Biotechnology

Second Year

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Technology is a Greek word consists of two words: techne means "craft" and logia means "knowledge". Technology is used as a broad term that means (the use and knowledge of humanity's tools and crafts).

Science, engineering and technology

The distinctions between science, engineering and technology are not always clear. Generally, science is the **reasoned investigation or study of nature, aimed at discovering relationships among elements.** Engineering is the **use of scientific principles to achieve a planned result.** However, technology broadly involves the use and application of knowledge (e.g., scientific, engineering, mathematical, language, and historical), **both formally and informally, to achieve some "practical" result.**

For example, science might study the flow of electrons in electrical conductors. This knowledge may then be used by engineers to create artifacts such as computers and other forms of advanced technology. In this sense, scientists and engineers may both be considered technologists, but scientists generally less so.

Naturally, since these fields are so broad, it is difficult to obtain precise definitions. Generally, these distinctions can be made:

Science is the process of investigating natural phenomena. ***Scientists*** are researchers who study these fundamental principles.

Engineering is the process of designing and building tools to exploit natural phenomena for a practical means.

Engineers work within the constraints of natural laws and societal needs to create technology.

Technology is the result of these two processes. It usually embodies the physical result, such as a device or machine which was designed by engineers (and/or scientists).

Biotechnology

Biotechnology is a technology based on biology, especially when used in agriculture, food science, and medicine.

Or

Biotechnology means any technological application that uses biological systems, living organisms, or derivatives thereof, to make or modify products or processes for specific use.

Or

Biotechnology is the manipulation of organisms to do practical things and to provide useful products.

Uses
There are many uses of biotechnology, like:

- use of organisms for the manufacture of organic products (examples include beer, milk products, and skin).
- Use microorganisms in the mining industry (bioleaching).
- Use microorganisms to recycle, treat waste, clean up sites contaminated by industrial activities (bioremediation),
- Use microorganisms to produce biological weapons (Biological warefare).
- Use DNA as a genetic and radioactive tracers in medicine.
- DNA fingerprinting

Sub-fields of biotechnology

There are a number of jargon (commom person) terms for sub-fields of biotechnology.

Red biotechnology is biotechnology applied to medical processes. (Examples: designing of organisms to produce antibiotics, and the engineering of genetic cures to cure diseases through genomic manipulation).

White biotechnology, also known as **grey biotechnology**, is biotechnology applied to industrial processes. (Example: the designing of an organism to produce a useful chemical).

Green biotechnology is biotechnology applied to agricultural processes. (Examples: the designing of an organism to grow under specific environmental conditions, the engineering of a plant to express a pesticide, thereby eliminating the need for external application of pesticides).

Bioinformatics (**computational biology)** is a field which solve biological problems using computational techniques. It plays a key role in various areas like functional genomics, and structural genomics, and forms a key component in biotechnology and pharmaceutical sector.

Blue biotechnology describes the marine and aquatic applications of biotechnology.

In situ = in the same place
Ex situ = out the place
In vitro = outside living body
In vivio = inside the living body
GMF = Genetic modified food
GMOs = Genetic modified organisms

iv = intrvsencous
sc = subcutanously
bid= twice daily
tid= three times daily

Bioleaching

Leach = filtration

Bioleaching is the extraction of specific metals from their ores through the use of microorganisms.

Bioleaching is a technique used by the mining industry to extract minerals such as gold and copper from their ores. Traditional extractions are expensive which require sufficient concentrations of elements in ores and big work force.

Low concentrations are not a problem for bacteria because they simply ignore the waste which surrounds the metals, and yields over 90% in some cases. These microorganisms actually gain energy by breaking down minerals into their constituent elements. The company simply collects the pure metals out after the bacteria have finished.

Some advantages associated with bioleaching are:

- economical: bioleaching is generally simpler and therefore cheaper to operate and maintain than traditional processes. It needs small work force.

- environmental: The process do not damage (pollute) the area around mines. Less dioxide gases and less landscape damage occurs, since the bacteria involved grow naturally in the mine, they are easily cultivated and recycled.

Some disadvantages associated with bioleaching are:

- economical: the bacterial leaching process is very slow comparing to traditional methods. The profit is low and over many yeears.

- environmental: Toxic chemicals are sometimes produced in the process. Sulfuric acid and H^+ ions formed can leak into the ground- and surface- water turning it acidic, causing environmental damage. Heavy ions such as iron,

zinc, and arsenic obtained as side-products during the beaking of bacteria to metals components**.**

The traditional method of mining is more economical and gives profits, if concentration of metal in its ore is generally quite high.

However, if the concentration of the metal is generally very low, then bioleaching is used and has a profit after long years.

Bioleaching with fungi

Several species of fungi can be used for bioleaching. Fungi can mobilize Cu and Sn by 65%, and Al, Ni, Pb, and Zn by more than 95%.

Biological control

1) Bioremediation

Remediation = restoring balance

Bioremediation can be defined as **any process that uses microorganisms, fungi, green plants or their enzymes to return the environment altered by contaminants to its original condition.**

Uses

- Use of bacteria to attacks specific soil contaminants, such as degradation of chlorinated hydrocarbons
- Clean oil contaminations from shores

Bioremediation technologies can be generally classified as *in situ* or *ex situ*.

In situ bioremediation involves treating the contaminated material at the site while *ex situ* involves the removal of the contaminated material to be treated elsewhere.

Advantages and Disadavanteges

Advantages	Disadvantages
Cheap not expensive method to clean and restore the environment	Heavy metals such as cadmium and lead are not readily adsorbed by organisms. Mercury will contaminate the food chain and worsen matters.
Do not pollute the environment	Not always successful especially with heavy metals

Genetic engineering approaches

Genetic engineering aims to create organisms specifically designed for bioremediation. Some bacteria such as (Deinococcus radiodurans) has been modified to consume and digest toluene and ionic mercury from highly radioactive nuclear waste.

2) Phytoremediation

Phytoremediation is the treatment of environmental problems (bioremediation) through the use of plants.

What is phytoremediation ?

Greek « phyto » = plant,
Latin « remedium » = restoring balance

Phytoremediation is a process of depolluting contaminated soils, water or air with plants able to contain, degrade or eliminate metals, pesticides, solvants, explosives, crude oil and its derivatives, and various other contaminants, from the mediums that contain them.

Or

Phytoremediation is a process of removing coontaminated materials by plants.

The plants can depollute the soil, water and air through using several processes:

- adsorbs the polluted substances from the environment into its biomass. The plants absorb contaminants through the root system and store them in the root biomass and/or transport them up into the stems and/or leaves.
- Reduce the mobility of contaminated substances in the environment
- Modify the chemical structures of the polluted materials through its metabolism
- Increases the activity of microorganisms that associate with roots which will breakdown the polluted materials.

A living plant may continue to absorb contaminants until it is harvested. After harvest a lower level of the contaminant will remain in the soil, so the growth/harvest cycle must usually be repeated through several crops to achieve a significant cleanup. After the process, the cleaned soil can support other vegetation.

Examples of phytoextraction from soils

- Sunflower (*Helianthus annuus*) can adsorb arsenic compounds
- Sugar beets is salt-tolerant
- Uranium is adsorb by sunflowers. After Chernobyl accident, sunflowers planted in the area..

Advantages and Disadvantages

- **Advantages**:
  - the cost of the phytoremediation is lower than that of traditional processes both *in situ* and *ex situ*
  - the plants can be easily monitored
  - efficient method
  - soil stays in the same place
  - the possibility of the recovery and re-use of valuable metals (by companies specializing in “bioleaaching”)

- it is the least harmful method because it uses naturally occurring organisms and preserves the natural state of the environment.

- **Disadvantages**
  - Phytoremediation is limited to the surface area and depth occupied by the roots.
  - slow growth and low biomass require a long-term commitment
  - It is not possible completely to prevent the leaching of contaminants into the groundwater (without the complete removal of the contaminated ground which in itself does not resolve the problem of contamination)
  - the survival of the plants is affected by the toxicity of the contaminated land and the general condition of the soil.
  - possible bio-accumulation of contaminants which then pass into the food chain, from primary level consumers upwards.

3) Biostimulation

It involves the modification of the environment to stimulate existing bacteria capable of bioremediation. This can be done by addition of various forms of nutrients such as phosphorus, nitrogen, oxygen, or carbon (e.g. in the form of molasses). Additives are usually added to the sub-surface through injection wells. Removal of the contaminated material is also an option. Biostimulation is an alternative to bioaugmentation.

The primary advantage of biostimulation is that bioremediation will be undertaken by already present native microorganisms that are well suited to the environment, and are well distributed within the surface. The primary disadvantage is that the delivery of additives is difficult to penetrate the surface.

4) Bioaugmentation

It is the introduction of a group of natural microbial strains or a genetically engineered variant to achieve bioremediation.

