1			
2			
3			
4			
5			
6			
7			
8			
9			

<b><u>Round 2</u></b>			
<b>Patients</b>	<b>Saved</b>	<b>Harmed</b>	<b>Ratio of Saved to Harmed</b>
1			
2			
3			
4			
5			
6			
7			
8			
9			

Name: \_\_\_\_\_ Date: \_\_\_\_\_

## HSci20: HB1 Circulatory System **Physical Activity Lab**

### Introduction:

The purpose of this activity is to provide students the opportunity to measure the variation in heart rates in different people after performing different activities while learning about the heart.

### What you need to know for this lab:

The pulse may be felt at points where arteries pass over solid tissue, known as pressure points e.g. in the wrist and neck. Pulse rate is a direct measure of heart rate.

Heart rate can vary with age as shown below:

Newborn: 140 bpm      7 years: 85-90 bpm      14 years: 80-85      Adult: 70-80

### **Average Adult Heart Rate (beats per minute) = 72 bpm**

In normal healthy individuals the heart rate, and thus the pulse rate, varies with the phases of respiration. Irregular changes in heart rate occur in all people. Heart rate may be increased by exercise, nervous excitement, stress due to mental effort, by adrenaline entering the bloodstream, food sensitivities or with increase in temperature caused by fever. The heart rate decreases when asleep and some medical conditions may also cause a drop.

Safe Heart Rates: (which are the same as Pulse Rates!)

During experiments the safe heart rate should not be exceeded. The safe level is given as the maximum heart rate for age, minus 20 beats per minute.

### **Maximum heart rate (mhr) = 220 – age**

**Moderate** Exercise = **50-70%** of max heart rate

**Vigorous** Exercise = **70-85%** of max heart rate

**High Intensity** Exercise = **85-95%** of max heart rate

Complete the following chart:

Age	Maximum HR	Moderate HR (50%)	Vigorous HR (70%)	High Intensity HR (85%)
12	208			
13	207			
14	206			
15	205			
16	204			
17	203			
18	202			

Name: \_\_\_\_\_ Date: \_\_\_\_\_

## HSci20: HB1 Circulatory System **Physical Activity Lab**

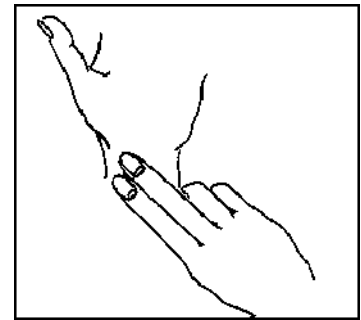
**THE PROBLEM TO SOLVE:** How will different physical activities affect my heart rate?

### **Hypothesis:**

### **Procedures and Observations:**

Work in pairs. Throughout this activity you and your partner will take turns being the subject and the experimenter.

First you must learn how to take a pulse. Study the picture to the right and locate the pulse in your partner's wrist. After you have sat quietly for 1 minute, have your partner count your pulse for 15 seconds.



*Record this number in Table 1 below.*

*Determine your pulse rate for 1 minute by multiplying the number by 4 and record in Table 1.*

Repeat two more times and record in the table. Switch roles with your partner. Transfer your recorded average resting pulse rate in Table 2.

**Table 1**

<b>Trial</b>	<b>Resting HR/15</b>	<b>Resting HR/min</b>	<b>Pulse Rate/15 sec.</b>	<b>Pulse Rate/min.</b>
<b>1</b>				
<b>2</b>				
<b>3</b>				

Perform the following activities, pulse should be taken by the experimenter for 15 seconds, record results in Table 2 and switch roles. Multiply this number by 4 and record on Table 2 and on the board.

- 1) The subject should stand stiffly at attention for 2 minutes. Then while the subject is still standing at attention, the pulse should be taken by the experimenter for 15 sec. Switch roles.
- 2) While seated, the subject should take a deep breath, exhale part of it and hold the breath as long as possible. While breath is being held, the subject's pulse should be taken by the experimenter for 15 seconds. Switch roles.
- 3) While seated, the subject should take deep breaths regularly for 30 seconds. After the first 15 seconds, the pulse of the subject should be taken by the experimenter for the remaining 15 seconds of deep breathing. Switch roles.
- 4) The subject should run in place, do jumping jacks or deep knee bends for 2 minutes. Immediately after exercising, the subject should sit and the pulse should be taken by the experimenter for 15 seconds. Then it should be taken again every minute for 15 seconds for the next 6 minutes. The time need for you pulse to return to the sitting pulse rate is called **recovery time**. Switch roles.

Name: \_\_\_\_\_ Date: \_\_\_\_\_

## HSci20: HB1 Circulatory System **Physical Activity Lab**

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- 5) Determine the class pulse rates for males and females in each activity and record them in Table 2.
- 6) Determine the class pulse rate averages for male and females in each activity and record in Table 2.

<b>Activity</b>	<b>Your Pulse Rate/Min.</b>	<b>Average Female Pulse Rate/Min</b>	<b>Average Male Pulse Rate/Min</b>
<b>Average Resting</b>			
<b>Standing at Attention</b>			
<b>Breath Holding</b>			
<b>Breathing Deeply</b>			
<b>Exercise</b>			
<b>Exercise (1 min. after)</b>			
<b>Exercise (2 min. after)</b>			
<b>Exercise (3 min. after)</b>			
<b>Exercise (4 min. after)</b>			
<b>Exercise (5 min. after)</b>			
<b>Exercise (6 min. after)</b>			

Construct a line graph to show what happens to your pulse rate after exercise. Put pulse rate per minute on the vertical axis and time in minutes on the horizontal axis. Plot your personal data, the average for females and the average for males.

Name: \_\_\_\_\_ Date: \_\_\_\_\_

## HSci20: HB1 Circulatory System **Physical Activity Lab**

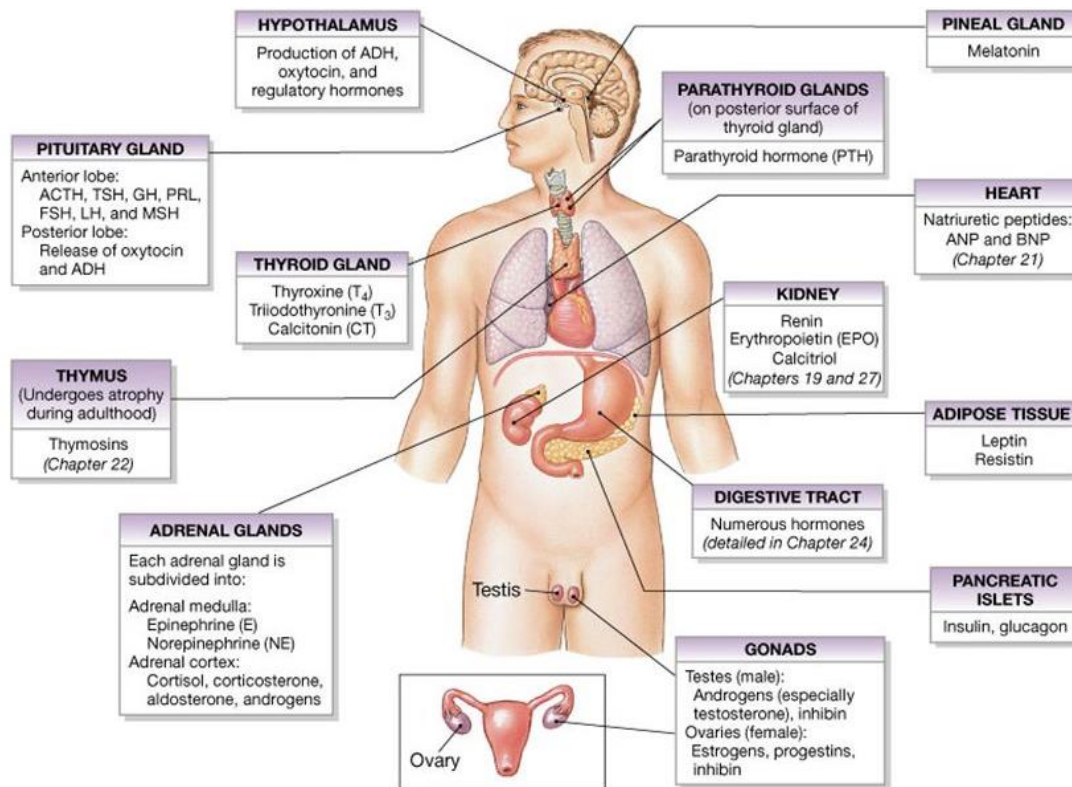
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### **Conclusions and Applications:**

1. How does your resting pulse rate compare with the average for your sex? Explain.
2. Why did you take a resting pulse rate (before the other activities)?
3. Why do you think holding your breath affects the pulse rate?
4. Compare the average male and average female pulse rates for the various activities.
5. For the same activity, do the pulse rates of females and males change in the same way?
6. Which activity increased your pulse rate the most? What does this increase indicate?
7. What do you think is the relationship between physical condition and pulse rate after exercise? Between physical condition and recovery time?

