

## PRODUCT MONOGRAPH

**PrNEUPRO<sup>®</sup>**

(rotigotine)

Transdermal System

1 mg/24h, 2 mg/24h, 3 mg/24h, 4 mg/24h, 6 mg/24h, 8 mg/24h rotigotine

Antiparkinsonian Agent / Dopamine Agonist



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Oakville, ON  
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**PrNEUPRO®**  
(rotigotine)  
Transdermal System

**PART I: HEALTH PROFESSIONAL INFORMATION**

**SUMMARY PRODUCT INFORMATION**

Route of Administration	Dosage Form / Strength	Nonmedicinal Ingredients																					
Transdermal	<p><i>NEUPRO (rotigotine) Transdermal System (patch):</i></p> <p><i>Six strengths delivering a nominal dose per 24 hours and containing rotigotine per patch as follows:</i></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">NEUPRO Nominal Dose</th> <th style="text-align: center;">Rotigotine Content per Patch</th> <th style="text-align: center;">NEUPRO Patch Size</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1 mg/24 hours</td> <td style="text-align: center;">2.25 mg</td> <td style="text-align: center;">5 cm<sup>2</sup></td> </tr> <tr> <td style="text-align: center;">2 mg/24 hours</td> <td style="text-align: center;">4.5 mg</td> <td style="text-align: center;">10 cm<sup>2</sup></td> </tr> <tr> <td style="text-align: center;">3 mg/24 hours</td> <td style="text-align: center;">6.75 mg</td> <td style="text-align: center;">15 cm<sup>2</sup></td> </tr> <tr> <td style="text-align: center;">4 mg/24 hours</td> <td style="text-align: center;">9 mg</td> <td style="text-align: center;">20 cm<sup>2</sup></td> </tr> <tr> <td style="text-align: center;">6 mg/24 hours</td> <td style="text-align: center;">13.5 mg</td> <td style="text-align: center;">30 cm<sup>2</sup></td> </tr> <tr> <td style="text-align: center;">8 mg/24 hours</td> <td style="text-align: center;">18 mg</td> <td style="text-align: center;">40 cm<sup>2</sup></td> </tr> </tbody> </table>	NEUPRO Nominal Dose	Rotigotine Content per Patch	NEUPRO Patch Size	1 mg/24 hours	2.25 mg	5 cm <sup>2</sup>	2 mg/24 hours	4.5 mg	10 cm <sup>2</sup>	3 mg/24 hours	6.75 mg	15 cm <sup>2</sup>	4 mg/24 hours	9 mg	20 cm <sup>2</sup>	6 mg/24 hours	13.5 mg	30 cm <sup>2</sup>	8 mg/24 hours	18 mg	40 cm <sup>2</sup>	<p><i>Backing layer:</i> Polyester film, siliconized, aluminized, colour coated with a pigment (titanium dioxide (E171), pigment yellow 95, pigment red 166) layer and imprinted (pigment red 144, pigment yellow 95, pigment black 7).</p> <p><i>Self adhesive drug-loaded silicone matrix layer:</i> Poly(dimethylsiloxane, trimethylsilyl silicate)-copolymerisate, Povidone K90, sodium metabisulphite (E223), ascorbyl palmitate (E304) and DL <math>\alpha</math> tocopherol (E307).</p> <p><i>Release liner:</i> Transparent fluoropolymer coated polyester film.</p>
NEUPRO Nominal Dose	Rotigotine Content per Patch	NEUPRO Patch Size																					
1 mg/24 hours	2.25 mg	5 cm <sup>2</sup>																					
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8 mg/24 hours	18 mg	40 cm <sup>2</sup>																					

**INDICATIONS AND CLINICAL USE**

**Adults (≥18 years of age):**

NEUPRO (rotigotine) is indicated for:

- The treatment of the signs and symptoms of idiopathic Parkinson's disease. NEUPRO may be used both as early therapy, without concomitant levodopa, and as an adjunct to levodopa.
- The symptomatic treatment of moderate to severe idiopathic Restless Legs Syndrome (RLS) in adults.

**Geriatrics (> 65 years of age):** Patients above the age of 65 were included in the clinical trials for NEUPRO. NEUPRO dosing can be titrated in the normal manner but may be individualized to accommodate advanced age and potential age-related comorbidity.

**Pediatrics (< 18 years of age):** The safety and efficacy of NEUPRO have not been studied in children less than 18 years of age, therefore NEUPRO is not recommended in this patient population (see **WARNINGS AND PRECAUTIONS, Special Populations, Pediatrics**).

## CONTRAINDICATIONS

- Hypersensitivity to the active substance or to any of the excipients. For a complete listing, see **DOSAGE FORMS, COMPOSITION AND PACKAGING**.

## WARNINGS AND PRECAUTIONS

### Serious Warnings and Precautions

#### Sudden Onset of Sleep

Patients receiving treatment with NEUPRO (rotigotine) and other dopaminergic agents have reported suddenly falling asleep while engaged in activities of daily living, including operating a motor vehicle, which has sometimes resulted in accidents. Although some of the patients reported somnolence while on NEUPRO, others perceived that they had no warning signs, such as excessive drowsiness, and believed that they were alert immediately prior to the event.

Physicians should alert patients of the reported cases of sudden onset of sleep, bearing in mind that these events are NOT limited to initiation of therapy. Patients should also be advised that sudden onset of sleep has occurred without warning signs. If drowsiness or sudden onset of sleep should occur, patients should immediately contact their physician.

Until further information is available on the management of this unpredictable and serious adverse event, patients should be warned not to drive or engage in other activities where impaired alertness could put themselves and others at risk of serious injury or death (e.g., operating machines). Episodes of falling asleep while engaged in activities of daily living have also been reported in patients taking other dopaminergic agents, therefore, symptoms may not be alleviated by substituting these products.

Currently, the precise cause of this event is unknown. It is known that patients with Parkinson's disease and Restless Legs Syndrome experience alterations in sleep architecture, which results in excessive daytime sleepiness or spontaneous dozing, and that dopaminergic agents can also induce sleepiness.

The following Warnings and Precautions are listed in alphabetical order.

## **Cardiovascular**

### **Elevation of Blood Pressure and Heart Rate**

Some patients treated with NEUPRO exhibited moderately severe increases in systolic blood pressure (> 180 mm Hg) and/or in diastolic blood pressure (> 105 mm Hg) while supine and/or standing. In patients with advanced-stage Parkinson's disease, there was an increased incidence of increased systolic blood pressure > 180 mm Hg and increased diastolic blood pressure > 105 mm Hg in patients treated with NEUPRO compared to patients treated with placebo. In patients with Restless Legs Syndrome, there was an increased incidence of increased diastolic blood pressure > 105 mm Hg in patients treated with NEUPRO compared to patients treated with placebo.

Mild-moderate increases in systolic blood pressure (> 20 mm Hg) and in diastolic blood pressure (> 10 mm Hg) and more severe increases in systolic blood pressure (> 40 mm Hg) and in diastolic blood pressure (> 20 mm Hg) occurred more frequently in all patients (i.e., early and advanced-stage Parkinson's disease and Restless Legs Syndrome) treated with NEUPRO compared to patients treated with placebo. These increases in systolic and diastolic blood pressure were observed when supine, standing, and changing from supine to standing position. Some threshold increases in blood pressure appeared to be dependent on the dose of NEUPRO and were also observed at the final study visit.

In the placebo-controlled trials, there was an increased incidence of hypertension as an adverse event in patients treated with NEUPRO for advanced-stage Parkinson's disease (NEUPRO 2.9% versus placebo 1.9%) and for Restless Legs Syndrome (NEUPRO 2.3% versus placebo 0.0%).

Some patients with advanced-stage Parkinson's disease and Restless Legs Syndrome treated with NEUPRO exhibited moderately increased pulse-rate (> 100 beats per minute) while supine and/or standing compared to patients treated with placebo.

These findings of blood pressure and heart rate elevations should be considered in patient follow-ups, especially when treating patients with cardiovascular disease.

### **Orthostatic Hypotension**

Dopaminergic agonists, including NEUPRO, appear to impair the systemic regulation of blood pressure, resulting in postural/orthostatic hypotension, especially during dose escalation. Parkinson's disease and Restless Legs Syndrome patients being treated with dopaminergic agonists require careful monitoring for signs and symptoms of postural hypotension, especially during dose escalation, and should be informed of this risk. Particular caution is recommended in patients with Parkinson's disease because of an impaired capacity to respond to postural challenge (see **ACTION AND CLINICAL PHARMACOLOGY**,

## **Clinical Safety Pharmacology, Electrocardiography and Orthostatic Hypotension).**

### **Syncope**

Dopamine agonists, including NEUPRO, have been associated with syncope. Particular caution is advised in patients with a history of orthostatic hypotension, syncope, or severe cardiovascular disease. In clinical trials with NEUPRO, syncope has been observed at a rate that was similar to that observed in patients treated with placebo. Because patients with clinically relevant cardiovascular disease were excluded in these studies, patients with severe cardiovascular disease should be asked about symptoms of syncope and pre-syncope.

