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NURSING

300 LEVEL

NSC 308

ASSIGNMENT

* 1. Write explicitly on 5 diagnostic techniques used in pathology, relevant illustrations and examples required.
	2. Cellular adaptation precedes cell death, discuss. Diagrams essential.
1. Diagnostic technique is a type of method or test used to help diagnose a disease or condition. Imaging tests and tests to measure blood pressure, pulse, and temperature are examples of diagnostic techniques. There are different diagnostic techniques used in pathology. The five diagnostic techniques are:
	1. Necroscopy
	2. Radiography
	3. Urinalysis
	4. Microscopic examination of tissues
	5. Hematologic tests
		* **NECROSCOPY:** this is the act of performing a necropsy which is the pathological examination of a body after death to determine the cause of death. It is another name for AUTOPSY. It is a surgical examination of a dead body, most commonly a dead animal, in order to learn why the animal died. it's the **dissection** of a corpse performed to learn something about the cause of death or about a particular disease. It is usually performed by a specialized medical doctor called a pathologist. In most cases, a medical examiner or coroner can determine cause of death and only a small portion of deaths require an autopsy. The types of autopsies are as follow;
* Medico-legal or forensic or coroner's autopsies seek to find the cause and manner of death and to identify the decedent. They are generally performed, as prescribed by applicable law, in cases of violent, suspicious or sudden deaths, deaths without medical assistance or during surgical procedures.
* Clinical or pathological autopsies are performed to diagnose a particular disease or for research purposes. They aim to determine, clarify, or confirm medical diagnoses that remained unknown or unclear prior to the patient's death.
* Anatomical or academic autopsies are performed by students of anatomy for study purpose only.
* Virtual or medical imaging autopsies are performed utilizing imaging technology only, primarily magnetic resonance imaging (MRI) and computed tomography (CT).

The procedure for performing an autopsy varies according to the extent and purpose of the examination. If there are no restrictions imposed by the family, most standard autopsies consist of an examination of the chest cavity, abdominal cavity, and the brain. To examine the organs in the chest and abdomen, the pathologist usually performs a Y- or U-shaped incision beginning at the shoulders that meets at the sternum and continues vertically down to the pubic bone. Examination of the brain is carried out through an incision made in the back of the skull from one ear to the other.

Before any incisions are made, the autopsy begins with a thorough physical examination of the outside of the body that includes determination of height and weight. Any scars, surgical incisions, wounds or evidence of lesions on the skin are also described.

For examination purposes, the organs are usually removed from the body. The pathologist may weigh the organs individually and further dissect the tissue to look for abnormalities inside the organs. After the organs are viewed with the naked eye, small pieces of tissue are taken from the organs for microscopic examination. The physical and microscopic characteristics of each tissue are carefully described in detail.

At the end of an autopsy, the incisions made in the body are closed. The organs may be returned to the body or may be retained for teaching, research, or diagnostic purposes. Performance of an autopsy does not interfere with an open casket funeral service, as none of the incisions made are apparent after the body is prepared for burial.