## Endocrine System Regulates:

1. Metabolism
2. Homeostasis
3. Growth
4. Reproduction



The endocrine system employs **chemical messengers** called **hormones**, which move through the blood stream, and can reach every cell in the body. Their effect can be rapid or delayed (Guinness, 1989, p. 74). Hormones help maintain **homeostasis** (a constant environment inside the body), adjusting the amount of salt and water in your tissues, sugar in your blood, and salt in your sweat to suit the particular conditions around you. Hormones produce both long-term changes, such as a child's growth and sexual maturation, and rhythmic ones, such as the menstrual cycle. They trigger swift, dramatic responses in the body whenever illness or injury strikes or your brain perceives danger. They have a lot to do with such powerful emotions as anger and fear, joy and despair (Guinness, 1989, p. 74).

**Homeostasis** - The ability to keep the internal environment of your body constant despite changes in the external environment.

**Glands** - Organs that secrete hormones.

**Hormones** - Chemical substances secreted into the blood that influence growth, development and behavior of other cells.

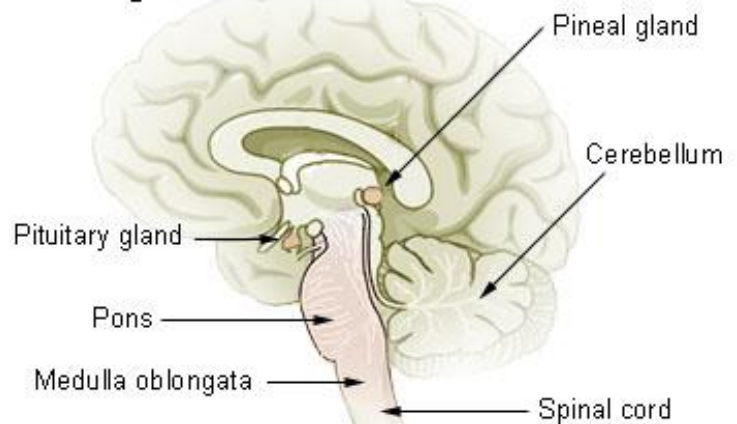
### Two (2) types of hormones:

1. **Protein** – Can NOT pass through membranes Example: Insulin
2. **Steroid** – Can pass through membranes Example: Estrogen

## Pituitary Gland: The “Master Commander”

The Pituitary gland is  
controlled by the  
*hypothalamus*  
in the brain.

**Pituitary and Pineal Glands**



**Anterior Pituitary:** Secretes hormones controlling other glands

**Thyroid Stimulating Hormone (TSH):** stimulates the production and release of thyroxine from the thyroid gland

**Adrenocorticotrophic Hormone (ACTH):** stimulates the production & release of hormones from the cortex layer of the adrenal glands

**Growth Hormone (GH):** controls growth

**Follicle Stimulating Hormone (FSH):** stimulates the development of egg cells in the ovaries in females; in males, it controls the production of sperm cells in testes

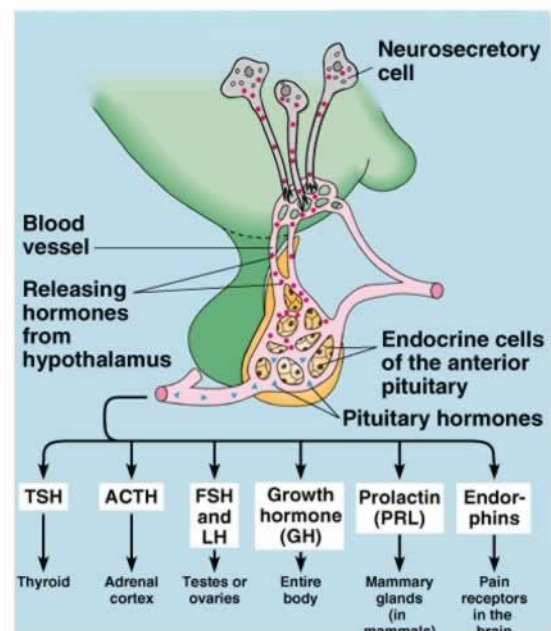
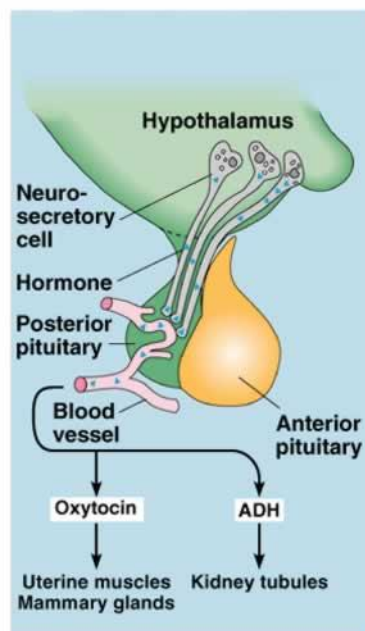
**Lutenizing Hormone (LH):** releases the egg cells from the ovaries in females

**Prolactin:** stimulates the secretion of milk by the mammary glands of the female after she gives birth

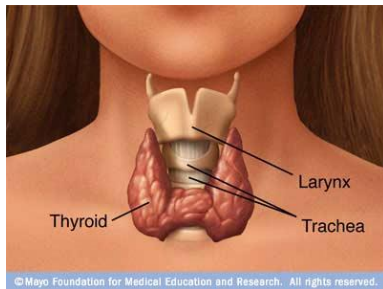
### **Posterior Pituitary:**

**Oxytocin:**  
controls  
contractions of  
uterus during  
childbirth

**Vasopressin:**  
(A.K.A. ADH)  
controls the re-  
absorption of  
water by the  
nephrons of the  
kidneys.







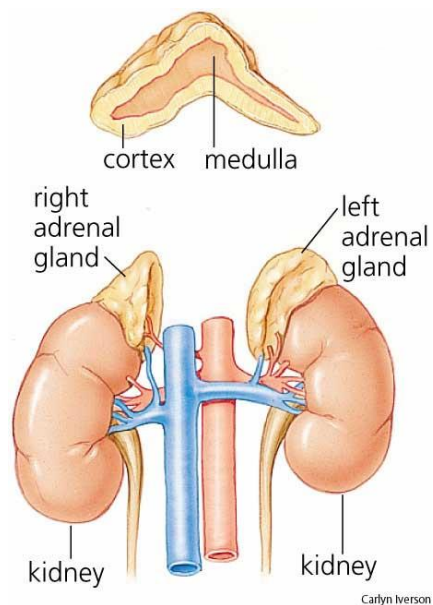
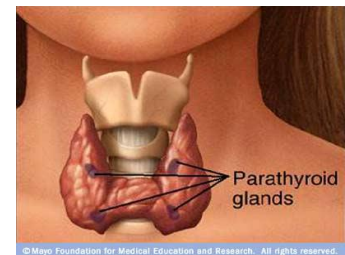
## Thyroid Gland

**Thyroxin:** regulates the metabolism of protein, fats & carbohydrates and cellular respiration rates; contains iodine

**Calcitonin:** regulates blood calcium levels

## Parathyroid Glands

**Parathyroid:** regulates the metabolism of calcium (growth, bones/teeth, clotting, nerve function & muscle contractions) and phosphate (bones, ATP, DNA & RNA)



## Adrenal Glands

Medulla (inner layer) deals with sudden stress

**Norepinephrine & Epinephrine:**  
**(A.K.A Adrenalin)**

Secreted to produce our emergency fight-or-flight response during sudden stress such as fear, anger, pain or physical exertion

Cortex (outer layer) deals with chronic Stress

**Cortisol (A.K.A. Hydrocortisone):** regulates metabolism of carbohydrates, proteins & fats

**Aldosterone:** maintains normal blood mineral balance

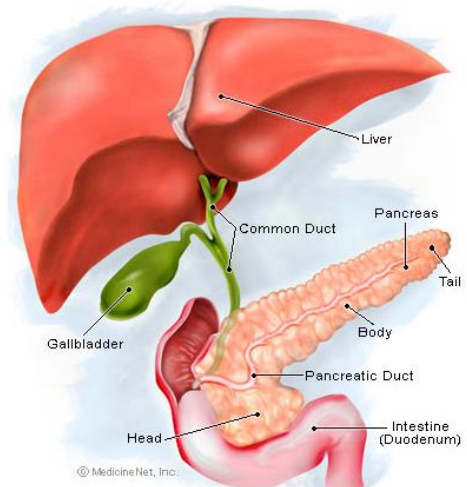
## Pancreas

*Islets of Langerhans* secrete glucagon and insulin.

**Glucagon:** pulls sugar from the cells back into the blood.

**Insulin:** releases sugar from the blood into the cells.

When insulin fails or isn't present, glucose can't leave the blood and enter the cells. As a result, the sugar punches holes in the blood vessels causing damage needing constant repair. This results in blindness or limb amputations when the body can't keep up with recovery. The kidneys must excrete the sugar in the urine = **DIABETES** = death if untreated.

