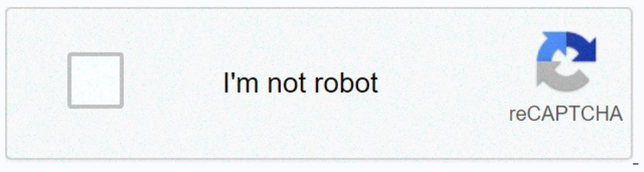

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Enteral administration involves absorption of the drug via the GI channel and includes oral, stomach or duodenal (e.g., feeding tube), and rectal administrationFrom: Applied Pharmacology, 2011Stan K. Bardal BSc (Pharm), MBA, PhD, ... Douglas S. Martin PhD, in Applied Pharmacology, 2011Enteral administration involves absorption of the drug via the GI channel and includes oral, stomach or duodenal (e.g., nutritional tube), and rectal administration▪Oral (PO) administration is the most widely used route of administration due to its simplicity and convenience, which improves Bioavailability This route is effective for drugs with moderate to high oral bioavailability and for drugs of different pKa because gut pH varies significantly along the length of the GI channel. Administration via this route is less desirable for drugs that are annoying to the GI channel or when the patient is vomiting or unable to swallow. Drugs given should be acidic stable or protected from stomach acid (e.g., by enteric coatings). Additional factors that affect the absorption of orally administered drugs include the following: ▲Grise emptying time. For most drugs, the largest absorption in the small intestine occurs due to its large surface. Faster stomach emptying facilitates their absorption because the drug is delivered more quickly to the small intestine. Con the other, factors that empty slowly stomach (e.g., food, anticholinergic drugs) generally slowly absorption.▲ Intestinal mobility. Increases in bowel mobility (e.g. diarrhea) can move drugs through the small intestine too quickly to allow effective absorption to ▲ Become. In addition to the influence of stomach emptying time, food can reduce the absorption of some drugs (e.g., tetracycline) due to physical interaction with the drug (e.g., chelation). Alternatively, absorption of some drugs (e.g. clarithromycin) is improved by application with food.▲Intestinal metabolism and transportation. The intestinal wall has extensive metabolic processes and transportation mechanisms (e.g., P-glycopy protein) that affect absorption of drugs given via the oral route.▲Hepatic metabolism. Orally administered drugs are absorbed into the portal circulation and carried directly to the liver. The liver has extensive metabolic processes that can affect drug bioavailability.▪Hetal administration via assuming to produce a systemic effect is useful in situations in which the patient is unable to take medication ories (e.g., is unconscious, vomiting, convulsions). Drugs are absorbed by the rectal mucosa. Due to the anatomy of the beneficial drainage of the rectum, about 50% of dosage by bysses the portal circulation, which is a benefit if the drug has low oral bioavailability. On the other hand, drug absorption this route is incomplete and erratic, partially partial of sensitability in drug dissociation of the suppository. Rectal administration is also used for local topical effects (e.g. antiinflammatory drugs in the treatment of colitis).▪Sublingual (under the tongue) or buccal (between gums and cheek) administration is beneficial for drugs that have low oral availability because numbed drainage from the mouth bytes the liver. Drugs should be lipophiles and quickly absorbed. Buccal formulations can provide extensive release options to provide long-lasting effects. George M. Kapalka, in Nutritional and Herbal Therapies for Children and Adolescents, 2010Enteral administration delivers the compound in the body through the gasintestinal tract (GI) channel. Both sides of the GI channel can be used - the mouth and the anus. Administering medications and other compounds by taking them in orally is by far the most common route of administration for medications and supplements. Usually, a pill is swallowed, thereby consuming the substance in the stomach. Prescriptions usually refer to this method of administration as 'by mouth' or PO (of Latin 'per ox'). Usually, oral administration is most convenient because it is the least invasive. Substances prepared for oral administration may be available in a variety of pills, including tablets, capsules, and caplets. Tablets are common round, and are sometimes covered so that they do not easily resolve in the mouth. Capsules are oblong and can contain grains of the active compound that release as the outer layer dissolved in the stomach. Caplets are a cross between the two, and usually are oblong tablets that are softer than traditional round tablets and can dissses more easily (for example, geltabs). Either way, the substance is embedded in the body when the outer layer dissolves in the stomach and the contents become available for absorption. Although they provide a convenient way to ingest a substance, pills are problematic for some populations. Children and the elderly may have difficulty swallowing pills, and can resist taking them. It is especially