### **Fluid Retention and Weight Gain**

In the placebo-controlled clinical trial database, peripheral edema was reported at a higher incidence in patients with Parkinson's disease and Restless Legs Syndrome treated with NEUPRO. The incidence increased to 12.4 – 18.7% in long-term open-label studies for patients with Parkinson's disease and 2.6% in long-term open-label studies for patients with Restless Legs Syndrome.

Patients taking NEUPRO for Parkinson's disease had a higher incidence of substantial weight gain (more than 10% of baseline weight) than patients taking placebo. This weight gain was frequently associated with the development of peripheral edema in patients with Parkinson's disease, suggesting that NEUPRO may cause substantial fluid retention in some Parkinson's patients. Although the weight gain was usually well-tolerated in patients observed in the Parkinson's clinical studies, it could cause greater difficulty in patients who may be especially vulnerable to negative clinical consequences from fluid retention such as those with significant congestive heart failure or renal insufficiency.

## **Connective Tissue**

### **Fibrotic complications**

Cases of retroperitoneal fibrosis, pulmonary infiltrates, pleural effusion, pleural thickening, pericarditis and cardiac valvulopathy have been reported in some patients treated with ergot-derived dopaminergic agents. While these complications may resolve when the drug is discontinued, complete resolution does not always occur.

Although these adverse events are believed to be related to the ergoline structure of these compounds, whether other, non-ergot derived dopamine agonists can cause them is unknown.

## **Hypersensitivity**

### **Sulfite Sensitivity**

NEUPRO contains sodium metabisulfite, a sulfite that may cause allergic-type reactions including anaphylactic symptoms and life threatening or less severe asthmatic episodes in certain susceptible people. The overall prevalence of sulfite sensitivity in the general population is unknown. Sulfite sensitivity is seen more frequently in asthmatic than in nonasthmatic people.

## **Neurologic**

### **Augmentation**

Augmentation is a worsening of Restless Legs Syndrome symptoms during treatment, leading to an increase in overall symptom severity or earlier time of symptom onset each day compared to before initiation of treatment. Dopaminergic medicinal products, including NEUPRO, may result in augmentation. Based on two 6-month, double-blind, placebo-controlled phase 3 Restless Legs Syndrome studies, clinically relevant augmentation was observed in 1.5% of NEUPRO-treated patients versus 0.5% of placebo-treated patients. In two open-label, follow-up studies over a subsequent 12 months, the rate of clinically relevant augmentation was 2.9%. None of these patients discontinued therapy because of augmentation. Analysis of a 5-year open-label treatment study showed that augmentation occurred in 11.9% of patients treated with the approved dosages for RLS (1-3 mg/24 h), and that 5.1% were considered clinically significant. The majority of augmentation episodes occurred in the first and second years of treatment.

### **Rebound**

Rebound, an exacerbation of Restless Legs Syndrome symptoms, is considered to be an end of dose effect, related to the half-life of the therapeutic agent. Reports in the published literature indicate discontinuation or wearing off of dopaminergic medications can result in rebound. In placebo-controlled trials and long-term open-label studies, rebound was not reported.

### **Neuroleptic Malignant Syndrome**

Symptoms resembling neuroleptic malignant syndrome have been reported with abrupt withdrawal of dopaminergic therapy. Therefore it is recommended to taper treatment during treatment discontinuation (see **DOSAGE AND ADMINISTRATION, Treatment Discontinuation**).

### **Dyskinesia**

NEUPRO may potentiate the dopaminergic side effects of levodopa and may cause and/or exacerbate pre-existing dyskinesia. The incidence of dyskinesia in patients with advanced-stage Parkinson's disease (ie. receiving concomitant levodopa) was higher in patients treated with NEUPRO than in those treated with placebo and this incidence increased with increasing dose. There was also an increase in discontinuation from the study because of dyskinesia for these same patients treated with NEUPRO.

## **Ophthalmologic**

### **Retinal Pathology: Albino rats**

Retinal degeneration was observed by transmission microscopy in albino rats at the 3-month time-point in a 6-month toxicity study at the highest dose of rotigotine at plasma exposures at least 7 times that of the maximum recommended human dose (MRHD). Retinal degeneration was not observed in the 2-year carcinogenicity studies in albino rat, albino mouse, or in monkeys treated for 1 year (plasma exposures up to 5-14 times of the MRHD).

The potential significance of this effect in humans has not been established, but cannot be disregarded because disruption of a mechanism that is universally present in vertebrates (i.e., disk shedding) may be involved.

## **Peri-operative Considerations**

Studies in patients with Parkinson's disease and Restless Legs Syndrome undergoing surgery have shown that NEUPRO can be administered in the peri-operative period to provide continuous treatment when oral administration of medication is limited or contraindicated.

## **Psychiatric**

### **Hallucinations / Abnormal Thinking and Behavior**

There was an increased incidence of hallucinations in patients with advanced-stage Parkinson's disease treated with NEUPRO (4.0%) compared with patients treated with placebo (1.3%) and this incidence increased with increasing dose. Hallucinations were of sufficient severity to cause a higher incidence of discontinuation of treatment (mainly during the dose escalation/titration period) in advanced-stage Parkinson's disease patients treated with NEUPRO (1.7%) compared with placebo-treated patients (<0.5%). Hallucinations have also been reported in post-marketing reports.

Post-marketing reports indicate that patients may experience new or worsening mental status and behavioral changes, which may be severe, including psychotic-like behavior during NEUPRO treatment or after starting or increasing the dose of NEUPRO. Other drugs prescribed to improve the symptoms of Parkinson's disease can have similar effects on thinking and behavior. This abnormal thinking and behavior can consist of one or more of a variety of manifestations including paranoid ideation, delusions, hallucinations, confusion, psychotic-like behavior, disorientation, aggressive behavior, agitation, and delirium. These various manifestations of psychotic-like behavior were also observed during the clinical development of NEUPRO for early and advanced-stage Parkinson's disease and Restless Legs Syndrome.

Patients with a major psychotic disorder should not be treated with NEUPRO because of the risk of exacerbating psychosis. In addition, certain medications used to treat psychosis may exacerbate the symptoms of Parkinson's disease and may decrease the effectiveness of NEUPRO (see **DRUG INTERACTIONS**).

### **Impulse Control Disorders**

Impulse control disorders including compulsive behaviours such as intense urges to gamble, increased sexual urges, intense urges to spend money, binge eating, compulsive eating, punding and/or other intense urges have been reported in Parkinson's disease and Restless Legs Syndrome patients treated with dopamine agonists, including NEUPRO. Because patients may not recognize these behaviors as abnormal, it is important for physicians to specifically ask patients and caregivers to identify new behaviour patterns. Physicians should consider dose reduction or stopping the medication if a patient develops such urges while taking NEUPRO. The incidence of compulsive-impulsive behaviours is lower in Restless Legs Syndrome patients treated with NEUPRO than in Parkinson's disease patients treated with NEUPRO.

In the NEUPRO clinical trial safety database, the incidence of reported compulsive-impulsive behaviours was higher in patients treated with NEUPRO compared with patients treated with placebo. The incidence increased in long-term open-label studies (see **ADVERSE REACTIONS, Other Clinical Trial Adverse Events, Impulse control disorders**).

## **Skin**

### **Application Site Reactions**

Application site skin reactions may occur and are usually mild or moderate in intensity. It is recommended that the application site be rotated on a daily basis. The same site should not be used within 14 days. If application site reactions occur which last for more than a few days or are persistent, if there is an increase in severity, or if the skin reaction spreads outside the application site, an assessment of the risk/benefit balance for the individual patient should be conducted.

If there is a skin rash or irritation from the transdermal system, direct sunlight on the area should be avoided until the skin heals. Exposure could lead to changes in the skin color.

If a generalized skin reaction associated with the use of NEUPRO is observed, NEUPRO should be discontinued.

### **Heat Application**

The effect of application of heat to the NEUPRO transdermal system has not been studied *in vivo*. However, heat application has been shown to increase absorption several fold with other transdermal products, and in *in vitro* release studies with the NEUPRO transdermal system. Patients should be advised to avoid exposing the applied NEUPRO transdermal system to external sources of direct heat, such as heating pads or electric blankets, heat lamps, saunas, hot tubs, heated water beds, and prolonged direct sunlight.

