

Intranasal drug delivery - General principles

The nasal cavity's easily accessible, rich vascular plexus permits topically administered drugs to rapidly achieve effective blood levels while avoiding intravenous catheters. This is most effectively accomplished by distributing drug solutions as a mist rather than as larger droplets which may aggregate and run off instead of being absorbed.

Because of this easily accessed vascular bed, nasal administration of medications is emerging as a promising method of delivering medications directly to the blood stream. This method of delivery can eliminate the need for intravenous catheters while still achieving rapid, effective blood levels of the medication administered.

Administering medications via the nasal mucosa offers several advantages:

1. The rich vascular plexus of the nasal cavity provides a direct route into the blood stream for medications that easily cross mucous membranes.
2. This direct absorption into the blood stream avoids gastrointestinal destruction and hepatic first pass metabolism (destruction of drugs by liver enzymes) allowing more drug to be cost-effectively, rapidly, and predictably bioavailable than if it were administered orally.
3. For many IN medications the rates of absorption and plasma concentrations are comparable to intravenous administration, and are typically better than subcutaneous or intramuscular routes.
4. Ease, convenience and safety: IN drug administration is essentially painless, and does not require sterile technique, intravenous catheters or other invasive devices, and it is immediately and readily available for all patients.
5. Because the nasal mucosa is nearby the brain, cerebrospinal fluid (CSF) drug concentrations can exceed plasma concentrations. IN administration may rapidly achieve therapeutic brain and spinal cord (CNS) drug concentrations.

In general, medications that consist of small, simple, lipophilic molecules will cross membranes most easily. Having a pH near physiologic helps as well. Finally, if the drug concentration is such that it can be delivered in a reasonable volume to the nose so no runoff into the throat or out the nostril occurs, then more absorption and higher bioavailability is possible. In general the ideal volume for one nostril is about 0.25 to 0.3 ml, though some clinicians use as much as 1 ml per nostril and accept runoff and drug loss at this higher volume.

Therapeutic indications for and medications commonly administered via the intranasal route, i.e., those with the most data to support this route of administration include:

- Seizure
 - Midazolam
 - Lorazepam
- Pain control
 - Fentanyl
 - Ketamine
 - Ketorolac
 - Butorphanol
 - Hydromorphone
- Sedation
 - Midazolam
 - Fentanyl
 - Ketamine

- Agitation
 - Haloperidol
 - Midazolam
- Opiate overdose
 - Naloxone
- Hypoglycemia
 - Glucagon

Disadvantages

Limited number of medications meet criteria for intranasal administration (medications must be concentrated to such a degree that a dose can be administered in < 1mL total volume)