WEEK 10

Implantable Controlled Drug Delivery Systems

IMPLANTS

- Implants are long-acting dosage forms that provide continuous release of the drug substance often for periods of months to years.
- Implants are usually administered by means of
  - a surgical incision or by
  - a suitable special injector (e.g., trocar).

Implants are available in a variety of shapes, sizes and materials:

- pellets,
- resorbable microparticles,
- polymer implants (biodegradable or non-biodegradable),
- metal or metal/plastic implants (osmotic pumps and stents).

Advantages

- Localized delivery
- Improved patient compliance
- Minimized systemic side effects
- Lower dose
- Improved drug stability
- Suitability over direct administration
- Facile termination of drug delivery

Disdvantages

- Difficult implantation procedure (surgery-large implants)
- Complications of surgery (pain, infection)
- Local reactions
- Inadequate drug release

Therapeutic Applications of Implants

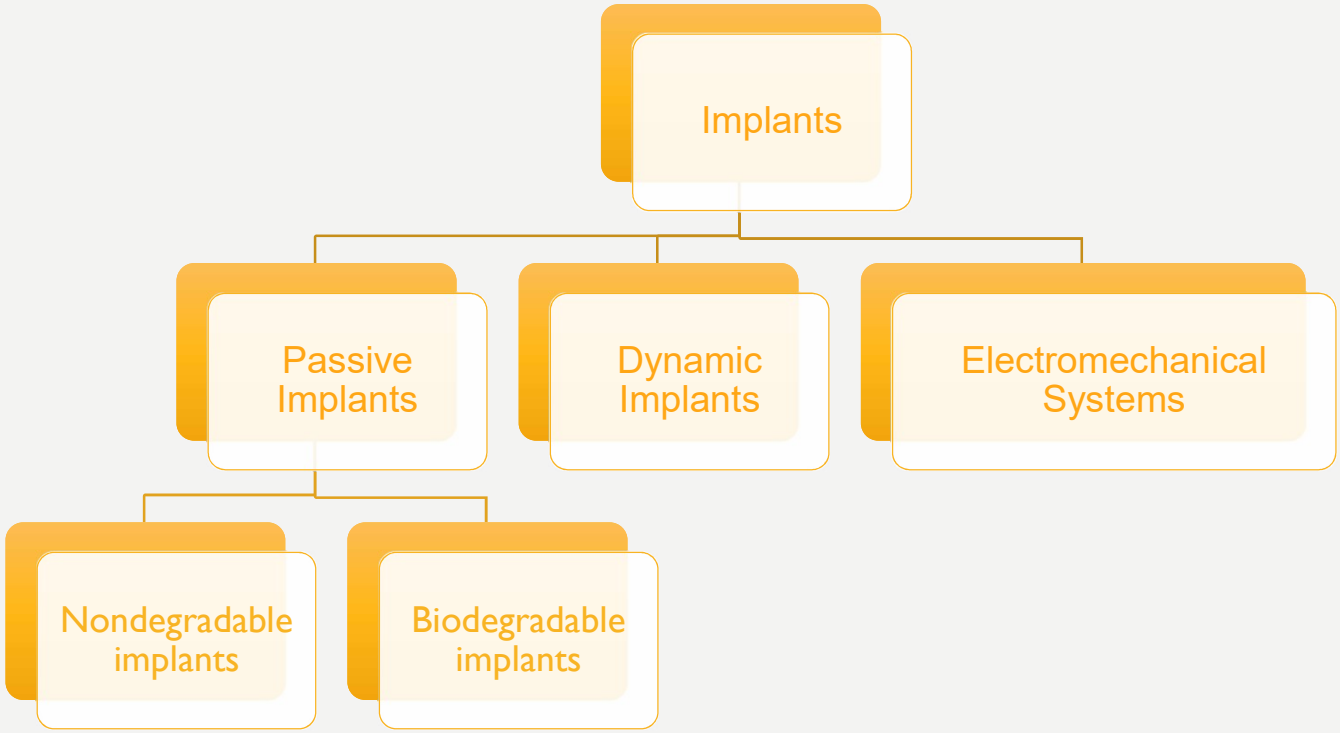
- Women's Health
- Chronic Diseases
- Infectious Diseases (Tuberculosis)
- Neurology and Central Nervous System Health