### **Magnetic Resonance Imaging and Cardioversion**

The backing layer of NEUPRO contains aluminum. To avoid skin burns, NEUPRO should be removed if the patient has to undergo magnetic resonance imaging (MRI) or cardioversion.

### **Melanoma**

Epidemiological studies have shown that patients with Parkinson's disease have a higher risk (approximately 6-fold higher) of developing melanoma than the general population. Whether the increased risk observed was due to Parkinson's disease or other factors, such as drugs used to treat Parkinson's disease, is unclear. Although no cases of melanoma were reported during the placebo-controlled studies, six cases (0.3%) were reported during long-term open-label studies for NEUPRO in patients with Parkinson's disease.

For the reasons stated above, patients and providers are advised to monitor for melanomas frequently and on a regular basis when using NEUPRO for any indication. Ideally, periodic skin examinations should be performed by appropriately qualified individuals (e.g., dermatologists).

### **Special Populations**

**Pregnant Women:** NEUPRO is not recommended during pregnancy as there are no adequate data from the use of NEUPRO in pregnant women. In studies conducted in mice,

rats, and rabbits, rotigotine was shown to have adverse effects on embryo-fetal development when administered during pregnancy at doses similar to or lower than those used clinically (see **TOXICOLOGY, Reproductive Toxicology**).

**Nursing Women:** NEUPRO is not recommended during breast feeding. Should NEUPRO therapy be considered necessary, breast-feeding should be discontinued. Because rotigotine decreases prolactin secretion in humans, inhibition of lactation is expected. Studies in rats have shown that rotigotine and/or its metabolite(s) are excreted in breast milk.

**Pediatrics (< 18 years of age):** The safety and efficacy of NEUPRO have not been studied in children less than 18 years of age, therefore NEUPRO is not recommended in this patient population.

**Geriatrics (≥ 65 years of age):** No overall differences in plasma levels of rotigotine were observed between patients who were 65 to 80 years old compared with younger patients approximately 40 to 64 years of age, receiving the same NEUPRO doses. Although not studied, exposures in older subjects (>80 years) may be higher due to skin changes with aging (see **ACTION AND CLINICAL PHARMACOLOGY, Special Populations and Conditions, Geriatrics**). Mild to moderate renal impairment has little effect on the pharmacokinetics of rotigotine.

Of subjects treated with NEUPRO in clinical studies for the treatment of Parkinson's disease, approximately 50% were 65 years old and older, and approximately 11% were 75 and older. Among subjects treated with NEUPRO in clinical studies for the treatment of Restless Legs Syndrome, 26% were 65 years and older. In clinical trials, a titration period was included to initiate NEUPRO treatment at a low dose and titrate up gradually to clinical tolerability to obtain the optimum therapeutic effect.

## **ADVERSE REACTIONS**

### **Adverse Drug Event Overview**

Treatment emergent adverse events (TEAEs) reported in more than 10% of patients treated with NEUPRO (rotigotine) transdermal system for Parkinson's disease included nausea, vomiting, dizziness, somnolence, application site reactions and headache. Treatment emergent adverse events reported in more than 10% of patients treated with NEUPRO (rotigotine) transdermal system for Restless Legs Syndrome, included nausea, application site reactions, fatigue and headache.

At the beginning of therapy, dopaminergic adverse reactions such as nausea and vomiting may occur. In clinical trials, these adverse reactions had a higher incidence during titration than during maintenance treatment. These adverse reactions are usually mild or moderate in intensity and transient even if treatment is continued.

In clinical trials, patients were instructed to rotate the application sites. The majority of the application site reactions were mild or moderate in intensity and were limited to the application areas.

### **Clinical Trial Adverse Events**

*Because clinical trials are conducted under very specific conditions, the adverse reaction rates observed in the clinical trials may not reflect the rates observed in practice and should not be compared to the rates in the clinical trials of another drug. Adverse drug reaction information from clinical trials is useful for identifying drug-related adverse events and for approximating rates.*

### **Incidence of Treatment Emergent Adverse Events in Controlled Clinical Trials in Early-Stage Parkinson's disease**

The safety of NEUPRO was evaluated in 649 patients with early-stage Parkinson's disease in three double-blind, placebo-controlled trials with durations of 3 to 9 months. These trials included one fixed-dose, dose-response double-blind, placebo-controlled phase 2 trial and two flexible-dose, double-blind, placebo-controlled phase 3 trials. Patients received NEUPRO doses ranging from 2 mg/24h to 8 mg/24h or placebo once daily.

The most commonly observed treatment emergent adverse events (incidence  $\geq 5\%$ ) that appeared more frequently in the NEUPRO groups than in the placebo groups were nausea, application and instillation site reactions, somnolence, dizziness, headache, vomiting, fatigue, insomnia, peripheral edema and constipation.

Approximately 6.8% of NEUPRO-treated patients reported serious adverse events, versus 5.9% of patients on placebo. The most frequent serious adverse event was application site reactions (0.5% on NEUPRO versus 0.0% on placebo).

Approximately 13% of 649 NEUPRO-treated patients discontinued treatment because of adverse events, compared with 6% of 290 patients who received placebo. The adverse events most commonly causing discontinuation of treatment were: application site reaction, nausea, and vomiting.

Table 1 lists treatment emergent adverse events from the three double-blind, placebo-controlled trials in early-stage Parkinson's disease that occurred in  $\geq 2\%$  of the patients treated with NEUPRO and that were proportionally more frequent than in the placebo group. In these trials, patients did not receive concomitant levodopa.

**Table 1 Incidence (%) of Treatment Emergent Adverse Events in Three Double-Blind, Placebo-Controlled Early-Stage Parkinson's disease Trials (events in  $\geq 2\%$  of subjects treated with NEUPRO and numerically more frequent than in the placebo group)**

System Organ Class/Preferred or High Level Term	Placebo N=290 %	Total NEUPRO N=649 %
<b>Ear and labyrinth disorders</b>		
Vertigo	1.4	2.0
<b>Gastrointestinal disorders</b>		
Nausea	15.5	37.3
Vomiting	2.1	12.5
Constipation	3.8	5.5
Diarrhoea	3.8	3.9
Dyspepsia	1.4	3.1
Dry mouth	1.7	3.1
<b>General disorders and administration site conditions</b>		
Application and instillation site reactions <sup>a</sup>	13.8	36.2
Fatigue	6.9	7.6
Peripheral edema	5.5	5.9
Asthenia	2.1	2.2
<b>Infections and Infestations</b>		
Nasopharyngitis	3.8	3.9
Urinary tract infection	1.4	2.8
Influenza	0.7	2.0
<b>Musculoskeletal and connective tissue disorders</b>		
Back Pain	4.5	4.8
Muscle spasms	1.7	3.2
Arthralgia	2.4	2.9
<b>Nervous system disorders</b>		
Somnolence	14.5	23.0
Dizziness	10.7	17.4
Headache	10.3	13.6
<b>Psychiatric disorders</b>		
Insomnia	3.8	7.4
Abnormal dreams	0.3	3.5
Depression	2.1	2.6
<b>Skin and subcutaneous tissue disorders</b>		
Hyperhidrosis	2.4	3.4
Erythema	1.0	2.5

System Organ Class/Preferred or High Level Term	Placebo N=290 %	Total NEUPRO N=649 %
<b>Vascular disorders</b>		
Hypertension	2.1	2.9

<sup>a</sup> High Level Term

### **Dose-Related Adverse Reactions**

Many adverse reactions appeared to be dose-related. Dose-related adverse drug reactions included nausea, application site reactions, dizziness, vomiting, somnolence, asthenic conditions (including fatigue and asthenia), insomnia, abnormal dreams, and peripheral edema.

### **Incidence of Treatment Emergent Adverse Events in Controlled Clinical Trials in Advanced-Stage Parkinson's disease**

The safety of NEUPRO was evaluated in 658 patients with advanced-stage Parkinson's disease in 3 double-blind, placebo-controlled trials with durations of 3 to 7 months. These trials included one fixed dose, dose-response, double-blind, placebo-controlled phase 2 trial, one fixed-dose, double-blind, placebo-controlled phase 3 trial and one flexible-dose, double-blind, placebo-controlled phase 3 trial. Subjects received concomitant levodopa in these trials. Patients received NEUPRO doses ranging from 4 mg/24h to 16 mg/24h or placebo once daily.