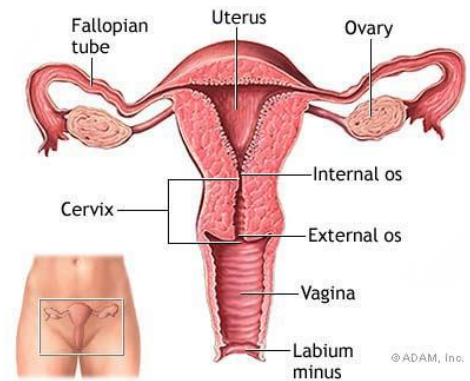




## Female Gonads: Ovaries “A.K.A. Female Sex Glands”

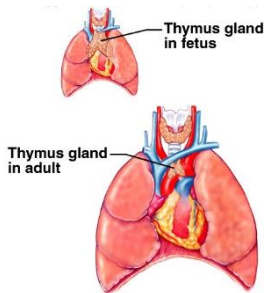
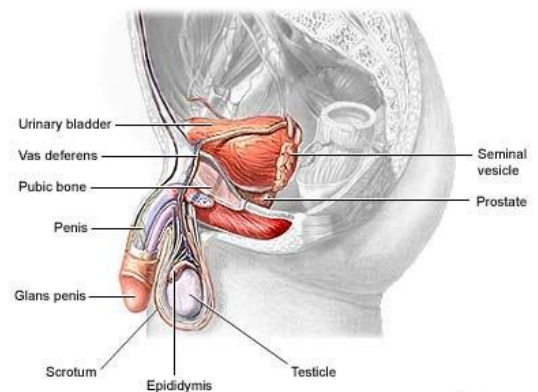
**Estrogen:** stimulates the development of the female reproductive system; promotes the development of secondary sex characteristics such as broadening hips and development of breasts; regulates menstrual cycle.

**Progesterone:** works with estrogen to regulate the menstrual cycle.



## Male Gonads: Testes “A.K.A. Male Sex Glands”

**Testosterone:** stimulates the development of the male reproductive system; promotes the development of secondary sex characteristics such as deepening of the voice, beard, body hair and the male body form



## The Thymus

**Thymosin:** stimulates the development of T- lymphocytes which help defend the body against infection as children.

It *APPEARS* not to serve any function in adults.

## The Pineal Gland

**Melatonin:** regulates the sleep/wake pattern; causing drowsiness & lowering body temperature; needed to trigger quality sleep patterns; may inhibit sexual development



## The Digestive Glands

**Saliva:** stimulates the flow of saliva & the enzyme amylase to break down starches

**Gastrin:** stimulates the flow of gastric juices in the stomach

**Secretin:** stimulates the flow of pancreatic juices in the small intestines

Miss Foley

HSci20: HB1 Digestive System

**Digestion**

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FINISH!!!!

## What Your Bowel Movements Are Telling You About Your Health

It may not be a topic typically talked about at the dinner table or a cocktail party, but most people are actually somewhat obsessed with it. And with good reason: The state of your gastrointestinal tract (as well as the quality and quantity of its output) is a great barometer of the health of your body. "The GI tract is a processing unit that metabolizes all of the nutrients you take in and eliminates all of the body's waste," explains Dr. Amy Foxx-Orenstein, president of the American College of Gastroenterology. "What comes through it is reflective of how well or how ill the body is."

**Hard and Dry:** The amount of time it takes for the food you eat to make its way through the gastro-intestinal system and exit into the toilet will have an impact on the consistency of your stool. "Intestinal transit averages 40 to 45 hours from when you eat to when it comes out," says Foxx-Orenstein. If it stays in the GI tract for longer than that, fluid is re-absorbed into the body and the stool becomes harder and dryer. Certain medications—like blood pressure drugs, antidepressants and histamines—can slow down the GI tract. Constipation, which has a myriad of causes, will lead to harder, drier stools (since you're going less often, your stool will stall in the system and the fluid re-absorbed). For some people, a diet high in dairy can be a cause of constipation, so if you are experiencing problems going (and have dry, hard-to-pass stool when you do finally go), it is worth reducing your dairy intake for a week or two to see if that helps. And being dehydrated can also lead to this problem because if the body is lacking in water, it will draw it—and conserve it—from wherever it can find it.

**Little Lumps:** "An ideal stool looks like a torpedo—it should be large, soft, fluffy and easy to pass," says Foxx-Orenstein. But when conditions are less than ideal, the stool may become more like little deer pellets. Again, transit time may be part of the issue because slow-moving stool will lose fluid, making them less fluffy and lumpier. A lack of fiber in the diet may also be to blame. Beware if you're following a weight-loss plan (such as Atkins) that focuses on increasing protein and decreasing carbohydrates, since that can leave you with a diet that's low in fiber. And since fiber holds on to fluid, a lack of it will lead to harder, pellet-like poops that may be more difficult to pass.

**Too Much Liquid:** Your body secretes about eight liters of fluid during the course of a day—from the stomach, salivary glands and pancreas—to help your food get broken down and make its way through the digestive system. Under normal, healthy conditions, the majority of that fluid is absorbed along the way, resulting in those sought-after soft, fluffy stools. But if food passes through too quickly, there isn't enough time for all of that liquid to absorb, and the stool emerges in a too-soft state. The reasons for such super-quick transit could include a sudden increase in fiber in the diet, or a bacterial or viral infection. "When there is an infection, the body produces toxins which cause water to be released," says Dr. Michael Farber, director of the Executive Health Program at Hackensack University Medical Center. "Things move through very quickly through your system because the body wants to get rid of them."



**Pencil Thin:** Thin may be the preferable state for many things—figures, cell phones, television screens—but when it comes to bowel movements, thin is definitely not a good thing. Specifically, thin stools could be an indicator of colon cancer, or its precursor, polyps in the colon. "Whenever you have mass in the colon that creates blockage, anything that needs to be pushed past that mass will become thinner," Farber says. "If you are seeing thin stools on a consistent basis, that is something you should have looked at by your doctor."

**Looking Pale or Gray:** Normal stool can come in a range of colors (influenced by what you eat and what medications you take, among other factors). But if your stool has an unhealthy hue, particularly if it's pale or grayish in tone, you could have problems somewhere along your digestive tract. The liver excretes bile to help break down fats in the food you eat, and that bile also adds color to the stool. But if there's a blockage in the liver—or in the tubes through which the bile travels—the stool might take on a too-pale appearance. Also, if you are suffering from a pancreatic disorder, the stool might look gray because it will be lacking the color imbued by the digestive enzymes produced in that organ.

**Bright Red:** Your first instinct upon seeing red-colored stool in the toilet would probably be to panic. But before you speed-dial your doctor, think about what you ate several hours ago—if it was beets or bright red popsicles, that might be the culprit for creating those colored stools. If it's obviously a streak of red blood in the stool, in the toilet, or on the toilet paper, then it's given that you're bleeding somewhere inside. There's still not necessarily any reason to panic—the cause could be something as benign as a hemorrhoid or just a small fissure caused by straining to go. That said, it's a wise idea to discuss with your doctor if you are straining often since that can lead to painful hemorrhoids. Also, if you've never seen blood before it's definitely worth having your doctor rule out more serious causes—like colon cancer.

**Too Dark:** If your stool is suddenly black and looks sort of tar-like, the culprit could be lurking in your daily vitamin pill. Iron supplementation (on its own or when it's included in a multi-vitamin) can have that effect on the stool. But if you haven't recently started taking extra iron and you see this sort of change, you should make an appointment to see your doctor. "If there is bleeding higher up in the GI tract—like the stomach or esophagus—the result can be stool that looks black and tar-like," says Foxx-Orenstein. "It's very useful information for the doctor to know if what you're seeing is black or bright red because that gives a clue to the location of the bleeding." In either case, she strongly urges anyone who is seeing blood in their stool to get checked out by their doctor.

**It Floats (And Stinks!):** Those ideal torpedo-like poops should sink when they hit they hit the toilet. But when the body isn't properly absorbing fat from the food you eat, it ends up being excreted in your stool. The result: stool that's yellowish in color, greasy in consistency, foul smelling, and that floats in the toilet. Certain medical conditions, like celiac disease, can cause these malabsorption problems. And since essential nutrients could also be lost along with the unabsorbed fat, it's important to see your doctor if you experience this problem. These fatty, smelly stools are also one of the more unpleasant side effects of eating foods that contain Olestra (the faux fat found in some chips and other fried snacks) or of taking the weight loss drug Xenicalor its over-the-counter cousin, Alli.

