SECTION I

ABSORPTION, DISTRIBUTION AND EXCRETION OF FOREIGN CHEMICALS

by
M. Jakubowski

Absorption of Foreign Chemicals

Absorption is usually defined as the passage of a given substance from its site of administration (experimental toxicology or medicine) or site of contact (industrial or environmental toxicology) into the systemic circulation. Depending on the area of toxicology, the roles of the particular routes of absorption will differ. In industry, toxic substances are absorbed mainly by inhalation or through the skin; in acute intoxications, the main route of absorption is through the alimentary tract. In environmental toxicology, foreign chemicals are absorbed mainly by inhalation or from the alimentary tract.

Regardless of the site of absorption, a toxic substance must cross one or more barriers: the surface epithelia, the capillary endothelia, the plasma membranes of the cell and the intracellular membranes. Both the surface epithelia and the capillary endothelia are ultimately derived from the plasma membrane that surrounds every individual cell. According to the simple Danielli-Davison model, the biological membrane is composed of a bimolecular lipid leaflet consisting of lipid molecules arranged with their lipophilic tails oriented towards the centre of the leaflet. Protein molecules are adsorbed as a monolayer on to the polar heads of the lipids to give stability to the structure. The membrane is not continuous but has aqueous pores which allow the passage of small hydrophobic molecules. Present in the membrane are selective carriers which have specific affinity for particular substances and cause their active transport through the membrane. Foreign chemicals may be transported through the biological membranes by passive diffusion, active transport, pinocytosis and filtration.

Passive diffusion

Passive diffusion is the most important mechanism for the transmembrane movement of foreign chemicals. According to Fich's law: