



For the prevention of nausea and vomiting in patients receiving moderately and/or highly emetogenic chemotherapy regimens of up to 5 consecutive days' duration.¹

See if Sancuso (Granisetron Transdermal System) Is Right for You to Treat Your Chemotherapy-Induced Nausea and Vomiting (CINV)

- **Some patients may have difficulty swallowing or absorbing oral CINV medications** because of complications from their cancer and cancer treatments²⁻⁴
- **The Sancuso patch**—the first and only patch for CINV—may be an option for you based on your cancer and your treatment^{1,5}

Use the handy checklist on back to start a conversation with your healthcare provider!

Indication

Sancuso (Granisetron Transdermal System) is indicated for the prevention of nausea and vomiting in patients receiving moderately and/or highly emetogenic chemotherapy regimens of up to 5 consecutive days' duration.

Important Safety Information

Do not use Sancuso if you are allergic to granisetron or any of the other ingredients in Sancuso. Tell your healthcare professional if you are pregnant, if you plan to become pregnant, or you are breastfeeding. Tell your healthcare professional if you have pain or swelling in stomach area (abdomen), or if you are allergic to medical adhesive tape, adhesive dressings, or other skin patches. Skin reactions can happen just at the patch application site or outside the patch application site. Tell your healthcare professional if you get any redness, rashes, bumps, blisters or itching at the patch application site, and especially if they spread outside the place where the patch was or if they appear outside the patch application site. You may need to stop using Sancuso. Tell your healthcare professional about all the medicines you take, including prescription and nonprescription medicines, vitamins, and herbal supplements. Other medicines may affect how Sancuso works. Sancuso may also affect how your other medicines work. Do not apply any heat source over or near the Sancuso patch. For example, a heating pad or heat lamp should not be used where the patch is applied. You should also avoid extended exposure to heat as it may increase your granisetron blood levels during the time of heat exposure. The medicine in Sancuso (granisetron) may not work well and/or may affect your skin if exposed to direct sunlight and the light from sunlamps or tanning beds. While wearing the patch keep it covered with clothing if you will be in sunlight or near a sunlamp, including tanning beds. Keep the skin where Sancuso was applied covered for another 10 days after the patch is taken off to protect from exposure to direct sunlight. You may see mild redness on the skin where the patch is removed. This redness should go away within three days. If redness continues, tell your healthcare professional. The most common side effect of Sancuso is constipation. This is not the only possible side effect of Sancuso. Tell your healthcare professional if you have any side effect that bothers you or that does not go away. Sancuso is a prescription medicine used to prevent nausea and vomiting in people receiving some types of chemotherapy treatment. For more information, ask your healthcare professional or pharmacist.

To report suspected adverse reactions, contact Kyowa Kirin at 1-800-SANCUSO. You are encouraged to report negative side effects of prescription drugs to the FDA. Visit <http://www.fda.gov/medwatch> or call 1-800-FDA-1088.

Please see accompanying full Prescribing Information and Important Safety Information, including sunlight warning. Take the Patient Information attached to the back of this pad.

If You Have Chemotherapy Complications
That May Make Oral Medications Hard to Take...

Ask Your Doctor About Saying NO to Chemotherapy-Induced Nausea and Vomiting (CINV) with the Sancuso[®] Patch

If you can check any of the boxes below, ask your healthcare provider if the Sancuso patch may be a CINV treatment option for you

 MOUTH PROBLEMS	 GASTROINTESTINAL (GI) ISSUES	 CHEMOTHERAPY WITH A 90% OR MORE CHANCE OF CINV¹⁷
<input type="checkbox"/> Hard to swallow ² <input type="checkbox"/> Physical difficulty due to the cancer (eg, head or neck cancer) <input type="checkbox"/> Side effects from chemotherapy, such as: <input type="checkbox"/> mouth sores ⁶ <input type="checkbox"/> oral mucositis ^{6,7} <input type="checkbox"/> oral infections ⁸ <input type="checkbox"/> xerostomia/mouth dryness ⁹	<input type="checkbox"/> Chemotherapy lasting up to 5 days ^{10,11} for GI ¹² or gynecologic cancers <input type="checkbox"/> Opioids taken for pain management that may cause constipation ¹³ <input type="checkbox"/> Side effects from chemotherapy, such as: <input type="checkbox"/> GI mucositis ¹⁴ <input type="checkbox"/> diarrhea ¹⁵ <input type="checkbox"/> bowel obstructions or perforations ¹⁶	<input type="checkbox"/> AC (doxorubicin or epirubicin with cyclophosphamide) <input type="checkbox"/> Carmustine >250 mg/m ² <input type="checkbox"/> Cisplatin <input type="checkbox"/> Cyclophosphamide >1500 mg/m ² <input type="checkbox"/> Dacarbazine <input type="checkbox"/> Mechlorethamine <input type="checkbox"/> Streptozocin

To learn more about the Sancuso patch and how to tell if it may be right for you to help control CINV, call 1-800-SANCUSO (1-800-726-2876) or visit www.Sancuso.com.