* + **RADIOGRAPHY:** it is the process or occupation of taking radiographs to assist in medical examinations. it is an imaging technique using X-rays, gamma rays, or similar ionizing radiation and non-ionizing radiation to view the internal form of an object. Since the body is made up of various substances with differing densities, Ionising and non-ionising radiation can be used to reveal the internal structure of the body on an image receptor by highlighting these differences using attenuation, or in the case of ionising radiation, the absorption of X-ray photons by the denser substances. The discipline involving the study of anatomy through the use of radiographic images is known as radiographic anatomy. Medical radiography acquisition is generally carried out by radiographers, while image analysis is generally done by [radiologists](https://en.wikipedia.org/wiki/Radiologist). Some radiographers also specialise in image interpretation. Medical radiography includes a range of modalities producing many different types of image, each of which has a different clinical application. There are some diagnostic procedures that uses radiation and they are; fluoroscopy, computed tomography, projectional radiography(x-ray), dual energy x-ray absorpptiometry, angiography, contrast radiography. Although not technically radiographic techniques due to not using X-rays, imaging modalities such as PET and MRI are sometimes grouped in radiography because the radiology department of hospitals handle all forms of imaging. Treatment using radiation is known as radiotherapy. Although not technically radiographic techniques due to not using X-rays, imaging modalities such as PET and [MRI](https://en.wikipedia.org/wiki/Magnetic_resonance_imaging) are sometimes grouped in radiography because the radiology department of hospitals handle all forms of imaging. Treatment using radiation is known as radiotherapy.
	+ **URINALYSIS**: A urinalysis is a test for urine. A urinalysis is used to detect and manage a wide range of disorders, such as urinary tract infections, kidney disease and diabetes. A urinalysis involves checking the appearance, concentration and content of urine. Abnormal urinalysis results may point to a disease or illness. For example, a urinary tract infection can make urine look cloudy instead of clear. Increased levels of protein in urine can be a sign of kidney disease. Unusual urinalysis results often require more testing to uncover the source of the problem. To get the most accurate results, the sample may need to be collected midstream, using a clean-catch method. This method involves the following steps:
		- Cleanse the urinary opening. Women should spread their labia and clean from front to back. Men should wipe the tip of the penis.
		- Begin to urinate into the toilet.
		- Pass the collection container into your urine stream.
		- Urinate at least 1 to 2 ounces (30 to 59 millilitres) into the collection container.
		- Finish urinating into the toilet.
		- Deliver the sample as directed by the doctor.
		- If you can't deliver the sample to the designated area within 60 minutes of collection, refrigerate the sample, unless you've been instructed otherwise by the doctor.

In some cases, the doctor may insert a thin, flexible tube (catheter) through the urinary tract opening and into the bladder to collect the urine sample. The urine sample is sent to a lab for analysis. For a urinalysis, your urine sample is evaluated in three ways: visual exam, dipstick test and microscopic exam. For the visual exam; the lab technician examines the urines appearance. Dipstick test; the lab technician uses a dipstick which has plenty chemicals on it and it is used to check for acidity(ph), concentration, protein, glucose, ketones, bilirubin, evidence of infection, blood. Microscopic exam; if any of the following are observed under the microscope in above average level, additional test is required: white blood cells, red blood cells, bacteria or yeasts, casts, crystals.

