

DIFFORAL CAPSULES 125 mg
DIFFORAL CAPSULES 250 mg

Vancomycin Hydrochloride USP

PRODUCT DESCRIPTION

DIFFORAL CAPSULES 125 mg contain vancomycin hydrochloride, equivalent to 125 mg vancomycin. DIFFORAL CAPSULES 250 mg contain vancomycin hydrochloride, equivalent to 250 mg vancomycin. Excipient in the capsule includes polyethylene glycol. The capsule shells contain the excipients listed below:

- 125 mg: Gelatin, titanium dioxide, brilliant blue, allura red, polyethylene glycol, iron oxide yellow and iron oxide red.
- 250 mg: Gelatin, titanium dioxide, brilliant blue, allura red, polyethylene glycol, iron oxide red and iron oxide black.

DIFFORAL CAPSULES 125 mg: A size 2, opaque blue/opaque brown hard gelatin capsule with a white to slightly red solid mass.
DIFFORAL CAPSULES 250 mg: A size 0, opaque blue/opaque lavender hard gelatin capsule with a white to slightly red solid mass.

INDICATIONS AND USAGE

Vancomycin Hydrochloride Capsule is indicated for the treatment of *C. difficile*-associated diarrhea. Vancomycin Hydrochloride Capsule is also used for the treatment of enterocolitis caused by *Staphylococcus aureus* (including methicillin-resistant strains) in adult and pediatric patients less than 18 years of age.

Limitations of Use

- Parenteral administration of vancomycin is not effective for the above infections; therefore, Vancomycin Hydrochloride Capsule must be given orally for these infections.
- Orally administered Vancomycin Hydrochloride Capsule is not effective for other types of infections.

To reduce the development of drug-resistant bacteria and maintain the effectiveness of Vancomycin Hydrochloride Capsule and other antibacterial drugs, Vancomycin Hydrochloride Capsule should be used only to treat or to prevent infection that are proven or strongly suspected to be caused by susceptible bacteria. When culture and susceptibility information are available, they should be considered in selecting or modifying antibacterial therapy. In the absence of such data, local epidemiology and susceptibility patterns may contribute to the empiric selection of therapy.

DOSAGE AND ADMINISTRATION

Adults

Vancomycin Hydrochloride Capsule is used in treating *C. difficile*-associated diarrhea and staphylococcal enterocolitis.

- C. difficile*-associated diarrhea: The recommended dose is 125 mg administered orally 4 times daily for 10 days.
- Staphylococcal enterocolitis: Total daily dosage is 500 mg to 2 g administered orally in 3 or 4 divided doses for 7 to 10 days.

Pediatric Patients (less than 18 years of age)

For both *C. difficile*-associated diarrhea and staphylococcal enterocolitis, the usual daily dosage is 40 mg/kg in 3 or 4 divided doses for 7 to 10 days. The total daily dosage should not exceed 2 g.

CONTRAINDICATIONS

Vancomycin Hydrochloride Capsule is contraindicated in patients with known hypersensitivity to vancomycin.

WARNINGS AND PRECAUTIONS

Oral Use Only

The Capsule should be taken whole. This preparation for the treatment of colitis is for oral use only and is not systemically absorbed. Vancomycin Hydrochloride Capsule must be given orally for treatment of staphylococcal enterocolitis and *Clostridium difficile*-associated diarrhea. Orally administered Vancomycin Hydrochloride Capsule is not effective for other types of infections. Parenteral administration of vancomycin is not effective for treatment of staphylococcal enterocolitis and *C. difficile*-associated diarrhea. If parenteral vancomycin therapy is desired, use an intravenous preparation of vancomycin and consult the package insert accompanying that preparation.

Potential for Systemic Absorption

Clinically significant serum concentrations have been reported in some patients who have taken multiple oral doses of Vancomycin Hydrochloride Capsule for active *C. difficile*-associated diarrhea. Some patients with inflammatory disorders of the intestinal mucosa also may have significant systemic absorption of vancomycin. These patients may be at risk for the development of adverse reactions associated with higher doses of Vancomycin Hydrochloride Capsule; therefore, monitoring of serum concentrations of vancomycin may be appropriate in some instances, e.g., in patients with renal insufficiency and/or colitis or in those receiving concomitant therapy with an aminoglycoside antibiotic.