References: 1. Sancuso [package insert], Bedminster, NJ; Prostrakan Inc 2015. 2. Raber-Durlacher JE, Brennan MT, Verdonck-de Leeuw IM, et al. Swallowing dysfunction in cancer patients. *Support Care Cancer*. 2012;20:433-443. 3. Di Lorenzo C, Youssef NN. Diagnosis and management of intestinal motility disorders. *Semin Pediatr Surg*. 2010;19:50-58. 4. Keller J, Layer P. Intestinal and anorectal motility and functional disorders. *Best Pract Res Clin Gastroenterol*. 2009;23:407-423. 5. Schulmeister L. Granisetron transdermal system: a new option to help prevent chemotherapy-induced nausea and vomiting. *Clin J Oncol Nurs*. 2009;13(6):711-714. 6. Cawley MM, Benson LM. Current trends in managing oral mucositis. *Clin J Oncol Nurs*. 2005;9(5):584-592. 7. Lalla RV, Bowen J, Barasch A, et al. MASCC/ISO clinical practice guidelines for the management of mucositis secondary to cancer therapy. *Cancer*. 2014;120:1453-1461. 8. Lalla RV, Latortue MC, Hong CH, et al. A systematic review of oral fungal infections in patients receiving cancer therapy. *Support Care Cancer*. 2010;18(8):985-992. 9. Jensen SB, Pedersen AML, Vissink A, et al. A systematic review of salivary gland hypofunction and xerostomia induced by cancer therapies: prevalence, severity and impact on quality of life. *Support Care Cancer*. 2010;18:1039-1060. 10. Tuca A. Use of granisetron transdermal system in the prevention of chemotherapy-induced nausea and vomiting: a review. *Cancer Manag Res*. 2009; 2:1-12. 11. Boccia RV. Chemotherapy induced nausea and vomiting: identifying and addressing unmet needs. *JCOM*. 2013;20(8):377-384. 12. Blazer M, Phillips G, Reardon J, et al. Antiemetic control with palonosetron in patients with gastrointestinal cancer receiving a fluoropyrimidine-based regimen in addition to either irinotecan or oxaliplatin: a retrospective study. *Oncology*. 2012;83:135-140. 13. National Cancer Institute website. Nausea and Vomiting (PDQ®) Nausea, Vomiting (Emesis), Constipation, and Bowel Obstruction in Advanced Cancer. http://www.cancer.gov/about-cancer/treatment/side-effects/pain/pain-hp-pdq/#link/_62. Accessed on March 3, 2016. 14. Keefe DM. Intestinal mucositis: mechanisms and management. *Curr Opin Oncol*. 2007;19:323-327. 15. Muehlbauer PM, Thorpe D, Davis A, et al. Putting evidence into practice: evidence based interventions to prevent, manage, and treat chemotherapy- and radiotherapy-induced diarrhea. *Clin J Oncol Nurs*. 2009;13(3):336-341. 16. Ripamonti CI, Easson AM, Gerdes H. Management of malignant bowel obstruction. *Eur J Cancer*. 2008;44:1105-1115. 17. National Comprehensive Cancer Network website. NCCN Clinical Practice Guidelines in Oncology: Antiemesis V.2.2015. http://www.nccn.org/professionals/physician_gls/PDF/antiemesis.pdf. Accessed March 2, 2016.

HIGHLIGHTS OF PRESCRIBING INFORMATION

These highlights do not include all the information needed to use SANCUSO safely and effectively. See full prescribing information for SANCUSO.

SANCUSO (Granisetron Transdermal System)

Initial U.S. Approval: 2008

INDICATIONS AND USAGE

Sancuso is a serotonin -3 (5-HT3) receptor antagonist indicated for the prevention of nausea and vomiting in patients receiving moderately and/or highly emetogenic chemotherapy for up to 5 consecutive days. (1)

DOSAGE AND ADMINISTRATION

Apply a single transdermal system (patch) to the upper outer arm a minimum of 24 hours before chemotherapy. The patch may be applied up to a maximum of 48 hours before chemotherapy as appropriate. Remove the patch a minimum of 24 hours after completion of chemotherapy. The patch can be worn for up to 7 days depending on the duration of the chemotherapy regimen. (2)

DOSAGE FORMS AND STRENGTHS

Transdermal System: 52 cm² patch containing 34.3 mg of granisetron delivering 3.1 mg per 24 hours (3)

CONTRAINDICATIONS

Known hypersensitivity to granisetron or to any of the components of the patch (4)

WARNINGS AND PRECAUTIONS

- Granisetron may mask a progressive ileus and/or gastric distention caused by the underlying condition. (5.1)
- Serotonin syndrome has been reported with 5-HT3 receptor antagonists alone but particularly with concomitant use of serotonergic drugs. (5.2)

