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EXPLORING OVER-THE-COUNTER (OTC) MEDICATIONS: A COMPREHENSIVE REVIEW OF MARKET OFFERINGS AND THEIR CLINICAL IMPLICATIONS

Vivek Adesh Burunkar*, Kartik Shelar, Patil Aditi, Edavi Yash and Shravani Kherade

Govindrao Nikam College of Pharmacy sawarde Chiplun Ratnagiri Maharashtra India.

***Corresponding Author: Vivek Adesh Burunkar**
Govindrao Nikam College of Pharmacy Sawarde Chiplun Ratnagiri Maharashtra India.

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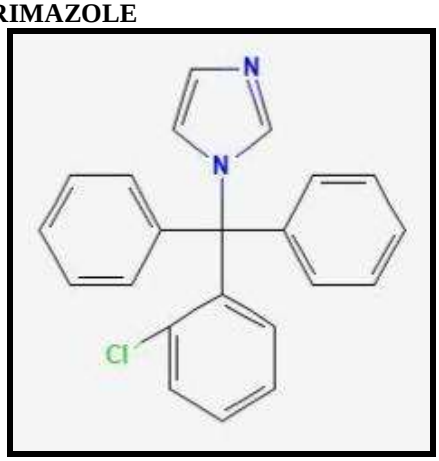
ABSTRACT
The review article provides a thorough examination of over-the-counter (OTC) medications, examining the variety of goods on the market and their notable therapeutic effects. An extensive variety of over-the-counter medications are covered by the study, including antacids, sleep aids, cold cures, and pain relievers. This article provides a critical evaluation of popular over-the-counter drugs' efficacy, safety, and potential side effects. The evaluation's systematic classification of medicines available without a prescription based on their pharmacologic classes sheds light on their pharmacological mechanisms and indications. It also discusses the evolving legislation pertaining to over-the-counter medications, emphasizing recent advancements and their impact on consumer availability and safety. The study delves into the financial aspects of the over-the-counter industry by examining pricing strategies, market trends, and the role of generic alternatives. The emphasis on clinical outcomes draws attention to how important it is for patients and healthcare providers to make informed decisions. It is advisable to have a well-rounded understanding of the benefits and drawbacks of over-the-counter medications, considering the potential risks linked to self-medication and potential conflicts with prescription medications. The review assesses the role of over-the-counter (OTC) drugs in preventive healthcare as well as their impact on public health outcomes.

KEYWORDS: Over the counter Medication, OTC market, Drug Safety, Self-Medication.

INTRODUCTION
An Extensive Examination of Available Products and Their Clinical Consequences" seeks to offer a thorough examination of several over-the-counter drugs, assessing their market presence and exploring the clinical implications of their use. It is likely that the article looks at safety, effectiveness, and possible interactions, providing useful information for patients and medical professionals alike. Over-the-counter (OTC) or non-prescription medications are those that are available without a prescription and that, when used as directed by a doctor and according to the directions on the label, are safe and effective.[1] The trend toward deregulating more medications with established safety and efficacy profiles to OTC status is growing along with the rise in self-care and self-medication practices. Policymakers, consumers, Healthcare Professionals (HCPs), and the pharmaceutical industries all support this trend. Self-medication with over-the-counter (OTC) drugs not only gives patients more autonomy over how they treat minor ailments, but it also helps save costs associated with medical care. As self-care and self-medication behaviours increase, so does the trend toward deregulating more drugs with proven safety and efficacy profiles to OTC status. This tendency is supported by consumers, healthcare professionals (HCPs), policymakers, and the pharmaceutical industry. Patients can lower their health care costs and increase their autonomy in managing mild ailments by self-medicating with over-the-counter (OTC) medications.[2] Due to the Internet's widespread use and expansion in company and consumer activities, marketing strategies and technology have undergone a dramatic transformation in the current digital era.[3]

CLOTRIMAZOLE


Introduction

Clotrimazole is a typical broad-spectrum antimycotic used to treat fungal infections, including Candida albicans. Its antimycotic properties were discovered in the late 1960s. It is marketed as an active ingredient and distributed as a generic drug by many companies worldwide under various trade names.[4]

Mechanism Of Action

Clotrimazole exhibits its antifungal action by altering the permeability of cell membranes, most likely by interacting with phospholipids present in the fungal cell membrane. Clotrimazole's action is less potent than that of polyene antibiotics, like amphotericin B. depending on the sterol content of the cell membrane. When changed permeability compromises the cell membrane's ability to function as a selective barrier, potassium and other cellular components are lost.[5]

Uses

Clotrimazole, a synthetic imidazole derivative, is mostly utilized topically to treat cutaneous and vaginal infections caused by dermatophytes and yeasts. Comparable to standard nystatin vaginal tablets, clotrimazole vaginal pills have demonstrated comparable cure rates for vaginal candidiasis. The application of topical clotrimazole has demonstrated efficacy in treating dermatophytes or Candida-related skin infections. Comparative research has demonstrated that clotrimazole cream is equally successful in treating cutaneous candidiasis as nystatin is, as well as dermatophytosis. It is also equally effective in treating Whitfield's ointment and tolnaftate.[6]

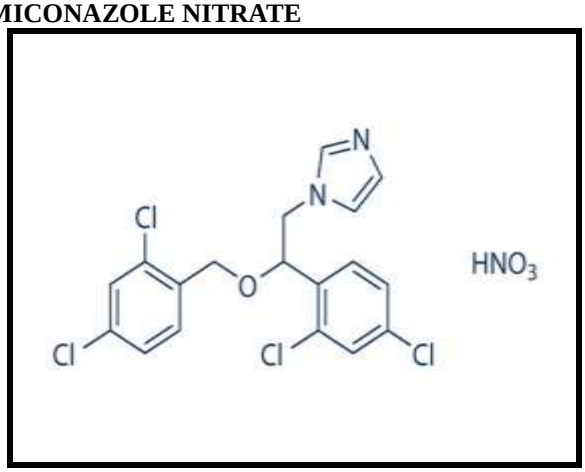
Adverse Drug Reaction

Gastric: lower abdominal cramps, vomiting, and a queasy feeling in the mouth that can be relieved with lozenges.

GU: recurrent vaginal burning or irritation, cramping, and frequent urination.

Skin: blistering, stinging, peeling, urticarial, erythema, edema, pruritus, skin cracks, and general irritation.[7]

MICONAZOLE NITRATE



Introduction

The synthetic antifungal imidazole miconazole has been used to treat superficial fungal infections safely and effectively for about 40 years. Miconazole is a powerful anti-Candida drug with a wide range of effects that can be used to treat a variety of species, including Candida albicans, Candida glabrata, Candida dubliniensis, Candida parapsilosis, and Candida tropicalis. Moreover, miconazole has demonstrated efficacy against some Candida species (Candida albicans, certain Candida glabrata) that have fluconazole resistance. Numerous in vitro studies have shown the broad-spectrum action of miconazole. The frequency of fungal skin diseases is increasing globally. Over 40 million people have been impacted by fungal infections. Fungal infections will impair the immune system's functionality, potentially resulting in the disease progressing.[8]

Mechanism Of Action

Miconazole works in a number of ways. Azoles, the most often used antimycotics in the pharmacopeia, work against fungal species by preventing ergosterol from being made, which increases the concentration of dangerous methylated sterol. described a different way that miconazole combats fungal infections: oxidative damage and fungal cell death are brought about by the accumulation of drug-induced reactive oxygen species (ROS). Moreover, miconazole increases intracellular ROS partly through catalase and fungal peroxidase inhibition. It is likely that ROS-induced apoptosis is the cause of miconazole's fungicidal action, whereas other azoles are fungistatic. It might also be demonstrated that no other imidazole can produce ROS in C. albicans; only miconazole exposure can do so.[9]

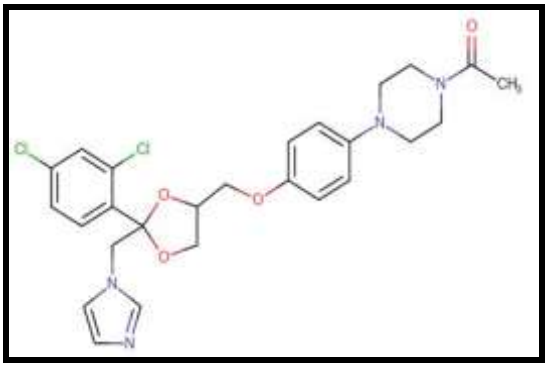
Uses

Miconazole is a synthetic imidazole derivative and a new topical antifungal drug used locally to treat dermatophyte and yeast-induced skin and nail infections as well as vaginal infections. More vaginal candidiasis cure rates have been seen with miconazole vaginal cream than with conventional nystatin vaginal tablets or amphotericin B vaginal cream.[10]

Adverse Drug Reaction

The most frequent side events were phlebitis (28%), pruritus, nausea, fever or chills, rash, both about 10%), vomiting, and anemia (6 to 7%). However, in a sizable individual series of individuals in the USA, hyponatraemia also occurred often (50%) and was more common in some cases, particularly in patients with meningitis. There have also been reports of leucopenia, erythrocyte aggregation on blood smears, thrombocytosis, reduced haematocrit, and other reversible haematological issues. The carrier solution, "Cremophor EL," a polyethoxylated castor oil, may be linked to these occurrences. Reversible hyperlipidemia appears to be caused by the carrier solution as well. Allergic reactions have happened seldom.[11]

KETOCONAZOLE



Introduction

Ketoconazole (NIZORAL) has the chemical name CIS4-[4-[[2-(2,4-dichlorophenyl) - 1H-imidazol-1-ylmethyl-1-ethanoyl -2- The all-purpose antifungal drug Four-yl [methoxy]phenyl -1,3-dioxolan] As an azol-based drug, piperazine acts by inhibiting the formation of ergosterol in fungal cells and cell walls, as well as the absorption of precursors of DNA and RNA, which increases the permeability of cells within myocytes and further damages and inhibits them. Most commonly, it is used to treat systemic infections such as candidiasis, histoplasmosis, chromoblastomycosis, coccidioidomycosis, and blastomycetic dermatitidis. Furthermore, it was mentioned that oral ketoconazole has been used to treat female hirsutism, polycystic ovarian syndrome, and ovarian hyperstimulation syndrome.[10] As well as masculine alopecia, etc. Ketoconazole was developed by Belgian pharmacologists in 1978 and was formerly a widely used drug globally. It was introduced to China in the mid-1980s as a superior griseofulvin substitute.[12]