Nephrotoxicity

Nephrotoxicity (e.g., reports of renal failure, renal impairment, blood creatinine increased) has occurred following oral Vancomycin Hydrochloride Capsule therapy in randomized controlled clinical studies and can occur either during or after completion of therapy. The risk of nephrotoxicity is increased in patients >65 years of age (see *ADVERSE REACTIONS* and *USE IN SPECIFIC POPULATIONS, Geriatric Use*). In patients >65 years of age, including those with normal renal function prior to treatment, renal function should be monitored during and following treatment with Vancomycin Hydrochloride Capsule to detect potential vancomycin induced nephrotoxicity.

Ototoxicity

Ototoxicity has occurred in patients receiving vancomycin. It may be transient or permanent. It has been reported mostly in patients who have been given excessive intravenous doses, who have an underlying hearing loss, or who are receiving concomitant therapy with another ototoxic agent, such as an aminoglycoside. Serial tests of auditory function may be helpful in order to minimize the risk of ototoxicity (see *ADVERSE REACTIONS, Post marketing Experience*).

Superinfection

Use of Vancomycin Hydrochloride Capsule may result in the overgrowth of nonsusceptible bacteria. If superinfection occurs during therapy, appropriate measures should be taken.

Development of Drug-Resistant Bacteria

Prescribing Vancomycin Hydrochloride Capsule in the absence of a proven or strongly suspected bacterial infection is unlikely to provide benefit to the patient and increases the risk of the development of drug resistant bacteria.

ADVERSE REACTIONS

Clinical Trial Experience

Because clinical studies are conducted under widely varying conditions, adverse reaction rates observed in the clinical studies of a drug cannot be directly compared to rates in the clinical studies of another drug and may not reflect the rates observed in practice.

The data described below reflect exposure to vancomycin hydrochloride in 260 adult subjects in two Phase 3 clinical trials for the treatment of diarrhea associated with *C. difficile*. In both trials, subjects received vancomycin hydrochloride capsule 125 mg orally four times daily. The mean duration of treatment was 9.4 days. The median age of patients was 67, ranging between 19 and 96 years of age. Patients were predominantly Caucasian (93%) and 52% were male.

Adverse reactions occurring in ≥ 5% of vancomycin hydrochloride-treated subjects are shown in Table 1. The most common adverse reactions associated with vancomycin hydrochloride (≥ 10%) were nausea, abdominal pain, and hypokalemia.

Table 1: Common (≥ 5%) Adverse Reactions* for Vancomycin Hydrochloride Reported in Clinical Trials for Treatment of Diarrhea Associated with *C. difficile*

System/Organ Class	Adverse Reaction	Vancomycin Hydrochloride % (N=260)
Gastrointestinal disorders	Nausea	17
	Abdominal pain Vomiting	15
	Diarrhea	9
	Flatulence	9
		8
General disorders and administration site conditions	Pyrexia	9
	Edema peripheral	6
	Fatigue	5
Infections and infestations	Urinary tract infection	8
Metabolism and nutrition disorders	Hypokalemia	13
Musculoskeletal and connective tissue disorders	Back pain	6
Nervous system disorders	Headache	7
* Adverse reaction rates were derived from the incidence of treatment-emergent adverse events.		

Nephrotoxicity (e.g., reports of renal failure, renal impairment, blood creatinine increased) occurred in 5% of subjects treated with vancomycin hydrochloride. Nephrotoxicity following vancomycin hydrochloride typically first occurred within one week after completion of treatment (median day of onset was Day 16). Nephrotoxicity following vancomycin hydrochloride occurred in 6% of subjects >65 years of age and 3% of subjects ≤65 years of age (see *WARNINGS AND PRECAUTIONS, Nephrotoxicity*). The incidences of hypokalemia, urinary tract infection, peripheral edema, insomnia, constipation, anemia, depression, vomiting, and hypotension were higher among subjects >65 years of age than in subjects ≤65 years of age (see *USE IN SPECIFIC POPULATIONS, Geriatric Use*). Discontinuation of study drug due to adverse events occurred in 7% of subjects treated with vancomycin hydrochloride. The most common adverse events leading to discontinuation of vancomycin hydrochloride were *C. difficile* colitis (<1%), nausea (<1%), and vomiting (<1%).