* + **MICROSCOPIC EXAMINATION OF TISSUES:** Histopathology is the microscopic examination of biological tissues to observe the appearance of diseased cells and tissues in very fine detail. Hence histopathology is the study of microscopic changes or abnormalities in tissues that are caused as a result of diseases. Histopathological examination of tissues starts with [surgery](https://en.wikipedia.org/wiki/Surgery), [biopsy](https://en.wikipedia.org/wiki/Biopsy), or [autopsy](https://en.wikipedia.org/wiki/Autopsy). The tissue is removed from the [body](https://en.wikipedia.org/wiki/Human_body) or [plant](https://en.wikipedia.org/wiki/Plant), and then...often following expert dissection in the fresh state...placed in a [fixative](https://en.wikipedia.org/wiki/Fixation_%28histology%29) which stabilizes the tissues to prevent [decay](https://en.wikipedia.org/wiki/Decomposition). The most common fixative is [formalin](https://en.wikipedia.org/wiki/Formalin) (10% neutral buffered [formaldehyde](https://en.wikipedia.org/wiki/Formaldehyde) in water). The tissue is then prepared for viewing under a [microscope](https://en.wikipedia.org/wiki/Microscope) using either chemical fixation or frozen section. If a large sample is provided e.g. from a surgical procedure then a pathologist looks at the tissue sample and selects the part most likely to yield a useful and accurate diagnosis - this part is removed for examination in a process commonly known as grossing or cut up. Larger samples are cut to correctly situate their anatomical structures in the cassette. Certain specimens (especially biopsies) can undergo [agar](https://en.wikipedia.org/wiki/Agar) pre-embedding to assure correct tissue orientation in cassette & then in the block & then on the diagnostic microscopy slide. This is then placed into a plastic cassette for most of the rest of the process. Water is removed from the sample in successive stages by the use of increasing concentrations of [alcohol](https://en.wikipedia.org/wiki/Alcohol). Xylene is used in the last dehydration phase instead of alcohol - this is because the wax used in the next stage is soluble in [xylene](https://en.wikipedia.org/wiki/Xylene) where it is not in alcohol allowing wax to permeate the specimen.This process is generally automated and done overnight. The wax infiltrated specimen is then transferred to an individual specimen embedding (usually metal) container. Finally, molten wax is introduced around the specimen in the container and cooled to solidification so as to embed it in the wax block. This process is needed to provide a properly oriented sample sturdy enough for obtaining a thin [microtome](https://en.wikipedia.org/wiki/Microtome) section(s) for the slide. Once the wax embedded block is finished, sections will be cut from it and usually placed to float on a water bath surface which spreads the section out. This is usually done by hand and is a skilled job (histotechnologist) with the lab personnel making choices about which parts of the specimen microtome wax ribbon to place on slides. A number of slides will usually be prepared from different levels throughout the block. After this the thin section mounted slide is stained and a protective cover slip is mounted on it. For common stains, an automatic process is normally used; but rarely used stains are often done by hand. The histological slides are examined under a microscope by a [pathologist](https://en.wikipedia.org/wiki/Pathology), a medically qualified specialist who has completed a recognised training program. This [medical](https://en.wikipedia.org/wiki/Medical_diagnosis) diagnosis is formulated as a pathology report describing the histological findings and the opinion of the pathologist. In the case of [cancer](https://en.wikipedia.org/wiki/Cancer), this represents the tissue diagnosis required for most treatment protocols. In the removal of [cancer](https://en.wikipedia.org/wiki/Cancer), the pathologist will indicate whether the [surgical margin](https://en.wikipedia.org/wiki/Surgical_margin) is cleared, or is involved (residual cancer is left behind). This is done using either the bread loafing or [CCPDMA](https://en.wikipedia.org/wiki/CCPDMA) method of processing. [Microscopic visual artifacts](https://en.wikipedia.org/wiki/Visual_artifact#In_microscopy) can potentially cause misdiagnosis of samples.
	+ **HEMATOLOGIC TEST:** Hematology tests include tests on the blood, blood proteins and blood-producing organs. These tests can evaluate a variety of blood conditions including infection, anaemia, inflammation, haemophilia, blood-clotting disorders, leukaemia and the body's response to chemotherapy treatments. Some of the common hematologic tests are:
		- Full Blood Count Testing: FBC testing is a routine test that evaluates three major components found in blood: white blood cells, red blood cells and platelets. There are many reasons for a full blood count test, but common reasons include infection, anaemia and suspected haemato-oncological diseases.

### White Blood Cells (WBC) Testing: White blood cells are responsible for assisting the body’s defenses in fighting illnesses and disease. Knowing how many white cells are within the blood can prove invaluable for diagnosing and treating a range of conditions. Increased white blood cells are common in people fighting infection or suffering from anemia.

### Red Blood Cells (RBC) Testing: The number of red blood cells in the body can increase through dehydration, stress and anxiety, or failure of the bone marrow, to name a few conditions. Decreased blood cells can be the result of receiving chemotherapy treatments, chronic inflammatory diseases, blood loss and some types of cancer.

### Haemoglobin Testing: Without hemoglobin, oxygen would not be able to travel around the body. This oxygen-rich protein is essential to life, but it can increase or decrease due to a number of conditions. Dehydration, congestive heart failure and chronic obstructive pulmonary disease can all cause an increase in haemoglobin levels, while blood loss, anaemia, liver disease and lymphoma can result in a decrease.

### Haematocrit and Platelets: Haematocrit, or HCT as it is commonly known in medical circles, is the ratio of plasma to red blood cells. Plasma accounts for the fluid component in blood. HCT testing is usually carried out when hydration levels and anaemia are suspected of causing problems. HCT levels can be affected in the same way as haemoglobin levels. If anaemia is suspected, it is common for doctors to carry out testing on red blood cells, hemoglobin and haematocrit at the same time. Platelets are responsible for causing the blood to clot. Without them blood would continue to flow from a wound and would need immediate medical attention in order to stem the flow. Increased platelet levels can be the result of inflammatory conditions such as trauma, acute infection and a number of malignant cancers. Decreases in platelet levels can occur from anemia, coagulation disorders such as sickle cell anemia, alcohol toxicity and infection.