The steps involve studying the indigenous varieties present in the location to determine if biostimulation is possible. If the indigenous variety do not have the metabolic capability to perform the remediation process, exogenous varieties with such sophisticated pathways are introduced.

Bioaccumulation

It is a process that measures the uptake over time of a substance, called a **bioaccumulant** that can accumulate in a biological system.

Half-life

It is the interval required for the quantity to decay to half of its initial value. The concept originated in the study of radioactive decay which is subject to exponential decay but applies to all phenomena including those which are described by non-exponential decays.

Biological half-life

It the time required for half of that substance to be removed from an organism by either a physical or a chemical process. Biological half-life is an important pharmacokinetic parameter and is usually denoted by the abbreviation $t_{1/2}$

Examples of biological half-lives

Water

The biological half-life of water in a human is about 7 to 10 days. It can be altered by behavior. Drinking large amounts of beer will reduce the biological half-life of water in the body. This has been used to decontaminate humans who are internally contaminated with tritiated water (radioactive water). Drinking the same amount of water would have a similar effect, but many

would find it difficult to drink a large volume of water. The basis of this idea is that the water in the body is replaced with new water.

Alcohol

The removal of ethanol (alcohol) through oxidation by alcohol dehydrogenase in the liver from the human body is limited. To save the life of a person that take a formaldehyde, he must take an appropriate amount of ethanol. A person who has ingested ethylene glycol can be treated in the same way.

Metals

It is important to think of the human or animal body as being made up of several parts, each with their own affinity for the substance, and each part with a different biological half-life. Attempts to remove a substance from the whole organism may have the effect of increasing the burden present in one part of the organism. For instance, if a person who is contaminated with lead (Pb) is given EDTA, then while the rate of Pb is reduced in the body, it increased in the brain where it can do the most harm.

Polonium (Po) in the body has a biological half-life of about 30 to 50 days.

Cesium (Cs) in the body has a biological half-life of about one to four months.

Lead (Pb) in the bone has a biological half-life of about ten years.

Cadmium (Cd) in the bone has a biological half-life of about 30 years.

Plutonium (Pu) in bone has a biological half-life of about 100 years, while in the liver has a biological half-life of about 40 years.

In clinical practice, this means that it takes just over 4.7 times the half-life for a drug's serum concentration to reach steady state after regular doses are started, stopped, or the dose changed.

This means that a change in the drug will take 3-7 days to take full effect. For this reason, drugs with a long half-life (elimination $t_{½}$ of about 90 days) are usually started with a high dose to achieve their desired clinical effect more quickly.

The problem arises when toxic substances stay in the body for a long period of time. They are not **acute poisonous**, but **chronic poisonous.**

Uranium (U), arsenic (As), nicotine, lead (Pb) and zinc (Zn) can accumulate easily and cause damages to health. Other compounds that are not normally considered toxic can be accumulated to toxic levels in organisms such as the accumulation of Vitamin A in liver.

Biofilm

It is a complex aggregation of microorganisms (mostly single celled organisms) adheres together and usually held by extracellular polymeric matrix. It is floating in water or attached to a solid surface (a rock). Biofilms are important components of foodchains in rivers and streams.

In industry, biofilms can develop inside the pipes and clogging and corrosive them. Biofilms are also present on the teeth and responsible for tooth decay.

Cancer Techniques

Cancer is a group of diseases in which cells are *aggressive* (grow and divide without respect to normal limits), *invasive* (invade and destroy adjacent tissues), and/or *metastatic* (spread to other locations in the body). These three malignant properties of cancers differentiate them from benign tumors.

A **benign tumor** is a tumor that lacks all three of the malignant properties of a cancer. Thus, by definition, a benign tumor:

- does not grow in an unlimited, **aggressive** manner
- does not **metastasize**
- does not **invade** surrounding tissues

Causes

Cancer may affect people at all ages, even fetuses, but risk for the more common varieties tends to increase with age.
All cancers are caused by abnormalities in the genetic material of the transformed cells. These abnormalities may be caused by:

1) Effects of carcinogens, such as tobacco smoke,
2) Exposures to chemicals such as radon gas, lead and copper
3) Exposure to ultraviolet radiation, and other types of radiation
4) Infectious agents such as viruses or bacteria
5) Heredity
6) Immune system dysfunction
7) Hormonal imbalances
8) unknown factors

Genetic abnormalities found in cancer typically affect two general classes of genes. They are:

- Cancer-promoting *oncogenes* are activated in cancer cells, giving those cells new properties, such as hyperactive growth and division, protection against programmed cell death, loss of respect for normal tissue boundaries, and the

ability to become established in diverse tissue environments.
- *Tumor suppressor genes* are often inactivated in cancer cells, resulting in the loss of normal functions in those cells, such as accurate DNA replication, control over the cell cycle, orientation and adhesion within tissues, and interaction with protective cells of the immune system.

Classification

Cancer is usually classified according to the tissue (or organ) from which the cancerous cells originate. Malignant tumors are usually named using the Latin or Greek root of the organ of origin as a prefix and the above category name as the suffix. For instance, a malignant tumor of the liver is called *hepatocarcinoma*; a malignant tumor of the fat cells is called *liposarcoma*. For common cancers, the English organ name is used. For instance, the most common type of breast cancer is called *ductal carcinoma of the breast*.

Benign tumors are named using -oma as a suffix with the organ name as the root. For instance, a benign tumor of the smooth muscle of the uterus is called *leiomyoma* (the common name of this frequent tumor is *fibroid*). **However, some cancers also use this prefix for historical reasons, examples being melanoma and seminoma.**

Nomenclature

The following closely related terms may be used to designate abnormal growths:

Neoplasm: a scientific term which refers to an abnormal proliferation of genetically altered cells.

Biopsy: a removal of cells or tissues for examination أخذ عينة

Malignant neoplasm: synonymous with cancer.

Tumor: broadly defined, can be any swelling or mass. However, the vast majority of entities referred to as 'tumors' in common usage are in fact neoplasms. Specifically, a tumor is a solid

neoplasm; some neoplasms, such as cancers of the blood, are not solid.

Benign tumor: a tumor (solid neoplasm) that has self-limiting growth and does not invade other tissues nor metastasize. Usually not cancerous.

Pre-malignancy or pre-cancer: A non-invasive neoplasm that may not form an obvious mass or lesion but has the potential to progress to cancer if left untreated.

Transformation: the concept that an indolent or minimally aggressive neoplasm can transition to a state of more malignant behavior over time. Example: Richter's transformation.

Cancers are classified by the type of cell that resembles the tumor and, therefore, the tissue presumed to be the origin of the tumor. Examples of general categories include:

Carcinoma: Malignant tumors derived from epithelial cells. This group represents the most common cancers, including the common forms of breast, prostate, lung and colon cancer.

Sarcoma: Malignant tumors derived from connective tissue, or mesenchymal cells.

Lymphoma and leukemia: Malignancies derived from hematopoetic (blood-forming) cells

Germ cell tumor: Tumors derived from totipotent cells. In adults most often found in the testicle and ovary; in fetuses, babies, and young children most often found on the body midline, particularly at the tip of the tailbone; in horses most often found at the poll (base of the skull).

Blastic tumor: A tumor (usually malignant) which resembles an immature or embryonic tissue. Many of these tumors are most common in children.

Adult cancers

In the U.S. and other developed countries, cancer is presently responsible for about 25% of all deaths. On a yearly basis, 0.5% of the population is diagnosed with cancer. The statistics below are for adults in the United States, and may vary substantially in other countries:

Male		Female	
most common (by occurrence)	most common (by mortality) [3]	most common (by occurrence)	most common (by mortality) [3]
prostate cancer (33%)	lung cancer (31%)	breast cancer (32%)	lung cancer (27%)
lung cancer (13%)	Prostate cancer (10%)	lung cancer (12%)	breast cancer (15%)
colorectal cancer (10%)	colorectal cancer (10%)	colorectal cancer (11%)	colorectal cancer (10%)
bladder cancer (7%)	pancreatic cancer (5%)	endometrial cancer (6%)	ovarian cancer (6%)
cutaneous melanoma (5%)	leukemia (4%)	non-Hodgkin lymphoma (4%)	pancreatic cancer (6%)

Signs and symptoms

Roughly, cancer symptoms can be divided into three groups:

***Local symptoms*:** unusual lumps or swelling (*tumor*), hemorrhage (bleeding), and pain.

Symptoms of metastasis (spreading): enlarged lymph nodes, cough and hemoptysis (coughing blood), hepatomegaly (enlarged liver), bone pain, fracture of affected bones and neurological symptoms. Although advanced cancer may cause pain, it is often not the first symptom.

***Systemic symptoms*:** weight loss, poor appetite and cachexia (wasting), excessive sweating (night sweats) and anemia

Every symptom in the above list can be caused by a variety of conditions (a list of which is referred to as the differential diagnosis). Cancer may be a common or uncommon cause of each item.

Diagnosis

Most cancers are initially recognized either because signs or symptoms appear or through screening. Neither of these lead to a definitive diagnosis, which usually requires the opinion of a pathologist. People with suspected cancer are investigated with medical tests. These commonly include histological examination, blood tests, X-rays, CT scans and endoscopy.

Treatment

Cancer can be treated by surgery, chemotherapy, radiation therapy, immunotherapy, monoclonal antibody therapy or other methods. The choice of therapy depends upon the location and grade of the tumor and the stage of the disease, as well as the general state of the patient (performance status). A number of experimental cancer treatments are also under development.

Because "cancer" refers to a class of diseases, it is unlikely that there will ever be a single "cure for cancer" any more than there will be a single treatment for all infectious diseases.

Surgery

In theory, cancers can be cured if entirely removed by surgery, but this is not always possible. When the cancer has metastasized to other sites in the body prior to surgery, complete surgical excision is usually impossible.

Radiation therapy

Radiation therapy (also called radiotherapy, X-ray therapy, or irradiation) is the use of ionizing radiation to kill cancer cells and shrink tumors. **The effects of radiation therapy are localised and confined to the region being treated**. Radiation therapy injures or destroys cells in the area being treated (the "target tissue") by damaging their genetic material, making it impossible for these cells to continue to grow and divide.

Although radiation damages both cancer cells and normal cells, most normal cells can recover from the effects of radiation and function properly. The goal of radiation therapy is to damage as many cancer cells as possible, while limiting harm to nearby healthy tissue. Hence, it is given in many fractions, allowing healthy tissue to recover between fractions.
Radiation therapy has side effects.

Chemotherapy

Chemotherapy is the treatment of cancer with drugs ("anticancer drugs") that can destroy cancer cells. Chemotherapy drugs interfere with cell division in various possible ways, e.g. with the duplication of DNA or the separation of newly formed chromosomes. Most forms of chemotherapy target all rapidly dividing cells and are not specific for cancer cells, although some degree of specificity may come from the inability of many cancer cells to repair DNA damage, while normal cells generally can.

Targeted therapies

Targeted therapy, which first became available in the late 1990s, has had a significant impact in the treatment of some types of cancer, and is currently a very active research area.
Several methods are used:

1) Agents specific for the cancerous proteins and will inhibit them whether they were enzymes or other kinds of proteins.

2) A therapeutic agent can be used as an antibody which specifically binds to a protein on the surface of the cancer cells.
3) The use of small peptides as "homing devices" which can bind to cell surface receptors or affected extracellular matrix surrounding the tumor.
4) Photodynamic therapy (PDT) is a treatment for cancer involving a photosensitizer, light, tissue oxygen and often use of lasers.
5) Several methods to induce the patient's own immune system to fight the tumor. Vaccines to generate specific immune responses are the subject of intensive research for a number of tumors.
6) Stem cell transplantation ("bone marrow transplantation") can be considered, although the side effects are also more severe.

Hormonal therapy

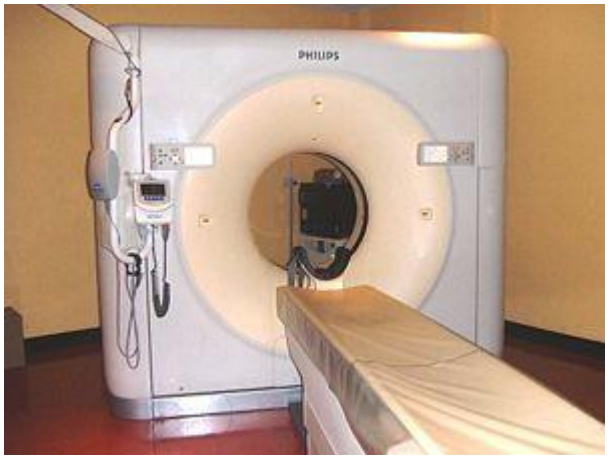
The growth of some cancers can be inhibited by providing or blocking certain hormones. Common examples of hormone-sensitive tumors include certain types of breast and prostate cancers. Removing or blocking estrogen or testosterone is often an important additional treatment.
In certain cancers, administration of hormone agonists, such as progestogens may be therapeutically beneficial.

Symptom control

Although the control of the symptoms of cancer is not typically thought of as a treatment directed at the cancer, it is an important determinant of the quality of life of cancer patients, and plays an important role in the decision whether the patient is able to undergo other treatments. Although all practicing doctors have the therapeutic skills to control pain, nausea, vomiting, diarrhea, hemorrhage and other common problems in cancer patients, the multidisciplinary specialty of palliative care has arisen specifically in response to the symptom control needs of this group of patients.

Complementary and alternative medicine (CAM)
Many patients use CAM which are not part of conventional medicine. Unconventional or botanical treatments used by patients as a cancer therapy.
Treatment trials
Clinical trials, also called research studies, test new treatments in people with cancer. The goal of this research is to find better ways to treat cancer and help cancer patients.
A clinical trial first tested in animals but treatments that work well for animals do not always work well in people. All patients used for clinical trial

Genes and **protein** products that have been identified by at least two independent publications as being involved in cancer are: ABI1, ABL2, ACSL6, AF1Q, AF5Q31 (also known as MCEF), AKT1, ARNT, ASPSCR1, ATF1, ATIC, BCL10, BFHD, BIRC3, BMPR1A, BTG1, CBFA2T1, CBFA2T3, CBFB, CCND1, CDC2, CDK4, CHIC2, CHN1, COPEB, COX6C, CTNNB1, CYLD, DDB2, DDIT3, DEK, EIF4A2, EPS15, ERCC2, ERCC3, ERCC5, ERG, ETV4, ETV6, EWSR1, EXT1, EXT2, FANCC, FANCG, FGFR1OP, FGFR3, FH, FIP1L1, FUS, GAS7, GATA1, GMPS, GOLGA5, GPC, GPHN, HIST1H4I, HRAS, HSPCA, IL21R, IRF4, KRAS2, LASP1, LCP1, LHFP, LMO2, LYL1, MADH4, MLF1, MLH1, MLLT3, MLLT6, MNAT1, MSF, MSH2, MSN, MUTYH, MYC, NCOA4, NF2, NPM1, NRAS, PAX8, PCBD, PDGFB, PIM1, PLK2, PNUTL1, POU2F1, PPARG, PRCC, PRKACB, PRKAR1A, PTEN, PTPN11, RABEP1, RAD51L1, RAP1GDS1, RARA, RB1, RET, RHOH, RPL22, SBDS, SDHB, SEPTIN6, SET, SH3GL1, SS18L1, SSX1, SSX2, SSX4, STAT3, TAF15, TCF12, TCL1A, TFE3, TFEB, TFG, TFPT, TFRC, TNFRSF6, TP53, TPM3, TPM4, TRIP11, VHL, WAS, WT1, ZNF198, ZNF278, ZNF384, ZNFN1A1



A Multislice CT Scanner

Computed tomography (CT-Scan)

It is a medical imaging method employing to generate a three-dimensional image of the inside of an object from a large series of two-dimensional X-ray images taken around a single axis of rotation.

The word "tomography" is derived from the Greek *tomos* (slice) and *graphein* (to write).

Computed tomography was originally known as the "EMI scan", but was later known as *computed axial tomography* (CAT or CT scan) and *body section röntgenography*.

CT produces a volume of data which can be manipulated, through a process known as *windowing*, in order to demonstrate various structures based on their ability to block the X-ray beam. Modern scanners allow this volume of data to be reformatted in various planes or even as volumetric (3D) representations of structures.

CT is also used in other fields, such as nondestructive materials testing and to study biological specimens.

Endoscopy

Endoscopy is a diagnostic medical procedure that is used to assess the interior surfaces of an organ by inserting إدخال a tube into the body. The instrument may have a rigid صلب or flexible tube and not only provide an image for visual inspection and photography, but also enable taking biopsies and retrieval يسحب of foreign objects.

The patient may receive conscious sedation مخدر لا يفقده الوعي so they do not have to be consciously aware of the discomfort.

Many endoscopic procedures are considered to be relatively painless and, at worst, associated with mild discomfort; for example, in esophago-gastro-duodenoscopy, most patients tolerate the procedure with only topical anaesthesia of the oropharynx using lignocaine spray. Complications are not common (only 5% of all operations).