- Mild application site reactions have occurred; remove patch if severe reactions or a generalized skin reaction occur. (5.3)
- Avoid exposing the granisetron patch and surrounding area to direct external heat sources, such as heating pads (5.4).
- Avoid direct exposure of application site to natural or artificial sunlight by covering with clothing while wearing the patch and for 10 days after removing it. (5.5)

ADVERSE REACTIONS

The most common adverse reaction (incidence ≥ 3%) is constipation. (6.1)

To report SUSPECTED ADVERSE REACTIONS, contact Kyowa Kirin, Inc. at 1-800-SANCUSO (1-800-726-2876) or FDA at 1-800-FDA-1088 or www.fda.gov/medwatch.

DRUG INTERACTIONS

No clinically relevant drug interactions have been reported in clinical studies with Sancuso. (7)

USE IN SPECIFIC POPULATIONS

- Pregnancy: Use only if clearly needed. (8.1)
- Nursing women: Caution should be exercised when administered to a nursing woman. (8.3)
- Pediatric use: Safety and effectiveness have not been established in pediatric patients. (8.4)
- Geriatric use: Clinical studies of Sancuso did not include sufficient numbers of subjects aged 65 and over to determine whether they respond differently from younger patients (8.5)

See 17 for PATIENT COUNSELING INFORMATION and FDA-approved patient labeling

Revised: 01/2017

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FULL PRESCRIBING INFORMATION

1 INDICATIONS AND USAGE

Sancuso® (Granisetron Transdermal System) is indicated for the prevention of nausea and vomiting in patients receiving moderately and/or highly emetogenic chemotherapy regimens of up to 5 consecutive days duration.

2 DOSAGE AND ADMINISTRATION

The transdermal system (patch) should be applied to clean, dry, intact healthy skin on the upper outer arm. Sancuso should not be placed on skin that is red, irritated, or damaged.

Each patch is packed in a pouch and should be applied directly after the pouch has been opened.

The patch should not be cut into pieces.

2.1 Adults

Apply a single patch to the upper outer arm a minimum of 24 hours before chemotherapy. The patch may be applied up to a maximum of 48 hours before chemotherapy as appropriate. Remove the patch a minimum of 24 hours after completion of chemotherapy. The patch can be worn for up to 7 days depending on the duration of the chemotherapy regimen.

3 DOSAGE FORMS AND STRENGTHS

Sancuso is a 52 cm² patch containing 34.3 mg of granisetron. The patch releases 3.1 mg of granisetron per 24 hours for up to 7 days.

4 CONTRAINDICATIONS

Sancuso is contraindicated in patients with known hypersensitivity to granisetron or to any of the components of the patch.

5 WARNINGS AND PRECAUTIONS

5.1 Gastrointestinal

The use of granisetron in patients may mask a progressive ileus and/or gastric distention caused by the underlying condition.

5.2 Serotonin Syndrome

The development of serotonin syndrome has been reported with 5-HT₃ receptor antagonists. Most reports have been associated with concomitant use of serotonergic drugs (e.g., selective serotonin reuptake inhibitors (SSRIs), serotonin and norepinephrine reuptake inhibitors (SNRIs), monoamine oxidase inhibitors, mirtazapine, fentanyl, lithium, tramadol, and intravenous methylene blue). Some of the reported cases were fatal. Serotonin syndrome occurring with overdose of another 5-HT₃ receptor antagonist alone has also been reported. The majority of reports of serotonin syndrome related to 5-HT₃ receptor antagonist use occurred in a post-anesthesia care unit or an infusion center.

Symptoms associated with serotonin syndrome may include the following combination of signs and symptoms: mental status changes (e.g., agitation, hallucinations, delirium, and coma), autonomic instability (e.g., tachycardia, labile blood pressure, dizziness, diaphoresis, flushing, hyperthermia), neuromuscular symptoms (e.g., tremor, rigidity, myoclonus, hyperreflexia, incoordination), seizures, with or without gastrointestinal symptoms (e.g., nausea, vomiting, diarrhea). Patients should be monitored for the emergence of serotonin syndrome, especially with concomitant use of Sancuso and other serotonergic drugs. If symptoms of serotonin syndrome occur, discontinue Sancuso and initiate supportive treatment. Patients should be informed of the increased risk of serotonin syndrome, especially if Sancuso is used concomitantly with other serotonergic drugs. [*see Drug Interactions (7), Patient Counseling Information (17.4)*].

5.3 Skin Reactions

In clinical trials with Sancuso, application site reactions were reported that were generally mild in intensity and did not lead to discontinuation of use. The incidence of reactions was comparable with placebo.

If severe reactions, or a generalized skin reaction occur (e.g., allergic rash, including erythematous, macular, papular rash or pruritus), the patch must be removed.