Mechanism of Action

Ketoconazole works as an antifungal medication by blocking the cytochrome P450 14α-demethylase enzyme. This enzyme is in charge of stopping fungi from making triglycerides and phospholipids. More specifically, lanosterol is a necessary precursor to ergosterol that is not produced by ketoconazole. The fungal membrane's structural stability depends on ergosterol. The membrane becomes more fluid in the absence of ergosterol, which prevents mushrooms from growing. Ketoconazole has the ability to bind to androgen receptors in a competitive way, including those of testosterone and dihydrotestosterone, when taken in significant doses. This could reduce these hormones' involvement in prostate cancer.[13]

Uses

Disrupting the fungal cell wall was the aim of all antifungal drugs in order to stop the infection process and cause cell death. Topical antifungals are often regarded as the first-line treatment for dermatomycosis since they are available in cream, liquid, or spray form and can be applied directly to the skin, nails, hair, mouth, and other body areas. Because topical antifungals target the infection site directly, they are able to treat skin conditions more successfully than systemic therapies. Topical antifungal drugs treat both first- and second-line cases of Candida infections, including pityriasis versicolor, tinea barbae, tinea capitis, tinea corporis, tinea cruris, tinea faciei, tinea manuum, tinea nigra, and tinea pedis, depending on the severity of the illness.[13]

Dosage

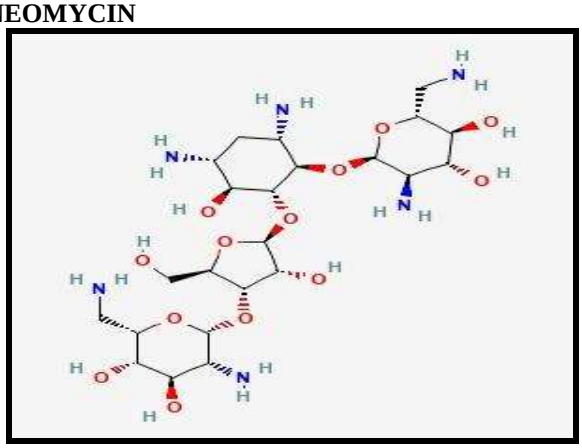
The initial recommended adult dosage for all disorders except vaginal candidosis is 200 mg once daily. If the clinical response is inadequate, the dose may be increased to 400 or 600 mg once daily; however, there is little evidence to support the idea that "higher" doses may produce a greater response. It is recommended to take 200 mg twice a day for five days in order to treat vaginal candidosis. The length of treatment should be tailored to each patient's needs and dictated by the clinical and mycological response.

The recommended dose is 20 mg three times a day for children under 15 kg, 100 mg once a day for children between 15 and 30 kg, and 200 mg once a day for children above 30 kg.[12]

Adverse Drug Reaction

Systemic ketoconazole medication is most commonly associated with gastrointestinal side effects. These include flatulence, dry mouth, nausea, vomiting, constipation, and abdominal pain in addition to stained tongue. Adrenal insufficiency may arise from it due to its role in suppressing enzymes in the steroid synthesis pathway. Decreases in cortisol production may lead to orthostatic hypotension. Large doses in men can also cause gynecomastia. Ketoconazole can cause severe liver damage and jaundice. Hypersensitivity reactions, such as urticaria and anaphylaxis, have also been reported. High-dose ketoconazole has been shown to make long bones more brittle and potentially fracture. Other side effects include nervousness, myalgia, edema, low platelet counts, fatigue, hot flushes, insomnia, paresthesia, and peripheral edema. Topical ketoconazole may cause dermatological adverse effects such as stinging, dryness, and itch at the application site.[14]

NEOMYCIN



Introduction

Neomycin, one of the more modern antibiotics, is produced by a native species of Streptomyces fradiae in the soil. Waksman and Lechevalier made this finding while searching for an antibiotic to use against strains of Mycobacterium tuberculosis that were resistant to streptomycin. Neomycin is a simple antibiotic that dissolves readily in water and is most active in an alkaline environment. It shows relative thermostabilty against both gram-positive and gram-negative organisms. Additionally, it works well against organisms that are resistant to streptomycin; in vitro, it has demonstrated strong activity against a number of Mycobacterium TB strains, occasionally even outperforming streptomycin in specific situations.[15]

Dosage

Adult Dosage

Hepatic coma: The suggested dosage for treating hepatic coma is 1000–3000 mg taken orally every 6 hours. To treat hepatic encephalopathy, this regimen may be extended for a maximum of six days.

Adult Dosage

Hepatic coma: 1000–3000 mg administered orally every 6 hours is the recommended dosage for treating hepatic coma. For a maximum of six days, this regimen may be continued to treat hepatic encephalopathy.[16]

Mechanism of Action

Like most aminoglycosides, neomycin suppresses bacterial protein synthesis by attaching to the 30S ribosomal subunit. The earliest steps of peptide synthesis proceed without interruption; nevertheless, the subsequent elongation process encounters difficulties due to the disturbance of translational accuracy. Thus, this interference with the bacterial translation process facilitates the drug's bactericidal effects.[17]

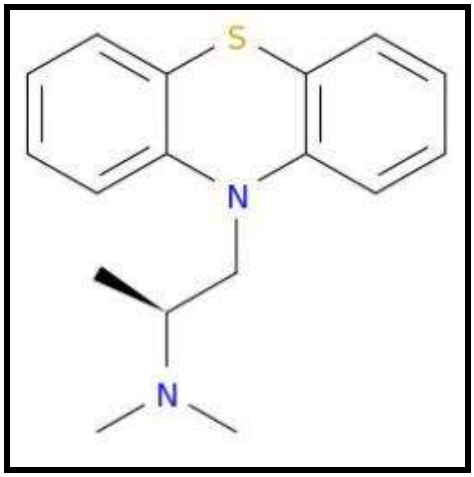
Uses

Neomycin is an ingredient in many over-the-counter (OTC) antibacterial drugs, including "triple antibiotics," which blend neomycin, bacitracin, and polymyxin B. It is a common allergen that comes into touch with people who have leg ulcers, venous stasis dermatitis, and surgical recovery. As venous stasis dermatitis worsens, it is important to determine whether topical neomycin is being utilized.[18]

Adverse Drug Reaction

The adverse effects of this medicine include nausea, diarrhea, and a higher chance of diarrhea associated with Clostridium difficile. Among the more serious side effects of neomycin are vestibular ototoxicity, auditory ototoxicity, and nephrotoxicity; the latter two often have long-term effects. Neuromuscular blockage is an uncommon but dangerous adverse drug event that can result after neomycin therapy.[16]

PROMETHAZINE



Introduction

Promethazine hydrochloride, an antihistamine, antiemetic, and first-generation H1 receptor antagonist, can also have strong sedative effects. The enhanced therapeutic efficacy for inflammatory dermatoses was attributed to topical H1r/2r antagonists' apparent ability to target epidermal H1/2r, most likely through improved barrier function and decreased inflammation.[19]

Dosage-For tablets, liquids, and suppositories, the typical dosage range is 12.5 mg to 50 mg.

Methacrine hydrochloride injectable solution: 25 mg/mL and 50 mg/mL.

Promethazine hydrochloride oral solution: 6.25 mg/5 mL.

Promethazine hydrochloride suppository doses: 12.5 mg, 25 mg, and 50 mg Oral promethazine hydrochloride syrup 6.25 mg/5 mL.

Oral promethazine hydrochloride tablets: 25 mg, 50 mg, and 12.5%.

To minimize gastrointestinal upset, it is recommended to take promethazine orally in combination with food, water, or milk. The intramuscular injection needs to be made into deep muscle tissue because a subcutaneous injection could harm the tissue.[19]

Mechanism of Action

Methazine is a derivative of phenothiazine with antidopaminergic, antihistaminergic, and anticholinergic properties. Two other phenothiazine derivatives are prochlorperazine and chlorpromazine. Methadone directly antagonistically targets the brain’s mesolimbic and alpha-adrenergic dopamine receptors. Promethazine has antihistamine effects by blocking the H1 receptor.[20]

Uses

Since promethazine is a strong sedative, it is usually given at night to treat allergy symptoms. Additionally, and especially in emergency conditions, methazine has been utilized to treat medication hypersensitivity and allergic reactions. It can also be used to treat symptoms of asthma, pneumonia, and lower respiratory tract infections.

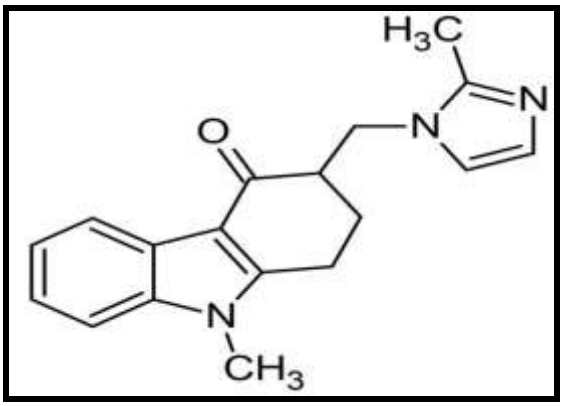
As a dose-controlled transdermal device, promethazine can be used as an anaesthetic premedication to induce drowsiness, lower anxiety, or diminish postoperative nausea and vomiting. In certain countries, it is also marketed for use as a sedative on occasion, including the sedation of young children as a nasal sleep inducing medication.[21]

Adverse Drug Reaction

Methazine can have a lot of negative side effects because of the way it functions. The most common side effects include sedation, confusion, and disorientation, which can impair thinking and functioning. Promethazine can occasionally cause convulsions, restlessness, and excitability, despite what the general public believes.

The anticholinergic properties of promethazine can cause a number of side effects, such as dry nasal passages, dilated pupils, constipation, xerostomia, and urine retention. Extrapyramidal symptoms, such as akathisia, tardive dyskinesia, pseudoparkinsonism, and acute dystonia, might result from methadone's antidopaminergic effects. Promethazine may therefore make victims' symptoms of Parkinson disease worse.[22]

ONDANSETRON



Introduction

Since its introduction into clinical settings, ondansetron—a selective antagonist of the 5-hydroxytryptamine3 (5-HT3, serotonin3) receptor subtype—has been the go-to medication for nausea and vomiting brought on by radiation therapy, chemotherapy, anesthesia, or dental procedures. Ondansetron also has antidepressant properties, relieves irritable bowel syndrome, some pain states, alcoholism, opiate withdrawal, vertigo, cerebellar tremor, and psychosis associated with Parkinson's disease treatment. It also treats anxiety and vomiting related to drug overdose or poisoning. There aren't many adverse effects of ondansetron, and they are all readily handled.[22]

Dosage

Ondansetron has been administered at a broad range of oral and intravenous dosages in published literature. Ondansetron ≤8 mg should be taken daily by patients with severe hepatic impairment. Dosage adjustments don't appear to be required in those who are elderly, have renal impairment, or are solely based on gender.[23]

Mechanism of Action

The antagonistic properties of ondansetron at the 5-HT3 receptors have been studied using rat isolated brain preparations, sedated cats, and rats' Bezold-Jarisch reflex response. Ondansetron is a potent, highly selective, and competitive antagonist at 5-HT3 receptors. Among other receptor subtypes, it has some affinity for opioid, a1-adrenergic, 5-HT1B, 5-HT1C, and 5-HT4 receptors. Conversely, on-dansetron exhibits a 1000:1 selectivity toward 5-HT3 receptors. In addition to the central nervous system (CNS), ondansetron also affects the peripheral nervous system (PNS). The dopamine receptor antagonist property of ondansetron is definitely absent, despite the fact that the exact mechanisms underlying its actions are still unknown. Ondansetron-induced 5-HT3 receptor antagonism is predicted in the CNS areas encompassing the area postrema, nucleus tractus solitarius, amygdala, and dorsal raphe nucleus.[22]

Uses

Patients with Hepatic Impairment: Ondansetron dose adjustments are not necessary for patients with mild to severe hepatic impairment. In individuals with significant liver impairment, ondansetron clearance is reduced, but the volume of distribution and the plasma half-life are increased. Consequently, ondansetron should be used with caution; the daily maximum for intravenous administration of ondansetron is currently 8 mg. People with Renal Impairment: Patients with renal impairment do not need dosage changes while receiving medicine intravenously (IV) or orally.

Pregnancy considerations: Ondansetron was once classified by the FDA as a "Pregnancy Category B" medicine. It should only be utilized after all other forms of treatment for pregnancy-related nausea, vomiting, and hyperemesis gravidarum have been exhausted.[10] Pyridoxine, either on its own or in conjunction with doxylamine, is the suggested pharmacological treatment for nausea and vomiting, according to the American College of Obstetricians and Gynecologists' (ACOG) recommendations.[24]

Adverse Drug Reaction

Ondansetron does not impair hemostatic, cardiovascular, or respiratory processes, according to Baber et al. (1992). Reviews state that adverse effects were reported in 13% and 18% of the 210 and 181 children who took ondansetron (Stevens 1991; McQueen & Milton 1994). Adverse events were no longer as common for children under four years old.

Headache

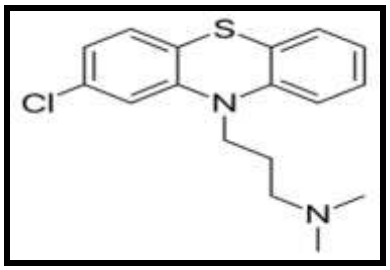
Headaches are more common in adults and children than in any other condition; after a single dose, 17% of people report having headaches, whereas 5% report having a placebo (Blackwell & Harding 1989). After taking the

medication again, the frequency of headaches (31%) was similar to that of the placebo (28%). There was no relationship between headache and dose.

Constipation

Ondansetron slows colon transit but has no effect on stomach emptying or small bowel transit in healthy volunteers (Talley et al., 1990). Age or gender have no bearing on the effect, which is greatest in the left colon. For the most part, baseline travel times were short. Constipation was noted in 0.5% and 7.1% of adult volunteers after a single dosage.[25]

CHLORPROMAZINE



Introduction

Schizophrenia, bipolar illness, and acute psychosis are all treated and managed with a medication called chlorpromazine. It is a member of the class of pharmaceuticals known as first-generation antipsychotics, also called neuroleptics or typical antipsychotics. This practice shows you how to use chlorpromazine for vomiting and nausea. It explains how to treat individuals with schizophrenia, bipolar disorders, and related psychoses with chlorpromazine therapy in clinical settings. It also discusses the medication's uses, adverse effects, precautions, and other crucial details.[26]

Dosage

Treatment lengths have ranged from one to two weeks, and intramuscular injections of chlorpromazine have been administered four times a day at doses ranging from 25 mg to 50 mg to minimize vomiting. In most successful cases, a single or double injection of 25–50 mg of chlorpromazine was beneficial, and the modest dosage led to a low incidence of adverse effects.[27]

Mechanism of Action

Chlorpromazine is a member of the first-generation antipsychotic (FGA) drug class, sometimes referred to as the neuroleptic or typical antipsychotic drug class. Its precise mode of action is unknown, although post-synaptic blocking at the mesolimbic pathway's D2 receptors is assumed to be the mechanism by which it possesses antipsychotic properties. Nevertheless, blocking D2 receptors in the nigrostriatal pathway results in its extrapyramidal adverse effects. The simultaneous blockage of histamine H1, dopamine D2, and muscarinic M1 receptors in the vomiting region is the mechanism underlying chlorpromazine's antiemetic action. Chlorpromazine is extensively metabolized by the liver (CYP450 enzymes 1A2 and 2D6; it is a substrate of CYP3A4). Additionally, it passes through renal and GI metabolism. Urine, feces, and bile all get rid of it. The half-life of the active metabolite of the parent medicine is 10–40 hours, whereas that of the medication itself is 23–37 hours.[26]

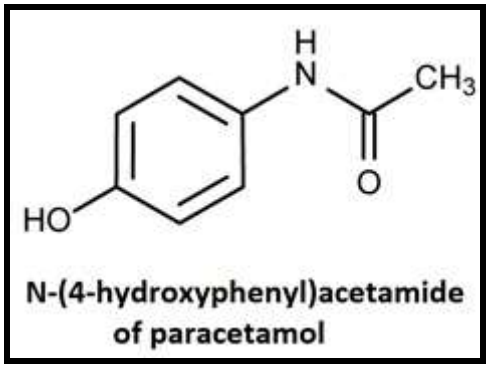
Uses

Schizophrenia, bipolar illness, and acute psychosis are all treated and managed with a medication called chlorpromazine. It is a member of the pharmacological class referred to as typical antipsychotics or neuroleptics.[26]

Adverse Drug Reaction

The majority of the side effects of low-potency antipsychotics, such as chlorpromazine, are not neurological. Its high lipid solubility and accumulation in adipose tissue cause it to exit the body more slowly. Its primary mode of action, as a low-potency typical antipsychotic, is to block muscarinic receptors, which causes dry mouth, vertigo, urine retention, blurred vision, and constipation. An increased risk of angle-closure glaucoma exists in the elderly. It also has sedative effects due to the blocking of histamine H1 receptors. It is believed that antagonistic interactions at the D2 receptors in the tuberoinfundibular pathway are the source of increased prolactin levels. One of the many endocrine side effects of this hyperprolactinemia is reduced libido in both genders. Gynecomastia, galactorrhea, and erectile dysfunction in men can result from elevated prolactin levels. Rarely, priapism may develop. Women who have high levels of prolactin may experience irregular menstruation, galactorrhea, amenorrhea, and oligomenorrhea.[26]

PARACETAMOL



Mechanism of action

Acetaminophen is one of the most widely used over-the-counter analgesic and antipyretic drugs because it inhibits the cyclooxygenase (COX) pathways. Despite the fact that the drug's precise mode of action is yet uncertain, nonsteroidal anti-inflammatory medicines (NSAIDs) have long been included in this classification. While acetaminophen lacks peripheral anti-inflammatory actions, it has comparable analgesic and antipyretic qualities as NSAIDs. Paracetamol has the potential to inhibit the COX pathway in the central nervous system

(CNS), but not in peripheral tissues. Moreover, paracetamol does not appear to bind to the active site of the COX-1 or COX-2 enzymes. Instead, it employs an alternative strategy to lower COX activity. Another theory holds that acetaminophen suppresses COX-3, a splice variant of COX-1, although there hasn't been any human validation of this theory.[28]

Regardless, the analgesic and antipyretic actions of acetaminophen are thought to be attributed to its suppression of the COX pathway activity, which inhibits prostaglandin generation in the central nervous system. The analgesic effects could be attributed to stimulation of the descending serotonergic pathways in the central nervous system. Subsequent research indicates that acetaminophen or AM404, one of its metabolites, might activate the cannabinoid system.[29] This activation may inhibit the absorption or degradation of anandamide and 2-arachidonoylglycerol, which could contribute to the substance's analgesic impact. AM404 has analgesic effects via preventing glutamatergic synaptic transmission in the spinal cord's dorsal horn. Transient receptor potential vanilloid subtype-1 (TRPV1) receptors must be activated in order to increase spontaneous transmission and reduce C-fiber-evoked transmission.[30]

Dosages

For adults and adolescents (13 years of age or older) weighing 50 kg or more, the recommended dosage of acetaminophen is 1000 mg every 6 hours or 650 mg every 4 hours. A minimum of four hours should elapse between dosages, and no more than 1000 mg should be taken in one dose. Interestingly, the highest recommended daily dose of acetaminophen is 4000 mg. The recommended dose of acetaminophen for adults and adolescents (13 years of age or older) weighing less than 50 kg is 12.5 mg/kg every 4 hours or 15 mg/kg every 6 hours. The maximum dosage for a single administration should be 15 mg/kg, and the minimum interval between doses should be 4 hours. In addition, it is crucial to adhere to a daily paracetamol dosage cap of no more than 75 mg/kg, or 3750 mg.[31]

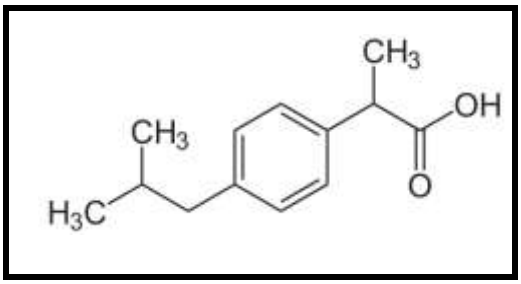
Adverse Effect

Common adverse effects associated with oral or rectal use of paracetamol include skin rash, hypersensitivity reactions, nephrotoxicity (characterized as increases in blood urea nitrogen, or BUN), and haematological abnormalities such as anemia, leukopenia, neutropenia, and pancytopenia. Moreover, it may lead to disorders related to electrolytes and metabolism, exhibiting symptoms such as hyperglycemia, hypobicarbonateemia, hyposodium and hypocalcium, hyperammonemia, hyperchloremia, and hyperuricemia, along with increased levels of bilirubin and alkaline phosphatase. Administering acetaminophen by IV is also associated with side effects that include vomiting, nausea, constipation, pruritus, and abdominal pain.[30]

Uses

Pain management that works is consequently essential for both patients and doctors. Clinicians can use paracetamol alone to treat patients with mild-to-moderate pain, or they can mix paracetamol with an opioid analgesic to treat patients with more severe pain.[30]

IBUPROFEN



Mechanism of Action

The main way that the NSAID ibuprofen works is by blocking the precursors of prostaglandins. When normal or pathological stimuli are encountered, phospholipase A2 triggers the release of arachidonic acid from membrane phospholipids. Subsequently, arachidonic acid proceeds by one of three enzymatic pathways: cyclooxygenase (COX), lipoxygenase (LOX), or cytochrome P450 (CYP450). Prostaglandins, prostacyclins, and thromboxanes are produced by the cyclooxygenase pathway of arachidonic acid metabolism, while the lipoxygenase pathway produces hydroxyeicosatetranoic acids (HETEs), leukotrienes, and lipoxins. Ultimately, arachidonic acid is converted by the cytochrome P450 mechanism into HETEs and epoxyeicosatrienoic acids (EET). Inhibiting the COX-1 and COX-2 pathways lowers the expression of prostaglandin precursors, which in turn lowers the degree of cellular response to physiological or pathologic stimuli. Non-selective NSAIDs like ibuprofen have analgesic, antipyretic, and anti-inflammatory properties, which are explained by this mechanism.] COX-1 is inhibited roughly 2.5 times more potently than COX-2 in the case of ibuprofen particularly. This may have consequences for many research on the relative efficiency of COX-2 selective inhibitors in treating disorders that are commonly treated with ibuprofen.[32]

According to a recent surveillance research, NSAIDs were nephrotoxic even in individuals with normal kidney function. Since dehydration is a prominent risk factor for ibuprofen-induced renal injury, NSAIDs and kidney function have been studied in great detail in populations that are more vulnerable to dehydration, such as endurance athletes or children with renal comorbidities. Reduced kidney function is an additional issue linked to ibuprofen use. Clinicians need to consider a patient's renal function when determining whether to treat them with ibuprofen or other NSAIDs. In a group of ultramarathon runners, a double-blind, placebo-controlled trial found that the medication's users

experienced a greater rate of acute kidney injury, with a number needed to harm of 5.5.[33]

Adverse Effects

Ibuprofen is known to cause bleeding into the stomach, which can lead to gastritis, ulcers, bleeding, or perforations. When COX isoforms are inhibited by ibuprofen use, prostaglandins are secreted less frequently, which helps to produce gastroprotective mucus. Since COX-2 selective NSAIDs are linked to a lower frequency of gastrointestinal complications—a concern particularly for pediatric patients—this impact is more pronounced when non-selective NSAIDs are administered. Ibuprofen is used more often than other NSAIDs since it is relatively safe in comparison to other drugs in its class. Taking ibuprofen without a prescription and using it over-the-counter increases the risk of taking too much of it at once and using it for short periods of time, which could accelerate gastrointestinal issues.[34]

Uses

Ibuprofen has been recommended and approved by the FDA to treat inflammatory and rheumatic conditions. Ibuprofen was created in response to the need for a non-corticosteroid alternative medication for rheumatoid arthritis. The illness was the initial impetus for the creation of the drug currently marketed as ibuprofen; Dr. Stewart Adams OBE was the researcher who made the discovery in this field. Originally invented as 2-(4-isobutylphenyl) propionic acid by Dr. Adams and John Nicholson in 1961, ibuprofen has become one of the most widely used NSAIDs in the world. In inflammatory and rheumatoid conditions, it is still used as a monotherapy to relieve pain; however, research is continuously being done to discover other drugs. One such study focuses on creating hybrid medications to alleviate rheumatoid arthritis pain, which combines an NSAID with a carbonic anhydrase inhibitor.[34]

ACECLOFENAC

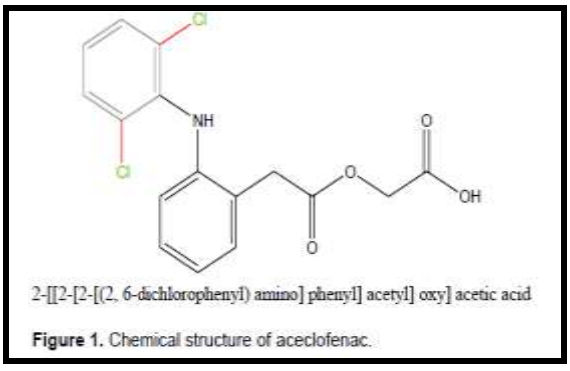


Figure 1. Chemical structure of aceclofenac.

Mechanism of Action

Aceclofenac has a more potent anti-inflammatory impact than other NSAIDs (non-anti-inflammatory steroid medicines). Aceclofenac works by stopping the body's normal synthesis of an enzyme called oxygenase cyclo-. Cyclo-oxygenase plays a role in the production of prostaglandins, which are physiological chemicals that cause pain, swelling, and inflammation. Aceclofenac is the name of the glycolic acid ester of diclofenac. Anti-inflammatory properties: Recent and chronic inflammation have both benefited from aceclofenac's anti-inflammatory qualities. It stops a range of inflammatory and uncomfortable mediators.[35]

Dosage and administration[35]

• Adults: Two dosages of 100 mg each day are recommended.
• Children: There is no clinical data available on the usage of aceclofenac in children.
• Seniors: The pharmacokinetics of aceclofenac do not alter in this population.

Therefore, it is decided that changing the dosage or frequency of dosing is not necessary for these patients.

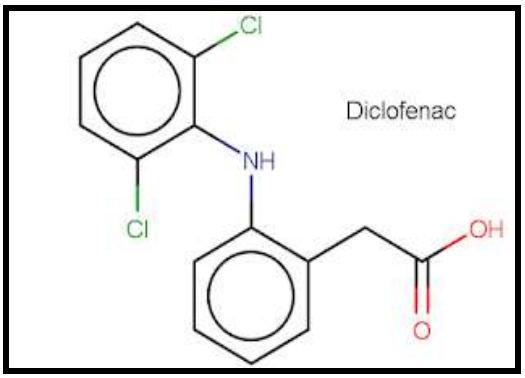
Adverse effect[35]

The majority of the adverse effects that have been documented are mild and transient, and they include occasional episodes of vertigo as well as gastrointestinal disorders such dyspepsia, stomach discomfort, nausea, and diarrhea.
• Dermatological conditions including rash, itching, and strange.
• There have been isolated reports of elevated liver enzyme and blood creatinine levels.

Uses[35]

- Arthritis.
- Arthritis rheumatoid.
- Idiopathic spondylitis.
- Pain in the teeth.
- Pain in the gynaecology.
- For the purpose of reducing rheumatoid arthritis and osteoarthritis pain and inflammation and spondylitis that is ankylosing.

DICLOFENAC



Mechanism of Action

As an NSAID from the phenylacetic acid family, diclofenac reduces inflammation in a manner similar to that of other medications in its class. It also shares analgesic and antipyretic effects with other NSAIDs. Diclofenac works by preventing the production of

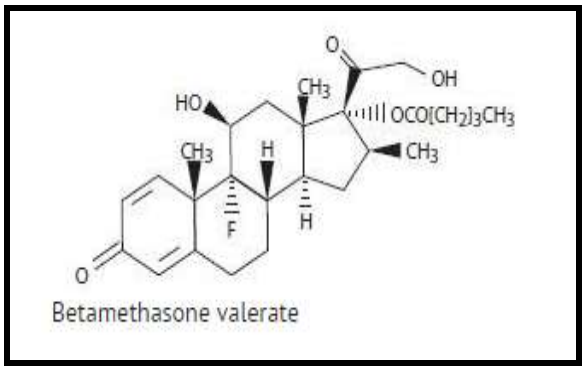
prostanoids, which are vital elements of the inflammatory and nociceptive response, such as prostaglandin-E2 (PGE2), prostacyclins, and thromboxanes. This inhibits the activities of cyclooxygenase-1 (COX-1) and cyclooxygenase-2 (COX-2). It prevents arachidonic acid from binding to COX-1 and COX-2 in a competitive manner. Although data suggests that diclofenac has selective COX-2 inhibition, almost four times that of COX-1 inhibition during in vitro research, it inhibits COX-1 and COX-2 relatively similarly. Diclofenac and other NSAIDs also have effects in blocking the production of thromboxanes, especially thromboxane-B2 (TXB2). This value is far from the reported 20-fold selectivity of COX-2 inhibition of the more selective COX-2 inhibitors like rofecoxib, but diclofenac's activity can be compared more accurately to that of celecoxib. Diclofenac is considered to be one of the most potent inhibitors of PGE2 synthesis; an inflammatory response elevates primary prostanoids.[36]

Diclofenac's effectiveness in treating actinic keratosis and halting the advancement of more malignant illness may be explained by its mode of action, which inhibits downstream arachidonic acid metabolite synthesis. In this manner, topical diclofenac may prevent the synthesis of growth factors for epithelium, which would otherwise encourage angiogenesis and prevent apoptosis in tissue that is proliferating. Nevertheless, testing and discussion of this approach are still ongoing.[37]

Adverse Effect

Cardiovascular: All NSAIDs, particularly the more selective COX-2 inhibitors, increase the risk of heart failure, stroke, myocardial infarction (MI), and death. Gastrointestinal (GI): NSAIDs that inhibit COX-1 activity are associated with GI complications because they prevent the production of prostaglandins and other gastroprotective agents like PGE2.[38]

BETAMETHASONE



Mechanism of Action[39]

Strong medication betamethasone has minimal mineralocorticoid action and strong anti-inflammatory and immunosuppressive effects. Its primary mode of action involves activating a class of proteins called lipocortins, which phospholipase A2 inhibits, preventing the inflammatory cascade from being initiated and releasing leukotrienes from arachidonic acid. Conversely, leukocytes, or white blood cells, are directly affected by betamethasone, which prevents the release of a number of chemical mediators, including interleukins and acid hydrolases.

Adverse effects[39]

When applied topically, particularly on the skin and over an extended period of time, incidences of.

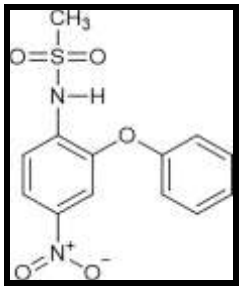
- Dermatitis from contact.
- Hypertrichosis, a condition where the treated area has more hair.
- The flu.
- Miliaria.
- Atrophy of the skin.
- Dehydration
- Insufficient pigmentation.

Uses[39]

There are many different medicinal uses for betamethasone, ranging from treating mild skin inflammation to treating severe autoimmune conditions like systemic lupus erythematosus.

For the treatment of dermatitis fungicide's, eczema, pemphigus, and atopic dermatitis, betamethasone is recommended.

NIMESULIDE



Mechanism of Action

Nimesulide's whole mechanism of action, which targets multiple important inflammatory mediators including COX-2-mediated prostaglandins, free radicals, proteolytic enzymes, and histamine, is what gives it its therapeutic effects.[40]

Adverse ef[41]

- The diarrhoea
- vomiting and nausea
- Rash on the skin
- Itching
- lightheadedness
- mouth acrimony
- sour or acidic stomach
- Pain and cramping in the stomach
- discomfort where the injection was made
- Anxiety
- appetite decline

Uses

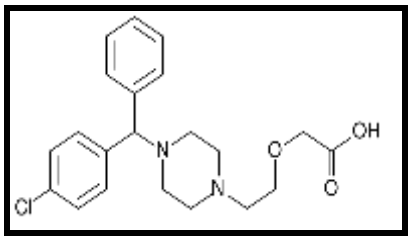
Period aches are among the pains for which it can be used. For long-term conditions like arthritis, nimesulide is not advised. This is because it has been linked to a lower risk of liver damage, including liver failure.

Nimesulide dosage

Missing of Dose

Oral forms: As soon as you recall, take the missed dose of nemesulide. Forget the missed dose if the next one is almost here. Never reduce the dosage to make up for a dose that was missed. States that can be injected: It's crucial to provide your nimesulide injection at the scheduled time. Notify your doctor and schedule an appointment for additional education if you missed the dose. Topical forms: As soon as you realise you've missed a dose of nimesulide, take action. Don't apply again to make up for the dose you missed.

CETRIZINE



Mechanism of Action

A highly selective and fast-acting antagonist of the peripheral histamine H1 receptor is cetirizine. Cetirizine mainly inhibits the H1-receptors on immunological cells, gastrointestinal tract, vascular endothelial cells, and respiratory smooth muscle cells. Cetirizine avoids the central nervous system's neurons by partially overcoming the blood-brain barrier, in contrast to first-generation antihistamines like diphenhydramine and doxylamine. Cetirizine hence causes less sedation than many first-generation antihistamines Since cetirizine binds to histamine H1-receptors, many of the effects of histamine are effectively reversed. Similar to other second-generation antihistamines, cetirizine reduces the amount of fluid that escapes capillaries into tissues via decreasing vascular permeability. Moreover, cetirizine inhibits bronchospasm brought on by histamine.[42]

Dose

Cetirizine is used therapeutically to alleviate ocular and nasal symptoms in seasonal and the management of long-term idiopathic urticaria as well as persistent allergic rhinitis. A pill containing 10 mg is available. The usual dosage is 10 milligrams once daily.

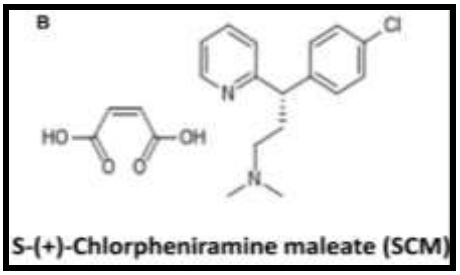
Adverse Effects

Cetirizine is an effective and generally well-tolerated treatment for urticaria and allergic rhinitis. Its main side effects in adults are somnolence, weariness, pharyngitis, dizziness, and dry mouth, however these are rare.[43]

Uses

Antihistamines may be helpful for people with allergic asthma who also have allergic rhinitis. Asthma and allergic rhinitis actually cause an obstruction in the upper and lower airways. Widespread inflammatory process that can be exacerbated and maintained by linked mechanisms.[44]

CHLORPHENERAMINE



Mechanism of Action

Rivals' histamine for H receptor sites on effector cells in the blood and digestive system. Respiratory tract, and vessels.[45]

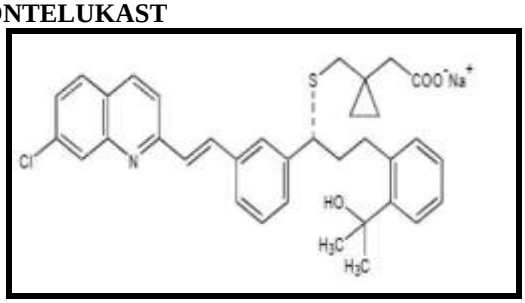
Adverse effects[26]

- Depression of the central nervous system
- Deep sleep to moderate tiredness is the most common type of sedation. Lightheadedness
- Energy deficiency (lassitude) a lack of cooperation
- Weakened Muscles
- Anxiety
- Passivity
- Lack of sleep
- Euphoria
- Anxiety
- Intolerance

Uses(45)

- Seasonal and perennial allergies causing rhinitis
- Seasonal and perennial vasomotor rhinorrhea
- Inflammatory conjunctivitis
- Typical colds
- Urticaria, or hives
- Pruritus, or itching swelling of the mucous membranes and tissue beneath the skin (angioedema)severe allergic reactions (anaphylactic reactions), which include throat swelling, breathing difficulties, and a decrease in hypotension, light-headedness, and fainting.

MONTELUKAST



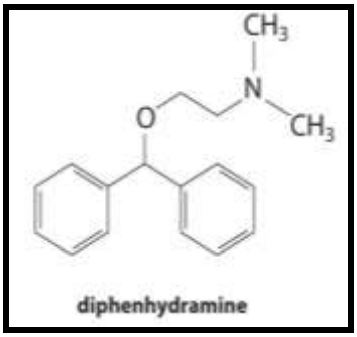
Mechanism of Action

Montelukast is a highly selective leukotriene receptor with the empirical formula C35H35ClNNaO3 S.antagonist that binds highly selectively to the leukotriene D4 and D4 receptor cysteinyl leukotriene receptor E4. Many cells, including mast cells, release these leukotrienes, which are implicated in the inflammation that could result in symptoms and signs of allergic rhinitis and asthma. Leukotriene Smooth muscle and macrophage cells, as well as other airway cells, include receptors. When obligated to Without displaying any of the physiological effects of leukotriene, such as airway edema, smooth muscle contraction, and impairment of normal cellular activity, montelukast prevents these effects. Antagonistic behaviour. Little doses of montelukast (5 mg) cause a notable suppression of Blurred airways due to leukotriene D4 production. Furthermore, in a crossover analysis, montelukast induced inhibition of both early and late phase bronchoconstriction caused by a challenge with antigen in 12 asthmatic individuals. Although most worldwide asthma guidelines indicate that children ≤5 years with asthma be treated with daily low- moderate dosage inhaled corticosteroids (ICS) as the chosen controller and montelukast as an alternate therapy.[46]

Adverse effect[46]

- Headaches, fever, tiredness
- Upper respiratory symptoms (rhinorrhea, pharyngitis, laryngitis, sinusitis, epistaxis)
- Auricular signs: otitis
- Lower respiratory signs: a cough, pneumonia, wheezing
- Ocular signs: conjunctivitis
- Gastrointestinal signs (nausea, diarrhea, vomiting, abdominal pain, dyspepsia, pancreatitis).
- Some of these may be secondary to lactose that is compounded with montelukast.
- Infections (influenza, varicella)
- Dermatologic manifestations (pruritus, eczema, atopic dermatitis, angioedema, urticaria, skin
- rash, bruising, erythema multiforme, erythema nodosum, toxic epidermal necrolysis, and
- Stevens Johnson syndrome)
- Musculoskeletal signs: Arthralgia, myalgia

DIPHENYDRAMINE



Mechanism of Action[47]

Diphenhydramine mainly works through antagonizing the H1 (histamine 1) receptor, although it has other mechanisms of action as well The H1 receptor is located on respiratory smooth muscles, vascular endothelial cells, the gastrointestinal tract (GIT), cardiac tissue, immune cells, the uterus, and the central nervous system (CNS) neurons. When the H1 receptor is stimulated in these tissues, it produces a wide variety of actions, including increased vascular permeability, promotion of vasodilation causing flushing, decreased atrioventricular (AV) node conduction time, stimulation of sensory nerves of airways producing coughing, smooth muscle contraction of bronchi and GIT, and eosinophilic chemotaxis promoting the allergic immune response.

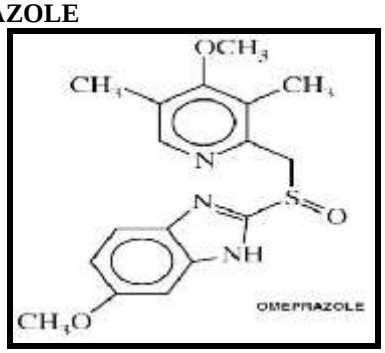
Adverse effects[47]

- Drowsiness
- Light-headedness
- A lack of cooperation
- Headache
- Epigastric discomfort
- Thickened bronchial secretions
- Dry mucous membranes
- CNS stimulation, paradoxical
- Constipation
- euphoria
- Ataxia
- Dysuria
- Urinary retention
- Hypotension

Uses

The variety of conditions to treat and prevent dystonias, insomnia, pruritis, urticaria, vertigo, and motion sickness. It also possesses local anaesthetic properties for patients.

