Pharmaceutics

The science of dosage form design

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Associated problems for parenterals

STERILIZATION OF INJECTIONS

Injections are sterile products intended for administration into the bodily tissues. Their formulation involves careful consideration of all the following inter-relating factors:

1 the proposed route of administration,
2 the volume of the injection,
3 the vehicle in which the medicament is to be dissolved or suspended,
4 the osmotic pressure of the solution,
5 the use of preservative,
6 the pH of the solution,
7 the stability of the medicament and methods of sterilization,
8 the specific gravity of the injection,
9 the properties of suspensions for injection,
10 the properties of emulsions for injection,
11 containers or closures for injections,
12 particulate contamination,
13 biopharmacy of injections.

THE BIOPHARMACY OF INJECTIONS

Injections are administered into the body by many routes. The route of administration affects the formulation and biopharmaceutics of the preparation. There now follows a description of routes of administration to clarify nomenclature used throughout the rest of the chapter. Fig. 21.1 shows the sites of injection.

Routes of administration

The most important routes are as follows.

Intracutaneous or intradermal route

Injections are made into the skin between the inner layer (dermis) and the outer layer (epidermis). The volume that can be injected intradermally is small, usually 0.1–0.2 ml, due to the poor vascularity of the site which gives poor dispersion of the drug, and leaves blisters or weals at the site of the injection. The route is used mainly for diagnostic tests.

Subcutaneous or hypodermic route

Injections are made under the skin into the subcutaneous tissue. The volume injected is usually 1 ml or less. This route is not used for aqueous suspensions or oily suspensions and fluids since these would cause pain and irritation at the injection site.

Intramuscular route

Injections are made by passing the needle into the muscle tissue via the skin, subcutaneous tissue and membrane enclosing the muscle. The volume is usually no greater than 2 ml and should not exceed 4 ml. This route is used for aqueous and oily suspensions and oily solutions, since if they were injected intravenously blockage of small blood vessels might occur leading to poor vascular supply of local tissues possibly resulting in gangrene.

Intravascular routes

These are either intra-arterial (into arteries) or intravenous (into veins). The intra-arterial route is used for an immediate effect in a peripheral organ, e.g. to improve circulation to the extremities when arterial flow is restricted by arterial spasm or early gangrene. Tolazoline hydrochloride, a peripheral vasodilator, is sometimes administered by this route.

Substances are introduced directly into the blood stream by the intravenous route. The most common site is the median basilic vein at the anterior surface of the elbow. The volume can vary from less than 1 ml to in excess of 500 ml. Small volumes may be administered for a rapid effect (e.g. anaesthetics) and large volumes (perfusion or infusion fluids) to replace body fluid loss in shock, severe burns, vomiting and di-

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