An endoscope can consist of

- a rigid or flexible tube
- a light delivery system to illuminate the organ or object under inspection. The light source is normally outside the body and the light is typically directed via an optical fiber system

- a lens system transmitting the image to the viewer from the fiberscope
- an additional channel to allow entry of medical instruments or manipulators

Endoscopy can be used in:

- The gastrointestinal tract (GI tract):
  - esophagus, stomach and duodenum (esophago-gastro -duodenoscopy)
  - small intestine
  - colon (colonoscopy)

- The respiratory tract
  - The nose (rhinoscopy)
  - The lower respiratory tract (bronchoscopy)
- The urinary tract (cystoscopy)
- The female reproductive system
  - The cervix (colposcopy)
  - The uterus (hysteroscopy)
  - The Fallopian tubes (Falloscopy)
- Normally closed body cavities (through a small incision):
  - The abdominal or pelvic cavity (laparoscopy)
  - The interior of a joint (arthroscopy)
  - Organs of the chest (thoracoscopy)
- During pregnancy
  - The amnion (amnioscopy)
  - The fetus (fetoscopy)
- Plastic Surgery

- Non-medical uses for endoscopy
  - The planning and architectural community have found the endoscope useful for pre-visualization of scale models of proposed buildings and cities (architectural endoscopy)

- Internal inspection of complex technical systems (borescope)
- Endoscopes are also a tool helpful in the examination of improvised explosive devices by bomb disposal personnel.
- The FBI uses endoscopes for conducting surveillance via tight spaces.

Risks of endoscopy

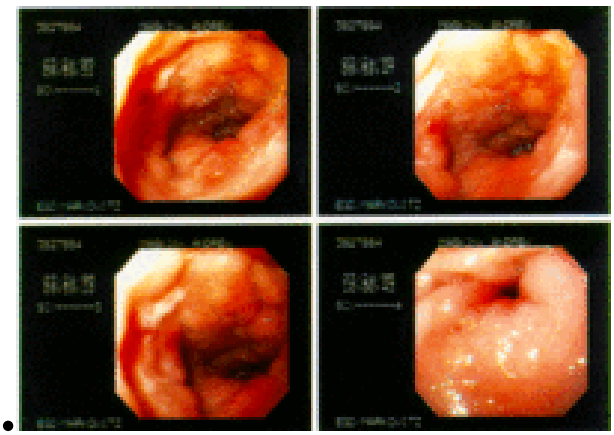
- Infection
- Punctured organs
- Allergic reactions due to Contrast agents or dyes (such as those used in a CT scan)
- Over-sedation

After Endoscopy

Occasionally a patient is left with a mild sore throat, which promptly responds to saline gargles.

When fully recovered, the patient will be instructed when to resume his/her usual diet (probably within a few hours) and will be allowed to be taken home.

Because of the use of sedation, most facilities mandate that the patient is taken home by another person and not to drive on his/her own or handle machinery for the remainder of the day.

1. 

Sweets and Enzymes

Sweets الحلويات

Sweets are a non-essential commodity, but consumed by people for pleasure or to get energy. It is called, therefore, junk food. The variety of products is enormous, ranging from cheap, individually-wrapped sweets, to those presented in boxes with sophisticated packaging.

Nutritional significance

The main ingredient used in the production of sweets is sugar (sucrose). There is a danger that if sweets consumed in excess over a prolonged period, they may contribute to obesity. Unless good dental care practiced, over-consumption can also lead to tooth decay .

Many factors affect the production and storage of sweets :

1) Degree of inversion

Sweets containing high concentrations of sugar (sucrose) that may crystallized either during manufacture or on storage.

When a sugar solution heated, a certain percentage of sucrose breaks down to form 'inverted sugar'. This inverted sugar inhibits the crystallization of sucrose and increases the overall concentration of sugars in the mixture. This natural process of inversion, however, makes it difficult to assess the degree of inverted sugar that produced .

As a way of controlling the amount of inversion, certain ingredients, such as cream or citric acid are used. These ingredients accelerate the breakdown of sucrose into inverted sugars, and thereby increase the overall percentage of inverted sugars in the solution.

The amount of inverted sugar in the sweet must controlled, since too much may make the sweets absorbs water from the air and become sticky. Too little inverted sugar will be insufficient to prevent crystallization of the sucrose.

2) Time and temperature of boiling

The temperature of boiling is very important, as it directly affects the final sugar concentration and moisture content of the sweet.

Variations in boiling temperature can make a difference between a sticky, cloudy sweet and a dry, clear sweet. The increase in temperature lead to a hard sweets.

3) Moisture content

The water left in the sweet influences its storage behavior and determine whether the product will dry out, or pick up moisture. For sweets that contain more than 4% moisture, it is likely that sucrose will crystallize on storage.

4) Additional ingredients

The addition of certain ingredients can affect the temperature of boiling. For example, if liquid milk used in the production of toffees, this will increase moisture content of the mixture immediately, and will therefore require a longer boiling time in order to reach the desired moisture content .

Additional ingredients have an effect on the shelf life (storage) of the sweet. Toffees and caramels that contain milk-solids and fat, have a higher viscosity, which controls crystallization. On the other hand, the use of fats may make the sweets ready to rancidity, and consequently the shelf-life will be shortened .

Inversion

A process where + sucrose is hydrolyzed by dilute aqueous acid or by the action of the enzyme Invertase to yield equal amounts of D-(+) glucose and D-(-) fructose

The inversion of sucrose occurs during the making of jams مربيات. When sucrose added to the fruits, the acids (especially citric acids) will hydrolyze sucrose into glucose and fructose (Inverted sugars). One gram of acid can hydrolyzes 1 kg of sucrose.

Sucrose

- Disaccharide
- Consists of two monosaccharide (glucose and fructose) connected by a glycosidic bond
- a common table sugar
- obtained from sugar cane and sugar beets قصب السكر والبنجر السكري
- molecular formula $C_{12}H_{22}O_{11}$
- non-reducing sugar
- melting point 186ºC
- when hydrolyzed by dilute aqueous acid or by the action of the enzyme Invertase, it yield equal amounts of D-(+) glucose and D-(-) fructose

Glucose and fructose are called (inverted sugars)

Glucose

- monosaccharide
- molecular formula $C_6H_{12}O_6$
- During metabolism, all proteins, carbohydrates and lipids convert into glucose. Excess glucose in the body will store as fat under skin and as glycogen in the liver.
- Plants produce glucose through photosynthesis.

Fructose (levulose in some books)

- Monosaccharide
- Molecular formula $C_6H_{12}O_6$
- It is an isomer of glucose
- Found in many foods and is one of the three most important blood sugars along with glucose and galactose.
- Honey, tree fruits, berries, melons, and some root vegetables, such as beets, sweet potatoes, parsnips, and onions, contain fructose, usually in combination with sucrose and glucose.
- Fructose is a reducing sugar, as are all monosaccharide.

- The free fructose present in fruits, their juice, and honey is responsible for the greater sweetness of these natural sugar sources.
- Honey is an inverted sugars since it contains large amounts of fructose

For information only للمعلومات فقط

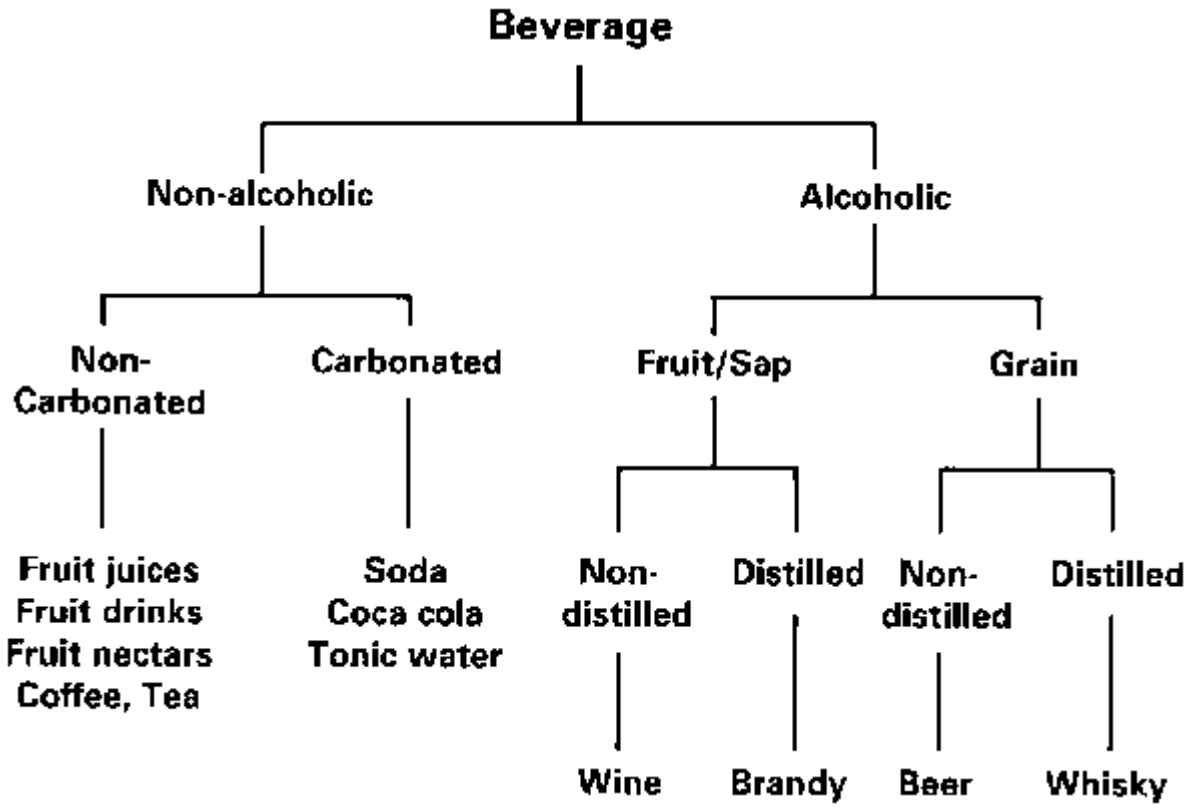
When the light pass through a solution, it will rotate to the right (+) or to the left (-). Each liquid has specific degree of rotation. (+) sucrose has a specific rotation of + 66.5º, while D-(+) glucose has a specific rotation of + 52.7º, while D-(-) fructose has a specific rotation of - 92.4º.
When the light pass through equal mixture of D-(+) glucose and D-(-) fructose, it will rotate to the left (-39.7 º).