OMEPRAZOLE



Omeprazole is a well-researched short-term therapy for reflux esophagitis. Omeprazole has regularly been observed to provide better symptomatic relief, macroscopic and histological healing, and healing than Ha-receptor blocker treatment. Relapse occurs quickly if therapy is stopped. Reflux illness is therefore a chronic ailment that can lead to significant discomfort for the patient due to repeated symptoms and a reduced quality of life. Additionally, there's a chance that problems like

bleeding and strictures will occur. Therefore, a maintenance treatment that is both safe and effective is preferred. In studies involving maintenance therapy, HI-receptor blockers have not shown any discernible advantages above placebo. This study was intended to evaluate long-term treatment of reflux esophagitis in a primary-care patient setting and under conditions that mimic, as much as possible, a standard primary-care regimen with practical definitions of the disease. Omeprazole has been found to be superior to Hz blockers, especially in patients with severe esophagitis refractory to standard doses of Hz blockers.[48]

Compared to histamine H2-receptor antagonists, omeprazole promotes faster healing and symptom alleviation from acute duodenal ulcers and reflux oesophagitis by controlling stomach acid output. Omeprazole lowers the risk of relapse when used as maintenance therapy. Additionally, the medication works very well in patients who don't respond well to histamine Hz receptor antagonists. It is crucial to assess the pharmaco-economic effects of omeprazole in the short- and long-term therapy of duodenal ulcer and reflux oesophagitis since in many countries, the daily acquisition cost of omeprazole is greater than that of histamine H2-receptor antagonists.[49]

Omeprazole's molecular structure consists of a sulfoxide chain connecting a benzimidazole to a substituted pyridine ring. 345 daltons make up its molecular weight. Since omeprazole is a weak base that is lipophilic, it will collect more readily in acidic environments like the parietal cell's secretory membrane.

USES

PPIs are prescribed as the initial line of treatment for abnormalities of the digestive system or to prevent gastrointestinal damage caused by non-steroidal anti-inflammatory medicines (NSAIDs).[50]

Mechanism of Action

The parietal cell takes omeprazole very well. It is changed to its active form, a sulphonamide, in an acidic pH by protonation. In this form, the drug forms an irreversible linkage via a disulfide bond with the enzyme HK ATPase, also known as the proton pump, which is in charge of the parietal cells' active secretion of hydrogen ions.

Omeprazole inhibits gastric acid secretion in response to all known stimuli, including agents like dibutryl cyclic adenosine monophosphate (db-CAMP), which acts intracellularly. This action sets omeprazole apart from other gastric antisecretory drugs, which are competitive antagonists at specific cellular receptors on the basolateral aspect of the parietal cell.

Since omeprazole is broken down by acid, it needs to be shielded from stomach acid when taken orally. This is accomplished by using enteric-coated granules that have been encapsulated.[51]

Adverse Drug Reaction

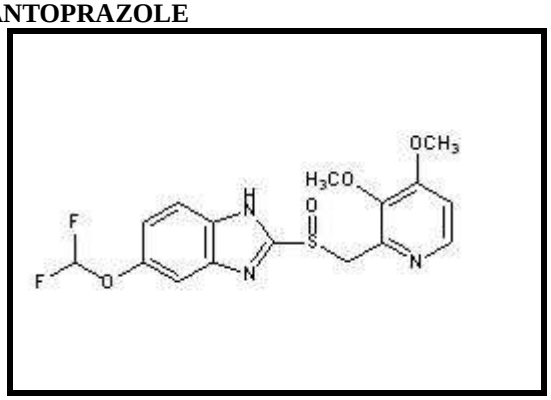
Less than 1% of all PPI-induced adverse events that are voluntarily reported to the FDA include hypomagnesaemia. Investigations are currently ongoing to determine the mechanism underlying this. PPIs have the potential to reduce intestinal magnesium (Mg) absorption by obstructing both passive (by Para cellular pores) and active (via transient receptor potential melastatin (TRPM) protein channels) absorption. PPIs attach irreversibly to the H/K adenosine triphosphate (ATP) pump in parietal cells, thereby 95% inhibiting the formation of stomach acid. Hypomagnesaemia in certain cases may be caused by congenital abnormalities, such as mutations in TRPM channels.[52]

Proton pump inhibitors are one family of drugs that may have an impact on the metabolism of bone minerals. Proton pump inhibitors are a class of medication that inhibits the production and intragastric secretion of hydrochloric acid, which is thought to be an important mediator of calcium absorption in the small intestine. Four years or more of use has been linked to hip fractures and other osteoporotic fractures, according to recent studies; however, there is limited information available regarding additional risk after the four-year mark.15,16 Since proton pump inhibitors are frequently prescribed to control and prevent symptoms of persistent chronic conditions, it is likely that a large number of patients will use these drugs for more than four years. Therefore, we investigated the impact of extended proton pump inhibitor use durations on the development of osteoporosis-related fractures using an administrative database.[53]

INTERACTIONS WITH DRUGS

A PPI-induced increase in stomach pH may lead to group-specific interactions between PPIs and other drugs. This increase in pH can change the kinetics of pro-drugs, change the amount of other drug substances that are soluble, or change the way that drugs are released from products that have pH-dependent dissolving properties. The decreased peak plasma concentration (Cmax) and mean area under the concentration-time curve at 24 hours (AUC24) of oral itraconazole 200 mg capsules given with concurrent omeprazole 40 mg, as well as the decreased bioavailability of oral ketoconazole when co-administered with omeprazole 60 mg.[54]

PANTOPRAZOLE



It has been demonstrated that pantoprazole, a more modern PPI used in clinical settings, is equally effective as omeprazole at inhibiting the secretion of stomach acid. Furthermore, pantoprazole seems to be the only PPI that, when taken at therapeutic levels, does not interfere with cytochrome P450 enzymes or affect how other medications, such as diclofenac, are metabolized. Because of this characteristic, pantoprazole may be a safer medication, particularly when taken in conjunction with other medications.[55]

USES

The more recent proton pump inhibitor, pantoprazole, works similarly well to omeprazole in treating diseases associated with stomach acid.

40 mg of pantoprazole o.d. is well tolerated by patients needing ongoing NSAID treatment for osteoarthritis or rheumatoid arthritis. It is also quite helpful in treating endoscopically verified stomach and duodenal lesions (Lanza classification grade 0, 1 or 2.[56]

Mechanism of Action

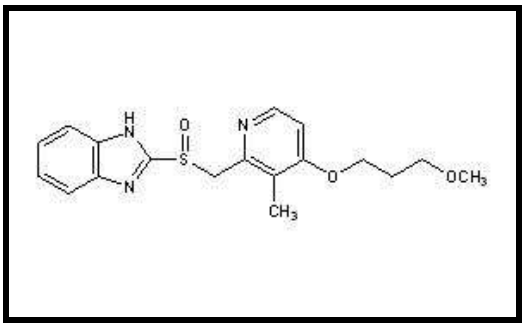
PPIs are divided into two groups: imidazopyridine and benzimidazole. Within the class of PPIs known as benzimidazoles is pantoprazole. Benzimidazoles differ from the other category in that they have a longer rate of metabolism, which means that their time in plasma is shorter. Pantoprazole blocks the H+/K+ ATP pumps irreversibly as its mode of action. Since pantoprazole degrades more quickly in low pH environments, it makes obvious that the stomach, which contains the H+/K+ ATP pumps (more specifically, the parietal cells that line the stomach), would be the ideal location for this medicine to function. The synthesis of stomach acid ends with this stage. Consequently, pantoprazole's binding to these pumps stops acid secretion for a maximum of twenty-four hours. Since new pumps have formed after 24 hours, pantoprazole must be taken again to prevent their effect. The maximum effect happens two to six hours after drug administration, and the commencement of action is swift. In the liver, pantoprazole is also metabolized, primarily via sulfation and demethylation of CYP2C19. It is unknown if these metabolites are significant.[55]

Adverse Drug Reaction

Medication-related adverse events, specifically vitamin B12 malabsorption, have been linked to vitamin B12 deficiency. Prolonged use of metformin, proton pump inhibitors, and histamine-2 receptor antagonists (H2RAs) has been linked to vitamin B12 deficiency.8–17 Gastric acid suppression agents are among the medications linked to vitamin B12 malabsorption. These drugs can be combined or used as monotherapy.[57]

According to a study by Mr. Lam and colleagues, using proton pump inhibitors (PPIs) or histamine 2 receptor antagonists (H2RAs) for two or more years has been linked to a higher risk of vitamin B12 deficiency. This link was stronger the more PPIs or H2RAs a person took on a daily basis. This is the largest study to date that looks at the possibility of a link between vitamin B12 deficiency and PPIs or H2RAs.[58]

RABEPRAZOLE



Proton pump inhibitors like rabeprazole are substitutes for benzimidazoles. By inhibiting H+, K+-ATPase on the secretory surface of the partial cellular cells, the sodium salt of rabeprazole, a proton pump inhibitor in the stomach, can control gastric acid production without altering cholinergic or histamine H2-receptors. Prescriptions containing sodium rabeprazole are typically taken in combination to get rid of Helicobacter pylori. Additionally, one treatment for duodenal ulcers is rabeprazole. Additionally, it is used to treat Zollinger-Ellison syndrome, a disorder in which the stomach generates a lot of acid, and gastroesophageal reflux. It is often used in conjunction with antibiotics to treat bacterial stomach ulcers.[59]

Applications

Rabeprazole reduces baseline and peptone-stimulated acid secretion in a dose-dependent manner by inhibiting the stomach parietal cell proton pump (H+/K+-ATPase). The best antisecretory effect is seen at a dosage of 20 mg/day. With no impact on endocrine function, rabeprazole causes dose-dependent increases in gastrin levels that are directly correlated with pH rises. Rabeprazole had a comparable or quicker beginning of effect in healthy volunteers when compared to omeprazole and pantoprazole. Furthermore, rabeprazole outperformed esomeprazole, omeprazole, lansoprazole, and pantoprazole in terms of its antisecretory impact during a 24-hour period. The half-life of rabeprazole was

less than twenty-four hours. When it comes to restoring normal 24-hour oesophageal acid exposure in patients with gastro-oesophageal reflux disorder (GORD), rabeprazole works just as well as omeprazole and better than a placebo.[25]

Mechanism of Action

After oral treatment, proton pump inhibitors are absorbed somewhat quickly and reach their maximal plasma concentrations a few hours after dosage. Furthermore, these medications have substantial bioavailabilities (usually greater than 50%) and are widely absorbed (Table 1).8–10 Proton pump inhibitors vary significantly in terms of how they are metabolized in the liver and the possible effects of genetic polymorphisms.[60]

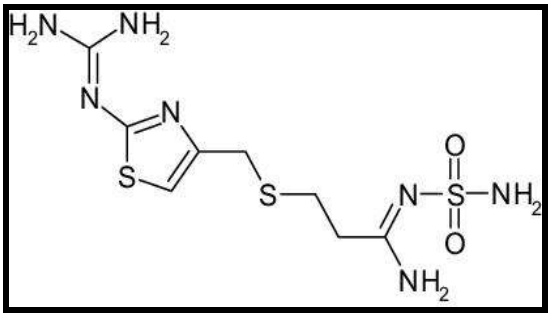
PPIs are weak bases with membrane permeability that accumulate in the extremely acidic secretory cannaliculus of the parietal cell after being absorbed from the proximal small intestine. There, they transform into active sulphonamide derivatives and attach covalently through disulfide bridges to the α subunit of the H+/K+-ATPase pump, causing the gastric acid secretion to be irreversibly inhibited. Active parietal cells' ability to secrete acid is restored by the membrane translocation of new pumps. substituents on the benzimidazole or pyridine moieties. PPIs are weak bases with membrane permeability that accumulate in the extremely acidic secretory cannaliculus of the parietal cell after being absorbed from the proximal small intestine. There, they transform into active sulphonamide derivatives and attach covalently through disulfide bridges to the α subunit of the H+/K+-ATPase pump, causing the gastric acid secretion to be irreversibly inhibited. Acid secretion in an active parietal cell is restored by the membrane translocation of new pumps.[61]

DRUG-RELATED TRANSACTIONS

In a water bath at 37 ± 2 °C for 24 hours, the linagliptin and rabeprazole sodium complex was produced at a 1:1 ratio in both aqueous and simulated acidic media. After filtering, the complex was left in the oven at 60 °C for one to two hours to dry. Following that, chromatographic (TLC, HPLC) and spectroscopic (FT-IR) studies of the dried complex were conducted.[62]

The effectiveness of clopidogrel may be weakened by a combination of PPIs, although results were constrained by the absence of a double-blind, randomized, controlled research. There is currently little information available regarding the interactions between clopidogrel and rabeprazole as well as the effects of the CYP2C19 genetic polymorphism on the in vivo metabolism of these two medications. In order to maximize the therapeutic benefit and minimize side effects, CYP2C19 genotypes were examined for the in vivo metabolism and pharmacological interaction of rabeprazole and clopidogrel in this study.[63]

FAMOTIDINE



One recent, strong, long-acting addition to this group of drugs is famotidine. The inclusion of a guanyithiazole ring sets it apart chemically from the two Hz-receptor antagonists that are currently on the market, ranitidine and cimetidine. It has been observed that famotidine is 20–160 times more potent than cimetidine and 3–20 times more potent than ranitidine on an equimolar basis [6– 161]. After taking 40 mg of famotidine at night, antisecretory activity lasts for around 12 hours. It has been demonstrated that famotidine exhibits longer-lasting antisecretory action at equipotent dosages.[64]

USES

By decreasing the amount of gastric acid secreted, famotidine is known to prevent UGI ulcers caused by NSAIDs. It is an ideal addition to a three-times-daily regimen of an NSAID to provide maximal gastroprotection since it has a longer duration of action than other H2RAs and, when taken three times a day, is able to maintain a more stable gastric pH level. Famotidine decreases basal, nocturnal, and induced stomach acid output by competitively inhibiting histamine H2 receptors. When alcohol is consumed with these medications, the inhibition of alcohol dehydrogenase can lead to elevated serum alcohol concentrations. In contrast, famotidine does not affect this enzyme's activity, and its duration of action is longer than that of other H2RAs.[65]

Mechanism of Action

Competitive histamine-2 (H2) receptor antagonist fremotidine binds specifically to H2 receptors located on the basolateral membrane of the stomach's parietal cells. This interaction effectively blocks the histamine-mediated effects. By simultaneously lowering the levels of acidity and the amount of gastric secretions, the drug's pharmacological action suppresses gastric secretion. Along with reducing gastric volume, acidity, and secretions brought on by food, coffee, insulin, and pentagastrin, famotidine also suppresses basal and nocturnal gastric acid secretion.[66]

DRUG-RELATED TRANSACTIONS

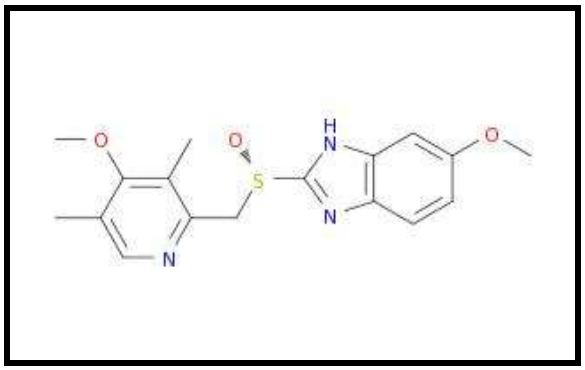
H2-receptor antagonists will continue to be administered alongside a variety of therapeutic treatments because they have a sizable market and are often utilized in clinical practice. Consequently, physicians need to be aware of the pharmacokinetic and pharmacodynamic

interactions between famotidine and other commonly prescribed medications, as well as medications that are more likely to be prescribed in conjunction with famotidine, that are clinically important. Based on available data, it seems that famotidine has a lower propensity for drug interactions than cimetidine, the two earlier agents, in terms of both renal and hepatic drug clearance.[64]

ESOMEPRAZOLE

The S-isomer of omeprazole, esomeprazole is a novel proton pump inhibitor and the first of its kind to be created as a single isomer. In studies including patients with gastro-oesophageal reflux disease (GORD) or healthy volunteers (n = 20 to 115), esomeprazole gave superior regulation of intragastric pH than omeprazole, lansoprazole, and pantoprazole. Esomeprazole 20 and/or 40 mg for 8 weeks resulted in higher healing rates of erosive oesophagitis and better symptom control than omeprazole 20 mg in patients with GORD, according to two sizable randomised, double-blind multicentre trials.[67]

USES



In two major randomized, double-blind multicentre trials, patients with endoscopically verified healed erosive oesophagitis, treated with esomeprazole 10, 20, or 40 mg once daily for six months sustained healing over placebo ($p < 0.001$).[67]

When compared to omeprazole, esomeprazole exhibits far better acid control, is less variable between patients, and is well tolerated. When considered collectively, these results imply that esomeprazole may provide patients with GERD and other acid-related disorders with increased therapeutic efficacy.[68]

Mechanism of Action

Esomeprazole inhibits the gastric H+, K+-ATPase only in the acidic canalicular region of the parietal cell, a site of high specificity. In the colon and kidney, similar (though not identical) H+, K+-ATPases are found, but the acidity in these areas is not high enough to allow proton pump inhibitor buildup and conversion to the active sulphonamide. Therefore, high intravenous omeprazole doses did not appear to have any effect on the urine excretion of potassium or hydrogen ions in acid-loaded rats with increased levels of renal H+, K+-ATPase.[69]

Adverse Drug Reaction

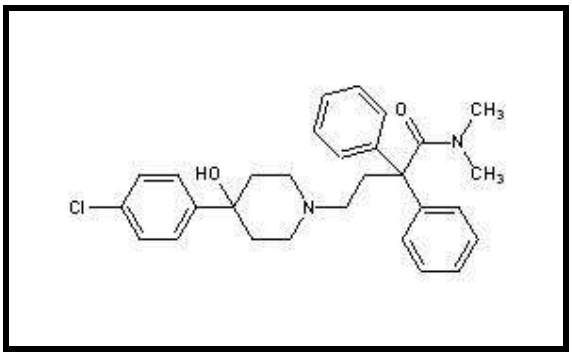
About 1% of people experience side effects with PPIs, although they are usually well tolerated. Although hypersensitivity events are uncommon, anaphylaxis, urticaria, or asthma have been reported in a few cases.

PPI hypersensitivity is challenging to diagnose because the medication is frequently taken in combination with other medications. Oral provocation testing (OPT) is still a valid method for verifying hypersensitivity, but it is laborious and not risk-free.

Thus, it would be ideal to have a trustworthy in vivo test to replace OPT. Although PPI skin tests have been mentioned, it is unclear how accurate these are.

In this multicenter research, we looked at how well skin testing and OPT worked for patients who had severe allergic reactions to PPIs right away.[69]

LOPERAMIDE



Mechanism of Action

A synthetic phenylpiperidine opioid that is very lipophilic is called loperamide. An agonist of the mu-receptor is loperamide. When taken in prescribed amounts, loperamide increases rectal tone, reduces transition time, and prevents peristalsis electrolyte loss by directly acting on the mu-opioid receptors in the circular and longitudinal intestine muscles. Higher dosages of loperamide, which substrate P-glycoprotein, cause P-glycoprotein to become inhibited, which permits loperamide to pass across the blood-brain barrier and act on the central nervous system, resulting in toxicity and central opioid effects.[70]

Common Adverse Effects[71]

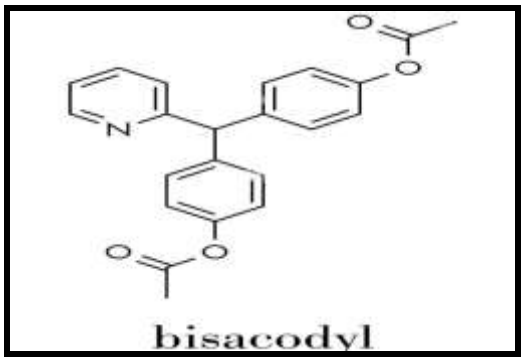
- Dry mouth
- Flatulence
- Abdominal cramps
- Nausea
- Ileus
- Constipation
- Urinary retention
- Dizziness

- Drowsiness

Serious Adverse Effects[71]

- Toxic megacolon
- Necrotizing enterocolitis
- Stevens-Johnson syndrome
- Toxic epidermal necrolysis
- Syncope
- QT/QTc interval prolongation, torsades de pointed, ventricular tachycardia
- Other ventricular arrhythmias and/or cardiac arrest.