5.4 External Heat Sources

A heat pad should not be applied over or in vicinity of Sancuso patch. Patients should avoid prolonged exposure to heat as plasma concentration continues increasing during the period of heat exposure [*see Clinical Pharmacology (12.3)*].

5.5 Exposure to Sunlight

Granisetron may be affected by direct natural or artificial sunlight. Patients must be advised to cover the patch application site, e.g. with clothing, if there is a risk of exposure to sunlight throughout the period of wear and for 10 days following its removal because of a potential skin reaction [*see Nonclinical Toxicology (13.3)*].

6 ADVERSE REACTIONS

6.1 Clinical Trials Experience

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

The safety of Sancuso was evaluated in a total of 404 patients undergoing chemotherapy who participated in two double-blind, comparator studies with patch treatment durations of up to 7 days. The control groups included a total of 406 patients who received a daily dose of 2 mg oral granisetron, for 1 to 5 days.

Adverse reactions occurred in 8.7% (35/404) of patients receiving Sancuso and 7.1% (29/406) of patients receiving oral granisetron. The most common adverse reaction was constipation that occurred in 5.4% of patients in the Sancuso group and 3.0% of patients in the oral granisetron group.

Table 1 lists the adverse reactions that occurred in at least 3% of patients treated with Sancuso or oral granisetron.

Table 1: Incidence of Adverse Reactions in Double-Blind, Active Comparator Controlled Studies in Cancer Patients Receiving Chemotherapy (Events \geq 3% in either group)

Body System Preferred Term	Sancuso TDS N=404 (%)	Oral granisetron N=406 (%)
Gastrointestinal disorders		
Constipation	5.4	3.0
Nervous system disorders		
Headache	0.7	3.0

5-HT₃ receptor antagonists, such as granisetron, may be associated with arrhythmias or ECG abnormalities. Three ECGs were performed on 588 patients in a randomized, parallel group, double-blind, double-dummy study: at baseline before treatment, the first day of chemotherapy, and 5 to 7 days after starting chemotherapy. QTcF prolongation greater than 450 milliseconds was seen in a total of 11 (1.9%) patients after receiving granisetron, 8 (2.7%) on oral granisetron, and 3 (1.1%) on the patch. No new QTcF prolongation greater than 480 milliseconds was observed in any patient in this study. No arrhythmias were detected in this study.

Adverse reactions reported in clinical trials with other formulations of granisetron include the following:

Gastrointestinal: abdominal pain, diarrhea, constipation, elevation of ALT and AST levels, nausea and vomiting

Cardiovascular: hypertension, hypotension, angina pectoris, atrial fibrillation and syncope have been observed rarely

Central Nervous System: dizziness, insomnia, headache, anxiety, somnolence and asthenia

Hypersensitivity: rare cases of hypersensitivity reactions, sometimes severe (e.g. anaphylaxis, shortness of breath, hypotension, urticaria) have been reported

Other: fever; events often associated with chemotherapy have also been reported: leucopenia, decreased appetite, anemia, alopecia, thrombocytopenia.

6.2 Postmarketing Experience

The following adverse reactions have been identified during post approval use of Sancuso. 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.

General Disorders and Administration Site Conditions: Application site reactions (pain, pruritus, erythema, rash, irritation, vesicles, burn, discoloration, urticaria); patch non-adhesion.

Cardiac Disorders: bradycardia, chest pain, palpitations, sick sinus syndrome

7 DRUG INTERACTIONS

Granisetron does not induce or inhibit the cytochrome P-450 drug-metabolizing enzyme system *in vitro*. There have been no definitive drug-drug interaction studies to examine pharmacokinetic or pharmacodynamic interaction with other drugs. However, in humans, granisetron hydrochloride injection has been safely administered with drugs representing benzodiazepines, neuroleptics and anti-ulcer medications commonly prescribed with antiemetic treatments. Granisetron hydrochloride injection also does not appear to interact with emetogenic cancer therapies. In agreement with these data, no clinically relevant drug interactions have been reported in clinical studies with Sancuso.

Because granisetron is metabolized by hepatic cytochrome P-450 drug-metabolizing enzymes (CYP1A1 and CYP3A4), inducers or inhibitors of these enzymes may change the clearance and hence, the half-life of granisetron. In addition, the activity of the cytochrome P-450 subfamily 3A4 (involved in the metabolism of some of the main narcotic analgesic agents) is not modified by granisetron hydrochloride *in vitro*. In *in vitro* human microsomal studies, ketoconazole inhibited ring oxidation of granisetron hydrochloride. However, the clinical significance of *in vivo* pharmacokinetic interactions with ketoconazole is not known. In a human pharmacokinetic study, hepatic enzyme induction with phenobarbital resulted in a 25% increase in total plasma clearance of intravenous granisetron hydrochloride. The clinical significance of this change is not known.