**Not Going:** How often is normal? How much is too much? Or not enough? Everyone wonders if they're spending too much—or too little—time on the toilet. Turns out, there is no one right answer. "There is no true ideal for how frequent your bowel movements should be," Foxx-Orenstein says. "What's 'normal' is going to be different for different people." Once a day, three times a day, every other day—all of these could very well fall within the definition of normal and healthy bowel movements. But if you experience a change in your normal pattern, then you need to look at what might be causing it. If you're suddenly going too much, it could be because you've recently increased the amount of fiber in your diet. That's a good thing, but it will take the body a little while to adjust to the change. And if you are suddenly dealing with constipation, look first at what changes you've made to your diet. If you're not eating enough fiber, not eating breakfast [which helps get things moving in the morning], or just not eating enough food, you may be constipated because your body's not able to produce enough waste.

## What Your Urine is Telling You About Your Health

A trip to the toilet may be more revealing than you think. "The appearance and smell of your urine—as well as the frequency with which you have to go—can provide many clues to what else is going on in your body," says Dr. Michael Farber, director of the Executive Health Program at Hackensack University Medical Center in Hackensack, N.J.

**Looking Pale:** If your urine is as colorless as water, well, that's probably because you've been drinking a lot of water. And besides the inconvenience of going to the bathroom many times a day because your bladder is filling up with fluid faster, there's really nothing medically worrisome about having a light colored output.

**Too Dark:** If your urine has a brownish, iced tea-colored tinge, that could be a sign that you are dehydrated and the kidney is producing more concentrated (as opposed to diluted) urine. "The urine gives good indications of the body's level of hydration," Farber says, "so if a patient complains of dizziness or lightheadedness, you would want to check the urine to rule out dehydration as a cause of the problem." The ideal shade to strive for is the color of straw. Another reason to get yourself checked out if you see dark urine—especially if it doesn't lighten up after you drink a few glasses of water—is that the cause could actually be blood. It won't be as obvious as a bright red drop in the toilet, but it could be a sign of bleeding higher up in the kidney which could indicate an infection, kidney disease or even cancer.

**Sweet Smelling:** Catching a whiff of something sugary sweet after you pee might actually be a clue to something very serious going on in your body. "A sugary smell might indicate the presence of blood sugar that's being excreted in the urine," says Farber. And a high concentration of blood sugar in the urine is one sign of diabetes. The kidney acts as a filter for all sorts of waste that flows through the body. But if your filter is damaged, things can leak out of it and end up being excreted in the urine. In the case of diabetes, excess blood sugar sneaks out through a leaky filter and shows up in the urine. If you are pregnant, changes in the kidney filtration system can result in the presence of sugar in the urine. Whether pregnant or not, if a doctor finds sugar in your urine, he or she should order further tests to determine if diabetes is a concern.



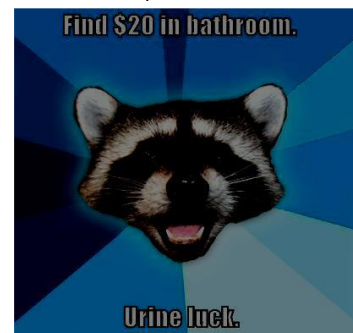
**Funny Smelling:** It can be a little bit disconcerting, but, smelling an odd odor when you pee is probably nothing to be worried about. Certain foods—asparagus, most notoriously—produce a sulfur-containing amino acid. So when the food is broken down in the digestive system, those smelly substances are released, filtered through the kidney, and then make their way into the urine where they create an unpleasant scent. As soon as the food responsible has been fully digested and flushed from your system completely, the smell will vanish as well.

**Bright Yellow:** Urine that looks nearly neon-colored may seem somewhat alarming, but the cause is most likely nothing more sinister than your daily multivitamin pill. "The B vitamins and carotene in particular give the urine a deeper, more golden color," says Dr. Deborah J. Lightner, associate professor of urology at the Mayo Clinic in Rochester, Minn. And don't worry: That brightly colored urine means you're simply pissing away all of your expensive supplements. The urine color can be affected as the vitamins filter through your system—even as they are being absorbed and utilized.

**A Spot of Blood:** Seeing a splash of red in the toilet can mean many things—some quite benign, others quite serious. “For that reason, you should always have your doctor check your urine if you see blood,” warns Lightner. “In an otherwise healthy young woman, the chances are overwhelmingly in favor of it being a sign of a urinary tract infection, but blood in the urine is also one of the seven deadly signs of bladder cancer in both women and in men.” Beyond the possibilities of infection or (worst case scenario) cancer, blood in the urine can also be caused by microscopic trauma or tears (not uncommon after an endurance event like a marathon), kidney stones, or as a side effect of taking blood-thinning medication or daily aspirin therapy.

**“Always Gotta Go”:** You’ve seen the commercials of people racing to the bathroom in a panic because they have to go so often and so urgently. There are a variety of possible causes, and unless you are going so often that it’s truly affecting your life, frequent bathroom urges probably are not cause for concern (or for taking the medications advertised in those commercials). Look first at your diet and lifestyle. If you’ve suddenly picked up the habit of toting a water bottle with you everywhere and have greatly increased your H<sub>2</sub>O intake, the reason could be as simple as the fact that you’re filling your bladder up more often and more quickly than you used to—and, consequently, it needs to be emptied more frequently than it used to. Or maybe you’ve recently changed your diet to include foods that contain more water (such as fruits and vegetables) and act as diuretics, or begun taking medications (like drugs used to treat high blood pressure) which are also diuretics. One of the common symptoms of a urinary tract infection is an urgent need to pee (often without being able to once you get to the toilet). Growing older can also be to blame for increased frequency and urgency in both men and women—as the way the kidney and the bladder make and discharge urine changes with age. For men, however, the prostate may play a role. It’s not uncommon as men age for the prostate to become enlarged and cause an obstruction that causes weak urine flow and prevents the bladder from emptying effectively, which then creates the need to go more often.

**A Little Leakage:** It’s one of those topics no one likes to talk about, but a lot of women—even very young women who have never gone through childbirth—experience some type of urinary incontinence. “Stress incontinence is a condition in which the muscles of the pelvic floor can’t handle the increased pressure of high impact activities like running or gymnastics, or even something like coughing or sneezing,” Lightner says. And when the pelvic floor is too weak to withstand that sort of pressure, the result is that a small amount of urine will leak out. The situation often begins—or gets significantly worse—after a woman gives birth. The best solution is to strengthen the pelvic floor by regularly doing Kegel exercises (in which you repeatedly contract and release those muscles as if you were trying to stop your flow of urine). Another type of urinary incontinence is called urge incontinence, and it is characterized, not by weak muscles, but by a bladder malfunction. “The bladder will fire without your permission, so you won’t necessarily get the signal to head to the bathroom before your bladder decides it’s time to empty itself,” says Lightner.



**A Burning Sensation:** If you are suddenly experiencing pain when you pee, it’s highly likely that you are experiencing one of the first signs of a urinary tract infection. Such infections are incredibly common among sexually active, pre-menopausal women, thanks to the fact that the female anatomy puts a relatively short urinary canal in close proximity with the vagina and rectum. That proximity makes it very easy for bacteria to find its way into the urethra and up the urinary canal. Oral antibiotics can clear the infection up within days, and increasing fluids can help flush out bacteria to shorten the duration of the infection. The male anatomy makes urinary tract infections a much rarer event for men, but they can happen—and, Lightner warns, similar signs and symptoms in men can also signal an infection of the prostate.



This assignment will focus  
on analyzing three  
separate bowel  
movements over the  
course of a week.










1. Observe and analyze three different bowel movements over a week using the Bristol Stool Chart. Write a paragraph about each considering the following:
  - a. Shape – What shapes are there? Describe. If not ideal ("S" shaped or "C" shaped) Consider why? (ie. Not enough fiber? Inappropriate hydration? Lack of food?)
  - b. Color/Consistency – Describe and consider why? (Lots of corn? Beets?)
  - c. Effort – Did it come out easily? Did you blow out your eyeballs (excess strain)? Any pain? How long did it take?
2. Give it a rating – 1 (Dangerous / Should see a doctor) to 5 (Extremely healthy / absolutely no issues).
3. Use paragraphs and analyze how your diet and hydrating habits are playing a role in your ability to produce healthy stool.

**Observations:**

Day	Shape	Color/Consistency	Effort

# Bristol Stool Chart

Type 1		Separate hard lumps, like nuts (hard to pass)
Type 2		Sausage-shaped but lumpy
Type 3		Like a sausage but with cracks on the surface
Type 4		Like a sausage or snake, smooth and soft
Type 5		Soft blobs with clear-cut edges
Type 6		Fluffy pieces with ragged edges, a mushy stool
Type 7		Watery, no solid pieces. Entirely Liquid













Name: \_\_\_\_\_ Date: \_\_\_\_\_

HSci20: HB1 Anatomy

**Circulatory System**

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## **Heart Rate, Blood Pressure & Reflexes Lab**

1. Explain how does the health care field assess the quality of a reflex?
  
  
  
  
  
  
  
  
  
  
2. Explain how to "mark" the correct contact point when testing the following reflexes:
  - Achilles Tendon Reflex –
  
  
  
  
  
  - Patellar Tendon Reflex –
  
  
  
  
  
  - Biceps Reflex –
  
  
  
  
  
  - Brachioradialis Reflex –
  
  
  
  
  
  - Triceps Reflex –
  
  
  
  
  
  - Babinski Response –
  
  
  
  
  
  
  
  
  
  
3. What is the relationship between respiration rate and heart rate? Does one affect the other? If so, how?
  
  
  
  
  
  
  
  
  
  
4. What factors could affect readings taken with the Lab Quest blood pressure sensors?

Name: \_\_\_\_\_ Date: \_\_\_\_\_

## HSci20: HB1 Anatomy

## **Circulatory System**

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5. What is the relationship between blood pressure & body position?

