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Study Q

1**. Monosodium Glutamate (MSG)**

Monosodium glutamate, or MSG, is a common food additive used to intensify and enhance the flavor of savory dishes. MSG consumption has also been associated with weight gain and metabolic syndrome. It’s found in a variety of processed foods like frozen dinners, salty snacks, canned soup and added to foods at restaurants and fast food places.

However, this additive is likely to have little to no effect on human brain health as it’s unable to cross the blood-brain barrier.

**Artificial Food Coloring**

Artificial food coloring is used to brighten and improve the appearance of everything from candies to condiments. Specific food dyes like Blue 1, Red 40, Yellow 5 and Yellow 6 have been associated with allergic reactions in some people. Food coloring may promote hyperactivity in children, although another study showed that some children may be more sensitive than others .

**High-Fructose Corn Syrup**

High-fructose corn syrup is a sweetener made from corn. It’s frequently found in soda, juice, candy, breakfast cereals and snack foods. It’s rich in a type of simple sugar called fructose, which can cause serious health issues when consumed in high amounts.The fructose-sweetened beverage caused significant increases in belly fat and blood sugar levels, plus decreased insulin sensitivity compared to the glucose-sweetened beverage

Additionally, high-fructose corn syrup contributes empty calories and added sugar to foods without any of the important vitamins and minerals that your body needs. It’s best to skip sugary snacks and foods that contain high-fructose corn syrup.

2a) Single or multiple dose (acute ) exposure: acute toxicity of chemical can be viewed into two perspectives .the experiment for acute can take up to 14 days , repeated exposure can take within 24 hours to years by this definition two component comprise acute toxicity .acute exposure and acute effect.

2b) **Repeated dose: sub- acute and sub-chronic toxicity studies involves investigating the effect of repeated exposure to the substances (3-4 doses) in animals for 14-28, and 90days respectively . sub-acute toxicity ;28days , sub\_chronic toxicity ;90days and cornice testing ;more than 90days .**

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| --- | --- |
| Category | Parameter |
| Species | Rats preferred for oral and inhalation tests; rabbits preferred for dermal tests |
| Age | Young adults |
| Number of animals | 5 of each sex per dose |
| Dosage | Three dose levels recommended; exposures are single doses or fractionated doses up to 24 hours for oral and dermal studies and 4-hour exposure for inhalation studies. |
| Observation period | 14days |

**Chronic Toxicity**

Chronic toxicity tests determine toxicity from exposure for a substantial portion of a subject's life. They are similar to the subchronic tests except that they extend over a longer period of time and involve larger groups of animals.

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| --- | --- |
| Category | Parameter |
| Species | Two species recommended; rodent and non-rodent (rat and dog) |
| Age | Young adults |
| Number of animals | 20 of each sex for rodents, 4 of each sex for non-rodents per does level |
| Dosage | Three dose levels recommended; includes a toxic dose level plus NOAEL. The recommended maximum chronic testing durations for pharmaceuticals are now 6 and 9 months in rodents and non-rodents, respectively. (Historicallyexposures were for 12 months, 24 months for food chemicals.) |
| Observation period | 12-24month |

3. There are four routes by which a substancecan enter the body: inhalation, skin (or eye) absorption, ingestion, and injection. Inhalation: For most chemicals in the form of vapors, gases, mists, or particulates, inhalation is the major route of entry.

**Inhalation:** for most chemicals in the form of vapors, gases, mists, or particulates, inhalation is the major route of entry. Once inhaled, chemicals are either exhaled or deposited in the respiratory tract. If deposited, damage can occur through direct contact with tissue or the chemical may diffuse into the blood through the lung-blood interface. Upon contact with tissue in the upper respiratory tract or lungs, chemicals may cause health effects ranging from simple irritation to severe tissue destruction. Substances absorbed into the blood are circulated and distributed to organs that have an affinity for that particular chemical. Health effects can then occur in the organs, which are sensitive to the toxicant. **• Skin (or eye) absorption:** Skin (dermal) contact can cause effects that are relatively innocuous such as redness or mild dermatitis; more severe effects include destruction of skin tissue or other debilitating conditions. Many chemicals can also cross the skin barrier and be absorbed into the blood system. Once absorbed, they may produce systemic damage to internal organs. The eyes are particularly sensitive to chemicals. Even a short exposure can cause severe effects to the eyes or the substance can be absorbed through the eyes and be transported to other parts of the body causing harmful effects. **• Ingestion:** Chemicals that inadvertently get into the mouth and are swallowed do not generally harm the gastrointestinal tract itself unless they are irritating or corrosive. Chemicals that are insoluble in the fluids of the gastrointestinal tract (stomach, small, and large intestines) are generally excreted. Others that are soluble are absorbed through the lining of the gastrointestinal tract. They are then transported by the blood to internal organs where they can cause damage. **• Injection:** Substances may enter the body if the skin is penetrated or punctured by contaminated objects. Effects can then occur as the substance is circulated in the blood and deposited in the target organs.

5. Toxins and toxicants that modify cellular or molecular processes can have repercussions throughout the organism. These interactions can be common to all cell types, or may reflect unique targets or unique bioactivations that are to be found in limited subpopulations of cells. The consequences of these modifications will produce a host of different changes. These changes can be characterized by measurements of transcription factor activity, gene expression at the RNA or protein level, by cellular molecular responses that attempt to re‐establish homoeostasis, and by the consequences to cellular organelle structure and function.

6. Toxicological effects of anti-caking agents: Anti-caking agents are compounds used to prevent clumping and sticking in packaged products. Some common anti-caking agents are silicon dioxide, calcium silicate, iron ammonium citrate, and yellow prussiate of soda. Sodium potassium ferrocyanide are feared because the chemical compound contains cyanide, a known toxin.