Post marketing Experience

The following adverse reactions have been identified during post-approval use of vancomycin hydrochloride. Because these reactions are reported voluntarily from a population of uncertain size, it is not always possible to reliably estimate their frequency or establish a causal relationship to drug exposure.

Ototoxicity: Cases of hearing loss associated with intravenously administered vancomycin have been reported. Most of these patients had kidney dysfunction or a preexisting hearing loss or were receiving concomitant treatment with an ototoxic drug (see *WARNINGS AND PRECAUTIONS, Ototoxicity*).

Vertigo, dizziness, and tinnitus have been reported.

Hematopoietic: Reversible neutropenia, usually starting 1 week or more after onset of intravenous therapy with vancomycin or after a total dose of more than 25 g, has been reported for several dozen patients. Neutropenia appears to be promptly reversible when vancomycin is discontinued. Thrombocytopenia has been reported. *Miscellaneous*: Patients have been reported to have had anaphylaxis, drug fever, chills, nausea, eosinophilia, rashes (including exfoliative dermatitis), Stevens-Johnson syndrome, toxic epidermal necrolysis, and rare cases of vasculitis in association with the administration of vancomycin. A condition has been reported that is similar to the IV-induced syndrome with symptoms consistent with anaphylactoid reactions, including hypotension, wheezing, dyspnea, urticaria, pruritus, flushing of the upper body (“Red Man Syndrome”), pain and muscle spasm of the chest and back. These reactions usually resolve within 20 minutes but may persist for several hours.

DRUG INTERACTIONS

No drug interaction studies have been conducted.

USE IN SPECIFIC POPULATIONS

Pregnancy

Pregnancy Category B: The highest doses of vancomycin tested were not teratogenic in rats given up to 200 mg/kg/day IV (1180 mg/m² or 1 time the recommended maximum human dose based on body surface area) or in rabbits given up to 120 mg/kg/day IV (1320 mg/m² or 1.1 times the recommended maximum human dose-based body surface area). No effects on fetal weight or development were seen in rats at the highest dose tested or in rabbits given 80 mg/kg/day (880 mg/m² or 0.74 times the recommended maximum human dose based on body surface area).

In a controlled clinical study, the potential ototoxic and nephrotoxic effects of vancomycin on infants were evaluated when the drug was administered intravenously to pregnant women for serious staphylococcal infections complicating intravenous drug abuse. Vancomycin was found in cord blood.

No sensorineural hearing loss or nephrotoxicity attributable to vancomycin was noted. One infant whose mother received vancomycin in the third trimester experienced conductive hearing loss that was not attributed to the administration of vancomycin. Because the number of subjects treated in this study was limited and vancomycin was administered only in the second and third trimesters, it is not known whether vancomycin causes fetal harm. Because animal reproduction studies are not always predictive of human response, vancomycin hydrochloride capsule should be given to a pregnant woman only if clearly needed.

Nursing Mothers

Vancomycin is excreted in human milk based on information obtained with the intravenous administration of vancomycin. However, systemic absorption of vancomycin is very low following oral administration of vancomycin hydrochloride capsule (see *CLINICAL PHARMACOLOGY, Pharmacokinetics*). It is not known whether vancomycin is excreted in human milk, as no studies of vancomycin concentration in human milk after oral administration have been done. Caution should be exercised when vancomycin hydrochloride capsule is administered to a nursing woman. Because of the potential for adverse events, a decision should be made whether to discontinue nursing or discontinue the drug, taking into account the importance of the drug to the mother.

Pediatric Use

Data on safety and effectiveness of the product in paediatric patients is limited.

Geriatric Use

In clinical trials, 54% of vancomycin hydrochloride-treated subjects were >65 years of age. Of these, 40% were between the ages of >65 and 75, and 60% were >75 years of age. Clinical studies with vancomycin hydrochloride in diarrhea associated with *Clostridium difficile* have demonstrated that geriatric subjects are at increased risk of developing nephrotoxicity following treatment with oral vancomycin hydrochloride, which may occur during or after completion of therapy. In patients >65 years of age, including those with normal renal function prior to treatment, renal function should be monitored during and following treatment with vancomycin hydrochloride to detect potential vancomycin induced nephrotoxicity (see *WARNINGS AND PRECAUTIONS, Nephrotoxicity; ADVERSE REACTIONS, Clinical Trial Experience* and *CLINICAL STUDIES, Diarrhea Associated with Clostridium difficile*).