Serotonin syndrome (including altered mental status, autonomic instability, and neuromuscular symptoms) has been described following the concomitant use of 5-HT₃ receptor antagonists and other serotonergic drugs, including selective serotonin reuptake inhibitors (SSRIs) and serotonin and noradrenaline reuptake inhibitors (SNRIs) [*see Warnings and Precautions (5.4)*].

8 USE IN SPECIFIC POPULATIONS

8.1 Pregnancy

Pregnancy Category B

Reproduction studies with granisetron hydrochloride have been performed in pregnant rats at intravenous doses up to 9 mg/kg/day (54 mg/m²/day, about 24 times the recommended human dose delivered by the Sancuso patch, based on body surface area) and oral doses up to 125 mg/kg/day (750 mg/m²/day, about 326 times the recommended human dose with Sancuso based on body surface area). Reproduction studies have been performed in pregnant rabbits at intravenous doses up to 3 mg/kg/day (36 mg/m²/day, about 16 times the human dose with Sancuso based on body surface area) and at oral doses up to 32 mg/kg/day (384 mg/m²/day, about 167 times the human dose with Sancuso based on body surface area). These studies did not reveal any evidence of impaired fertility or harm to the fetus due to granisetron. There are, however, no adequate and well-controlled studies in pregnant women. Because animal reproduction studies are not always predictive of human response, Sancuso should be used during pregnancy only if clearly needed.

8.3 Nursing Mothers

It is not known whether granisetron is excreted in human milk. Because many drugs are excreted in human milk, caution should be exercised when Sancuso is administered to a nursing woman.

8.4 Pediatric Use

Safety and effectiveness of Sancuso have not been established in pediatric patients.

8.5 Geriatric Use

Clinical studies of Sancuso did not include sufficient numbers of subjects aged 65 and over to determine whether they respond differently from younger subjects. Other reported clinical experience has not identified differences in responses between the elderly and younger patients. In general, cautious treatment selection for an elderly patient is prudent because of the greater frequency of decreased hepatic, renal, or cardiac function, and of concomitant disease or other drug therapy.

8.6 Renal Impairment or Hepatic Impairment

Although no studies have been performed to investigate the pharmacokinetics of Sancuso in patients with renal or hepatic impairment, pharmacokinetic information is available for intravenous granisetron [*see Clinical Pharmacology (12.3)*].

10 OVERDOSAGE

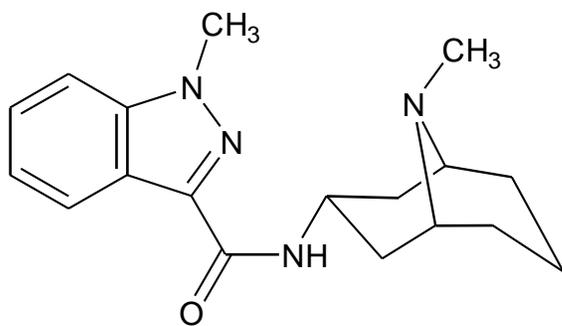
There is no specific antidote for granisetron overdose. In the case of overdose, symptomatic treatment should be given.

Overdosage of up to 38.5 mg of granisetron hydrochloride, as a single intravenous injection, has been reported without symptoms or only the occurrence of a slight headache.

In clinical trials there were no reported cases of overdose with Sancuso.

11 DESCRIPTION

Sancuso contains granisetron, which is a serotonin-3 (5-HT₃) receptor antagonist. Chemically it is 1-methyl-N-[(1R,3r,5S)-9-methyl-9-azabicyclo[3.3.1]non-3-yl]-1H-indazole-3-carboxamide with a molecular weight of 312.4. Its empirical formula is C₁₈H₂₄N₄O, while its chemical structure is:



Granisetron

Granisetron is a white to off-white solid that is insoluble in water. Sancuso is a thin, translucent, matrix-type transdermal patch that is rectangular-shaped with rounded corners, consisting of a backing, the drug matrix and a release liner.

12 CLINICAL PHARMACOLOGY

12.1 Mechanism of Action

Granisetron is a selective 5-hydroxytryptamine₃ (5-HT₃) receptor antagonist with little or no affinity for other serotonin receptors, including 5-HT₁, 5-HT_{1A}, 5-HT_{1B/C}, 5-HT₂; for alpha₁-, alpha₂-, or beta-adrenoreceptors; for dopamine-D₂; or for histamine-H₁; benzodiazepine; picrotoxin or opioid receptors.

Serotonin receptors of the 5-HT₃ type are located peripherally on vagal nerve terminals and centrally in the chemoreceptor trigger zone of the area postrema. During chemotherapy that induces vomiting, mucosal enterochromaffin cells release serotonin, which stimulates 5-HT₃

receptors. This evokes vagal afferent discharge, inducing vomiting. Animal studies demonstrate that, in binding to 5-HT₃ receptors, granisetron blocks serotonin stimulation and subsequent vomiting after emetogenic stimuli such as cisplatin. In the ferret animal model, a single granisetron injection prevented vomiting due to high-dose cisplatin or arrested vomiting within 5 to 30 seconds.