The most commonly observed treatment emergent adverse events (incidence  $\geq 5\%$ ) that appeared more frequently in the NEUPRO groups than in the placebo groups were application and instillation site reactions, nausea, somnolence, dyskinesia, dizziness, vomiting, insomnia and peripheral edema.

Approximately 7.4% of NEUPRO-treated patients reported serious adverse events versus 6.9% of patients on placebo. The most frequent serious adverse events included nausea and application site dermatitis (both 0.6% on NEUPRO versus 0.0% on placebo).

Approximately 11% of 658 NEUPRO-treated patients discontinued treatment because of adverse events, compared with 8% of patients who received placebo. The adverse events most commonly causing discontinuation of treatment were: nausea, vomiting, dizziness, and application site reactions.

Table 2 lists treatment emergent adverse events from the three double-blind, placebo-controlled trials in advanced-stage Parkinson's disease that occurred in  $\geq 2\%$  of the patients treated with NEUPRO and that were proportionally more frequent than in the placebo group.

**Table 2 Incidence (%) of Treatment Emergent Adverse Events in Three Double-Blind, Placebo-Controlled Advanced-Stage Parkinson's disease Trials (events  $\geq 2\%$  of subjects treated with NEUPRO and numerically more frequent than in the placebo group)**

System Organ Class/Preferred or High Level Term	Placebo N=317 %	Total NEUPRO N=658 %
<b>Gastrointestinal disorders</b>		
Nausea	14.2	22.2
Vomiting	4.4	8.8
Constipation	3.5	3.8
Diarrhoea	2.8	3.5
<b>General disorders and administration site conditions</b>		
Application and instillation site reactions <sup>a</sup>	11.4	25.8
Peripheral edema	0.9	5.3
Asthenia	1.9	2.3
<b>Infections and infestations</b>		
Nasopharyngitis	2.2	3.8
<b>Musculoskeletal and connective tissue disorders</b>		
Arthralgia	3.2	4.4
Back Pain	4.1	4.3
Muscle spasms	1.9	2.6
<b>Nervous system disorders</b>		
Somnolence	13.6	16.0
Dyskinesia	5.0	12.5
Dizziness	7.6	11.6
Headache	6.6	7.3
<b>Psychiatric disorders</b>		
Insomnia	5.0	6.2
Hallucination	1.3	4.0
<b>Skin and subcutaneous tissue disorders</b>		
Rash	1.6	2.6
Pruritus	1.6	2.0
<b>Vascular disorders</b>		
Hypertension	1.9	2.9

<sup>a</sup> High Level Term

### **Dose-Related Adverse Reactions**

Dose-related adverse drug reactions included application site reactions, somnolence, dizziness, dyskinesia, insomnia, perception disturbances (including hallucinations), headache and peripheral edema.

### **Incidence of Treatment Emergent Adverse Events in Controlled Clinical Studies in Restless Legs Syndrome**

The safety of NEUPRO was evaluated in 748 NEUPRO-treated subjects with Restless Legs Syndrome who participated in 2 fixed-dose, double-blind, placebo-controlled phase 3 trials with maintenance durations of 6 months. Patients received NEUPRO doses ranging from 0.5 mg/24h to 3 mg/24h or placebo once daily.

The most commonly observed treatment emergent adverse events (incidence  $\geq 5\%$ ) that appeared more frequently in the NEUPRO groups than in the placebo groups were application and instillation site reactions, nausea, headache, fatigue, nasopharyngitis, somnolence, dizziness, and pruritus.

Approximately 5.6% of NEUPRO-treated patients reported serious adverse events versus 4.1% of patients on placebo. The most frequent serious adverse event was application site and instillation reactions (0.8% on NEUPRO versus 0.0% on placebo).

Approximately 18% of 748 NEUPRO-treated patients discontinued treatment because of adverse events, compared with 6% of patients who received placebo. The adverse events most commonly causing discontinuation of treatment were: application site reactions, dizziness, and nausea.

Table 3 lists treatment emergent adverse events from the two double-blind, placebo-controlled trials in Restless Legs Syndrome that occurred in  $\geq 2\%$  of the patients treated with NEUPRO and that were proportionally more frequent than in the placebo group.

**Table 3: Incidence (%) of Treatment Emergent Adverse Events in Two Double-Blind, Placebo-Controlled Restless Legs Syndrome Phase 3 Trials (events  $\geq 2\%$  of subjects treated with NEUPRO and numerically more frequent than in the placebo group)**

System Organ Class/Preferred or High Level Term	Placebo N=214 %	Total NEUPRO N=748 %
<b>Ear and labyrinth disorders</b>		
Vertigo	1.4	2.3
<b>Gastrointestinal disorders</b>		
Nausea	9.3	19.3
Dry mouth	3.7	4.4
Diarrhoea	4.2	4.4
Constipation	3.3	3.5
Vomiting	0.9	3.3
Dyspepsia	0.9	2.1
<b>General disorders and administration site conditions</b>		
Application and instillation site reactions <sup>a</sup>	3.3	34.2
Fatigue	7.5	10.6
<b>Infections and infestations</b>		
Nasopharyngitis	7.0	7.9
Urinary tract infection	1.9	2.4
<b>Musculoskeletal and connective tissue disorders</b>		
Pain in extremity	1.9	2.7
Muscle spasms	1.4	2.0
<b>Nervous system disorders</b>		
Headache	11.2	16.7
Somnolence	4.2	7.5
Dizziness	5.6	6.6
<b>Psychiatric disorders</b>		
Insomnia	3.3	4.4
Sleep disorder	0.9	2.1
<b>Respiratory, thoracic and mediastinal disorders</b>		
Cough	1.9	2.0
<b>Skin and subcutaneous tissue disorders</b>		
Pruritus	3.3	5.3
Hyperhidrosis	2.3	3.5
<b>Vascular disorders</b>		
Hypertension	0.0	2.3

<sup>a</sup> High Level Term

## **Dose-Related Adverse Reactions**

Dose-related adverse drug reactions included application site reactions, nausea and somnolence.

## **Other Clinical Trial Adverse Events**

NEUPRO was administered to 4089 subjects with Parkinson's disease and Restless Legs Syndrome in placebo-controlled and open-label clinical trials. In addition to the treatment emergent adverse events reported during the clinical trials specified above, the following treatment emergent adverse events have also been reported. In the absence of appropriate controls in some of the studies, a causal relationship between these events and treatment with NEUPRO cannot be determined. Events are classified within System Organ Class and enumerated in order of decreasing frequency using the following definitions: frequent adverse events are defined as those occurring in at least 1/100 patients; infrequent adverse events are those occurring in 1/100 to 1/1000 patients; and rare events are those occurring in fewer than 1/1000 patients.

**Cardiac disorders:** *frequent* – atrial fibrillation *infrequent* – supraventricular tachycardia, palpitations, heart failure

**Eye disorders:** *frequent* – vision blurred, *infrequent* – visual disturbances, photopsia

**Gastrointestinal disorders:** *frequent* – abdominal pain, *rare* – intestinal obstruction

**General disorders and administration site conditions:** *frequent* – asthenic conditions<sup>a</sup> (incl. fatigue, asthenia, malaise), *infrequent* – irritability

**Immune system disorders:** *infrequent* – hypersensitivity, which may include angioedema

**Injury, poisoning and procedural complications:** *frequent* – fall

**Investigations:** *frequent* – weight increased, weight decreased, CPK increased (see Special Populations), *infrequent* – hepatic enzyme increased<sup>a</sup> (incl. AST, ALT, GGT), heart rate increased, hyperglycaemia

**Nervous system disorders:** *frequent* – disturbances in consciousness<sup>a</sup> (incl. syncope, syncope vasovagal, loss of consciousness) dizziness postural, *infrequent* – lethargy, convulsion, *rare* – cerebral ischemia

**Psychiatric disorders:** *frequent* – perception disturbances<sup>a</sup> (incl. hallucination, hallucination, visual; hallucination, auditory; illusion), sleep attacks, nightmare, confusional state, impulse control disorders (incl. pathological gambling, punting, binge-eating and compulsive eating), sexual desire disorders<sup>a</sup> (incl. hypersexuality, libido increased); obsessive-compulsive disorder, *infrequent* – paranoia, psychotic disorder, agitation, disorientation, *rare* – suicide ideation, suicide attempt, completed suicide, delusions, delirium

**Reproductive system and breast disorders:** *frequent* – erectile dysfunction

**Respiratory, thoracic and mediastinal disorders:** *infrequent* – hiccups

**Skin and subcutaneous tissue disorders:** *frequent* – dermatitis contact, skin irritation, *infrequent* – rash generalized, skin malignancy, melanoma

**Urinary disorders:** *frequent* – urinary infection, *infrequent* – urinary retention

**Vascular disorders:** *frequent* – orthostatic hypotension, hypotension

a=High Level Term

**Sudden onset of sleep and somnolence:**

NEUPRO has been associated with somnolence including excessive daytime somnolence and episodes of sudden onset of sleep. Sudden onset of sleep was reported in placebo-controlled trials of Parkinson's disease and Restless Legs Syndrome. The incidences ranged from 0% to 0.33% for patients on placebo and 0.2% to 1.2 for patients on NEUPRO. In long-term open-label trials, the incidences ranged from 1.2% to 1.8%. (see **WARNINGS AND PRECAUTIONS, Serious Warnings and Precautions, Sudden Onset of Sleep**).