common for children not to like taking pills. Many young children can form their mouth and throat incomplete, limiting the ability to swallow a solid pill. Similarly, children with significant developmental delays may not have formed adequate muscle tone and nerve control to allow adequate ability to swallow a pill. In general, the children who speak problems, and/or cannot swallow a moderate mouthful of water without it dripping from their mouth, can display immature muscle and nerve development and may not have adequately formed the swallowing reflex to swallow pills. Some children also don't like pills for psychological reasons. They may be afraid that the pill will be difficult to swallow, can hurt as they pass through the throat, or they can choke. They can also pills with unpleasant medical experiences, such as invasive examinations or giving a blood sample. Some children and adolescents may also fear that connecting their personality will change or cause unpleasant side effects. For many teenagers, taking the substance can be part of a larger power struggle, where assuming the pill can be seen symbolically as succumbing to the parents' wishes and giving up control. The pill can communicate to the teens that something is supposedly wrong with them and they get this connection to 'fixed'. In these cases, teenagers may refuse to swallow the substance. Instead of pills, using other means of oral administration can sometimes be elected. Some capsules can be opened, 'sprinkled,' and mixed into food. In general, a strong tasting, acidic food provides a convenient basis. For example, it is common for parents to sprinkle some medication in a spoonful of apple sauce, mix it and the child swallows this mixture. In addition, some medications are available in liquid form (as oral solution or syrup) that can be swallowed directly and/or mixed into other liquids if necessary. Herbal and nutritional supplements are mainly available in a variety of pill forms. Most are capsules that contain the active compound, but traditional tablets are sometimes also produced. When a child or adolescent struggles to swallow the pill, some capsules can be opened, so the contents can be mixed into a food base. However, many of the supplements have a strong taste, and thus the base cannot adequately hide the flavor, thus leading to a terribly tasting concoction. Trial and error will be needed in those cases. Some supplements can also be brewed in a tincture. However, this method requires careful control of the force, and if preparation is inconsistent, doses of different strengths will result and the compound will be administered unpredictable. This is likely to adversely affect efficiency. So, whenever possible, parents are advised to administer supplements in pill form, and if tincture preparation is needed, directions should be carefully followed each time prepared. Administering a substance by mouth (PO), whether in pill or liquid form, presents additional pharmacological challenges. When the compound is swallowed, it travels down the esophatherm, past the lower esophate sphikter, and enters the stomach. No absorption occurs in the stomach. Instead, the main functions of the stomach should eliminate unwanted bacteria that may have been ingested with the food, break down the food into a semi-liquid mass that allows distribution across a larger area for easier digestion and release content into the small intestine. The breakdown of the food is achieved by several stomach acids that are quite over-sided. While many (but not all) nutrients are taken in generally survive this environment, some supplements may not. For this reason, some pills are covered with a layer that withstands the stomach acids and allows the contents to pass into the small intestine, where absorption begins. However, liquid preparations naturally do not allow for such a mechanism, so any tincture taken in should survive the stomach environment to be available for absorption in the small intestine. Ingent substances by mouth still have a great disadvantage. As mentioned above, no absorption occurs in the stomach, and absorption begins when contents of the stomach are released into the duodenum (the first portion of the small intestine). The stomach is pre-programmed to release its contents in the duodenum at a controlled rate, allowing the small intestine to take place sufficient time for chemical digestion and absorption. This means that there is a time delay between consuming a substance (such as a pill) and its release into the small intestine. When a connection is taken on an empty stomach, it is transmitted faster in the duodenum. Since it is absorbed just after entering the small intestine, the effectiness can be seen in about 15-20 minutes. This is generally the fastest start that can be expected with any orally administered connection, and usually the delay is more significant. Factors such as the contents of the stomach when ingesting the compound, the solubility of the compound (discussed in the next section), and the metabolic processes (addressed later in the chapter) significantly affect the rate of absorption, and, generally, most substances ingest or take between 30 and 60 minutes before absorption begins (sometimes much longer). Consequently, oral intake is one of the slowest routes of administration. When it is necessary to deliver an active compound in the body as soon as possible, and injections are not possible or practical, the substance can be introduced into the body via the rectum. It is commonly used in emergency settings - for example, some seizure medications are available in crèmes or assumings and can be inserted into the rectal area even when a person is in the midst of a large convulsion. However, this method of administration also has drawbacks. It is considered more invasive, and (when conscious) individuals may not be comfortable have supposed or ice inserted into this private area. In addition, since the substance is introduced in the large (rather then small) intestine, different absorption properties apply and the substance should be highly hydrophilia to be absorbed, and it presents its own challenges and disadvantages (as discussed in the next section). In general, the vast majority of supplements are not delivered by rectal administration. Samuel D. Kim, ... Victor S.C. Fungus, in from Clinical Clinical 2018Continuous 16-hour enteral infusion of levodopa carbidopa bowel gel (LCIG) is a proven treatment of car fluctuations in advanced PD (Nutt, 2006; Olanow et al., 2014; Fernandez et al., 2015). Devos (2009) reported that, within a sample of 75 patients, 61% had less postural instability, festination and MIS symptoms after levodopa infusion. More recently, small retrostrosting and prospective open-label studies have reported that continuous 16-hour (Cossu et al., 2015; Zibetti et al., 2018) or 24-hour (Chang et al., 2015) LCIG may reduce levodopa-unresponsive MIS and related falls. In Meyler's Side Effects of Drugs (Sixteenth Edition), 2016Cell therapy consists of the parenteral or enteral administration of cells or parts of cells obtained from animal organs and/or tissues from cattle, sheep, pigs, or rabbits. Three different types of cell preparations are used: fresh cells, frozen cells (snap-frozen cell berries), and lyophilized cells (sicca cells) [145]. Cell therapy can cause local and common allergic reactions (fever, nausea, vomiting, urticaria and anaphyactic shock). Other postward consequences include fatal and non-fatal encephalomyelitis, polyneuritis, Landry-Guillain-Barré syndrome, fatal serum disease, perivenous leukoencephalitis, and immune complex vasculitis [146]. Carlos R. Ferreira, Clara D.M. van Karnebeek, in Textbook of Clinical Neurology, 2019Therapy is simple, i.e. oral or enteral administration of l-serine 200–600 mg/kg/day to normalization of l-serine in blood and ideal in CSF. If seizures persist, glycine should be added to a maximum dose of 200 mg/kg/day. In cases with low 5-methyletetrahydropholates (5-MTHF), additional treatment should be provided with folinical acid (10 mg/day). Oral l-serine supplementation has proven to be effective in treating seizures in these patients, especially those with 3-PGDH deficiency; Also, a remarkable increase of white matter volume on MRI has been noted. The effect of therapy on the patients' psychomotor development during long-term succession was much less. Prenate treatment of a mother with l-serine has proven effective; 1 case with 3-PGDH deficiency born to a mother treated from week 27 did not develop any of the neurological symptoms of the disorder (de King et al., 2004). Ralph A. Lugo, Robert M. Ward, in Fetal and Neonatal Physiology (Third Edition), 2004A special situation occurs for some drugs in which dramatic differences in concentrations and effects occur between enteral and parental administration due to first-pass effect or precisionic drug clearance. During the enteral absorption, drug passes through the intestinal wall, enters the portal venous circulation, and passes through the liver before reaching the systemic circulation (see Fig. 20-3). Almost complete metabolism can Wall or liver (especially for drugs metabolized by cytochrome P450 3A4), so the amount of older drug reaching the systemic circulation was administered only a small fraction of the dose.12,12,13 The fraction (F) of the oral dose reaching the systemic circulation, is that which remains after liver or intestinal metabolism and is expressed as the withdrawal ratio (ER) in the following equation :D ie F is determined from the ratio of the area under the plasma concentration curve after oral administration in comparison with those to intravenous administration. After an intravenous dose of medication, drug enters either the inferior or better vena caval circulation, returns to the heart, and enters the systemic circulation before taking the liver perfume. Drugs that undergo almost complete liver or intestinal metabolism before reaching systemic circulation are described as high liver or intestinal intrinsic cleanup. Some drugs used in the care of newborns that display moderate to significant first-fits, precisionic cleanup in adults and babies include midazolam,14 morphine,15 and propranolol.16Robert M. Ward, Steven E. Kern, in Fetal and Neonatal Physiology (Fifth Edition), 2017A special situation occurs for some drugs in which dramatic differences in concentrations and effects occur between enteral and parental administration due to first-fit effect or precisionous drug clearance. During absorption to enteral dosing, drugs pass through the intestinal wall, enter the portal buttock circulation, and pass through the liver before achieving the systemic circulation (Figure 19-3). For some drugs, almost complete metabolism of a dosage can occur in the intestinal wall or the liver (especially for drugs metabolized by cytochrome P450 3A4). When this happens, the amount of older drugs reaching the systemic circulation is only a small fraction of the dose administered.8.9 The fraction (F) of the oral dose that reached the systemic circulation that which remains after hepatic or intestinal metabolism expressed as the withdrawal ratio (ER) in the following equation: The ER is determined from the ratio of the AUC to oral administration versus it after intravenous administration. After an intravenous dose of medication infused peripherals, drug enters either the inferior or better vein caval circulation, returns to the heart, and enters the systemic circulation before perfusion of the liver, which receives 25% of the heart output. Drugs that undergo almost complete liver or intestinal metabolism before reaching systemic circulation are described as high liver or intestinal intrinsic cleanup. Some drugs used in the care of newborns that display moderate to significant first-fits precision cleanup are midazolam,10 morphine,11 and propranolol.12Prakesh S. Shah, in Hemodynamics and Cardiology (Third Edition), can be given oral or intravenously. Although the peak levels are reached earlier with intravenous delivery, the elimination is slower to enteral administration and thus no adjustment in dosage has been proposed for the route of administration. The usual dose is 10 mg/kg on day 1, followed by two doses of 5 mg/kg 24 hours apart. Suggestions for variable dosage based on the promotion of postnatal age (14-7-7 mg/kg for postnatal ages from 4 to 7 days and 20-10-10 mg/kg for postnatal ages >7 days)43 due to increased cleanup of ibuprofen after birth is made. A reduced rate of failure to close the ductus arteriosus was observed with high doses of ibuprofen compared to low doses (RR 0.27; 95% CI 0.11 to 0.64).44 In a study of 60 premature neonates with hsPDA, Pourarian et al.45 reported a 70% ductal closing rate in babies treated with an oral high-dose ibuprofen regimen (20-10-10 mg/kg) compared to a 37% closing rate with standard dosing (10-5 mg/kg) with no difference in adverse kidney or gas storage channel Singing in the form of continued doses of ibuprofen (up to six doses if PDA was not closed) was associated with an 88% closing rate (similar to indomethacin).46 Dosage of the doses during the second course was associated with 60% closing rates compared to 10% infants who received the same dose when a sequential treatment underline the need for further studies on ibuprofen dosing, pharmacokinetics, and pharmacodynamics.47Several trials also compared the effectiveness of routes of administration. A systematic review of oral versus intravenous ibuprofen indicated that a lower risk of failure to close a PDA with oral ibuprofen use (RR 0.41, 95% CI 0.27 to 0.64).44 But, it should be noted that oral ibuprofen is associated with higher rates of gastrointestinal bleeding. Furthermore, higher rates of sustained closure were observed after continuous infusion compared to bolusinfusion (closing to one or two courses 86% in continuous infusion group versus 68% to one or two courses in the intermittent infusion group; P = .02).48Ibuprofen is available in two preparations, ibuprofen lysine and ibuprofen-tris-hydroxymethyl-aminomethane (THAM). The association of ibuprofen use with pulmonary hypertension is initially specific to the ibuprofen-THAM preparation; however, in a cohort of 144 neonates who received ibuprofen treatment for PDA, 10 cases developed pulmonary arterial hypertension, 7 of which occurred in the intravenous ibuprofen-THAM group (n=100), 2 in the oral ibuprofen group (n=40), and 1 which received intravenous ibuprofen lysine preparation (n=4). Risk factors for the development of pulmonary arterial was small for pregnancy age, mother hypertension, and oligohydramnios.49 In one retrostrosting study from Italy it was identified that lysine was more effective than ibuprofen THAM in PDA lighting (73% vs. 51%, P = .002) when used prophecally in