All mammals (except felines –cats family- that lack the ability to taste sweets) eat sweets even when not hungry

Beverages المشروبات

A wide range of plant materials used to manufacture beverages. These include leaves, stems, sap, fruits, tubers, and seeds (grains).

The large number of beverages may classify as shown:



The beverages bought to stop thirst since they contain a great deal of water. This does not add many nutrients to the diet, but it does play an important role in maintaining body balance by preventing dehydration. Beverages, particularly the fruit drinks, contain quite a high percentage of sugar and therefore add to the energy content of the diet. Additionally fruit juices provide a supply of vitamins and minerals.

Alcoholic drinks

The most common examples of alcoholic beverages are wines and beers. Beer usually made from a cereal, whereas wine can produce from either cereals or fruit. Both can distilled to produce spirits with an alcohol content of 30-50%.

Both wines and beers are produce by fermentation that involves the conversion of sugars in the raw material or added sugar into alcohol and carbon dioxide. Different varieties of the yeast *Saccharomyces cerevisiae* used to produce wines or beer. Brandy and whiskey will be distilled after that.

Carbonation

It is a process that involves the addition of carbon dioxide into a drink. The most usual way of achieving this is to use a pressurized cylinder or tank which contains a mixture of water and carbon dioxide. In the case of soft drinks, the bottle is filled to a certain level with the flavored syrup, the bottle is positioned under the cylinder head and carbon dioxide is released. The bottles are capped immediately.

4) Pasteurization

Pasteurization involves heating the product to a temperature of 80-90°C and holding it at that temperature for between 0.5 and 5 minutes before filling into clean sterilized bottles.

الغش الصناعي

ينتشر بيع الكثير من عصائر وشراب الفواكه في الأسواق يدعي مصنعوها احتوائها على نسبة لا تقل عن ١٠% أو أكثر من لب الفواكه أو عصيرها الطبيعي، وتزعم بعض شركات إنتاج عصير الفواكه بأنه يحضر من عصير فواكه طبيعي ١٠٠% معاد تكوينه مع لب الثمار وبشكل خاص المانجو والبرتقال والتفاح، ويحتوي الكثير من هذه أنواع شراب الفواكه المحفوظة في علب على مركبات نكهة صناعية يقال بأنها طبيعية وأخرى ملونة مثل ترتزازين لونه برتقالي ورمزه E 102 وأصفر غروب الشمس ورمزه E 110 وسكر وحمض عضوي وتصل نسب مكوناتها الصناعية في بعض أنواعها التجارية إلى ١٠٠ .%

كما يزعم مصنع إنتاج نوع من شراب البرتقال احتوائه على المكونات التالية: عصير برتقال طبيعي بحد أدنى ١٠% وسكر وحمض الليمون E330 وبيتا كاروتين (مادة ملونة طبيعية صفراء) ونكهة البرتقال الطبيعي وبكتين (مثخن للقوام) وفيتامين C وأنه يحفظ بطريقة البسترة لتجنب استخدام مركبات حافظة ضد فساده بالميكروبات، وأصبحت المشروبات المحتوية على فيتامين C كثيرة

التنوع في السوق، علماً أن هذا الفيتامين يتصف بالحساسية المفرطة لظروف التخزين السيئة لعلب العصير مثل ارتفاع درجة الحرارة حيث تؤدي طول فترة التخزين إلى فقده معظم فعاليته الحيوية خلالها هذا إذا وجد فيها فرضياً ، ويمكن صناعة مشروبات فواكه صناعية تشابه الطبيعي منها باستعمال مواد مضافة للأغذية، بعضها تحسن مذاقها مثل أحماض عضوية كحمض الستريك citric acid في مشروب البرتقال وحمض الماليك maleic acid في عصير التفاح ومواد ملونة صناعية ونكهات صناعية ومركبات منظمة للحموضة مثل سترات الصوديوم، ومركبات تثخن قوام المشروب مثل البكتين والصمغ العربي والجيلاتين، وشاع استعمال مركب ميثايل سليلوز methyl cellulose في عمل حبيبات تشبه الموجود منها في عصير البرتقال .

.وتتصف معظم الأصباغ الصناعية المستخدمة في السلع الغذائية مثل المياه الغازية وعصائر الفواكه بأنها نسبياً غير ثابتة كيماوياً نتيجة تركيبها غير المشبع في روابطها الكيماوية فيبهت لونها عند تعرضها لضوء الشمس والحرارة والأحياء الدقيقة نتيجة تخزينها فترة طويلة وعند اتصالها بالمعادن، وتتأكسد هذه المركبات وتتفاعل مع العوامل المختزلة كالأحماض القوية الشديدة فتؤدي أحياناً إلى ظهور بقع ولطخ على السلع الغذائية، كما يتكون نتيجة اتحاد الأصباغ مع بعض العناصر كالكالسيوم والماغنسيوم مركبات غير ذائبة في الماء .

منتجات اللحوم وتلوثها

ينتشر استعمال مواد نشوية مالئة و بعض النواتج الثانوية لذبائح اللحوم كالأمعاء والكرش بعد طحنها وسحقها في تحضير بعض منتجات اللحوم مثل المارتدلا والنقانق والهمبرجر ويضاف إليها التوابل وغيرها لتغطية عيوب قد تظهر في مذاقها ونكهتها وتحسين لونها ومظهرها، كما شاع استعمال اللحم الصناعي المحضر رئيساً من بروتينات بذور فول الصويا كالهمبرجر والنقانق.

أما العسل التجاري، فمعظمه مصنع من نحل يتغذى على مواد سكرية وليس على زهور طبيعية، مما يؤدي إلى ارتفاع نسبة الفركتوز فيه فيميل إلى التبلور.

	Pepsi	Frisco	Dania	Lemonita	Nice up	Malita	Ugarit
	بيبسي	فريسكو	دانية	ليمونيتا	نايس آب	ماليتا	اوغاريت
Carbonated water	Yes	yes	Yes	Yes	yes	Yes	Yes
Crystals sugar	Yes	yes	Yes	Yes	yes	yes	Yes
Citric acid	No	yes	Yes	Yes	Yes	Yes	Yes
Caramel coloring E150	yes	yes			no		
Extract of orange						yes	
Sodium benzoate		yes		yes		yes	
Sodium citrate		yes			yes		
Peach pulp and dices			30%		no		
Maleic acid					yes		
Ascorbic yes			Yes				yes
Cellulose E466			Yes				
Phosphoric acid	Yes						
Caffeine	Yes						
Preservation	Yes						
Natural flavor	Yes				yes		
Food color yellow E102				yes		yes	
Food color yellow E110						yes	
Food color yellow E112		Yes				yes	
Arabic gum E414		yes				yes	
Natural orange juice							15%
betacarbonate							yes
Extracts of blackberry and strawberry		yes					
Concentrated lemon juice				??%			

E numbers

E numbers are codes for food additives and are usually found on food labels throughout the European Union. The numbering scheme follows that of the International Numbering System (INS) as determined by the Codex Alimentarius committee.