Standing to sitting –

Sitting to laying down –

Laying down to Standing up –

Higher intensity activity to laying down –

6. List the steps to properly taking blood pressure manually.

7. What factors could affect the accuracy of blood pressure readings taken manually

# New Patient Check Up!

During a physical examination, there are many things a Health Practitioner may be looking for as they gather cues and clues. Some clues are based on physical examination; others will be based on verbal information provided, such as a person's medical history. The Health Practitioner can tell a lot just by watching a patient. Are they limping? Are they breathing quickly? Is their skin pale and flushed? Observing a patient gives the healthcare professional a lot of useful information.

Marshalina is an 18-year-old new university student who has recently moved to a new town; this means, she needs a new family doctor! Being that she hasn't been for a basic check up in since she was a kid, she is VERY nervous. Your task, as Marshalina's roommate, is to walk her through the procedures that she is to expect while undergoing this nerve-racking experience.

**Step 1:** Patient History. Generate a list of 6 sample questions that Marshalina might be asked while at her doctor's office. You will also need to explain why it is important that Marshalina is honest when answering these questions.

[illegible]



**Step 2:** Physical Examination. The doctor will likely do a physical examination to use as a base point to compare from visit to visit. Some of the areas the doctor might examine are below. Help Marshalina by explaining the procedure of each of these exams, the tools used in each of the exams and the reasoning for why these examinations are helpful. If possible, also provide a base/normal value/range for an average 18 year old female.

Examination	Procedure/Tools Used	Helpfulness?
Height	During this examination, the practitioner will use a measuring tape/stick to determine your height in cm.	A practitioner might use your height and weight to calculate your BMI to determine if you are in the healthy range (18.5-24.9). BMI is a controversial measure of overweight and obesity but can be a starting point gauge of your risk for diseases that can occur with more body fat (heart disease, high blood pressure, type 2 diabetes, gallstones, breathing problems, and certain cancers)** These values many also be used as reference points to observe an increase or decrease in weight between visits.
Weight	During this examination, the practitioner will use a scale to measure your weight in kg.	
Vitals		
Body Temperature	normal value:	
Heart Rate	normal value:	
Respiration Rate	normal value:	
Blood Pressure	normal range:	

Other		
Examination	Procedure/Tools Used	Helpfulness?
Lungs		
Mouth and Throat		
Ears/Eyes		
Abdominal Check		
Lab Tests		
Urine		
Blood Glucose	normal range:	

\*\* Although BMI can be used for most men and women, it does have some limits. It may overestimate body fat in athletes and others who have a muscular build. It may underestimate body fat in older persons and others who have lost muscle.

**If you are going for a check-up for a specific reason, other types of laboratory tests such as culture swabs and tissue slides might be completed. We will learn about these procedures later in the course.**

**Helpful sites:**

<https://myhealth.alberta.ca/health/tests-treatments/Pages/searchTestsAndTreatmentsByName.aspx?test=a>

## **New Patient Intake Form**





## **“Peering Through Urine” Article**

## **“Peering Through Urine” Article**

Name: \_\_\_\_\_ Date: \_\_\_\_\_

HSci20: DT1 Diagnostics

**Urinalysis**

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## **“Peering Through Urine” Article Questions**

1. On average, how much urine does a person produce in a day?
2. What purpose does urine serve for the body?
3. What typically makes up a urine solution?
4. What are some factors that can affect the color of your urine?



Date: \_\_\_\_\_

## Urinalysis

5. List several physical properties of urine that can be observed when analyzing urine for potential signs of sickness?
6. What is one of the most common ways to detect chemical in urine?
7. List several substances that one can test for in the urine using a dipstick?
8. How is a dipstick able to indicate differing amounts of certain substances in your urine?

Complete some external research to determine the normal range for pH, glucose, ketones and protein in urine. In addition, determine what normal urine should look like in terms of color and turbidity. Use this information to fill in the normal range column of Table 1 and Table 2 in the observations section.

**Purpose:**

The purpose of this activity is to perform two types of analysis (macro analysis and microchemistry) on a variety of urine samples to understand the procedure and purpose of urine testing in the healthcare world.

**Materials:**

- Multipurpose urine testing strips (1 per urine sample per person)
- Urine samples (2 per person) PRE and 3 days later POST
- Small test tubes or cups (1 per urine sample)
- Test tube rack, if using test tubes
- Stop watch
- Latex gloves and safety glasses

**Test Procedure:**

1. Read through the whole procedure before starting the lab.
2. Obtain the materials necessary to complete the lab activity and put on safety equipment.
3. Label your test tube or cup sample. Obtain 5mL of each urine sample and place into the appropriate test tube OR leave urine sample in cup.
4. Complete the **macroscopic analysis** of your urine sample. You will only need your eyes for this step. Write down your observations for color and turbidity in the measured results column in Table 1 for each sample. If your measured result doesn't match your normal range, indicate this by writing 'Y' in the last column. If they do match, indicate this with 'N' in the last column.
5. Complete the **microscopic test strip analysis** of your urine samples. Be very careful that you follow the procedure below; if not, this could affect your results.
  - a. Swirl your urine sample
  - b. Remove lid of reagent container.
  - c. Lift 1 strip out of the container without contaminating it. This means do not touch any of the reagent pads with your fingers.
  - d. Close reagent container.
  - e. Dip strip into urine; covering all reagent bars without touching the rim of the urine container.
  - f. Remove strip after 1-2 seconds. Tap against side of container to remove excess urine.
  - g. Start stop watch immediately.
  - h. Read reagent strip at correct time and record results in the measured results of Table 2:
    - i. Glucose, Ketones and Protein: 1 minute
    - ii. pH: 10 seconds
  - i. Take a picture to document your strip results in comparison to results color chart.
  - j. Discard strip and urine immediately.
  - k. Repeat this process for as many urine samples as you have.
6. Clean work area with disinfectant. Wash and put away all materials as directed by your instructor. Remove safety goggles and gloves, and then wash hands.
7. Drink 2+ liters of water/day for the next three (3) days. Repeat procedure for POST urine sample

## Urinalysis Interpretation

### Smell

The normal smell of urine can be described as **urineoid**. Other smells of interest include:

- Fecal smell - gastrointestinal-bladder fistula
- Fruity or sweet smell - diabetic ketoacidosis
- Ammonia smell - alkaline fermentation.
- Asparagus smell - eating a lot of asparagus, can often smell it within 20 min of ingestion

### Colour

Normal urine colour is often described as straw, yellow or amber. This colour may be altered by medications, food sources or disease. Vitamin tablets often result in a bright yellow urine, as does the presence of bilirubin (a bile pigment). Red urine may be due to blood, hemoglobin, or beetroot. Iron supplements may cause a dark brown specimen, as might amounts of urobilin or urobilinogen (a chemical produced in the intestines). Normal urine is also transparent. Turbid or cloudy urine may result from infection the presence of blood cells, bacteria or yeast (ex. Candida). Foamy urine may indicate either the presence of glucose or protein.

### Leukocytes

This test detects white cells in the urine (pyuria) which is associated with urinary tract infection.

### Nitrites

Nitrites are formed by the breakdown of urinary nitrates. This is usually caused by Gram-negative and some Gram-positive bacteria. So the presence of nitrites suggests bacterial infection such as E. coli, Staphylococcus and Klebsiella. Commonly found during a urinary tract infection.

### Urobilinogen

Normally present in the urine in small quantity. Less than 1% of urobilinogen is passed by the kidneys the remainder is excreted in the feces or transported back to the liver and converted into bile. Raised levels may be due to:

- Cirrhosis
- Hepatitis
- Hepatic necrosis
- Hemolytic and pernicious anemia
- Malaria

### Protein

This is measuring the amount of albumin in the urine. Normally there should be no detectable quantities. Elevated protein levels are known as proteinuria. Albumin is one of the smaller proteins, and if the kidneys begin to dysfunction it may show an early sign of kidney disease. Other conditions which may lead to protein in the urine include:

- Injury to the urinary tract, bladder or urethra
- Inflammation, malignancies.
- Multiple myeloma

### Ketones

Not normally found in the urine, ketones are produced during fat metabolism. Presence of ketones may indicate:

- diabetes
- alcoholism
- eclampsia
- a state of starvation
- pregnancy

### Normal urine analysis

- Normal values are as follows:
- Color – Yellow (light/pale to dark/deep amber)
- Clarity/turbidity – Clear or cloudy
- pH – 4.5-8
- Specific gravity – 1.005-1.025
- Glucose –  $\leq 130$  mg/d
- Crystals – Occasionally
- Bacteria – None
- Yeast – None
- Casts – 0-5 hyaline casts/lpf
- Ketones – None
- Nitrates – Negative
- Leukocyte esterase – Negative
- Bilirubin – Negative
- Urobilinogen – Small amount (0.5-1 mg/dL)
- Blood –  $\leq 3$  RBCs
- Protein –  $\leq 150$  mg/d
- RBCs –  $\leq 3$  RBCs/hpf
- WBCs –  $\leq 2-5$  WBCs/hpf
- Squamous epithelial cells –  $\leq 15-20$  squamous epithelial cells/hpf

## pH

Measures the hydrogen ion concentration of the urine. It is important that a fresh sample be used as urine becomes more alkaline over time as bacteria convert urea to ammonia (which is very alkaline). Urine is normally acidic but its normal pH ranges from 4.5 to 8.

