Ojiji Mbala Margaret

300L

17/MHS01/239

Biochemistry of Obesity, diabetes and Cancer

1. **Simple Obesity** also called as primary obesity is due to excessive energy intake and too little consumption, also known as diet-induced obesity and has the largest proportion in all types of obesity(95%)

2. **Congenital Syndrome and Drug therapy on Obesity**

i. Congenital leptin deficiency is a condition that causes severe obesity beginning in the first few months of life. Affected individuals are of normal weight at birth, but they are constantly hungry and quickly gain weight. Without treatment, the extreme hunger continues and leads to chronic excessive eating (hyperphagia) and obesity. Beginning in early childhood, affected individuals develop abnormal eating behaviors such as fighting with other children over food, hoarding food, and eating in secret.
Congenital leptin deficiency is caused by mutations in the LEP gene. This gene provides instructions for making a hormone called leptin, which is involved in the regulation of body weight. Normally, the body's fat cells release leptin in proportion to their size. As fat accumulates in cells, more leptin is produced. This rise in leptin indicates that fat stores are increasing. LEP gene mutations that cause congenital leptin deficiency lead to an absence of leptin. As a result, the signaling that triggers feelings of satiety does not occur, leading to the excessive hunger and weight gain associated with this disorder
People with congenital leptin deficiency also have hypogonadotropic hypogonadism, which is a condition caused by reduced production of hormones that direct sexual development. Without treatment, affected individuals experience delayed puberty or do not go through puberty, and may be unable to conceive children (infertile).

ii. Prader-Willi syndrome is a rare genetic condition that causes a wide range of physical symptoms, learning difficulties and behavioral problems. It's usually noticed shortly after birth. Prader-Willi syndrome is caused by a fault in a group of genes on chromosome number 15. This fault leads to a number of problems and is thought to affect part of the brain called the hypothalamus, which produces hormones and regulates growth and appetite. This may explain some of the typical features of Prader-Willi syndrome, such as delayed growth and persistent hunger.
If children are allowed to eat as much as they want, they'll quickly become dangerously overweight. A child with the syndrome can eat 3 to 6 times more than other children of the same age and still feel hungry.
Prader-Willi syndrome itself isn't life-threatening. However, compulsive eating and weight gain can cause young adults with the syndrome to develop obesity-related conditions such as:
type 2 diabetes
heart failure
respiratory difficulties
If obesity is not prevented by controlling food intake, people with the condition are likely to die a lot younger than would normally be expected. If their diet is well controlled and they don't become overweight, adults can have a good quality of life and probably a normal life expectancy.

Cushing's syndrome, hypothyroidism and hypogonadism rarely cause obesity

Obesity Drug Therapy

Hypertension, dyslipidemia, diabetes and cardiovascular diseases are leading causes of mortality in the modern world. All of them are strongly linked to obesity. While treating obesity, those conditions are also managed. Obese patients should always be treated through lifestyle interventions, though the results of such interventions are modest. Pharmacotherapy is a second step in the treatment of obesity, approved only when weight loss targets were not reached through lifestyle intervention. During the history of anti-obesity drugs, many of them were withdrawn because of their side effects. Various guidelines recommend prescribing drug therapy for obesity through consideration of the potential benefits and limitations. Orlistat deactivates intestinal lipase and inhibits intestinal fat lipolysis. It is actually the only drug on the European market approved for the treatment of

obesity. Orlistat therapy reduces weight to a modest extent, but it reduces the incidence of diabetes beyond the result achieved with lifestyle changes.

3. Etiology of Cancer and its molecular basis

Etiology

Cancer is caused by accumulated damage to genes. Such changes may be due to chance or to exposure to a cancer causing substance.
The substances that cause cancer are called carcinogens. A carcinogen may be a chemical substance, such as certain molecules in tobacco smoke. The cause of cancer may be environmental agents, viral or genetic factors.

We should bear in mind, though, that in the majority of cancer cases we cannot attribute the disease to a single cause.

We can roughly divide cancer risk factors into the following groups:

- Biological or internal factors, such as age, gender, inherited genetic defects and skin type
- Environmental exposure, for instance to radon and UV radiation, and fine particulate matter
- Occupational risk factors, including carcinogens such as many chemicals, radioactive materials and asbestos
  lifestyle-related factors.
- Lifestyle-related factors that cause cancer include:
  tobacco
  alcohol
  UV radiation in sunlight
  some food-related factors, such as nitrites and poly aromatic hydrocarbons generated by barbecuing food).

Lifestyles can prevent cancer as well.

Cancer causing factors related to work and living environments include:
asbestos fibres, tar and pitch, polynuclear hydrocarbons (e.g. benzopyrene), some metal compounds, some plastic chemicals (e.g. Vinyl chloride) etc

Bacteria and viruses can cause cancer:
Helicobacter pylori (H. pylori, which causes gastritis)

HBV, HCV (hepatitis viruses that cause hepatitis)
HPV (human papilloma virus, papilloma virus, which causes changes eg. Cervical cells)
EBV (Epstein-Barr virus, the herpes virus that causes inflammation of the throat lymphoid)

Radiation can cause cancer:
ionising radiation (e.g. X-ray radiation, soil radon)
non-ionised radiation (the sun's ultraviolet radiation)
Some drugs may increase the risk of cancer:
certain antineoplastic agents
certain hormones
medicines that cause immune deficiency
In 5 – 10 per cent of breast cancer genetic predisposition plays an important role in the emergence of the disease.

Molecular basis
Cancer is a disease of uncontrolled growth and proliferation whereby cells have escaped the body's normal growth control mechanisms and have gained the ability to divide indefinitely. It is a genetic disease. Thus mutation in genes would result in altered proteins during cell division, etc. Some cancers are caused by mutations in germline cells.
It is a multi-step process that requires the accumulation of many genetic changes over time. These genetic alterations involve activation of proto-oncogenes to oncogenes, deregulation of tumour suppressor genes and DNA repair genes and 'immortalisation'