Classification by numeric range

100–199 Colors	100–109	Yellows
	110–119	Oranges
	120–129	Reds
	130–139	blues & violets
	140–149	Greens
	150–159	browns & blacks
	160–199	Others
200–299 Preservatives	200–209	sorbates
	210–219	benzoates
	220–229	sulphites
	230–239	phenols & formates (methanoates)
	240–259	nitrates
	260–269	acetates (ethanoates)
	270–	lactates

	279	
	280–289	propionates (propanoates)
	290–299	Others
	300–309	ascorbates (vitamin C)
	310–319	gallates & erythorbates
	320–329	lactates
300–399 Antioxidants & acidity regulators	330–339	citrates & tartrates
	340–349	phosphates
	350–359	malates & adipates
	360–369	succinates & fumarates
	370–399	Others
400–499 Thickeners, stabilisers & emulsifiers	400–409	alginates
	410–419	natural gums
	420–429	other natural agents
	430–439	polyoxythene compounds
	440–449	natural emulsifiers
	450–459	phosphates
	460–	cellulose compounds

	469	
	470–489	fatty acids & compounds
	490–499	Others
	500–509	mineral acids & bases
	510–519	chlorides & sulphates
	520–529	sulphates & hydroxides
500–599 pH regulators & anti-caking agents	530–549	alkali metal compounds
	550–559	silicates
	570–579	stearates & gluconates
	580–599	Others
	620–629	glutamates
600–699 Flavour enhancers	630–639	inosinates
	640–649	Others
900–999 Miscellaneous	900–909	waxes
	910–919	synthetic glazes
	920–929	improving agents
	930–949	packaging gases
	950–	sweeteners

	969	
	990–999	foaming agents
1100–1599 Additional chemicals	New chemicals that do not fall into standard classification schemes	

E100–E199 (colors)

- E100 Curcumin, turmeric (food coloring)
- E101 Riboflavin (Vitamin B_2), formerly called lactoflavin (Vitamin G) (food coloring)
- E101a Riboflavin-5'-Phosphate (food coloring)
- E102 Tartrazine (FD&C Yellow 5) (food coloring)
- E103 Chrysoine resorcinol (food coloring)
- E104 Quinoline yellow (food coloring)
- E105 Fast Yellow AB (food coloring)
- E106 Riboflavin-5-Sodium Phosphate (food coloring)
- E107 Yellow 2G (food coloring)
- E110 Sunset Yellow FCF, Orange Yellow S, FD&C Yellow 6 (food coloring)
- E111 Orange GGN (food coloring)
- E120 Cochineal, Carminic acid, Carmines, Natural Red 4 (food coloring)
- E121 Orcein, Orchil (food coloring)
- E122 Carmoisine, Azorubine (food coloring)
- E123 Amaranth (FD&C Red 2) (food coloring)
- E124 Ponceau 4R, Cochineal Red A, Brilliant Scarlet 4R (food coloring)
- E125 Ponceau SX, Scarlet GN (food coloring)
- E126 Ponceau 6R (food coloring)
- E127 Erythrosine (FD&C Red 3) (food coloring)
- E128 Red 2G (food coloring)
- E129 Allura Red AC (FD&C Red 40) (food coloring)
- E130 Indanthrene blue RS (food coloring)
- E131 Patent Blue V (food coloring)
- E132 Indigo carmine, Indigotine, FD&C Blue 2 (food coloring)

- E133 Brilliant Blue FCF (FD&C Blue 1) (food coloring)
- E140 Chlorophylls and Chlorophyllins: (i) Chlorophylls (ii) Chlorophyllins (food coloring)
- E141 Copper complexes of chlorophylls and chlorophyllins (i) Copper complexes of chlorophylls (ii) Copper complexes of chlorophyllins (food coloring)
- E142 Greens S (food coloring)
- E143 Fast Green FCF (FD&C Green 3) (food coloring)
- E150a Plain Caramel (food coloring)
- E150b Caustic sulfite caramel (food coloring)
- E150c Ammonia caramel (food coloring)
- E150d Sulphite ammonia caramel (food coloring)
- E151 Black PN, Brilliant Black BN (food coloring)
- E152 Black 7984 (food coloring)
- E153 Carbon black, Vegetable carbon (food coloring)
- E154 Brown FK, Kipper Brown (food coloring)
- E155 Brown HT, Chocolate brown HT (food coloring)
- E160a Alpha-carotene, Beta-carotene, Gamma-carotene (food coloring)
- E160b Annatto, bixin, norbixin (food coloring)
- E160c Capsanthin, capsorubin, Paprika extract (food coloring)
- E160d Lycopene (food coloring)
- E160e Beta-apo-8'-carotenal (C 30) (food coloring)
- E160f Ethyl ester of beta-apo-8'-carotenic acid (C 30) (food coloring)
- E161a Flavoxanthin (food coloring)
- E161b Lutein (food coloring)
- E161c Cryptoxanthin (food coloring)
- E161d Rubixanthin (food coloring)
- E161e Violaxanthin (food coloring)
- E161f Rhodoxanthin (food coloring)
- E161g Canthaxanthin (food coloring)
- E161h Zeaxanthin (food coloring)
- E161i Citranaxanthin (food coloring)
- E161j Astaxanthin (food coloring)
- E162 Beetroot Red, Betanin (food coloring)

- E163 Anthocyanins (food coloring)
- E170 Calcium carbonate, Chalk (food coloring)
- E171 Titanium dioxide (food coloring)
- E172 Iron oxides and hydroxides (food coloring)
- E173 Aluminium (food coloring)
- E174 Silver (food coloring)
- E175 Gold (food coloring)
- E180 Pigment Rubine, Lithol Rubine BK (food coloring)
- E181 Tannin (food coloring)

Single cell protein (SCP)

Definition

Dry microorganisms' cells (rich in proteins, carbohydrates, lipids, vitamins and minerals) produce through the culture of single celled microorganisms. These cells known as (single cell proteins) consumed as proteins-rich food by humans and livestock.

Another definition

Microbial biomass or proteins extracted from processes in which bacteria, yeasts, other fungi or algae are cultivated in large quantities as human or animal protein supplement in animal feed or in human nutrition.

Single cell protein was called (microbial protein).

Advantages

The microorganisms used to produce proteins must have several advantages such as:

- fast growth
- the growth media must consists of simple and available components
- non-toxic
- harvesting microbial proteins must be at low-costs
- a high rate of production of concentrated protein must achieved.

- do not form excretions that contaminate the food during the growth
- extract easily
- The produced protein can be digested easily with accepted color and smell.

SCP is a good food product as it has the texture تركيب of meat, and the taste can be easily overcome by flavoring and cooking. It is rich in protein (45% or more), low in fat and has a sufficient amount of fiber, which makes it a healthy protein source

Disadvantages

- Most expensive operation is the removal of large amounts of water necessary to stabilize the material for storage. This operation is not economic in small size operation.
- Single cell protein must be dried to about 10 % moisture, or condensed and acidified to prevent spoilage from occurring, or fed shortly after being produced.

For Knowledge للمعلومات

Human beings were eating microorganisms for a long time, for example, algae, yeast and bacteria in bread, cheese, milk, yogurt and other kinds of food. During First World War (1914-1918), Beaker's yeast used as protein supplement for human consumption, while Molas used as a carbohydrate source.

Single cell protein can be produced on a number of different substrates such as (whey*, orange peel residue مخلفات قشور البرتقال, sweet orange residue, sugarcane bagasse ثفل, paper waste, rice husks قشور التمن, wheat straw residue, coconut waste, potato waste, banana waste, mango waste, grape waste, straws القش; wood and wood processing wastes; food processing wastes; and residues from alcohol production or from human and animal excretes مخلفات)

*whey = مصل اللبن (حليب مخفف جداً ينفصل عند صنع الجبن)

Information

Today, protein with 72% concentration can produce from ethanol and crude petroleum.

Single cell protein has the potential to be developed into a very large source of supplemental protein that could be used in livestock feeding. In some regions single cell protein could become the principal protein source that is used for domestic livestock and humans, depending upon the population growth and the availability of plant feed protein sources.

Milk production and milk production efficiency was increased when single cell protein replaced groundnut meal in lactating goat diets. Same thing occurred when single cell protein was fed to layers (poultry lay on eggs). When single cell protein was fed to layers no depression in egg production was observed.

Single cell proteins can produce by photosynthetic microorganisms or non-photosynthetic microorganisms. In both cases, a carbon and nitrate sources must provide since CO_2 will not be enough.

Chlorella species (photosynthetic algae) are used mostly and can produce 2tons/day of single cell proteins. Other photosynthetic algae *(Spurulina* species) used to produce very expensive SCP in Hawaii, Thailand and Taiwan that sold 1Kg SCP for 18 US dollars.

Production plan

1) Heavy water is collected in artificial bonds
2) Chosen microorganisms grow in the upper layer of these bonds, 10-30 cm depth, where light intensity is strong and temperature constant.
3) The water in bonds must stirred regularly by pumps or paddle wheels to prevent microorganisms from settle down.

4) In successful bonds, 1-2 tons of microorganisms can harvest daily.
5) After harvesting, microorganisms' cells concentrated through several methods (participation, centrifugation or filtration), then dry with heat to kill harmful microorganisms.
6) Addition of artificial smell and taste will be the last process.