BISACODLY



Mechanism of Action

Bisacodyl's target of action is the gastrointestinal tract. Absorption from the GI tract is minimal because its formulation is a coated tablet, which is resistant to destruction in the stomach and small intestine and thus achieves transit to the colon in its intact form. It then dissolves in the colon and ensures a laxative effect after oral intake. Intestinal deacetylase and bacterial enzymes hydrolyze bisacodyl to a deacetylated active metabolite, bis-(p-hydroxyphenyl)-pyridyl-2-methane (BHPM), which stimulates the intestinal mucosa, causing peristalsis, which is responsible for the laxative action.

BPHM has a dual activity in the colon, including an anti-absorptive-secretory effect and a direct prokinetic effect by stimulating parasympathetic nerve endings in the colonic mucosa. It acts locally in the large bowel by stimulating the colon's myoelectrical and motor activity and intestinal secretion, thus enhancing the colon's motility, reducing overall colonic transit time, and increasing the water content of the stool. Bisacodyl inhibits the absorption of fluids by activating adenylate cyclase in the small intestinal enterocytes. This leads to an increase in cyclic AMP, active secretion of Cl- and HCO3-, passive efflux of Na+, K+, and water, and inhibition of the enterocyte's ability to absorb Na+ and Cl-.[72]

By reducing the expression of aquaporin 3 (AQP3) in the colon and preventing water passage from the digestive tract to the vascular side of the cells, bisacodyl may also have a laxative effect.

Bassotti et al. looked at the impact of a bisacodyl solution containing 10 mg. They discovered that one or more high amplitude propagated contractions (HAPCs) were present in the motor response of roughly 90% of patients with slow transit constipation. According to a study by Min et al., bisacodyl improves the spatiotemporal-coordinated pattern of HAPCs, which suggests that it may be used to treat constipation in patients with neuropathy. Bisacodyl increases sigmoid colon longitudinal muscle tone by directly acting on the smooth muscle, not the colonic circular muscle.[73]

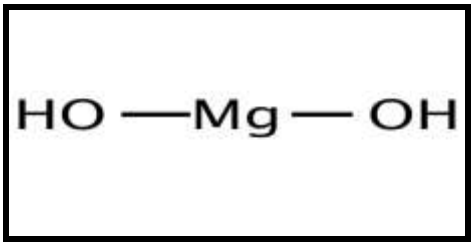
Adverse effects

More than 5% of individuals on bisacodyl have headache, diarrhea, and abdominal pain, primarily in the upper abdomen. These are the most frequent side effects. Chronic bisacodyl use is unlikely to be detrimental to the colon, but it may cause pain and discomfort in the abdomen, particularly cramping. However, it is generally safe, effective, and well-tolerated in both adults and children. Researchers Joo JS et al. found that 45 percent of patients who used bisacodyl or other laxatives (phenolphthalein, senna, and casanthranol) more than three times a week for a year or more experienced radiographic changes in their colonic redundancy and dilation, as well as a loss of haustral markings. These changes did not occur in the control groups. It might imply that these substances harm the colonic longitudinal muscles or cause damage to neurons.[74]

Dosage

Bisacodyl can be administered orally or intrarectally. Adults on bisacodyl are prescribed 5–10 mg tablets once a day, preferably at night or before bed, as the medication takes effect 6–12 hours after oral administration, allowing for morning therapy. Because bisacodyl takes 15 to 60 minutes to take effect after being administered rectal, it can also be given in doses of 10 mg as an enema or suppository in the morning. To achieve total bowel evacuation, oral doses of 10 to 20 mg are administered. The next morning, 10 mg is administered as a suppository. Five milligrams of oral or rectal bisacodyl administered once a day at night is the recommended dosage for children aged three to ten. Up to 10 mg can be administered daily to children over the age of ten in one dosage at night. Because bisacodyl promotes PGE2 synthesis, which lowers AQP3 expression, continued use of the drug may reduce its effectiveness. Prolonged usage of drugs that lower colonic AQP3 expression can decrease their effectiveness.[71

MILK OF MAGNESIA



Mechanism of action

After ingestion, the magnesium hydroxide suspension reaches the stomach. Depending on how much is consumed, magnesium hydroxide will function as a laxative or an antacid. When 0.5–1.5 grams are consumed (by adults), the magnesium hydroxide works in the stomach by neutralizing basic acid. The hydroxide ions from the magnesium hydroxide suspension will mix with the hydrochloric acid produced by the parietal cells in the stomach's acidic H+ ions. Water and magnesium chloride will be the products of this neutralizing process. When ingested in the colon in amounts ranging from 2 to 5 grams (for adults), magnesium hydroxide has laxative properties. The majority of the suspension draws water into the gut from surrounding tissues by an osmotic action because it is not absorbed in the intestinal system. The feces' intraluminal volume will rise and they will become softer as a result of the increased water content in the intestines. The urge to urinate is still induced and intestinal motility is stimulated by these effects. In the intestines, magnesium hydroxide also causes the production of cholecystokinin (CKK), which increases intestinal motility and causes the lumen to fill with water and electrolytes.[75]

Dosage

When taking milk of magnesia, individuals who are old enough should also drink a full glass (8 ounces) of water. For precision, use the supplied 15 milliliter (ml) dosage cup or spoon. Taking the prescription right before bed is recommended.

The number of milliliters required to treat constipation with the original form of milk of magnesia varies based on an individual's age.

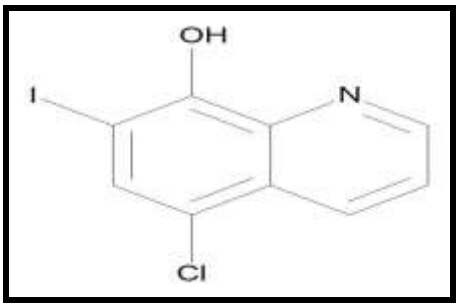
- An adult can consume 30 to 60 milliliters.
- 6–11-year-olds can take 15–30 milliliters.
- Consult a physician before administering this drug to kids younger than six. The recommended dosage for adults using the concentrated form of milk of magnesia is 15–30 ml.
- Consult a physician before administering this drug to kids younger than twelve.
- Children's chewable pills are also available. Every dosage should be followed by a full glass of liquid for kids. Age-related variations in dosage: Children between the ages of 6 and 12 can take 3-6 pills daily.
- 1-6-year-olds can take one to three pills daily.
- Before providing this drug to a kid under two years old, see a doctor.
- Magnesium milk shouldn't be used as a laxative for longer than seven days in a row. Consult a physician if you continue to experience stomach pain or if you require a laxative. After consuming milk of magnesia, constipation normally goes away after six hours. A person should cease taking milk of magnesia and consult a physician if they do not have a bowel movement after doing so.In some situations, constipation can be the result of an underlying medical ailment that requires further care from a physician.[76]

Side effects

If you have any of the following symptoms of an allergic reaction: hives; trouble breathing; swelling of the face, lips, tongue, or throat, get emergency medical attention.

If you experience severe nausea, vomiting, or diarrhea; no bowel movement after using the medication as a laxative; bleeding; or worsening symptoms, stop taking magnesium hydroxide and contact your doctor right once. Common adverse effects include be loss of flavor or diarrhea. Other adverse effects might also arise; this is not an exhaustive list. For medical advice regarding side effects, contact your physician. By calling 1-800-FDA-1088, you can report side effects to the FDA.[77]

QUINIODOCHLOR



Mechanism of action

Quiniodochlor is thought to obstruct the parasites' ability to replicate their DNA and metabolize their food. Additionally, quiniodochlor might impede several enzymes that are necessary for the parasites to survive.[77]

Adverse effects

Quiniodochlor adverse effects include headache, nausea, vomiting, dizziness, vertigo, rash, hair loss, and abnormal liver function tests. It can also cause gastrointestinal pain. In large dosages, quiniodochlor can potentially be neurotoxic, resulting in symptoms such ataxia, tremor, confusion, and visual loss.[78]

Uses

Quiniodochlor is used to treat intestinal illnesses brought on by worms and amoeba, including giardiasis, balantidiasis, and amoebic dysentery. Quiniodochlor is also applied topically to treat fungal-induced skin illnesses, including dermatophytosis, dermatitis, and pityriasis versicolor.[79]

Doses

Quiniodochlor comes in a variety of dosage forms and strengths, including pills, capsules, creams, and ointments. The kind and severity of the infection, the patient's age, weight, and health status all affect the dosage and length of treatment. Adults typically take 250–500 mg orally three times a day for ten days. Adults

often apply a thin layer of cream or ointment to the afflicted area two or three times a day as their topical dose. Children typically require a lesser dosage, which should be decided by the physician. It is recommended to take quiniodochlor with food and lots of water. If the next dose is almost due, then the missing dose should be taken as soon as feasible.[80]

CONCLUSION

To sum up, a full analysis of the OTC medicine landscape is provided in the review article "Exploring Over-the-Counter (OTC) Medications: A Comprehensive Review of Market Offerings and Their Clinical Implications." The thorough examination explores the variety of market offerings, illuminating the vast range of options accessible to customers. The article highlights the importance of over-the-counter (OTC) drugs in managing a range of health issues, stressing their availability and practicality. It emphasizes how the over-the-counter (OTC) sector is driven by consumers, who frequently look to self-care products for common illnesses. These drugs' clinical consequences are thoroughly examined, taking into account their safety, effectiveness, and any interactions. The writers carefully traverse the complexity of over-the-counter pharmaceuticals throughout the review, examining how to strike a balance between giving consumers choice and encouraging responsible use. The regulatory frameworks discussion sheds light on the difficulties in preserving safety while meeting the wide range of wants of the populace. The paper also highlights new developments and trends in the over-the-counter (OTC) business, projecting future changes in customer preferences and advances in formulation. It highlights how critical it is for medical staff to actively communicate with patients in order to guarantee that OTC decision-makers are making well-informed choices. The review highlights the need for more research to improve our knowledge of OTC medication's long-term effects, potential hazards, and effects on particular populations in order to evaluate the shortcomings of the existing OTC landscape. In order to promote a responsible and developing over-the-counter (OTC) sector, the authors urge continued cooperation between regulatory agencies, healthcare providers, and industry stakeholders. All things considered, "Exploring Over-the-Counter (OTC) Medications" is an invaluable tool for consumers, researchers, and healthcare professionals. The article enhances our understanding of OTC drugs by guiding readers through their complex environment and highlighting their clinical and wider public health implications.

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