### Mono Screening: Infectious mononucleosis, also known as mono, is caused by the Epstein Barr virus. It can be a serious condition and is highly contagious. Mononucleosis testing involves looking for the antibodies the immune system makes as it works to fight the infection.

### Vitamin B12 Deficiency Testing: A lack of vitamin B12 can make the patient feel tired, run down and without energy. A simple blood test can detect whether vitamin B12 levels have decreased. This vitamin is essential for healthy blood cells, healthy nerves and stable DNA. If a deficiency is detected, this condition is easy to manage with supplements, changes to the diet and vitamin shots.

### Renal Profiling: The kidneys are responsible for a lot of waste management and cleansing in the body. Renal profiling can provide a unique and valuable snapshot of how the kidneys are functioning. The blood test will include testing the levels of creatinine and blood urea nitrogen, both responsible for healthy kidney function.

### Cholesterol Testing: High levels of cholesterol have been linked to heart disease and other potentially fatal conditions for some time. Cholesterol testing can alert a doctor as to whether a patient needs to take action to lower blood cholesterol and whether further treatment is required. The blood test itself involves testing the Total Cholesterol, LDL Cholesterol (the bad), HDL Cholesterol (the good), Triglycerides and the patient’s risk ratio.

### Blood Glucose Testing: Blood glucose testing is used to show how well the patient has been able to control his or her diabetes over the past few months. It is a non-fasting test that shows the level of glucose values in the blood. It is also known as A1c, Glycohemoglobin or HbA1c testing. While it is a very accurate test, it should never be used in place of routine daily glucose testing.

1. Cellular adaptation occurs before cell death. Cellular adaptation refers to changes made by a cell in response to adverse or varying environmental changes. The adaptation may be physiologic (normal) or pathologic (abnormal). Four types of morphological adaptations include atrophy, hypertrophy, hyperplasia, and metaplasia.
	* **Atrophy**: is a decrease in cell size. If enough cells in an organ undergo atrophy the entire organ will decrease in size. [Thymus](https://en.wikipedia.org/wiki/Thymus) atrophy during early [human development](https://en.wikipedia.org/wiki/Human_development_%28biology%29) is an example of physiologic atrophy. [Skeletal muscle](https://en.wikipedia.org/wiki/Skeletal_muscle) atrophy is a common pathologic adaptation to skeletal muscle disuse (commonly called "disuse atrophy"). Tissue and organs especially susceptible to atrophy include skeletal muscle, cardiac muscle, [secondary](https://en.wikipedia.org/wiki/Secondary_sex_characteristic) [sex organs](https://en.wikipedia.org/wiki/Sex_organ), and the [brain](https://en.wikipedia.org/wiki/Brain).



* + **Hypertrophy**: it is an increase in cell size and volume. If enough cells of an organ hypertrophy the whole organ will increase in size. Hypertrophy may involve an increase in intracellular [protein](https://en.wikipedia.org/wiki/Protein) as well as [cytosol](https://en.wikipedia.org/wiki/Cytosol) and other cytoplasmic components. For example, [adipocytes](https://en.wikipedia.org/wiki/Adipocyte) may expand in size by depositing more [lipid](https://en.wikipedia.org/wiki/Lipid) within cytoplasmic [vesciles](https://en.wikipedia.org/wiki/Vesicle_%28biology_and_chemistry%29). Thus, in human adults, increases in body fat tissue occurs mostly by increases in the size of adipocytes, not by increases in the number of adipocytes. Hypertrophy may be caused by [mechanical](https://en.wikipedia.org/wiki/Biomechanics) signals (e.g., stretch) or [trophic](https://en.wikipedia.org/wiki/Tropic_hormone) signals (e.g., growth factors). An example of physiologic hypertrophy is in skeletal muscle with sustained [weight bearing](https://en.wikipedia.org/wiki/Weight_bearing) exercise. An example of pathologic hypertrophy is in cardiac muscle as a result of [hypertension](https://en.wikipedia.org/wiki/Hypertension).