The use of heavy water as a source of SCP has two advantages:
1) clean the environment from pollutants
2) produce high quality economic proteins

Many microorganisms can used for the production of SCP, most important are:

Bacteria

Bacteria can grow (20-120 minutes) on any media and under any circumstances. It can use carbohydrates, hydrocarbons, alcohol, crude oil and many other components as a source of energy. They can tolerate low and high temperatures.

Bacteria can grow on almost everything; however, only one group of bacteria - those which can oxidize methane - has been thoroughly investigated for the production of single-cell protein. These bacteria have not been isolated and clearly defined; usually called *Methanomonas methanica Söhngen*, they are probably not a single species. Methane-oxidizing bacteria need more oxygen for growth than yeast and algae, and this increases the cost of production. There are also problems in obtaining a concentration of bacteria in the medium that is high enough for profitable production.

Methane is among the most inexpensive and abundant sources of energy to be found.

The *Methanomonas* bacteria are the only ones that can utilize methane as a source of energy. The risk of contamination is minimal.

In laboratory, the bacteria are cultivated as a submerged culture in a water solution of mineral salts and a source of nitrogen (ammonia or urea). Air and methane are bubbled through the liquid and dispersed with an impeller. A batch culture is harvested after three days and yields about 12 g of wet bacteria per litre. The dried biomass of bacteria is pinkish white, odourless, tasteless and non-toxic and consists of about 70-80% protein of balanced amino acid composition.

For practical industrial application it has been suggested that natural gas together with air (certain proportions of air and methane are explosive) can be bubbled through a lake or a pond. As a source of mineral and nitrogen, manure will do. As the bacteria produce acid it will probably be necessary to add limestone to maintain a constant pH. The bacterial biomass may either be collected and used for feed or allowed to remain in the water as a food for fish.

Molasses المولاس is a thick syrup produce by the boiling of the sugarcane, sugar beet, grape or dates, so it contains concentrated amounts of sugar. The name in Greek means honey, and for that it called عسل السكر.

The quality of molasses depends on the amount of sugar extracted from it and upon the method of extraction. If the concentrated of sugar is high, the color of the syrup will be darker-brown.

Molases have high concentration of sucrose and inverted sugars.

Dandruff

The excessive shedding إزالة of dead skin cells from the scalp.

It is normal for skin cells to die and flake off يتقشر. A small amount of flaking is normal and in fact quite common. Some people, however, either chronically or as a result of certain triggers, experience an unusually large amount of cells' flaking, which can also be accompanied by redness and irritation تهيج الجلد.

Most cases of dandruff can be easily treated with specialized shampoos. Simple dandruff does not cause hair loss.

Dandruff is a global phenomenon ظاهرة عالمية and many people find that dandruff can cause social or self-esteem problems. Treatment may be important purely for psychological reasons.

As the epidermal layer continually replaces itself, cells are pushed outward where they eventually die and flake off. In most people, these flakes of skin are too small to be visible. However, certain conditions cause cell turnover to be unusually rapid, especially in the scalp.

For people with dandruff, skin cells may mature and be shed in 2-7 days, as opposed to around a month in people without dandruff. The result is that dead skin cells are shed in large, oily clumps, which appear as white or grayish patches on the scalp and clothes.

Causes

Dandruff has been shown to be the result of three required factors:

1) Excessive skin oil secretion (sebaceous secretions);
2) The presence of fat-consuming fungi, most specifically ***Malassezia*** ; that grows near sebaceous glands الغدد الدهنية .

3) An individual susceptibility (stress, nutritional deficiencies, hormone shifts, and environmental factors).

The fungus ***Malassezia globosa*** causes dandruff. These fungi is found naturally on the skin surface of both healthy people and those with dandruff Malassezia lives on the scalps of most healthy adults without causing problems, but sometimes it grows out of control, feeding on the oils secreted by the hair follicles (or added by the person) and causing irritation that leads to increased cells.

All skin cells die and are replaced by new cells. Normally, it takes about a month for new cells to move from the lowest layer of the skin, where they form, to the outermost layer, where they die and scale off in flakes. Since cells renew themselves slowly, this process usually isn't noticeable.

If malassezia thrives, the whole process can take as little as 11 days. The result is a large number of dead skin cells. As the cells fall off, they tend to clump together with oil from the hair and scalp, making them appear white, flaky and all too visible.

Treatments

There have been many strategies for the control of dandruff.

Most clinics recommended the following procedures:

- Human must learn to manage stress
- Shampooing often will remove flakes.
- Elimination of the fungus results in dramatic improvement.
- Minimized hair style products (like oils and gels)

تقليل استعمال الزيوت أو الجيل في الشعر

- East a healthy diet
- Washing hair with a dilute alcohol will rid the hair of the dandruff and leaves hair feeling soft and clean
- The sun will help.

For Knowledge للمعلومات

Some researchers suggest the use of:

- Head & Shoulders anti-dandruff shampoo containing active ingredient Zinc pyrithione.
- Nizoral Shampoo anti-fungal/anti-dandruff shampoo containing active ingredient Ketoconazole.
- Selsun Blue anti-dandruff shampoo containing active ingredient Selenium sulfide.
- The antifungal properties of Tea Tree Oil (Melaleuca Oil) have been reported as useful in the treatment of dandruff.
- Apple Cider Vinegar helps destroy the bacteria that cause Dandruff thus, eliminating your dandruff.

Misconceptions اعتقادات خاطئة

- Dandruff is sometimes confused with dried shampoo. This usually occurs when hair isn't rinsed properly.
- Dandruff is not an organism like lice القمل; it is just dead skin that accumulates in the scalp.
- Dandruff is unlikely to be the cause of hair loss.

يجب ملاحظة أن حدوث حكة في الأذن قد يكون بسبب قيام شعر الأذن بتكـــوين قشرة تهيج خلايا الأذن ، ولهذا يفضل استخدام قطرة تحوي كحول (أو تنظيـــف الأذن بقليل من الكحول المخفف) لإزالة القشرة.

Flow cytometry

Flow Cytometry is a test that can be used to measure the amount of **DNA** in cells. By measuring the amount of DNA in cells, this test is able to identify the proportions of cells in different parts of the **cell cycle**.

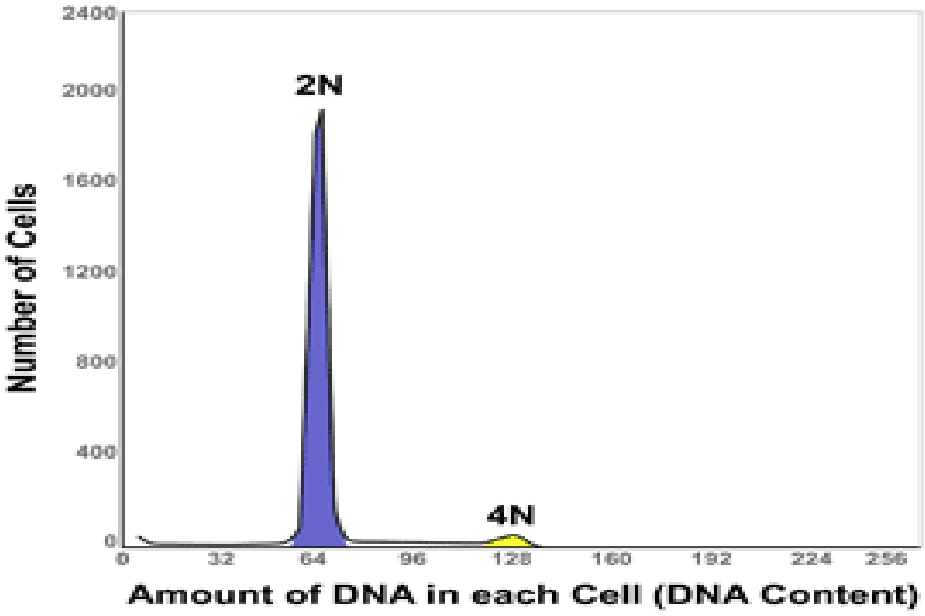
It can also detect populations of cells that have abnormal amounts of DNA (cells that have a lot of gene abnormalities).

Normally, in a biopsy of a cancerous tissue, most of the cells are in the G0/G1 phase of the **cell cycle** will have a 2N DNA content, the content of most of the normal cells of our bodies. Normally, in a biopsy from cancerous tissue, 6% or less of the cells have a 4N DNA content. In that case, the patient has a low risk progression of cancer.

If the percentage increased to 20% 4N DNA, then the patient has a high risk progression of cancer.

Disadvantages

The chance of developing cancer over a five year period was 0% in patients who had biopsy results of negative, 28% in patients with low-grade and 59% with patients with high-grade, so at present, treatment is not recommended based solely on flow cytometric results as 41% of patients who have flow cytometric abnormalities **DO NOT** progress to high-grade cancer during long-term.


