



PHARMSOL NEWS

NEEDLE FREE INJECTION TECHNOLOGY (NFIT) IN PHARMACEUTICAL DRUG DELIVERY

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Needle free injection technology (NFIT) is broad concept with application of wide range of drug delivery. This technology is more efficient to avoid needle phobia in pediatric patients, besides being beneficial during mass immunization exercise like COVID-19 vaccination.

Principle: NFIT harnesses energy stronger enough to propel a premeasured dose of drug formulation, loaded in unique "cassettes" which can be rigged with system. Driving forces are generated from high pressure gases, electromagnetic forces, shock waves or any form of energy capable enough to impart the motion to the medicament.

Device Components:

Needle free injection consist of following three components.

- Injection device:** It has sterilized needle free syringe made up of plastic material.
- Nozzle:** The nozzle creates passage to drug through skin contact. Nozzle contains orifice through which drug passes through skin.
- Pressure source:** Pressure source can be of mechanical movement, by pushing a plunger to provide a necessary pressure.

Drug Delivery Mechanism (DDM)

Powder injections are compounded with gas gun, provides the required particle velocity by mean of piston acceleration followed by leaving the piston surface by deacceleration to hit the target tissue area.

Liquid injections are compounded with high pressure generating piston at the skin surface, which puncture the skin surface followed by penetration of liquid due to continuous pressure generation.

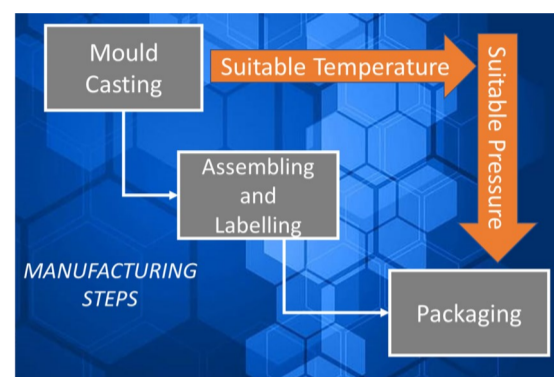
NFIT is categorized based on

- Working principle:**
 - Spring system
 - Laser Powered
- Type of loading:**
 - Liquid
 - Powder
 - Projectile
- Drug delivery mechanism:**
 - Nano Patches
 - Micro-needles
 - Iontophoresis enabled
- Site of delivery:**
 - Intra dermal injectors
 - Intramuscular Injector
 - Subcutaneous injectors

Formulation Component:

NFIT mainly consist of two components

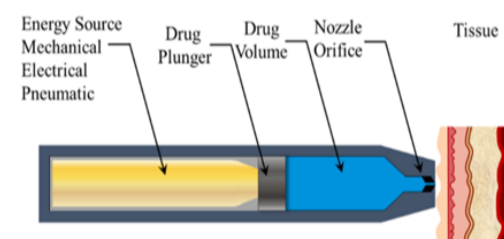
- Device:** Device shall be chosen carefully considering sterility of device, endotoxin and foreign particulate limit, leachable profile into formulation from contact surface and mechanical strength of device
- Medicated content:** Medicated content are in different form like powder, liquid, emulsion etc. and shall be complied as per pharmacopeial specification criteria.



Quality Control: The entire manufacturing process of both device and medicated component is required to be thoroughly supervised by line supervisor for any visual defect or structural deformity. The equipment is also evaluated for flow resistance, dimensions, labelling and calibration.

Type of needle free injections:

- Powder Injections:** Particles expel from nozzle along with gas pressure, rupture the skin surface and formation of pin hole and distribute the drug molecules in stratum corneum
- Liquid Injections:** Typical pistons used in this device generate pressure and expel the liquid from nozzle with high speed to puncture the skin
- Depot or projectile injection:** This type of device delivers the drug into muscle to release continuously for long time.



Advantages: NFIT can prevent hazards related to skin puncture and its destruction, imparts ease of drug delivery, acceptable drug stability during storage, avoid problems associated with reconstitution of injection, Pediatric patient compliance, Self-administration is possible, good dose response with increased drug dose.

Disadvantages: This is complex technology, not applicable for IV route.

Conclusion:

NFIT is an evolving drug delivery technology which uses application of force to facilitate penetration of drug through skin.

Technology can be used for mass immunization during emergency to avoid the spread of highly contagious diseases.

Example:

- Vitajet 3-Liquids based needle free injection for insulin delivery.*
- Powdeject system: Powder based needle free injection.*
- Biojector 2000: Liquid based needle free injection for vaccine delivery.*

How PharmSol can help you?

- Development and tech transfer of poorly soluble drug formulations.
- Reformulation of approved products with unpleasant test in cost-effective approach.



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