* + **HYPERPLASIA:** it is an increase in the number of cells. It is the result of increased cell [mitosis](https://en.wikipedia.org/wiki/Mitosis) or division (also referred to as [cell proliferation](https://en.wikipedia.org/wiki/Cell_proliferation)). The two types of physiologic hyperplasia are [compensatory](https://en.wikipedia.org/wiki/Compensatory_growth_%28organ%29) and [hormonal](https://en.wikipedia.org/wiki/Hormonal). Compensatory hyperplasia permits tissue and organ regeneration. It is common in epithelial cells of the [epidermis](https://en.wikipedia.org/wiki/Epidermis_%28skin%29) and [intestine](https://en.wikipedia.org/wiki/Intestine), [liver](https://en.wikipedia.org/wiki/Liver) [hepatocytes](https://en.wikipedia.org/wiki/Hepatocytes), [bone marrow](https://en.wikipedia.org/wiki/Bone_marrow) cells, and [fibroblasts](https://en.wikipedia.org/wiki/Fibroblasts). It occurs to a lesser extent in [bone](https://en.wikipedia.org/wiki/Bone), [cartilage](https://en.wikipedia.org/wiki/Cartilage), and [smooth muscle](https://en.wikipedia.org/wiki/Smooth_muscle) cells. Hormonal hyperplasia occurs mainly in organs that depend on [estrogen](https://en.wikipedia.org/wiki/Estrogen). For example, the oestrogen-dependent uterine cells undergo hyperplasia and hypertrophy following pregnancy. Pathologic hyperplasia is an abnormal increase in cell division. A common pathologic hyperplasia in women occurs in the [endometrium](https://en.wikipedia.org/wiki/Endometrium) and is called [endometriosis](https://en.wikipedia.org/wiki/Endometriosis).



* + **METAPLASIA:** it occurs when a cell of a certain type is replaced by another cell type, which may be less differentiated. It is a reversible process thought to be caused by stem cell reprogramming. [Stem cells](https://en.wikipedia.org/wiki/Stem_cells) are found in epithelia and [embryonic](https://en.wikipedia.org/wiki/Embryo) [mesenchyme](https://en.wikipedia.org/wiki/Mesenchyme) of [connective tissue](https://en.wikipedia.org/wiki/Connective_tissue). A prominent example of metaplasia involves the changes associated with the respiratory tract in response to inhalation of irritants, such as smog or smoke. The [bronchial](https://en.wikipedia.org/wiki/Bronchial) cells convert from [mucus](https://en.wikipedia.org/wiki/Mucus)-secreting, [ciliated](https://en.wikipedia.org/wiki/Ciliated), [columnar](https://en.wikipedia.org/wiki/Columnar) epithelium to non-ciliated, [squamous](https://en.wikipedia.org/wiki/Squamous) epithelium incapable of secreting mucus. These transformed cells may become dysplasic or cancerous if the stimulus (e.g., cigarette smoking) is not removed. The most common example of metaplasia is [Barrett's esophagus](https://en.wikipedia.org/wiki/Barrett%27s_esophagus), when the non-keratinizing squamous epithelium of the esophagus undergoes metaplasia to become mucinous columnar cells, ultimately protecting the esophagus from acid reflux originating in the stomach. If stress persists, metaplasia can progress to dysplasia and eventually carcinoma; Barrett's esophagus, for example, can eventually progress to adenocarcinoma.



* + **DYSPLASIA:** it refers to abnormal changes in cellular shape, size, and/or organization. Dysplasia is not considered a true adaptation; rather, it is thought to be related to hyperplasia and is sometimes called "atypical hyperplasia". Tissues prone to dysplasia include [cervical](https://en.wikipedia.org/wiki/Cervix) and [respiratory](https://en.wikipedia.org/wiki/Respiratory) epithelium, where it is strongly associated with the development of cancer; it may also be involved in the development of [breast cancer](https://en.wikipedia.org/wiki/Breast_cancer). Although dysplasia is reversible, if stress persists, then dysplasia progresses to irreversible carcinoma.