2400
2000
1600
1200
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0
Number of Cells
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4N
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64
96
128
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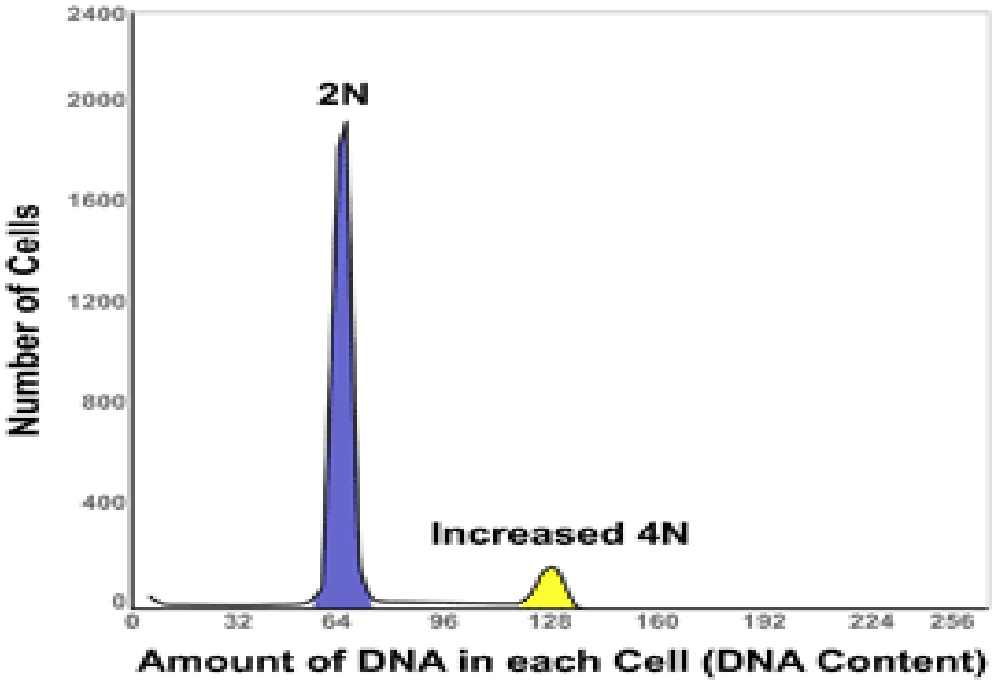
192
224
256
Amount of DNA in each Cell (DNA Content)

the .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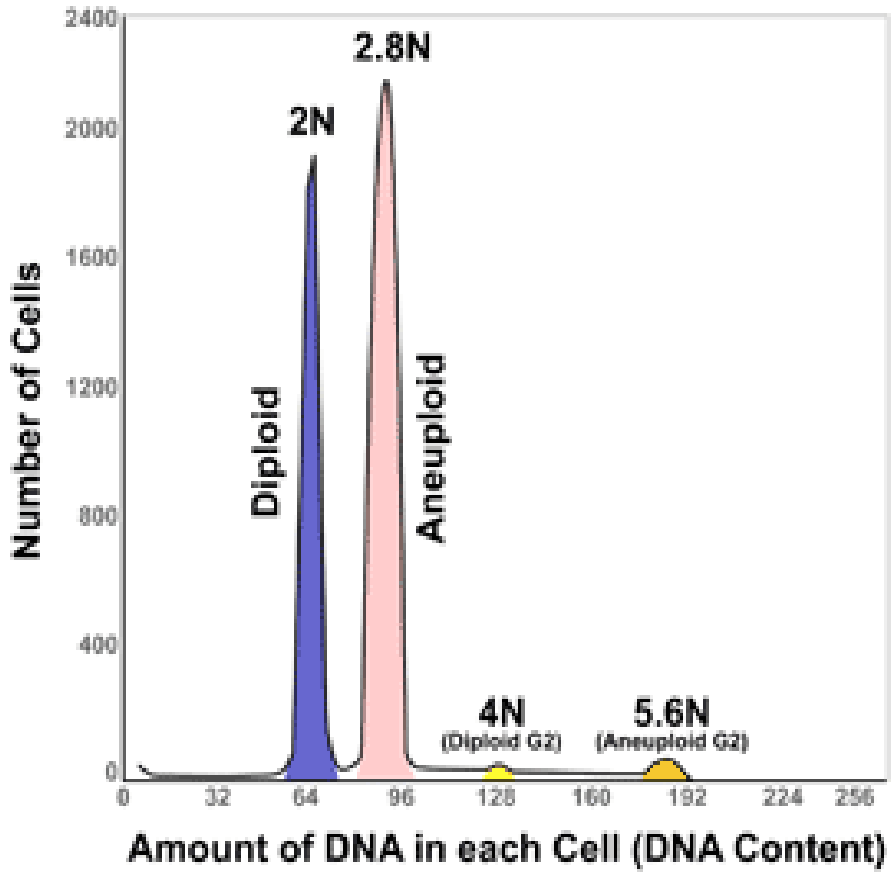

Immobilized Enzyme

The enzyme is a protein that catalyzes, or speeds up, a chemical reaction. Enzymes are protein molecules which serve to accelerate the chemical reactions of living cells. Not all proteins are enzymes but all enzymes are proteins.

Enzyme activity can be affected by other molecules such as:

- Inhibitors which are molecules naturally occurring (or synthetic molecules) that decrease or abolish enzyme activity;
- Activators which are molecules naturally occurring (or synthetic molecules) that increase enzyme activity.

The active site
Most enzymes are larger than the substrates they act on, so only a very small portion of the enzyme, around 10 amino acids, come into direct contact with the substrate. This region who is binding the substrate(s) and responsible for the reaction, is known as the active site of the enzyme.

The active site is a small portion of the enzyme, about 10 amino acids that binds to the substrate and permit the reaction to proceeds.

Without enzymes, most biochemical reactions would be too slow. Enzymes display great specificity and are not permanently modified by their participation in reactions. Since they do not change during the reactions, it is cost-effective (or cheaper) to use them more than once.

Why immobilized enzymes?
In industry, enzymes used in large quantities, but must be kept (when not in use) frozen, so they will not loss their activities. Immobilized enzymes can stay at liquid form without degrading for long periods of time.

The term "immobilized" means **unable to move. That is exactly what an immobilized enzyme is: an enzyme that is physically attached to a solid support and can participate with substrates without losing activity.**

Benefits of Immobilization
To keep the enzyme's catalytic activities stable due to the microenvironment of the support material and its characteristics.

Methods of Immobilization
There are several methods can immobilize the enzyme (or entrapped it), but all methods must:

- Prevent loss of enzyme activity by not changing the chemical nature or reactive groups in the binding site of the enzyme.
- The entrapped enzyme suffers little damage as possible, so a considerable knowledge of the active site of the enzyme will be helpful in achieving this task.
- The active site must be protected during attachment as long as the protective groups can be removed later on without loss of enzyme activity.
- The immobilized enzyme is attached to its support medium through hydrogen bonds or the formation of electron complexes. These links will prevent vibration of the enzyme and thus increase thermal stability and pH stability.

The support or entrapped medium must be insoluble in water, gel-like material that can cross-link with the enzyme. Examples are: Glass, silica, Celite, Bentonite, alumina, or titanium oxide.

Choice of Immobilization Methods

It is important to choose a method of enzyme attachment either: **aimed at reactive groups outside the active site** of that enzyme. The active sites of a particular enzyme must not be touched. Alternatively, the **active site can protected during attachment** by protective groups, if the protective groups can removed without loss of enzyme activity.

The surface on which the enzyme is immobilized has vital roles to play and must chose carefully, so it will not affect the active site of the enzyme. For industrial purposes, it is preferable to use supports (to the enzyme) that are non-bio-degradable such as glass, silica, Celite, Bentonite, alumina, or titanium oxide, if possible.

Cough السعال

A cough is a sudden, often repetitive متكـرر, spasmodic contraction تقلص تشنجي of the thoracic cavity, resulting in violent release of air from the lungs, and usually accompanied by a distinctive sound.

Coughing is an action the body takes to get rid of substances that are irritating the air passages. A cough is usually initiated to clear a buildup of phlegm in the trachea; air may move through this passage at up to 480 km/h during a contraction.

Coughing can also be triggered by a piece of food going down the trachea instead of the esophagus, due to a failure of the epiglottis لـسان المزمـار, although this may result in choking instead.

Frequent or chronic coughing usually indicates the presence of a disease. When cough lasts for more than a few weeks multiple causes are likely and only when all the causes are treated will the patient be symptom free.

Psychological and social reasons for coughing are well known. A person usually coughs or clears their throat before a public speech or answering a question in order to relieve nervousness.

Complications
The complications of coughing can be:

1) increase intrathoracic pressure
2) insomnia
3) chest pain due to muscular strain
4) decrease blood flow to the brain