### Low pH (acidic):

- Foods such as acidic fruits (cranberries) can lower the pH, as can high a high protein diet.
- As urine generally reflects the blood pH, metabolic or respiratory acidosis can make it more acidic.
- Other causes of acidic urine include diabetes, diarrhea and starvation.

### High pH (alkaline):

- Low carb or vegetarian diet
- May be associated with renal calculi.
- Respiratory or metabolic alkalosis
- Urinary tract infection

## Hematuria

Classified as microscopic or macroscopic. Microscopic means that the blood is not visible with the naked eye. Blood may be present in the urine following trauma, smoking, infection, renal calculi or strenuous exercise. It may also be present with:

- Urinary tract infections.
- Damage to the glomerulus or tumors which erode the urinary tract.
- Acute tubular necrosis.
- Traumatic catheterization.
- Damage caused by the passage of kidney stones.
- Contamination from the vagina during menstruation.
- The presence of myoglobin (myoglobinuria) after muscle injury will also cause the reagent strip to indicate blood.

## Specific Gravity

The specific gravity (SG) of urine signifies the concentration of dissolved solutes and reflects the effectiveness of the renal tubules to concentrate it (when the body needs to conserve fluid). If there were no solutes present the urine's SG would be 1.000, the same as pure water. The SG of urine is around 1.010 but can vary greatly:

### Decreased SG may be due to:

- Excessive fluid intake (oral or IV fluids)
- Renal failure
- Acute glomerulonephritis, pyelonephritis, acute tubular necrosis
- Diabetes insipidus

### Increased SG may be due to:

- Dehydration due to poor fluid intake, vomiting or diarrhea
- Heart failure
- Liver failure
- Inappropriate antidiuretic hormone secretion
- It also reflects a high solute concentration which may be from glucose (diabetes or IV glucose) or protein.

## Bilirubin

Produced as a by-product during the degradation of RBC in the liver and normally excreted in the bile. Once in the intestine it is excreted in the feces (as stercobilin) or by the kidneys (as urobilinogen). Presence of bilirubin in the urine may therefore indicate:

- liver disease
- biliary tract infection
- pancreatic causes of obstructive jaundice

## Glucose

Glucose is not normally present in the urine. Once the level of glucose in the blood reaches a renal threshold™ the kidneys begin to excrete it into the urine in an attempt to decrease the blood concentration. So high blood concentrations lead to glycosuria, as does conditions that may reduce this renal threshold.

- Diabetes
- Liver disease
- Medications such as tetracycline, lithium, penicillin, cephalosporins
- Pregnancy

Name: \_\_\_\_\_ Date: \_\_\_\_\_

Observations:

Table 1: Macroscopic Analysis

Urine Sample	Characteristic	Normal Range	Measured Results	Abnormal results? (y or n)
PRE	color			
	turbidity			
POST	color			
	turbidity			

Table 2: Chemical Analysis

Urine Sample	Characteristic	Normal Range	Measured Results	Abnormal results? (y or n)
PRE	pH			
	Protein			
	Glucose			
	Ketones			
POST	pH			
	Protein			
	Glucose			
	Ketones			

PRE Sample Comparison Pic

POST Sample Comparison Pic

Name: \_\_\_\_\_ Date: \_\_\_\_\_

## HSci20: DT1 Diagnostics

## Urinalysis Lab

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### Discussion Questions:

1. How can water intake be judged by the color of urine?
2. What is the normal value for glucose in urine?
3. Is it ever "normal" to find protein in urine? Why or why not?
4. a) Did you drink 2+ liters of water/day for the last 3 days?  
  
b) What affect did hydration or "de" hydration have on the macroscopic analysis of your POST urine sample?
5. The presence of ketones is often high in the urine of both diabetics and peoples who suffer from anorexia. What characteristics would these two groups have in common that would cause this to happen?

### Conclusion:

Write a paragraph that summarizes your results and relates back to your purpose. This is where you should summarize your data and have a chance to analyze the results you observed in the lab. For example, if a sample 2 had a positive protein and ketone result...what does that mean?

Name: \_\_\_\_\_ Date: \_\_\_\_\_

## HSci20: DT1 Diagnostics

## Medical Imaging

Below you will find scenarios that require the use of one of the many examples of medical imaging. Your task will be to fill in the table below each scenario to help you understand the differences between each type of medical imaging. One website has been provided for each scenario. This website should only be a starting point; be sure you are double-checking the information you find on CREDIBLE websites.

### Scenario #1: Billy's Bike Accident

Billy, an avid mountain biker, was out and about in the trails in Banff National Park. As some of you may know, these trails can get somewhat "steep". Billy, being the testosterone filled adolescent that he is, is not afraid of such tasks and does not hesitate in his attempt to conquer the mountainside. However, as most parents would have predicted, Billy suffers a gruesome fall and now cannot move his right arm. When the EMTs arrive, they take him into town for immediate medical assistance. It is here that the doctor on staff orders an x-ray for Billy's shoulder. The film below illustrates what the doctor found out from the x-ray.



Use your research skills to fill in the table below to help Billy understand why he had to wear that "ugly, heavy vest".

<http://www.medicalradiation.com/types-of-medical-imaging/imaging-using-x-rays/radiography-plain-x-rays/>

Complete Name	Why the doctor wanted an x-ray (ie. how the image is formed)	What types of structures can be viewed?



Name: \_\_\_\_\_ Date: \_\_\_\_\_

## HSci20: DT1 Diagnostics

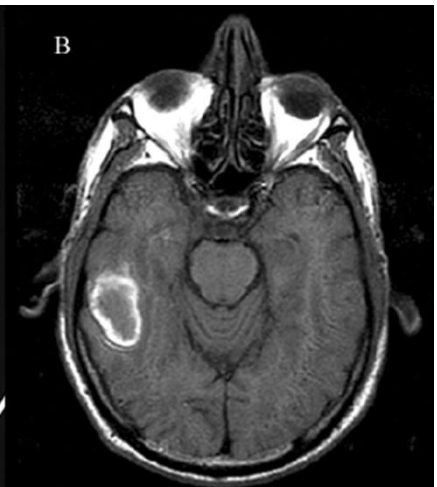
## Medical Imaging

### Scenario #2a: Sarah's Slip

Sarah loved being on the ice; the cantilever was her favorite spin to perform. However, Sarah had a new partner (Franco) and had not yet mastered the death spiral, which is what the judges wanted to see for the major points! Sarah and Franco worked very hard every day to master the death spiral, but one day the toe of Sarah's skate caught on some debris on the ice and she lost her balance. Being that Sarah's head was so close to the ground during this spin, it is not a surprise that she banged her head and lost consciousness. As with any loss of consciousness, the ambulance was called. When Sarah did not regain consciousness, she was rushed to hospital where the emergency doctor ordered a CT scan for her cranium.

Below you will see a normal CT scan:

Sarah's CT scan can be seen below:



Use your research skills to fill in the table below to help Sarah's mom understand why they rushed Sarah in for a CT scan when they got to the hospital and why they wanted her consent.