12.2 Pharmacodynamics

The effect of granisetron on QTc prolongation was evaluated in a randomized, single-blind, positive (moxifloxacin 400 mg) - and placebo controlled parallel study in healthy subjects. A total of 120 subjects were administered Sancuso patch (n=60) or intravenous granisetron (10 mcg/kg over 30 seconds; n=60). In a study with demonstrated ability to detect small effects, the upper bound of the 90% confidence interval for the largest placebo adjusted, baseline corrected QTc based on Fridericia correction method (QTcF) for Sancuso was below 10 ms. This study suggests that Sancuso does not have significant effects on QT prolongation.

No evidence of an effect on plasma prolactin or aldosterone concentrations has been found in studies using granisetron.

The effect on oro-cecal transit time following application of Sancuso has not been studied. Granisetron hydrochloride injection exhibited no effect on oro-cecal transit time in healthy subjects given a single intravenous infusion of 50 mcg/kg or 200 mcg/kg. Single and multiple oral doses of granisetron hydrochloride slowed colonic transit in healthy subjects.

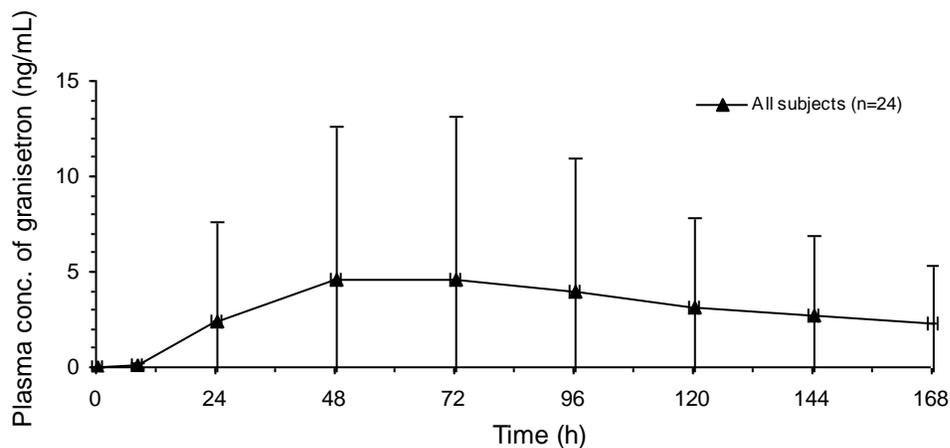
12.3 Pharmacokinetics

Absorption

Granisetron crosses intact skin into the systemic circulation by a passive diffusion process.

Following a 7-day application of Sancuso in 24 healthy subjects, high inter-subject variability in systemic exposure was observed. Maximal concentration was reached at approximately 48 hours (range: 24-168 hours) following patch application. Mean C_{max} was 5.0 ng/mL (CV: 170%) and mean AUC_{0-168hr} was 527 ng-hr/mL (CV: 173%).

Mean Plasma Concentration of Granisetron (mean ± SD)



Based on the measure of residual content of the patch after removal, approximately 66% (SD: \pm 10.9) of granisetron is delivered following patch application for 7 days.

Following consecutive application of two Sancuso patches, each for seven days, granisetron levels were maintained over the study period with evidence of minimal accumulation. The mean plasma concentration at 24 hours after the second patch application was 1.5-fold higher due to residual granisetron from the first patch. As the plasma concentration increased after the second patch application, the difference decreased and the mean plasma concentration at 48 hours was 1.3-fold higher after the second patch compared to that after the first patch.

In a study designed to assess the effect of heat on the transdermal delivery of granisetron from Sancuso in healthy subjects, a heat pad generating an average temperature of 42°C (107.6°F) was applied over the patch for 4 hours each day over the 5 day period of wear. The application of the heat pad was associated with an increase in plasma granisetron concentrations during the period of heat pad application. The elevated plasma concentration declined after removal of the heat pad. Mean C_{max} with intermittent heat exposure was 6% higher than without heat. Mean partial AUCs over 6 hours with 4 hour of heat application (AUC_{0-6} , AUC_{24-30} , and AUC_{48-54}) were 4.9, 1.4, and 1.1 folds higher, respectively, with heat pad than without heat pad. A heat pad should not be applied over or in the near vicinity of the Sancuso patch.

Distribution

Plasma protein binding is approximately 65%. Granisetron distributes freely between plasma and red blood cells.

Metabolism

Granisetron metabolism involves N-demethylation and aromatic ring oxidation followed by conjugation. *In vitro* liver microsomal studies show that granisetron's major route of metabolism is inhibited by ketoconazole, suggestive of metabolism mediated by the cytochrome P-450 3A subfamily. Animal studies suggest that some of the metabolites may also have 5-HT₃ receptor antagonist activity.

