

1.6 The effect of toxic substances may be divided into the following broad categories:

- (i) Physiological effects:** on metabolism, photosynthesis, respiration, osmoregulation, feeding, nutrition, heartbeat, blood circulation, body temperature, and water balance.
- (ii) Behavioural effects:** changes in sensory capacity, rhythmic activity, motivation and learning, migration, inter and intraspecific interaction, aggression, predation, vulnerability, and mating.
- (iii) Teratogenic effects:** involving viability of eggs and sperms, fertility, and survival of offspring. The teratogenic effect of toxic substances may induce adverse effects on developing embryos. Although a placental barrier is

present in mammals but lipid soluble substances can diffuse through this barrier and interfere with the replication process of the DNA molecules and active cell division resulting in abnormal births or death of the embryo. A **teratogen is a substance** that is capable of causing birth defects in a fetus. Most known teratogens (**isotretinoin and warfarin**) **cause birth defects if the fetus is exposed during a critical period, but are not harmful at other times.**

The first 10 weeks of a pregnancy is generally regarded as the most critical when it comes to birth defects because it is during this stage that the organs form and the fetus is most susceptible to injury. However, toxicity can occur at other stages of the pregnancy. Depressant drugs, such as tranquilizers and pain medications given to the mother close to delivery may impair a baby's ability to breath shortly after delivery. In addition, the brain continues to grow throughout the pregnancy, and substances that affect brain development can have serious consequences at any stage of development.

(iv) Mutagenic effects: A mutagen is a chemical agent which may able to react with nucleophilic structures such as DNA. Mutations can occur on the gene level (gene mutations) when, for example, one nucleotide base-pair changes to another. Mutations can also occur on the chromosomal level (chromosomal mutations or aberrations) when the number of chromosomal units or their morphological structure is altered. Examples of **mutagens include most radioisotopes**, barium permanganate and methyl isocyanate. These may manifest in the form of infertility, congenital anomalies, mental retardation, genetic diseases, reduced resistance, senility and cancer. Genetic defects induced into the population have long-term effects affecting subsequent generations.

(v) Carcinogenic effects: involves mutations within the DNA such that the cell loses its control over growth processes. These cells begin to divide abnormally resulting in a mass of cells forming a tumor. If it remains within its normal location, it is called a **benign tumor**. However, certain tumors also posses the ability to invade surrounding tissues, and to move to other sites within the body, destroying the architecture and function of the invaded organ. These tumors are known as **malignant tumors or cancer**. Toxic substances that induce cancer are said to be carcinogenic.