<http://www.medicalradiation.com/types-of-medical-imaging/imaging-using-x-rays/computed-tomography-ct/>

Complete Name	Why the doctor wanted a CT (ie. how the image is formed)	Advantages of diagnostic test	Disadvantages of the diagnostic test

Name: \_\_\_\_\_ Date: \_\_\_\_\_

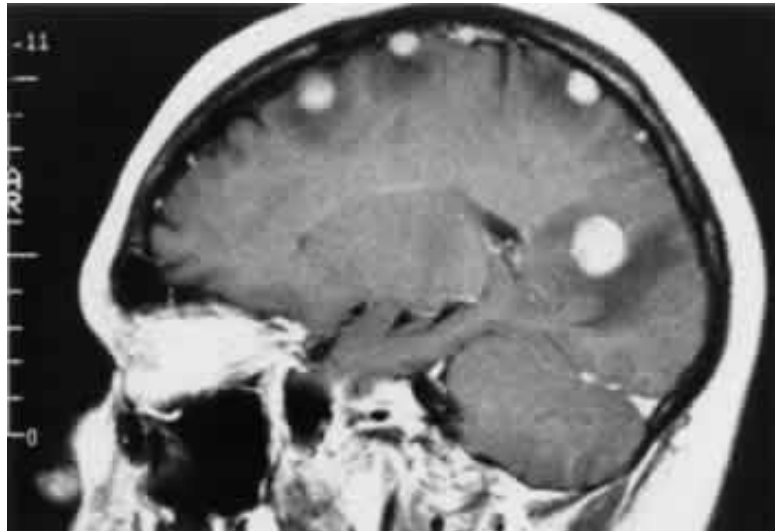
## HSci20: DT1 Diagnostics

## Medical Imaging

### Scenario #2b: Sarah's Continued Care

After the doctor sees Sarah's CT scan, he immediately orders a head MRI because he sees that her CT scan was abnormal. Even though Sarah is conscious now, he wants to take another look at the happy haps in her head. Below are Sarah's MRI results:

Use your research skills to determine why the doctor ordered an MRI on top of the CT Sarah had already undergone. In addition, find out how this procedure works so you can explain it to Sarah.



<https://www.livescience.com/39074-what-is-an-mri.html>

Complete Name	Why the doctor wanted an MRI (ie. how the image is formed)	Advantages of the diagnostic test	What does an MRI procedure entail for the patient?

Name: \_\_\_\_\_ Date: \_\_\_\_\_

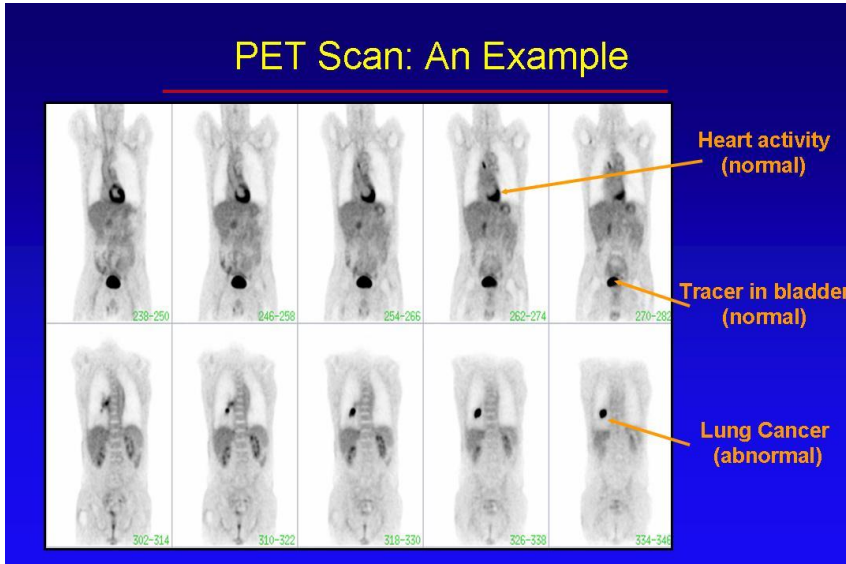
## HSci20: DT1 Diagnostics

## Medical Imaging

### Scenario #3: George's Growths

George is a 76-year old male, with a history of lung cancer. 5 years ago he had 1/3 of his left lung removed due to the presence of malignant tumors. Since the surgery, he has been asked to

monitor his blood oxygen levels and inform his doctor if they fall below 95%. Lately, George has noticed a decline in his blood oxygen levels and returns to see his doctor. Knowing George's dark history with lung cancer, the doctor does not waste any time in ordering a chest CT. The results show a small dense nodule on his right lung. To determine whether George's lung cancer has returned, the doctor orders him to travel to Saskatoon to receive a PET scan.



Using your research skills, find out how a PET scan is helpful in determining the presence of cancer.

<http://cancergrace.org/cancer-101/2007/01/09/pet-scanning-intro/>

[http://www.hopkinsmedicine.org/healthlibrary/test\\_procedures/neurological/positron\\_emission\\_tomography\\_pet\\_scan\\_92,P07654/](http://www.hopkinsmedicine.org/healthlibrary/test_procedures/neurological/positron_emission_tomography_pet_scan_92,P07654/)

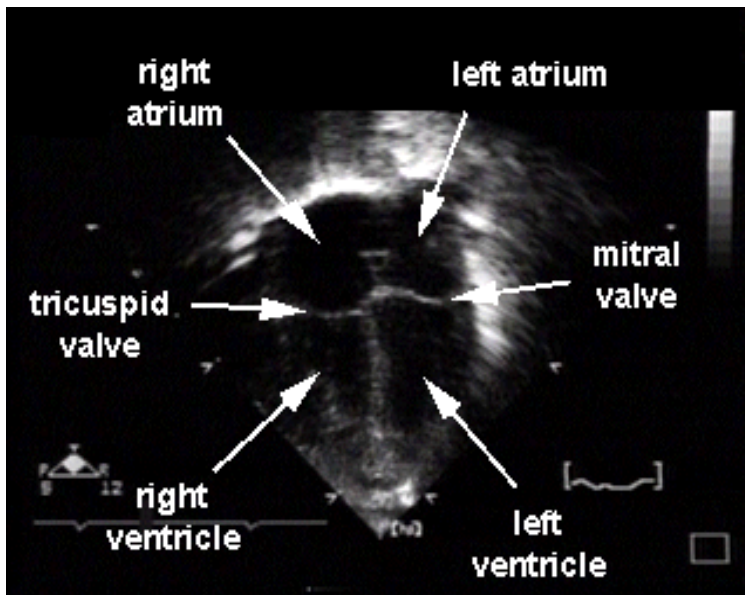
Complete Name	Why the doctor wanted a PET (ie. how the image is formed)	Advantages of diagnostic test	Disadvantages of the diagnostic test

Name: \_\_\_\_\_ Date: \_\_\_\_\_

## HSci20: DT1 Diagnostics

## Medical Imaging

### Scenario #4: A Healthy Heart



Jeremy is a regular 16-year-old. He is very physically active (plays volleyball, hockey and basketball) and his mom forces him to eat relatively healthy. One day, Jeremy is out shooting some hoops with his friends when suddenly he passes out. He regains consciousness very quickly, but his friends had already called Jeremy's mom. When she showed up, Jeremy appeared to be absolutely fine and was already practicing his free throws again. However, his mom (who has been called a helicopter mom) insists on taking him to the hospital anyway. Upon completion of his check-up, the doctor tells Jeremy and his mom that he thinks Jeremy suffered a mild heat stroke but thought he might have

heard a slight heart murmur during Jeremy's examination. Just to be safe, he is ordering an echocardiogram for Jeremy.

The doctor shows Jeremy the picture you see to the left. By filling out the table below, help the doctor explain to Jeremy how a picture like this will be produced of Jeremy's heart.

[http://www.lhsc.on.ca/Patients\\_Families\\_Visitors/Cardiac/Tests\\_Procedures/Echocardiogram.htm](http://www.lhsc.on.ca/Patients_Families_Visitors/Cardiac/Tests_Procedures/Echocardiogram.htm)

Complete Name	Why the doctor wanted an echocardiogram (ie. how the image is formed)	Advantages of diagnostic test	Disadvantages of the diagnostic test

Name: \_\_\_\_\_ Date: \_\_\_\_\_

## HSci20: DT1 Diagnostics

## Medical Imaging

### Scenario #5: Baby Beats

Joni has always wanted to be a mother. Her wedding was only a few months ago, but immediately afterwards, she and her husband begun trying to have a baby. Her period was 5 days late and a home pregnancy test confirmed her excitement. To be safe, she and her husband booked an appointment with their family doctor to make sure there wasn't a mistake with the home pregnancy test; turns out Joni and Caleb will be parents very soon! Today, she is going to see her doctor to have her 20-week ultrasound. Joni is nervous and is unsure about what the ultrasound consists of. Use your fantastical research skills to help Joni's anxiety by filling in the table below.



Here is a still picture taken from Joni's ultrasound:

[http://www.babycenter.com/0\\_all-about-ultrasounds\\_329.bc](http://www.babycenter.com/0_all-about-ultrasounds_329.bc)

<http://www.medicalradiation.com/types-of-medical-imaging/other-types-of-medical-imaging/ultrasound-imaging/>

Complete Name	Why the doctor wanted an ultrasound (ie. how the image is formed)	What does an ultrasound procedure entail for the patient?

### **Additional Terms you may come across during your research that may be helpful to know:**

**Contrast agent:** used to make organs or blood vessels visible on medical images. They can be given by injection into the blood stream or via tubes into internal organs. They can also be taken orally (ie. barium products).

**Angiography:** is an x-ray technique used in the examination of the arteries, veins and organs to diagnose and treat blockages and other blood vessel problems. During the angiogram, a catheter is inserted into a blood vessel and a contrast agent is injected to make the vessels visible. Angiograms can be performed with x-rays, CTs or MRIs.