neonates of ≤28 weeks' pregnancy.50Bryan S. Williams MD, MPH, Asokumar Buvanendran MD, in Necessities of Pain Medicine (Third Edition), 2011Naproxen is a non-prescriptionsteroidal anti-inflammatory drug; A newly formulated controlled-release tablet is available (Naprelan®). It is fully absorbed after enteral administration and has a half-life of 14 hours. Peak concentrations in plasma occur within 4 to 6 hours. The half-life is about 14 hours, but steady-state serum levels require more than 48 hours. Naproxen has a volume distribution of 0.16 L/kg. At therapeutic levels, naproxen is more than 99% albumin-bound. Naproxen is extensively metabolized to 6-0-desmethyl naproxen, and both older and metabolites do not cause metabolization of enzymes. Most of the drug is excreted in the urine, mainly as unchanged naproxen. Naproxen was used to treat arthritis and other inflammatory diseases. Metabolites of naproxen are excreted almost entirely in the urine. About 30% of the drug undergoes 6-demethylation, and most of this metabolite, as well as naproxen itself, is excreted as glucuronide or other conjugate. Jon A. Vanderhoof, Rosemary J. Young, in Encyclopedia or Gastroenterology, 2004When liquid and electrolyte status is stabilized with the parental regimen, enteral feeding can be considered and should begin as soon as possible. In babies, elemental diets are delivered via continuous enteral infusion. Elementary formulas are well tolerated and avoid the risk of allergy to proteins in more complex feed. Enteral feeding is typically started very slowly with a dilution concentration (5 calm/us), which is slowly increased to 20 calm/ we for patients less than 1 year and 30 calm / us for older patients. When final concentration is reached, the volume is progressed slowly. The technique of reaching final concentration before volume is increased avoids fluid overload for the patient who also receives parental nutrition. The continuous and aggressive use of enteral feeding should be encouraged unless significant dehydrating diarrhea follows, in which case the infusion should be adjusted so that overall fluid balance improves. Continuous inbelinfusion is inconvenient and is thought to reduce the normal development processes of eating. However, it can be managed later. Newer, small enteral infusion pumps along with backpack devices have been developed to allow the patient greater mobility. When long-term enteral feeding is expected, that is, greater than 3 months, gastrostomy tube placement facilitates continuous enteral feeding. The presence of a gastrostomy or nasogasmic tube does not contradict feeding. Continuous nutrition changes hunger mechanisms, and rejection of oral feed General. Use of continuous enteral feeding does reduce the likelihood of gastroesophaeal reflux. As the child progresses in age, a more complex formula, such as a protein hydrolysate, is usually well tolerated. For patients over 1-2 years of age, whole protein formulas stimulate further adjustment by increased the workload of the surface epithelial. Carbohydrates in enteral formulas are present in the form of one or more sources, including extensive hydrolyzed starch and disaccharactidases such as sucrose. Medium-chain fats, although well absorbed, are not as beneficial as long-chain fats in improving customization. Therefore, a mixture of both types of fat in the formula is most beneficial. Carbohydrate type is probably the least important type of required nutrient for patients with short bowel syndrome. However, lactose can be more slowly hydrified than glucose polymers. Table IV lists some commonly used formulas for babies and children with short bowel syndrome. Theoretically, a formula with improved ratios of fat, even up to 50% of the total daily energy intake, can be beneficial not only for delivering more calories in less volume, but also because high-fat formulas can slow gastroinal mobility to improve absorption. TABLE IV. Commonly used FormulasElementalSemitementalWhole proteinNeocateAlimentumPeptamenPeptide 1+ PregestimilPediasurePediatric VivonexNutramigenVitalElecareToleance of continuous enteral infusion is based in part on stool losses; losses of greater than 40-50 ml/kg/day, especially when accompanied by the presence of positive reduction substances, suggests that enteral feed should be reduced or stopped. Babies should be given small volumes of nipple feeds to facilitate developmental normal eating stages. At the appropriate ages, the introduction of solid food should also be attempted. Caution should be given to types of solids initially used. Avoidance of foods containing high carbohydrate levels reduces osmotic losses. Meat is often well tolerated. Nutrient delivery by the oral route may not be significant due to mismatch, but is key in later stages of therapy. In older babies and toddlers, when the colon is intact, complex diets can be beneficial in improving colonic salvage of short-chain fat-hours. Acids.