**Impulse control disorders:**

Pathological gambling, increased libido, hypersexuality, compulsive spending or buying, binge eating and compulsive eating can occur in patients treated with dopamine agonists, including NEUPRO. In the NEUPRO clinical trial safety database, the incidence of reported compulsive-impulsive behaviours ranged from 0 to 0.3%, with higher rates reported in patients treated with NEUPRO compared to patients treated with placebo. In long-term open-label studies, the incidence increased to 5.6% in patients with early-stage Parkinson's disease, 3.2% in patients with advanced-stage Parkinson's disease, and 0.4% in patients with Restless Legs Syndrome (see **WARNINGS AND PRECAUTIONS, Psychiatric, Impulse Control Disorders**).

**Special populations**

Adverse events of increased CPK were observed with NEUPRO in clinical studies conducted in Japan. These occurred in 3.4% of Japanese subjects on NEUPRO compared to 1.9% on placebo in double-blind studies. CPK levels have not been routinely measured in other populations.

**Post-Marketing Adverse Drug Reactions**

The post-marketing experience has been consistent with the adverse effect profile observed in the clinical trials. In addition to the adverse events reported during clinical trials, the following adverse events have been identified during post-marketing use of NEUPRO. Because these events 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.

**Immune system disorders:** hypersensitivity, which may include lip edema and tongue edema

**Gastrointestinal disorders:** Diarrhoea

**Nervous system disorders:** Dropped head syndrome<sup>a</sup>

**Psychiatric disorders:** aggression, dopamine dysregulation syndrome

**Skin and subcutaneous tissue disorders:** pruritus generalized

<sup>a</sup>=Only observed in Parkinson's disease patients

**DRUG INTERACTIONS****Drug-Drug Interactions**

### **Dopamine antagonists**

Because rotigotine is a dopamine agonist, it is not recommended to be used as a concomitant medication with dopamine antagonists, such as neuroleptics (e.g. phenothiazines, butyrophenones, thioxanthenes) or metoclopramide.

### **Sedating medicinal products**

Because of possible additive effects, caution should be advised when patients are taking sedating medicinal products or other CNS (central nervous system) depressants (e.g. benzodiazepines, antipsychotics, antidepressants) or alcohol in combination with rotigotine.

### **Levodopa and carbidopa**

Co-administration of levodopa and carbidopa with rotigotine had no effect on the pharmacokinetics of rotigotine, and rotigotine had no effect on the pharmacokinetics of levodopa and carbidopa.

The incidence of some dopaminergic adverse events, such as hallucinations, dyskinesia, and peripheral edema generally is higher when given in combination with levodopa.

### **Domperidone**

Co-administration of domperidone with rotigotine had no effect on the pharmacokinetics of rotigotine. It is recommended to consult the product monograph for domperidone for the most up-to-date safety warnings when considering co-administration with NEUPRO.

### **Oral contraceptives**

Co-administration of rotigotine 3 mg/24 h did not affect the pharmacodynamics and pharmacokinetics of oral contraceptives (0.03 mg ethinylestradiol, 0.15 mg levonorgestrel).

### **Omeprazole**

Co-administration of 40 mg/day omeprazole (inhibitor CYP2C19) had no effect on the steady-state pharmacokinetics of rotigotine (4 mg/24 h).

### **Drug-Food Interactions**

Because the patch is administered transdermally, no effect of food and gastrointestinal conditions is expected.

### **Drug-Herb Interactions**

Interactions with herb products have not been established.

### **Drug-Laboratory Interactions**

There have been no known interactions between NEUPRO (rotigotine) and laboratory tests.

## **DOSAGE AND ADMINISTRATION**

### **Dosing Considerations**

NEUPRO (rotigotine) is applied once a day.

NEUPRO should be initiated at a low dose and titrated up gradually to clinical tolerability to obtain the optimum therapeutic effect.

The patch should be applied at approximately the same time every day, but at a different location on the abdomen, shoulder, upper arm, thigh, hip, or flank. The patch remains on the skin for 24 hours and is then to be replaced by a new one at a different site of application. The used patches should be disposed of securely.

## **Recommended Dose and Dosage Adjustment**

### **Dosage**

The dose recommendations made are in nominal dose.

#### **Parkinson's disease**

- Dosing in patients with early-stage Parkinson's disease:

A single daily dose should be initiated at 2 mg/24h and then increased in weekly increments of 2 mg/24h to an effective dose up to a maximal dose of 8 mg/24h.

In some patients, 4 mg/24h may be an effective dose. For most patients an effective dose is reached within 3 or 4 weeks at doses of 6 mg/24h up to a maximal dose of 8 mg/24h, respectively. When necessary, back titration is recommended in 2 mg/24h steps every 2 days.

- Dosing in patients with advanced-stage Parkinson's disease:

A single daily dose should be initiated at 4 mg/24h and then increased in weekly increments of 2 mg/24h to an effective dose up to a maximal dose of 16 mg/24h.

In some patients, 4 mg/24h or 6 mg/24h may be effective doses. For most patients an effective dose is reached within 3 to 7 weeks at doses of 8 mg/24h up to a maximum dose of 16 mg/24h. When necessary, back titration is recommended in 2 mg/24h steps every 2 days.

For doses higher than 8 mg/24h multiple patches may be used to achieve the final dose (e.g. 10 mg/24h may be reached by combination of a 6 mg/24h and a 4 mg/24h patch).

#### **Restless Legs Syndrome**

A single daily dose should be initiated at 1 mg/24h. Depending on the individual response, the dose may be increased in weekly increments of 1 mg/24h up to a maximal dose of 3 mg/24h. When necessary, back titration is recommended in 1 mg/24h steps every 2 days.

#### **Treatment Discontinuation**

##### **Parkinson's Disease**

The dose of NEUPRO should be tapered, when treatment discontinuation is necessary. The daily dose should be reduced in steps of 2 mg/24h with a dose reduction preferably every other day, until complete discontinuation of NEUPRO (see **WARNINGS AND PRECAUTIONS, Neuroleptic Malignant Syndrome**).

##### **Restless Legs Syndrome**

The dose of NEUPRO should be tapered, when treatment discontinuation is necessary. The daily dose should be reduced in steps of 1 mg/24h with a dose reduction preferably every other day, until complete discontinuation of NEUPRO (see **WARNINGS AND PRECAUTIONS, Neuroleptic Malignant Syndrome**).

#### **Missed Dose**

If the patient forgets to change the patch at the usual time of the day the change should be

carried out and a new patch should be applied for the remainder of the 24 hour dosing interval.

In the event that a patch should fall off, a new patch should be applied for the remainder of the 24 hour dosing interval.

### **Administration**

The NEUPRO transdermal system should be applied to clean, dry, intact healthy skin on the abdomen, thigh, hip, flank, shoulder, or upper arm. Reapplication to the same site within 14 days should be avoided. NEUPRO should not be placed on skin that is red, irritated or damaged (see **WARNINGS AND PRECAUTIONS, Skin, Application Site Reactions**).

### **Use and handling**

Each NEUPRO transdermal system is packed in a pouch and should be applied directly after the pouch has been opened. One half of the release liner should be removed and the sticky side should be applied and pressed firmly to the skin. Then, the patch is folded back and the second part of the release liner is removed. The sticky side of the patch should not be touched. The patch should be pressed down firmly with the palm of the hand for 30 seconds, so that it sticks well.

The patch should not be cut into pieces as a way to achieve dose reduction.

### **Special Populations**

#### **Hepatic impairment**

Adjustment of the dose is not necessary in patients with mild to moderate hepatic impairment. NEUPRO has not been investigated in patients with severe hepatic impairment (see **ACTION AND CLINICAL PHARMACOLOGY, Pharmacokinetics**)

#### **Renal impairment**

Adjustment of the dose is not necessary in patients with mild to severe renal impairment including those requiring dialysis (see **ACTION AND CLINICAL PHARMACOLOGY, Pharmacokinetics**). For patients with severe renal impairment, exposure to the inactive conjugates of rotigotine is doubled based on single-dose studies, while rotigotine exposure remains comparable to subjects without renal impairment. Rotigotine is not eliminated through dialysis.

#### **Pediatrics**

The safety and efficacy of NEUPRO have not been studied in children less than 18 years of age, therefore NEUPRO is not recommended in this patient population (see **INDICATIONS AND CLINICAL USE** and **WARNINGS AND PRECAUTIONS, Special Populations, Pediatrics**).

### **OVERDOSAGE**

For management of a suspected drug overdose, contact your regional Poison Control Centre.
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### **Symptoms**

The most likely adverse reactions would be those related to the pharmacodynamic profile of a dopamine agonist, including nausea, vomiting, hypotension, involuntary movements, hallucinations, confusion, convulsions and other signs of central dopaminergic stimulation.

### Management

There is no known antidote for overdose of dopamine agonists. In case of suspected overdose, the NEUPRO (rotigotine) transdermal system(s) should be removed. After removal of the NEUPRO transdermal system(s), the drug input is stopped and the plasma concentration of rotigotine decreases rapidly. The patient should be monitored closely, including heart rate, heart rhythm and blood pressure. Treatment of overdose may require general supportive measures to maintain the vital signs. Dialysis would not be expected to be beneficial as rotigotine is not eliminated by dialysis.

If it is necessary to discontinue NEUPRO, this should be done gradually to prevent neuroleptic malignant syndrome (see **WARNINGS AND PRECAUTIONS, Neuroleptic Malignant Syndrome** and **DOSAGE AND ADMINISTRATION, Treatment Discontinuation**).

## **ACTION AND CLINICAL PHARMACOLOGY**

### Mechanism of Action

Rotigotine is a non-ergolinic dopamine agonist for the treatment of signs and symptoms of Parkinson's disease and idiopathic Restless Legs Syndrome.

Experimental data demonstrate that rotigotine is a D<sub>2</sub> and D<sub>3</sub> receptor agonist, acting also on D<sub>1</sub>, D<sub>4</sub> and D<sub>5</sub> receptors. Among non-dopaminergic receptors, rotigotine showed antagonism at alpha<sub>2B</sub> and agonism at 5HT<sub>1A</sub> receptors. There is no activity of rotigotine on the 5HT<sub>2B</sub> receptor.

The precise mechanisms of action of rotigotine as a treatment for Parkinson's disease or Restless Legs Syndrome are unknown. Rotigotine is believed to reduce the symptoms of Parkinson's disease by increasing the activities of the D<sub>3</sub>, D<sub>2</sub> and D<sub>1</sub> receptors of the caudate-putamen in the brain. The therapeutic effect of rotigotine for Restless Legs Syndrome is thought to be related to its activity on the dopamine receptors.

### Clinical Safety Pharmacology

#### **Electrocardiography and Orthostatic Hypotension**

A double-blind, randomized, placebo- and positive-controlled, parallel-group, dose escalation trial was performed to assess the potential electrocardiographic effects of NEUPRO (rotigotine). The study was performed in patients with advanced-stage idiopathic Parkinson's disease who were assigned to receive treatment with either NEUPRO (N=66) or placebo patch (N=64). NEUPRO was administered as ascending nominal doses ranging from 4 mg/24h to 24 mg/24h over a 43 day dose escalation period, with incremental increases of 4 mg/24h every 7 days. No treatment-related effects on the QTc interval were observed with NEUPRO doses up to 24 mg/24h. A modest increase from baseline in placebo-adjusted heart rate of about 2 beats per minute was observed throughout the NEUPRO dose range studied.

In this study, orthostatic hypotension was assessed at baseline and weeks 1, 2, 3, 4, 5, and 6. After measurement of blood pressure in the supine position, the subjects were asked to stand,

and blood pressure was measured 1 minute and 3 minutes after standing. A persistent drop in systolic blood pressure (BP) of  $\geq 20$  mm Hg and/or a drop of  $\geq 10$  mm Hg in diastolic BP measured at 1 and/or 3 minutes on standing was indicative of orthostatic hypotension. At week 1 (4 mg/24h) and week 2 (8 mg/24h) of treatment, the proportion of subjects with orthostatic hypotension was higher in the NEUPRO group than in the placebo group. At week 1, 12 hours after patch application, the proportion of subjects demonstrating orthostatic hypotension was 6.1% in the placebo group and 27.5% in the NEUPRO group. At week 2, 12 hours after patch application, the proportion of subjects demonstrating orthostatic hypotension was 4.0% in the placebo group and 19.6% in the NEUPRO group. At later time points, there was no consistent difference between the NEUPRO and placebo groups in terms of the proportion of subjects exhibiting orthostatic hypotension, suggesting that a degree of tolerance develops to this effect with continued treatment.

### **Pharmacokinetics**

On average, approximately 45% of the rotigotine from the patch is released within 24 hours ( $0.2 \text{ mg/cm}^2$ ). Rotigotine is primarily eliminated in the urine as inactive conjugates.

### **Absorption and Bioavailability**

When single doses of 8 mg/24 hours are applied to the trunk, there is an average lag time of approximately 3 hours until drug is detected in plasma (range 1 to 8 hours).  $T_{\text{max}}$  typically occurs between 15 to 18 hours post dose but can occur from 4 to 27 hours post dose.

However, there is no characteristic peak concentration observed. Rotigotine displays dose-proportionality over a daily dose range of 1 mg/24 hours to 24mg/24 hours. In the clinical studies of rotigotine effectiveness, the transdermal system application site was rotated from day to day (abdomen, thigh, hip, flank, shoulder, or upper arm) and the mean measured plasma concentrations of rotigotine were stable over the six months of maintenance treatment. Relative bioavailability for the different application sites at steady-state was evaluated in subjects with Parkinson's disease. In a single trial conducted in patients with early-stage Parkinson's disease differences in bioavailability ranged from less than 1% (abdomen vs hip) to 46% (shoulder vs thigh) with shoulder application showing higher bioavailability.

Because rotigotine is administered transdermally, food should not affect absorption, and the product may be administered without regard to the timing of meals.

In a 14-day clinical study with rotigotine administered to healthy subjects, steady-state plasma concentrations were achieved within 2 to 3 days of daily dosing.

### **Distribution**

The weight normalized apparent volume of distribution, ( $V_d/F$ ), in humans is approximately 84 L/kg after repeated dose administration.

The binding of rotigotine to human plasma proteins is approximately 92% *in vitro* and 89.5% *in vivo*.

### **Metabolism and Elimination**

Rotigotine is extensively metabolized by conjugation and N-dealkylation. After intravenous dosing the predominant metabolites in human plasma are sulfate conjugates of rotigotine, glucuronide conjugates of rotigotine, sulfate conjugates of the N-despropyl-rotigotine and

conjugates of N-desthienylethyl -rotigotine. Multiple CYP isoenzymes, sulfotransferases and two UDP-glucuronosyltransferases catalyze the metabolism of rotigotine.

After removal of the patch, plasma levels decreased with a terminal half-life of 5 to 7 hours. The pharmacokinetic profile showed a biphasic elimination with an initial half-life of 3 hours.

Rotigotine is primarily excreted in urine (~71%) as inactive conjugates of the parent compound and N-desalkyl metabolites. A smaller proportion is excreted in feces (~23%). The major metabolites found in urine were rotigotine sulfate (16% to 22% of the absorbed dose), rotigotine glucuronide (11% to 15%), and N-despropyl-rotigotine sulfate metabolite (14% to 20%) and N-desthienylethyl-rotigotine sulfate metabolite (10% to 21%). Approximately 11% is renally eliminated as other metabolites. A small amount of unconjugated rotigotine is renally eliminated (<1% of the absorbed dose).

### **Special Populations and Conditions**

**Pediatrics:** The pharmacokinetics of rotigotine in subjects below the age of 18 years has not been established.

**Geriatrics:** Plasma concentrations of rotigotine in patients 65 to 80 years of age were similar to those in younger patients, approximately 40 to 64 years of age. Although not studied, exposures in older subjects (>80 years) may be higher due to skin changes with aging (see **WARNINGS AND PRECAUTIONS, Special Populations, Geriatrics**).

**Gender:** Female and male subjects and patients had similar plasma concentrations (body weight normalized).

**Race:** The pharmacokinetic profile was similar in Caucasians, Blacks, and Asians. No dose adjustment is necessary based on ethnicity.

**Hepatic Impairment:** There were no relevant changes in rotigotine plasma concentrations in subjects with moderate hepatic impairment (Child Pugh classification – Grade B). No information is available on subjects with severe impairment of hepatic function.

**Renal Impairment:** There were no relevant changes in rotigotine plasma concentrations (up to end stage renal disease requiring hemodialysis). In subjects with severe renal impairment not on dialysis, (i.e., creatinine clearance 15 to <30 ml/min), exposure to inactive conjugated rotigotine metabolites was doubled based on single-dose studies, while rotigotine exposure remained comparable to subjects without renal impairment.

### **Effects on Early Morning Motor Symptoms in Parkinson's disease Patients:**

A double-blind study was conducted in 287 patients with early or advanced stages of Parkinson's disease who had unsatisfactory early morning motor symptom control with 81.5% of these patients on concomitant levodopa therapy. A total of 190 patients received NEUPRO, and 97 received placebo. The patients were titrated to their optimal dose of NEUPRO or placebo in weekly increments of 2 mg/24h starting at 2 mg/24h to a maximum dose of 16 mg/24h over 8 weeks. Patients in both treatment groups were maintained at their optimal dose for 4 weeks. Early morning motor symptoms were assessed with UPDRS Part III. At the end of maintenance of 4 weeks, the mean UPDRS part III score had improved by 7.0 points in NEUPRO-treated patients (baseline 29.6), and by 3.9 points in the placebo-

group (baseline 32.0). This treatment effect was statistically significant.

## **STORAGE AND STABILITY**

Store at room temperature (15 – 30°C).

NEUPRO (rotigotine) should be stored in the original pouch. Do not store outside of pouch.

Apply the transdermal system immediately upon removal from the pouch.

## **SPECIAL HANDLING INSTRUCTIONS**

After use, NEUPRO (rotigotine) transdermal system still contains active substance. After removal, the used patch should be folded in half, adhesive side inwards so that the matrix layer is not exposed, placed in an empty pouch and then discarded out of the reach of children.

## **DOSAGE FORMS, COMPOSITION AND PACKAGING**

NEUPRO (rotigotine) is a transdermal delivery system (patch) that provides rotigotine, a non-ergolinic dopamine agonist. When applied to intact skin, NEUPRO is designed to continuously deliver rotigotine over a 24 hour period.

NEUPRO is available in six strengths: 1 mg/24h, 2 mg/24h, 3 mg/24h, 4 mg/24h, 6 mg/24h, and 8 mg/24h. Each transdermal system has a release surface area of 5, 10, 15, 20, 30, and 40 cm<sup>2</sup> and contains 2.25, 4.5, 6.75, 9.0, 13.5, and 18.0 mg rotigotine, respectively. See Table 4. The composition of the transdermal system per area unit is identical.

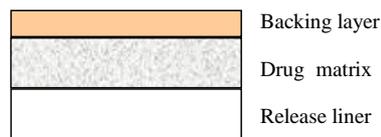
**Table 4 Transdermal System Size, Drug Content, and Nominal Delivery Rate**

<b>NEUPRO Nominal Dose</b>	<b>Rotigotine Content per System</b>	<b>NEUPRO System Size</b>
1 mg/24 hours	2.25 mg	5 cm <sup>2</sup>
2 mg/24 hours	4.5 mg	10 cm <sup>2</sup>
3 mg/24 hours	6.75 mg	15 cm <sup>2</sup>
4 mg/24 hours	9.0 mg	20 cm <sup>2</sup>
6 mg/24 hours	13.5 mg	30 cm <sup>2</sup>
8 mg/24 hours	18.0 mg	40 cm <sup>2</sup>

The patches are imprinted with “Neupro 1 mg/24h”, “Neupro 2 mg/24h”, “Neupro 3 mg/24h”, “Neupro 4 mg/24h”, “Neupro 6 mg/24h” or “Neupro 8 mg/24h”.

## **System Components and Structure**

NEUPRO is a thin, matrix-type square-shaped with rounded edges, transdermal system composed of three layers:



1. Flexible beige to light brown coloured backing layer, which is printed with an identification mark
2. Self adhesive, drug-loaded silicone matrix
3. Release liner

### **List of excipients**

#### Backing layer:

Polyester film, siliconized, aluminized, colour coated with a pigment (titanium dioxide (E171), pigment yellow 95, pigment red 166) layer and imprinted (pigment red 144, pigment yellow 95, pigment black 7).

#### Self adhesive drug-loaded matrix layer:

Poly(dimethylsiloxane, trimethylsilyl silicate)-copolymerisate, Povidone K90, sodium metabisulphite (E223), ascorbyl palmitate (E304) and DL  $\alpha$  tocopherol (E307).

#### Release liner:

Transparent fluoropolymer coated polyester film

### **Packaging**

Each transdermal system is packaged in a separate pouch.

Each strength is available in cartons of 7, 20, 28, 30, 42, 50, 84 (2 x 42), 100 (2 x 50), 56, 60, or 90 transdermal systems.

## PART II: SCIENTIFIC INFORMATION

### PHARMACEUTICAL INFORMATION

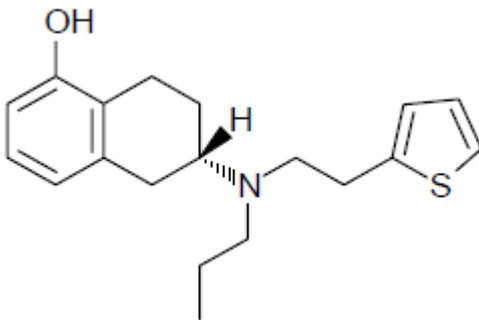
#### Drug Substance

Proper name: rotigotine

Chemical name: (6S)-6-{propyl[2-(2-thienyl)ethyl]amino}-5,6,7,8-tetrahydro-1-naphthalenol

Molecular formula and molecular mass:  $C_{19}H_{25}NOS$  / The molecular weight is 315.48

Structural formula:



Physicochemical properties: Rotigotine is a white to light-brownish powder. It is freely soluble in acetone, acetic acid, ethyl acetate, soluble in ethanol, methanol, 2-propanol, toluene, sparingly to slightly soluble in acetonitrile, hydrochloric acid and at buffer of low pH, propylene glycol, practically insoluble in water and buffer at pH 7.0 and higher. The melting point is between 94 – 100°C. The specific optical rotation in ethanol 96% (c = 10 mg/mL) at 25°C is between -39° and -42°. The pH in water is about 8. The pKa 1 (acidic phenolic hydroxy group) is 10.77 pKa 2 (basic amino group) is 8.93.

### CLINICAL TRIALS

#### Clinical Trials in Parkinson's disease

The effectiveness of NEUPRO (rotigotine) in the treatment of Parkinson's disease was evaluated in a multinational drug development program consisting of four randomized, double-blind placebo-controlled phase 3 trials. Two trials were conducted in patients with early-stage Parkinson's disease who were not receiving concomitant levodopa, and two were conducted in patients with advanced-stage Parkinson's disease who were receiving

concomitant levodopa. In all trials, patients underwent a weekly titration of NEUPRO in 2 mg/24h increments to the assigned or optimal dose. Back titrations by 2 mg/24h decrement of NEUPRO were permitted for intolerable adverse events. Patch application sites were changed on a daily basis.

Change from baseline in the Unified Parkinson's Disease Rating Scale (UPDRS), parts II (Activities of Daily Living) + III (Motor Examination), served as the primary outcome measure in the early-stage Parkinson's disease trials.

Change from baseline in time spent "off" (hours) based on daily diaries was the primary outcome assessment in the two trials of advanced-stage Parkinson's disease (with levodopa).

### **Clinical Trials in Patients with Early-Stage Parkinson's disease:**

#### Study Demographics and Trial Design

**Table 5 Summary of Patient Demographics for Clinical Trials in Patients with Early-stage Parkinson's disease**

<b>Study</b>	<b>Trial design and duration</b>	<b>Dosage</b>	<b>Study subjects (n=number)</b>	<b>Mean age (Range)</b>	<b>Gender</b>
North American Trial	Double-blind, randomized, placebo-controlled 27 weeks	NEUPRO: 2 mg/24h, 4 mg/24h, or 6 mg/24h	181	63 years (32-86)	65% male 35% female
		Placebo	96		
Multinational Trial	Double-blind, randomized, placebo- and active controlled, double-dummy Up to 37 weeks	NEUPRO: 2 mg/24h, 4 mg/24h, 6 mg/24h, or 8 mg/24h	215	61 years (30-86)	58% male 42% female
		Ropinirole: 0.75-24.0 mg	228		
		Placebo	118		

Patients in the two trials of early-stage Parkinson's disease had limited or no prior exposure to levodopa (off levodopa for at least 28 days prior to baseline or levodopa use for no more than 6 months). Patients were excluded from the trials if they had a history of pallidotomy, thalamotomy, deep brain stimulation, or fetal tissue transplant. Patients receiving selegiline, anticholinergic agents, or amantadine must have been on a stable dose and able to maintain that dose for the duration of the trial. A total of 396 patients were treated with NEUPRO in these two trials.