- Therapeutic effects of implants

- Systemic (SC,IM,IV)

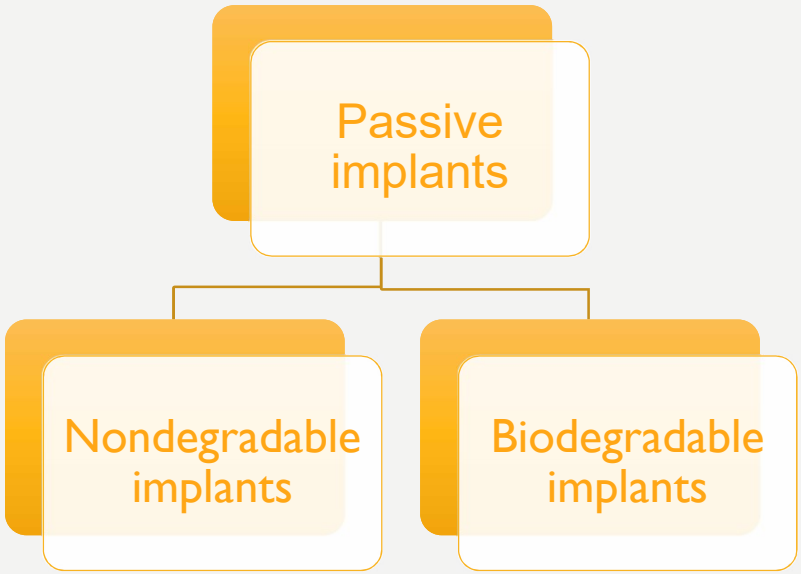
- Local therapeutic effects (intravaginal, intravascular, intraocular, intrathecal intracranial,peritoneal)

Classification of Implantable Drug Delivery Systems



Passive implants

Passive implants tend to be relatively simple, homogenous and singular devices, typically comprising the simple packaging of drugs in a biocompatible material or matrix. By definition, they do not contain any moving parts, and depend on a passive, diffusion-mediated phenomenon to modulate drug release.



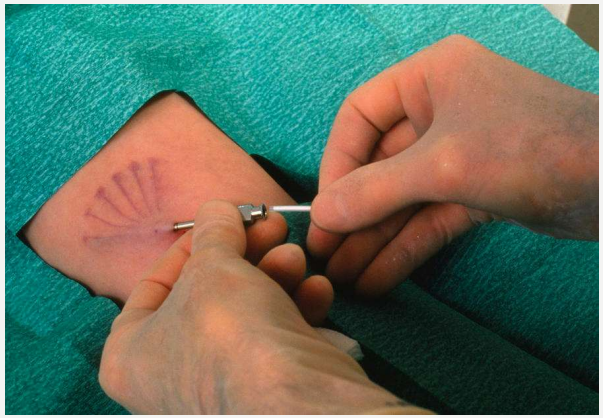
Nondegradable implantable drug delivery systems

membrane-enclosed reservoirs and matrix-controlled system

Polymers include elastomers such as silicones and urethanes, acrylates and their copolymers, and copolymers vinylidenefluoride and polyethylene vinyl acetate (PEVA)

NORPLANT

- Contraceptive system
- six thin, flexible silicone capsules (silastic tubing)
- 36 mg of the hormone levonorgestrel
- SC implantation on the inside upper arm of female users,
- 5 years



