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**MATRIC NUMBER: 17/MHS03/012**

**DEPARTMENT: ANATOMY**

**COURSE: CELLULAR BIOCHEMISTRY (BCH 308)**

**ASSIGNMENT**

1. What do you understand by primary obesity

Primary obesity is essentially an excessive accumulation of triacylglycerols in fatty tissue that is the net result of excessive energy intake compared to energy usage. Most importantly, it is not caused by any disease. It is due to excessive intake of calories and lack of physical activity.

1. How does drug therapy and congenital syndrome affect secondary obesity

Secondary obesity means that you have a medical condition that has caused you to gain weight. Weight-loss medications or drug therapy are meant to help people who may have health problems related to overweight or obesity. However, it works best when combined with a lifestyle program. Prescription weight-loss medications help to lose 10 percent or more of starting weight. Weight loss of 5 to 10 percent of your starting body weight may help improve your health by lowering blood sugar, blood pressure, and triglycerides. Losing weight also can improve some other health problems related to overweight and obesity, such as joint pain or sleep apnea.

The negative impact of overweight and obesity is potentially greater in children affected by a congenital heart disease (CHD). Research has shown that the proportion of obesity is high in children treated for CHD and is associated with high systolic blood pressure (SBP) level. The risk of long-term complications needs to be reduced by means of prevention and treatment of obesity in this vulnerable population.

1. Discuss the aetiology of cancer and its molecular basis.

Etiology of Cancer

Generally, cancer is caused by changes (mutation) to the DNA within cells. These gene mutations are caused either by genetic or environmental factors which is why the etiology of cancer is multifactorial (i.e. involving both genetic and environmental factors.). Environmental factors that lead to cancer include: age, ultraviolet radiation, viruses, tobacco, diet etc.

* Age: Cancer can take decades to develop. That's why most people diagnosed with cancer are 65 or older. Over time, the cells in our body can become damaged. As we age, there’s more time for damage in our cells to build up, and more chance that some of this damage might eventually lead to cancer.
* Ultraviolet radiation: Too much UV radiation from the sun or sunbeds can damage the genetic material (the DNA) in your skin cells. If enough DNA damage builds up over time, it can cause cells to start growing out of control, which can lead to skin cancer.
* Viruses: When viruses cause an infection, they spread their DNA, affecting healthy cells' genetic makeup and potentially causing them to turn into cancer. HPV (human papillomavirus) infections, for instance, cause the virus' DNA to combine with the host's DNA, disrupting the normal function of cells.
* Tobacco: Poisons in tobacco smoke can damage or change a cell's DNA. Smoking can cause cancer and then block your body from fighting it. Poisons in cigarette smoke can weaken the body's immune system, making it harder to kill cancer cells. When this happens, cancer cells keep growing without being stopped.
* Diet and obesity: Being overweight can increase cancer risk in many ways. One of the main ways is that excess weight causes the body to produce and circulate more estrogen and insulin, hormones that can stimulate cancer growth. High consumption of certain foods may also increase the likelihood of developing cancer. Processed foods that are high in sugar and low in fiber and nutrients have been linked to a higher cancer risk.

On the other hand, cancer can also be caused by genetic factors. For instance, if you've inherited a genetic mutation that predisposes you to cancer, this genetic mutation could make you more likely than other people to develop cancer when exposed to a certain cancer-causing substance. This type of mutation accounts for a small percentage of cancers.

Molecular Basis of Cancer

Genetic mutations are responsible for the generation of cancer cells and are thus present in all cancers. These mutations alter the quantity or function of protein products that regulate cell growth and division and DNA repair. Two major categories of mutated genes are: Oncogenes & Tumor suppressor genes.

Oncogenes

Oncogenes are abnormal forms of normal genes (proto-oncogenes) that regulate various aspects of cell growth and differentiation. Mutation of these genes may result in direct and continuous stimulation of the pathways (e.g. cell surface growth factor receptors, intracellular signal transduction pathways, transcription factors, secreted growth factors) that control cellular growth and division, cellular metabolism, DNA repair, angiogenesis, and other physiologic processes.

There are > 100 known oncogenes that may contribute to human neoplastic transformation. For example, the *RAS* gene encodes the ras protein, which carries signals from membrane-bound receptors down the RAS-MAPKinase pathway to the cell nucleus, and thereby regulates cell division. Mutations may result in the inappropriate activation of the ras protein, leading to uncontrolled cell growth. The ras protein is abnormal in about 25% of human cancers. Other oncogenes have been implicated in specific cancers. These include:

* HER2 (amplified in breast and gastric cancer and less commonly in lung cancer)
* BCRABL1 (a translocation of 2 genes that underlies chronic myeloid leukemia and some B-cell acute lymphocytic leukemias)
* CMYC (Burkitt lymphoma)
* NMYC (small cell lung cancer, neuroblastoma)
* EGFR (adenocarcinoma of the lung)
* EML4ALK (a translocation that activates the ALK tyrosine kinase and causes a unique form of adenocarcinoma of the lung).

Tumor Suppressor Genes

Genes such as *TP53*, *BRCA1*, and *BRCA2* play a role in normal cell division and DNA repair and are critical for detecting inappropriate growth signals or DNA damage in cells. If these genes, as a result of inherited or acquired mutations, become unable to function, the system for monitoring DNA integration becomes inefficient, cells with spontaneous genetic mutations persist and proliferate, and tumors result.

As with most genes, 2 alleles are present that encode for each tumor suppressor gene. A defective copy of one gene may be inherited, leaving only one functional allele for the individual tumor suppressor gene. If a mutation is *acquired* in the functional allele, the normal protective mechanism of the 2nd normal tumor suppressor gene is lost.

The important regulatory protein, p53, prevents replication of damaged DNA in normal cells and promotes cell death (apoptosis) in cells with abnormal DNA. Inactive or altered p53 allows cells with abnormal DNA to survive and divide. *TP53* mutations are passed to daughter cells, conferring a high probability of replicating error-prone DNA, and neoplastic transformation results. *TP53* is defective in many human cancers.

*BRCA1* and *BRCA2* mutations that decrease function increase risk of breast and ovarian cancer.

Another example, the retinoblastoma (*RB*) gene encodes for the protein Rb, which regulates the cell cycle by stopping DNA replication. Mutations in the *RB* gene family occur in many human cancers, allowing affected cells to divide continuously.

As with oncogenes, mutation of tumor suppressor genes such as *TP53* or *RB* in germ cell lines may result in vertical transmission and a higher incidence of cancer in offspring.