Elimination

Clearance is predominantly by hepatic metabolism. Based on a study with intravenous injection, approximately 12% of the dose is excreted unchanged in the urine of healthy subjects in 48 hours. The remainder of the dose is excreted as metabolites, 49% in the urine, and 34% in the feces.

Subpopulations

Gender

There is evidence to suggest that female subjects had higher granisetron concentrations than males following patch application. However, no statistically significant difference in clinical efficacy outcome was observed between genders.

Pediatrics

No studies have been performed to investigate the pharmacokinetics of Sancuso in pediatrics.

Elderly

Following application of Sancuso patch in healthy subjects, mean AUC_{0-z} , C_{max} , and C_{avg} were 17%, 15%, and 16% higher, respectively in male and female elderly subjects (≥ 65 years) compared to younger subjects (aged 18-45 years inclusive). These pharmacokinetic parameters were largely overlapped between the two age groups with high variability (CV: >50%).

Following a single 40 mcg/kg intravenous dose of granisetron hydrochloride in elderly volunteers (mean age 71 years), lower clearance and longer half-life were observed compared to younger healthy volunteers.

Renal Impairment

Total clearance of granisetron was not affected in patients with severe renal failure who received a single 40 mcg/kg intravenous dose of granisetron hydrochloride.

Hepatic Impairment

In patients with hepatic impairment due to neoplastic liver involvement, total plasma clearance following a single 40 mcg/kg intravenous dose of granisetron hydrochloride was approximately halved compared to patients without hepatic impairment. Given the wide variability in pharmacokinetic parameters of granisetron and the good tolerance of doses well above the recommended dose, dose adjustment in patients with hepatic functional impairment is not necessary.

Body Mass Index

In a clinical study designed to assess granisetron exposure from Sancuso in subjects with differing levels of body fat, using body mass index (BMI) as a surrogate measure for subcutaneous fat, no significant differences were seen in the plasma pharmacokinetics of Sancuso in male and female subjects with low BMI [<19.5 kg/m² (males), <18.5 kg/m² (females)] and high BMI (30.0 to 39.9 kg/m² inclusive) compared to a control group (BMI 20.0 to 24.9 kg/m² inclusive).

Race

The pharmacokinetic profile of granisetron from Sancuso was assessed in healthy Japanese males. Following the application of a single 6-day Sancuso 52 cm², in healthy male Japanese subjects, mean C_{max}, AUC₍₀₋₁₄₄₎, and AUC_(0-∞) values were 5.02 ng/mL (CV: 66%), 492 ng.hr/mL (CV: 72%), and 562 ng.hr/mL (CV: 60%), respectively, and a median t_{max} value was 48 hours.

13 NONCLINICAL TOXICOLOGY

13.1 Carcinogenesis, Mutagenesis, Impairment of Fertility

In a 24-month carcinogenicity study, rats were treated orally with granisetron 1, 5 or 50 mg/kg/day (6, 30 or 300 mg/m²/day). The 50 mg/kg/day dose was reduced to 25 mg/kg/day (150 mg/m²/day) during week 59 due to toxicity. For a 50 kg person of average height (1.46 m² body surface area), these doses represent about 2.6, 13, and 65 times the recommended clinical dose (3.1 mg/day, 2.3 mg/m²/day, delivered by the Sancuso patch, on a body surface area basis). There was a statistically significant increase in the incidence of hepatocellular carcinomas and adenomas in males treated with 5 mg/kg/day (30 mg/m²/day, about 13 times the recommended human dose with Sancuso, on a body surface area basis) and above, and in females treated with 25 mg/kg/day (150 mg/m²/day, about 65 times the recommended human dose with Sancuso, on a body surface area basis). No increase in liver tumors was observed at a dose of 1 mg/kg/day (6 mg/m²/day, about 2.6 times the recommended human dose with Sancuso, on a body surface area basis) in males and 5 mg/kg/day (30 mg/m²/day, about 13 times the recommended human dose with Sancuso, on a body surface area basis) in females.

In a 12-month oral toxicity study, treatment with granisetron 100 mg/kg/day (600 mg/m²/day, about 261 times the recommended human dose with Sancuso, on a body surface area basis) produced hepatocellular adenomas in male and female rats while no such tumors were found in the control rats. A 24-month mouse carcinogenicity study of granisetron did not show a statistically significant increase in tumor incidence, but the study was not conclusive.

Because of the tumor findings in rat studies, Sancuso should be prescribed only at the dose and for the indication recommended [*see Indications and Usage (1) and Dosage and Administration (2)*].

Granisetron was not mutagenic in an *in vitro* Ames test and mouse lymphoma cell forward mutation assay, and *in vivo* mouse micronucleus test and *in vitro* and *ex vivo* rat hepatocyte UDS assays. It, however, produced a significant increase in UDS in HeLa cells *in vitro* and a significant increased incidence of cells with polyploidy in an *in vitro* human lymphocyte chromosomal aberration test.