Patients >65 years of age may take longer to respond to therapy compared to patients ≤65 years of age (see *CLINICAL STUDIES, Diarrhea Associated with Clostridium difficile*). Clinicians should be aware of the importance of appropriate duration of vancomycin hydrochloride treatment in patients >65 years of age and not discontinue or switch to alternative treatment prematurely.

OVERDOSAGE

Supportive care is advised, with maintenance of glomerular filtration. Vancomycin is poorly removed by dialysis. Hemofiltration and hemoperfusion with polysulfone resin have been reported to result in increased vancomycin clearance.

To obtain up-to-date information about the treatment of overdose, a good resource is your certified Regional Poison Control Center. In managing overdose, consider the possibility of multiple drug overdoses, interaction among drugs, and unusual drug kinetics.

CLINICAL PHARMACOLOGY

Mechanism of Action

Vancomycin is an antibacterial drug (see *CLINICAL PHARMACOLOGY, Microbiology*). Details of the actions is provided in *Microbiology* section.

Pharmacokinetics

Vancomycin is poorly absorbed after oral administration. During multiple dosing of 250 mg every 8 hours for 7 doses, fecal concentrations of vancomycin in volunteers exceeded 100 mg/kg in the majority of samples. No blood concentrations were detected and urinary recovery did not exceed 0.76%. In anephric subjects with no inflammatory bowel disease who received vancomycin oral solution 2 g for 16 days, blood concentrations of vancomycin were less than or equal to 0.66 µg/mL in 2 of 5 subjects. No measurable blood concentrations were attained in the other 3 subjects. Following doses of 2 g daily, concentrations of drug were >3100 mg/kg in the feces and <1 µg/mL in the serum of subjects with normal renal function who had *C. difficile*-associated diarrhea. After multiple-dose oral administration of vancomycin, measurable serum concentrations may occur in patients with active *C. difficile* associated diarrhea, and, in the presence of renal impairment, the possibility of accumulation exists. It should be noted that the total systemic and renal clearances of vancomycin are reduced in the elderly (see *USE IN SPECIFIC POPULATIONS, Geriatric Use*).

Microbiology

Mechanism of action

The bactericidal action of vancomycin against *Staphylococcus aureus* and the vegetative cells of *Clostridium difficile* results primarily from inhibition of cell-wall biosynthesis. In addition, vancomycin alters bacterial-cell-membrane permeability and RNA synthesis.

Mechanism of resistance

Staphylococcus aureus:

S. aureus isolates with vancomycin minimal inhibitory concentrations (MICs) as high as 1024 mcg/mL have been reported. The exact mechanism of this resistance is not clear but is believed to be due to cell wall thickening and potentially the transfer of genetic material.

Clostridium difficile:

Isolates of *C. difficile* generally have vancomycin MICs of <1 mcg/mL, however vancomycin MICs ranging from 4 mcg/mL to 16 mcg/mL have been reported. The mechanism which mediates *C. difficile*'s decreased susceptibility to vancomycin has not been fully elucidated. Vancomycin has been shown to be active against susceptible isolates of the following bacteria in clinical infections as described in the *INDICATIONS AND USAGE* section.

Gram-positive bacteria:

Staphylococcus aureus (including methicillin-resistant isolates) associated with enterocolitis.

Anaerobic gram-positive bacteria:

Clostridium difficile isolates associated with *C. difficile* associated diarrhea.

NONCLINICAL TOXICOLOGY

Carcinogenesis, Mutagenesis, Impairment of Fertility

No long-term carcinogenesis studies in animals have been conducted. At concentrations up to 1000 µg/mL, vancomycin had no mutagenic effect *in vitro* in the mouse lymphoma forward mutation assay or the primary rat hepatocyte unscheduled DNA synthesis assay. The concentrations tested *in vitro* were above the peak plasma vancomycin concentrations of 20 to 40 µg/mL usually achieved in humans after slow infusion of the maximum recommended dose of 1 g. Vancomycin had no mutagenic effect *in vivo* in the Chinese hamster sister chromatid exchange assay (400 mg/kg IP) or the mouse micronucleus assay (800 mg/kg IP). No definitive fertility studies have been conducted.