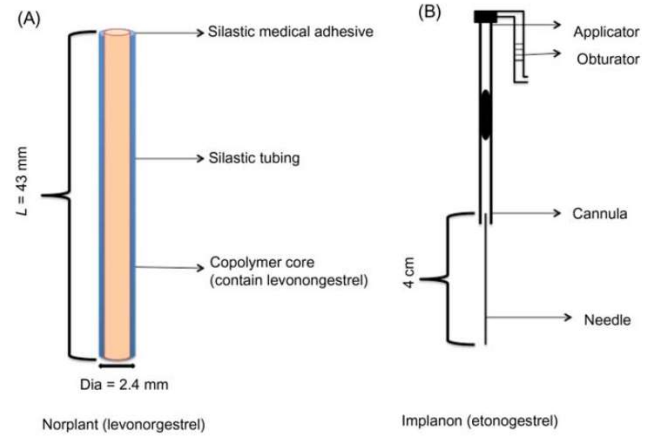
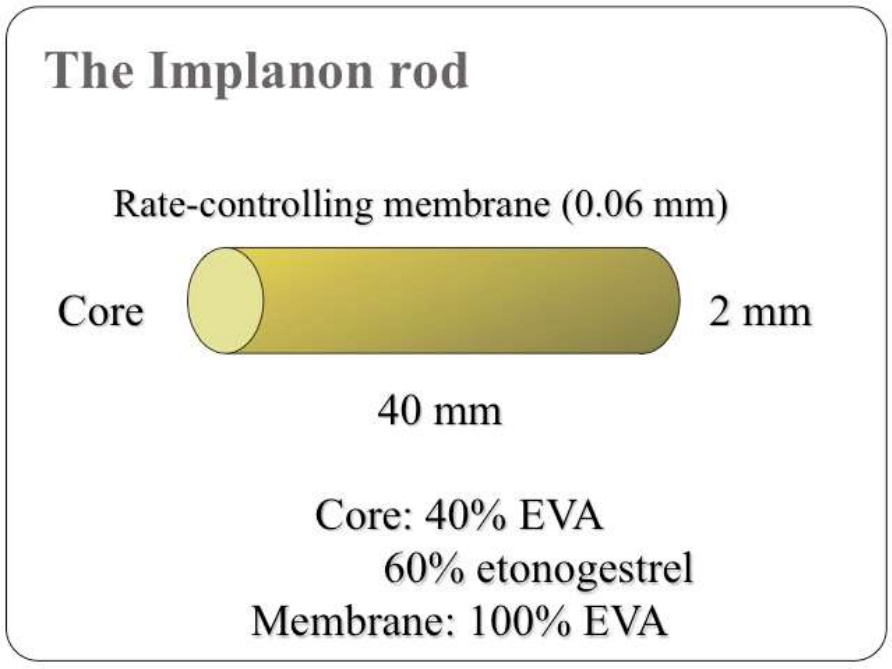


FIGURE 13.1
Nonbiodegradable implants (A) norplant and (B) implanon.

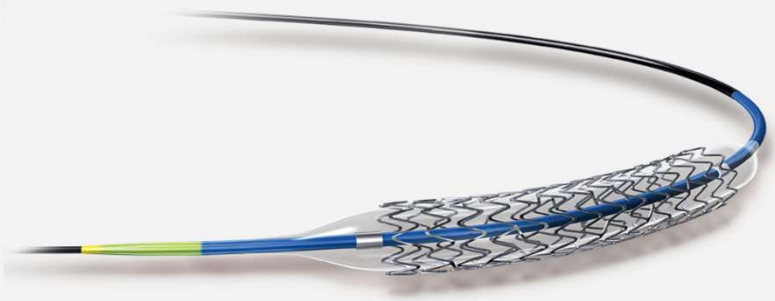
IMPLANON

- Contraceptive system
- A single-rod implant (length 4 cm, width 2 mm)
- PEVA membrane
- 68 mg of etonogestrel
- SC implantation
- 3 years



DES- drug-eluting stent

- treatment of vascular diseases
- reduce restenosis typically seen in bare-metal stents
- a three-component system, comprising a scaffold (or stent) for ensuring vascular luminal patency, a matrix or coating (polymer) to control drug release, and a drug to inhibit neointimal restenosis.
- Diffusion controlled drug release



Vitrasert

- Antiviral drug- ganciclovir
- cytomegalovirus (CMV) retinitis.
- compressed tablet of the drug coated with polyvinyl alcohol (PVA), then partially over-coated with PEVA, and finally affixed to a PVA suture stub.

Drawbacks:

- Need for extraction after depletion of the drug cargo
- Risk of infection and cosmetic defacement at the site of subcutaneous implantation