7.Tobacco

Thirty percent of all cancers are caused by smoking or chewing tobacco. Cigarette, cigar, and pipe smoking can cause cancers of the lung, mouth, throat, larynx (voice box), esophagus, pancreas, kidney, bladder, stomach, and cervix, as well as acute myeloid leukemia. You should also avoid exposure to secondhand smoke, which causes lung cancer in nonsmoking adults and may increase the risk of other cancers in adults and children.

Diet & Exercise Maintain a healthy body weight and live an active lifestyle. Obesity is associated with an increased risk of cancers of the breast, colon, kidney, and esophagus. Physical activity may also lower your risk for some cancers, including cancers of the colon and breast.

Sexual Behavior Cervical, vaginal, and other genital cancers are caused by certain types of HPV. Genital HPV spreads through sexual contact, but condoms may reduce your risk of getting HPV. Vaccines can prevent infections with some but not all cancer-causing HPV types.

Alcohol If you overuse alcohol, you may be putting yourself at risk for cancer. Long-term alcohol misuse is associated with cancers of the mouth, throat oesophagus, liver, colon, and breast.

Medical Tests and Treatments

Certain medical tests, such as certain types of imaging scans, can increase your risk of cancer. Hormones and hormonerelated drugs, such as menopausal hormone therapy, may increase the risk of breast or uterine cancer in women. Even some treatments used to fight cancer, including drugs and radiation, have been shown to increase the patient’s chance of a second occurrence of cancer. Talk to your doctor about the risks and benefits of medical tests and treatments.

Exposure at Work Jobs that put workers at high risk for cancer include uranium miners, asbestos workers, shipbuilders, certain factory and chemical plant workers, and workers in nuclear industries. Workers can also bring home contamination on their clothing, shoes, or skin, which can potentially put others

Pollution & Exposure to Chemicals Exposure to some chemicals and hazardous substances can increase the risk of cancer. A few well-known carcinogens are asbestos, nickel, cadmium, radon, vinyl chloride, benzidene, and benzene. These carcinogens may act alone or with another carcinogen to increase your risk. For example, asbestos workers who also smoke have a higher risk of lung

8. The main routes of excretion are via urine, feces, and exhaled air. Thus, the primary organ systems involved in excretion are the urinary system, gastrointestinal system and respiratory system. A few other avenues for elimination exist but they are relatively unimportant, except in exceptional circumstances

Urinary Excretion

Elimination of substances by the kidneys into the urine is the primary route of excretion of toxicants. The primary function of the kidney is the excretion of body wastes and harmful chemicals. The functional unit of the kidney responsible for excretion is the nephron. Each kidney contains about one million nephrons. The nephron has three primary regions that function in the renal excretion process, the glomerulus, proximal tubule, and the distal tubule. These are identified in the illustrations.

Three processes are involved in urinary excretion: filtration, secretion, and reabsorption. Filtration, the first process, takes place in the glomerulus, the very vascular beginning of the nephron. Approximately one-fourth of the cardiac output circulates through the kidney, the greatest rate of blood flow for any organ. A considerable amount of the blood plasma filters through the glomerulus into the nephron tubule. This results from the large amount of blood flow through the glomerulus, the relatively large pores (40 angstrom, an angstom is one one-hundred millionth of a centimeter) in the glomerular capillaries, and the hydrostatic pressure of the blood. Small molecules, including water, readily pass through the sieve-like filter into the nephron tubule. Both lipid-soluble and polar substances will pass through the glomerulus into the tubule filtrate. The amount of filtrate is very large, about 45 gallons/day in an adult human. About 99% of the water-like filtrate, small molecules, and lipid-soluble substances, are reabsorbed downstream in the nephron tubule. The urine, as eliminated, is thus only about one percent of the amount of fluid filtrated through the glomerulae into the renal tubules.

Molecules with molecular weights greater than 60,000 (which include large protein molecules and blood cells) cannot pass through the capillary pores and remain in the blood. If albumen or blood cells are found in urine it is an indication that the glomerulae have been damaged. Binding to plasma proteins will influence urinary excretion. Polar substances usually do not bind with the plasma proteins and thus can be filtered out of the blood into the tubule filtrate. In contrast, substances extensively bound to plasma proteins remain in the blood.

Secretion, which occurs in the proximal tubule section of the nephron, is responsible for the transport of certain molecules out of the blood and into the urine. Secreted substances include potassium ions,hydrogen ions, and some xenobiotics. Secretion occurs by active transport mechanisms that are capable of differentiating among compounds on the basis of polarity. Two systems exist, one that transports weak acids (such as many conjugated drugs and penicillins) and the other that transports basic substances (such as histamine and choline).

Reabsorption takes place mainly in the proximal convoluted tubule of the nephron. Nearly all of the water, glucose, potassium, and amino acids lost during glomerular filtration reenter the blood from the renal tubules. Reabsorption occurs primarily by passive transfer based on concentration gradient, moving from a high concentration in the proximal tubule to the lower concentration in the capillaries surrounding the tubule.A factor that greatly affects reabsorption and urinary excretion is the pH of the urine. This is especially the case with weak electrolytes. If the urine is alkaline, weak acids are more ionized and thus excreted to a great extent. If the urine is acidic, the weak acids (such as glucuronide and sulfate conjugates) are less ionized and undergo reabsorption

11.Toxicokinetics is a quantitation of the time of toxic ants in the body during the process of absorption , distribution , bio transformation and excretion of toxicants . the end result of toxiicokinectics processes is a biologically effect dose of the toxicants.

Toxicodynamics, termed pharmacodynamics in pharmacology, describes the dynamic interactions of a toxicant with a biological target and its biological effects. A biological target, also known as the site of action, can be binding proteins, ion channels, DNA, or a variety of other receptors.