CLINICAL STUDIES

Diarrhea Associated with *Clostridium difficile*

In two trials, Vancomycin Hydrochloride Capsule 125 mg orally four times daily for 10 days was evaluated in 266 adult subjects with *C. difficile*-associated diarrhea (CDAD). Enrolled subjects were 18 years of age or older and received no more than 48 hours of treatment with oral vancomycin hydrochloride or oral/intravenous metronidazole in the 5 days preceding enrolment. CDAD was defined as ≥3 loose or watery bowel movements within the 24 hours preceding enrolment, and the presence of either *C. difficile* toxin A or B, or pseudomembranes on endoscopy within the 72 hours preceding enrolment. Subjects with fulminant *C. difficile* disease, sepsis with hypotension, ileus, peritoneal signs or severe hepatic disease were excluded. Efficacy analyses were performed on the Full Analysis Set (FAS), which included randomized subjects who received at least one dose of vancomycin hydrochloride and had any post-dosing investigator evaluation data (N=259; 134 in Trial 1 and 125 in Trial 2).

The demographic profile and baseline CDAD characteristics of enrolled subjects were similar in the two trials. Vancomycin Hydrochloride-treated subjects had a median age of 67 years, were mainly white (93%), and male (52%). CDAD was classified as severe (defined as 10 or more unformed bowel movements per day or WBC ≥ 15000/mm3) in 25% of subjects, and 47% were previously treated for CDAD. Efficacy was assessed by using clinical success, defined as diarrhea resolution and the absence of severe abdominal discomfort due to CDAD, on Day 10. An additional efficacy endpoint was the time to resolution of diarrhea, defined as the beginning of diarrhea resolution that was sustained through the end of the prescribed active treatment period.

The results for clinical success for vancomycin hydrochloride-treated subjects in both trials are shown in Table 2.

Table 2: Clinical Success Rates (Full Analysis Set)

System/Organ Class	Clinical Success Rate	95% Confidence Interval
	Vancomycin Hydrochloride % (N)	
Trial 1	81.3 (134)	(74.4, 88.3)
Trial 2	80.8 (125)	(73.5, 88.1)

The median time to resolution of diarrhea was 5 days and 4 days in Trial 1 and Trial 2, respectively. For subjects older than 65 years of age, the median time to resolution was 6 days and 4 days in Trial 1 and Trial 2, respectively. In subjects with diarrhea resolution at end-of-treatment with vancomycin hydrochloride capsule, recurrence of CDAD during the following four weeks occurred in 25 of 107 (23%) and 18 of 102 (18%) in Trial 1 and Trial 2, respectively. Restriction Endonuclease Analysis (REA) was used to identify *C. difficile* baseline isolates in the BI group. In Trial 1, the Vancomycin Hydrochloride-treated subjects were classified at baseline as follows 31 (23%) with BI strain, 69 (52%) with non-BI strain, and 34 (25%) with unknown strain. Clinical success rates were 87% for BI strain, 81% for non-BI strain, and 76% for unknown strain. In subjects with diarrhea resolution at end-of-treatment with vancomycin hydrochloride, recurrence of CDAD during the following four weeks occurred in 7 of 26 subjects with BI strain, 12 of 56 subjects with non-BI strain, and 6 of 25 subjects with unknown strain.

PATIENT COUNSELING INFORMATION

Patients should be counselled that antibacterial drugs including Vancomycin Hydrochloride should only be used to treat bacterial infections. They do not treat viral infections (e.g., the common cold). When Vancomycin Hydrochloride is prescribed to treat a bacterial infection, patients should be told that although it is common to feel better early in the course of therapy, the medication should be taken exactly as directed. Skipping doses or not completing the full course of therapy may (1) decrease the effectiveness of the immediate treatment and (2) increase the likelihood that bacteria will develop resistance and will not be treatable by Vancomycin Hydrochloride or other antibacterial drugs in the future.

STORAGE CONDITION

Store at or below 30°C. Protect from moisture. Keep out of reach and sight of children.

PRESENTATION

DIFFORAL CAPSULES 125 mg and DIFFORAL CAPSULES 250 mg are available in PVC/PE/Aclar – Alu blister packs. Each blister strip contains 10 capsules, and 2 blister strips are packed in a carton.

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