**Fluoroscopy:** a specific type of x-ray imaging used when real-time examination of the patient's body is required. As the x-ray beams are detected, the image is displayed on a fluorescent screen.

**Mammography:** a specific type of x-ray imaging that uses a low dose x-ray system specially designed for creating detailed images of the breasts known as mammograms (screening tool used to detect early breast cancer in women).

**Carcinogenic:** a cancer causing substance or agent

Name: \_\_\_\_\_ Date: \_\_\_\_\_

HSci20: DT1 Diagnostics

**Medical Imaging**

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## What Is the Effect of Caffeine on Heart Rate?

How do medical researchers study the effect certain drugs have on the human body? They make sure to conduct what's called a **blind study**. A blind study is one where the people being tested have no idea whether they're taking the drug itself or a **placebo**—a pill or drink containing no drugs at all. Taste tests are often conducted as blind studies. Why? It has been shown that people who are told the brands of the drinks they're tasting tend to say better things about the brands they're more familiar with.



We're going to conduct a blind study to determine the effect caffeine has on the human pulse. For this experiment in particular, be sure to tell your subjects exactly what they will be asked to do, the kinds of questions you will ask them, and what you will do with the information they give you. When it comes to studying other people, ethics are extremely important!

### Problem:

What effect does caffeine have on human heart rate?

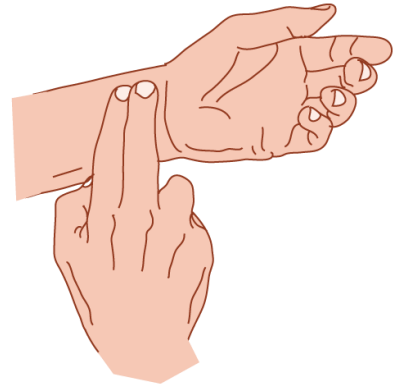
### Materials:

- 10 Adults or more (We want to test as many as possible = larger sample size = more valid results)
- Mp3 player loaded with relaxing music
- Clock and stopwatch (a cell phone usually has both of these functions)
- Eye mask
- 5 cans of a caffeinated version of a drink
- 5 cans of a non-caffeinated version of the same drink
- Paper and tape
- Notebook



## Procedure

1. Spend some time learning how to accurately take a person's pulse. There are plenty of good resources online that can teach you how. Using a stopwatch, make sure to practice taking somebody else's pulse until you're sure you can get an accurate reading every time.
2. Mask your drinks using your paper and tape and label each can with a number.
3. Make sure that you record whether each number is caffeinated or non-caffeinated in your notebook.
4. Arrange a time to test each adult. It will take around 30 minutes to perform the test. Test each person at around the same time of day, in the same circumstances (same chair, same song, etc.). Be sure to test each adult one at a time. Ask each person to refrain from eating or drinking for two hours before the test. *Why do you think we want to make sure all of these things are the same from one test to the next?*
5. Ask each subject what his or her caffeine consumption habits are. Record the subject's answers on a sheet of paper dedicated to that subject, and be sure to keep your records confidential.
6. Have your subject put the mask over his or her eyes. Have the subject put the headphones on, listen to the music, and relax.
7. After five minutes have passed, take and record your subject's starting pulse without disturbing them.
8. Provide your subject with a randomly selected drink. Record the drink's number in your notebook. Ask your subject to drink it as quickly as possible.
9. Wait five minutes, and then take and record your subject's pulse. Continue taking the subject's pulse at 5-minute intervals until 15 minutes have passed.
10. Graph the data you recorded.
11. *Do people who consume caffeine regularly react to the caffeine? To the placebo? To both? Is there a correlation between habitual caffeine consumption and the change in pulse rate?* Try to think of as many questions as you can, and keep an eye out for surprising results. After you are satisfied with your analysis, look up the effects of caffeine on the body and see if your study agrees with what other scientists have found.





## **Results:**

The results you get will depend strongly on what subjects you used for your study.

## **Why?**

Caffeine is a **stimulant**, a class of drugs that increase your heart rate and make you more energetic. However, the effects of caffeine are not identical between subjects. Plenty of people are born with a natural **tolerance** to caffeine, meaning that the caffeine's effects aren't so pronounced when such people consume it. People without a natural tolerance may also develop one over time simply by drinking caffeine.

The possibility that certain people may have a tolerance to caffeine while others may not is one example of a **variable**—something that has a direct influence on the information we gather. Here's an example of how this variable might work: you may find yourself testing two people that just happen to be naturally very tolerant to caffeine. If these happened to be the only two people you tested, you may not have seen a significant change in heart rate. This data may have led you to a misleading conclusion about caffeine's effect on the human body! This is why you were instructed to test as many subjects as possible and why you were told to ask your subjects about their caffeine habits. When you take these steps, you can collect more useful data that lets you control the variable of tolerance by identifying the people that are more likely to have a similar tolerance to the drug.

## Classroom Results – January 2019

Subject #	Resting Heart Rate	Heart Rate after 5 min	Heart Rate after 10 min	Heart Rate after 15 min	Product Consumed	Amount Caffeine	Amount Sugar
1	56	68	64	64	Black Ops Monster	166 mg	54 g
2	68	72	64	64	Coke	48 mg	55 g
3	56	72	72	60	Barq's Root Beer	31 mg	60 g
4	64	77	70	65	Sprite	0 g	54 g
5	56	49	31	30	Fresca	0 g	0 g (Aspartame)
6	60	80	64	60	Mountain Dew	86 mg	77 g
7	57	58	55	54	7-Up	0 g	70 g
8	62	66	51	48	Pepsi Max	115 mg	0 (Aspartame)
9	68	72	70	71	Mug Root Beer	0 g	71 g
10	64	70	75	69	Diet Coke	64 mg	0 g (Aspartame)

### Caffeine Content Of Popular Drinks

Soft drinks (12-ounce)	caffeine (mg)	Coffee and tea (8-ounce)	caffeine (mg)
Red Bull (8.2 oz)	80.0	Coffee, Drip	115-175
Jolt	71.2	Coffee, Brewed	80-135
Pepsi One	55.5	Coffee, Espresso (2 ounces)	100
Mountain Dew	55.0	Ben & Jerry's Coffee Fudge Frozen Yogurt(8oz)	85
Mountain Dew Code Red	55.0	Coffee, Instant	65-100
Diet Mountain Dew	55.0	Tea, iced	47
Kick Citrus	54.0	Tea, brewed, imported brands (avg.)	60
Mellow Yellow	52.8	Tea, brewed, U.S. brands (avg.)	40
Surge	51.0	Tea, instant	30
Tab	46.8	Tea, green	15
Diet Coke	45.6	Hot cocoa	14
Shasta Cola	44.4	Coffee, Decaf, brewed	3-4
Shasta Cherry Cola	44.4	Coffee, Decaf, instant	2-3
Shasta Diet Cola	44.4	Dark chocolate (1 oz)	20 mg
RC Cola	43.0		
Diet RC	43.0		
Dr. Pepper	41.0		
Diet Dr. Pepper	41.0		
Diet Sunkist Orange	41.0		
Mr. Pibb	40.0		
Sugar-Free Mr. Pibb	40.0		
Red Flash	40.0		
Sunkist Orange	40.0		
Slim-Fast Cappuccino Delight Shake	40.0		
Ruby Red	39.0		
Storm	38.0		
Big Red	38.0		
Pepsi-Cola	37.5		

Bottles/Cans of: (Each)

①Pepsi One      ⑥Mug Root Beer  
 ③Mountain Dew      ⑦Fresca  
 ③Coke      ⑧7-Up  
 ④Dr. Pepper      ⑨Sprite  
 ④Barq's Root Beer      ⑩Minute Maid  
 ⑤Diet Coke      Orange  
                                  OR  
                                  Sierra Mist  
                                  OR  
                                  Slice

4/27/2016 How Much Caffeine in Drinks -

Pepsi Twist	37.5
Diet Pepsi Jazz	37.5
Diet Pepsi	36.0
Wild Cherry Pepsi	38.0
Diet Wild Cherry Pepsi	36.0
Diet Pepsi Twist	36.0
Aspen	36.0
Coca-Cola Classic	34.0
Cherry Coke	34.0
Lemon Coke	34.0
Vanilla Coke	34.0
Diet Cherry Coke	34.0
Snapple Flavored Teas (Reg. or Diet)	31.5
Canada Dry Cola	30.0
A&W Creme Soda	29.0
Nestea Sweet Iced Tea	26.5
Nestea Unsweetened Iced Tea	26.0
Barq's Root Beer	23.0
A&W Diet Creme Soda	22.0
Slim-Fast Chocolate Flavors	20.0
Snapple Sweet Tea	12.0
Lipton Brisk, All Varieties	9
Canada Dry Diet Cola	1.2
Diet Rite Cola	0
Sprite	0
7-Up	0
Mug Root Beer	0
Diet Barq's Root Beer	0
Sundrop Orange	0
Minute Maid Orange	0
A&W Root Beer	0
Slice	0
Sierra Mist	0
Fresca	0