Granisetron at subcutaneous doses up to 6 mg/kg/day (36 mg/m²/day, about 16 times the recommended human dose of Sancuso, on a body surface area basis), and oral doses up to 100 mg/kg/day (600 mg/m²/day, about 261 times the recommended human dose of Sancuso, on a body surface area basis) was found to have no effect on fertility and reproductive performance of male and female rats.

13.3 Phototoxicity

When tested for potential photogenotoxicity *in vitro* in a Chinese hamster ovary (CHO) cell line, at 200 and 300 mcg/mL, granisetron increased the percentage of cells with chromosomal aberration following photoirradiation.

Granisetron was not phototoxic when tested *in vitro* in a mouse fibroblast cell line. When tested *in vivo* in guinea-pigs, Sancuso patches did not show any potential for photoirritation or photosensitivity. No phototoxicity studies have been performed in humans.

14 CLINICAL STUDIES

The effectiveness of Sancuso in the prevention of chemotherapy-induced nausea and vomiting (CINV) was evaluated in a randomized, parallel group, double-blind, double-dummy study conducted in the U.S. and abroad. The study compared the efficacy, tolerability and safety of Sancuso with that of 2 mg oral granisetron once daily in the prevention of nausea and vomiting in a total of 641 patients receiving multi-day chemotherapy.

The population randomized into the trial included 48% males and 52% females aged 16 to 86 years receiving moderately emetogenic (ME) or highly emetogenic (HE) multi-day chemotherapy. Seventy-eight (78%) of patients were White, 12% Asian, 10% Hispanic/Latino and 0% Black.

The granisetron patch was applied 24 to 48 hours before the first dose of chemotherapy, and kept in place for 7 days. Oral granisetron was administered daily for the duration of the chemotherapy regimen, 1 hour before each dose of chemotherapy. Efficacy was assessed from the first administration until 24 hours after the start of the last day's administration of the chemotherapy regimen.

The primary endpoint of the trial was the proportion of patients achieving no vomiting and/or retching, no more than mild nausea and no rescue medication from the first administration until 24 hours after the start of the last day's administration of multi-day chemotherapy. Using this definition, the effect of Sancuso was established in 60.2% of patients in the Sancuso arm and 64.8% of patients receiving oral granisetron (difference -4.89%; 95% confidence interval - 12.91% to +3.13%).

An assessment of patch adhesion in 621 patients receiving either active or placebo patches showed that less than 1% of patches became detached over the course of the 7 day period of patch application.

16 HOW SUPPLIED/STORAGE AND HANDLING

Sancuso (Granisetron Transdermal System) is supplied as a 52 cm² patch containing 34.3 mg of granisetron. Each patch is printed on one side with the words "Granisetron 3.1 mg/24 hours". Each patch is packaged in a separate sealed foil-lined plastic pouch.

Sancuso is available in packages of 1 (NDC 42747-726-01) patch.

Store at 20°-25°C (68°-77°F); excursions permitted between 15°-30°C (59°-86°F). [see USP Controlled Room Temperature].

Sancuso should be stored in the original packaging.

17 PATIENT COUNSELING INFORMATION

Advise the patient to read the FDA-approved patient labeling (Patient Information)

17.1 Gastrointestinal

Because the use of granisetron may mask a progressive ileus and/or gastric distention caused by the underlying condition, patients should be instructed to tell their physician if they have pain or swelling in their abdomen.

17.2 Skin Reactions

Patients should be instructed to remove the patch if they have a severe skin reaction, or a generalized skin reaction (e.g. allergic rash, including erythematous, macular, papular rash or pruritus).

When patients remove the patch, they should be instructed to peel it off gently.

17.3 Exposure to Sunlight

Granisetron may be degraded by direct sunlight or exposure to sunlamps. In addition, an *in vitro* study using Chinese hamster ovary cells suggests that granisetron has the potential for photogenotoxicity [see *Nonclinical Toxicology (13.3)*].

Patients must be advised to cover the patch application site, e.g. with clothing, if there is a risk of exposure to sunlight or sunlamps throughout the period of wear and for 10 days following its removal.

17.4 Serotonin Syndrome

Advise patients of the possibility of serotonin syndrome with concomitant use of Sancuso and another serotonergic agent such as medications to treat depression and migraines. Advise patients to seek immediate medical attention if the following symptoms occur: changes in mental

status, autonomic instability, neuromuscular symptoms, with or without gastrointestinal symptoms.

17.5 External Heat Sources

Patients should be advised not to apply a heat pad over or near the Sancuso patch. Patients should avoid prolonged exposure to heat as plasma concentration continues increasing during the period of heat exposure.

Rx Only

Manufactured by:

3M Delivery Systems
St. Paul, MN 55107

Manufactured for:

Kyowa Kirin, Inc.
Bedminster, NJ 07921

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