#### ***North American Trial***

This trial was a multinational, flexible NEUPRO dose (2 mg/24h, 4 mg/24h, or 6 mg/24h), parallel group trial in which 277 patients with early-stage Parkinson's disease were assigned (2:1 ratio) to treatment with NEUPRO or placebo for a period up to about 28 weeks. Patients underwent a weekly titration over 3 weeks to a maximal dose of 6 mg/24h depending on efficacy and tolerability, and then received treatment over a 24 week maintenance phase,

followed by a de-escalation over a period up to 4 days. This study was conducted in 47 sites in North America (U.S. and Canada).

Mean baseline combined UPDRS (Parts II + III) was similar in both groups (29.9 NEUPRO group, 30.0 placebo). NEUPRO-treated patients experienced a mean change in the combined UPDRS (Parts II + III) from baseline to end of treatment of 4.0 (Table 6), and the difference from placebo was statistically significant. Symptomatic improvement started to appear as titration progressed. The responder rates, based on a 20% reduction on the primary endpoint UPDRS (Part II + III), were 48% of the patients on NEUPRO versus 19% on placebo.

**Table 6 North American Trial: ANCOVA Results for UPDRS (Parts II + III) from Baseline at End of Treatment for Intent-to-Treat Population**

Treatment	Mean Change from Baseline at endpoint	Difference from placebo
Placebo (n=96)	+1.3	NA
NEUPRO up to 6 mg/24h (n=177)	-4.0	-5.3*

\* p<0.0001

***Multinational Trial***

This trial was a multinational, flexible NEUPRO dose (2 mg/24h, 4 mg/24h, 6 mg/24h, or 8 mg/24h), three-arm, parallel group, trial using a double-dummy treatment in which 561 patients with early-stage Parkinson’s disease were assigned to treatment with either placebo or NEUPRO or active oral comparator in a ratio of 1: 2: 2 for a period up to about 39 weeks. Patients underwent a weekly titration over 4 weeks to a maximal NEUPRO dose of 8 mg/24h depending on efficacy and tolerability, and then received treatment over a 24 week maintenance phase, followed by a de-escalation over a period up to 12 days. This trial was conducted in up to 81 sites in countries outside North America.

Mean baseline combined UPDRS (Parts II + III) was similar across all groups (33.2 NEUPRO, 31.3 placebo, 32.2 active comparator). NEUPRO-treated patients experienced a mean change in the combined UPDRS (Parts II + III) from baseline to end of treatment of -6.8 (Table 7), and the difference from placebo was statistically significant. Symptomatic improvement started to appear as titration progressed. The responder rates, based on a 20% reduction on the primary endpoint UPDRS (Part II + III), were 52% of the patients on NEUPRO versus 30% on placebo. The active comparator performed as expected.

**Table 7 Multinational Trial: ANCOVA Results for UPDRS (Parts II + III) from Baseline at End of Treatment for Intent-to-Treat Population**

Treatment	Mean change from baseline	Difference from placebo
Placebo (n=117)	-2.3	NA
NEUPRO up to 8 mg/24h (n=213)	-6.8	-4.5*

\*p<0.0001

## Clinical Trials in Patients with Advanced-stage Parkinson’s disease:

### Study Demographics and Trial Design

**Table 8 Summary of Patient Demographics for Clinical Trials in Patients with Advanced-stage Parkinson’s disease**

Study	Trial design and duration	Dosage	Study subjects (n=number)	Mean age (Range)	Gender
North American Trial	Double-blind, placebo-controlled, parallel, fixed dose, dose ranging 30 weeks	NEUPRO: 8 mg/24h or 12 mg/24h	229	66 years (33-87)	64% male 36% female
		Placebo	120		
Multinational Trial	Double-blind, double-dummy, placebo- and active-controlled, parallel, optimal dose 24 weeks	NEUPRO: Up to 16 mg/24h	205	64 years (36-84)	63% male 37% female
		Pramipexole: Up to 4.5mg/day	202		
		Placebo	99		

Patients in the two phase 3 trials of NEUPRO in advanced-stage Parkinson’s disease had to be experiencing “on-off” periods at baseline, despite treatment with optimal doses of levodopa. Patients continued concomitant levodopa during the trial; however, reductions in the dosage of levodopa were allowed if patients experienced adverse events that the investigator considered related to dopaminergic therapy. Patients were excluded from the trials if they had a history of pallidotomy, thalamotomy, deep brain stimulation, or fetal tissue transplant. Patients receiving selegiline, anticholinergic agents, or amantadine must have been on a stable dose and able to maintain that dose for the duration of the study. In the North American trial, COMT-inhibitors were not permitted. A total of 434 patients were treated with NEUPRO in these two trials.

#### ***North American Trial***

This trial was a multinational, three-arm, parallel group study in which 349 patients with advanced-stage Parkinson’s disease were titrated over 5 weeks to treatment with either placebo or NEUPRO (8 mg/24h or 12 mg/24h) and maintained treatment for 24 weeks, followed by a down titration over the last week. This trial was conducted in 55 sites in North America (U.S. and Canada).

Mean baseline “off” times were similar among all treatment groups (6.4, 6.8, and 6.3 hours for the placebo, NEUPRO 8 mg/24h and 12 mg/24h treatment groups, respectively). NEUPRO-treated patients experienced a mean change in “off” time from baseline to end of treatment of -2.7 hours for the 8 mg/24h treatment arm and -2.1 hours for the 12 mg/24h treatment arm (Table 9), and the difference from placebo was statistically significant for both NEUPRO doses (8 mg/24h, 12 mg/24h). Symptomatic improvement started to appear as titration progressed. The responder rates, based on a 30% reduction on the primary endpoint (“off” time at the end of treatment) were 57% and 55% for the NEUPRO 8mg/24h and 12mg/24h groups respectively versus 34% on placebo.

**Table 9 North American Trial: ANCOVA Results for “off” time (hours) from Baseline at End of Treatment for Intent-to-Treat Population**

Treatment	Mean Change From Baseline	Difference from placebo
Placebo (n=119)	-0.9	NA
NEUPRO 8 mg/24h (n=113)	-2.7	-1.8*
NEUPRO 12 mg/24h (n=109)	-2.1	-1.2**

\*p<0.001; \*\*p=0.003

### ***Multinational Trial***

This trial was a multinational, three-arm, parallel group trial using a double-dummy treatment in which 506 advanced-stage Parkinson’s disease patients were titrated over 7 weeks to treatment with either NEUPRO up to a maximal dose of 16 mg/24h, active oral comparator, or placebo and maintained treatment for 16 weeks followed by a down titration over 6 days. This trial was conducted in 77 sites in many countries outside of North America.

Mean baseline “off” times were similar among all treatment groups (6.6, 6.2, and 6.0 hours for the placebo, NEUPRO, and comparator treatment groups, respectively). NEUPRO-treated patients experienced a mean 2.5 hour decrease change in “off” time from baseline to end of treatment (Table 10), and the difference from placebo was statistically significant.

Symptomatic improvement started to appear as titration progressed. The responder rates, based on a 30% reduction on the primary endpoint (“off” time at the end of treatment) were 60% of the patients on NEUPRO versus 35% on placebo.

**Table 10 Multinational Trial: ANCOVA Results for “off” time (hours) from Baseline at End of Treatment for Intent-to-Treat Population**

Treatment	Mean Change From Baseline	Difference from placebo
Placebo (n=100)	-0.9	NA
NEUPRO Up to 16 mg/24h (n=201)	-2.5	-1.6*

\*p<0.001

### **Clinical Trials in Restless Legs Syndrome**

The efficacy of NEUPRO in the treatment of Restless Legs Syndrome (RLS) was evaluated in two fixed-dose, randomized, double-blind, placebo-controlled phase 3 trials with maintenance periods of 6 months duration. Patients received NEUPRO doses ranging from 0.5 mg/24h to 3 mg/24h or placebo once daily. In both trials, patches were applied to different application sites including the abdomen, thigh, hip, flank, shoulder, and/or upper arm and patch application sites were rotated on a daily basis.

The two outcome measures used to assess the effect of treatment were the International RLS Rating Scale (IRLS Scale) and a Clinical Global Impression - Improvement (CGI-I) assessment. The IRLS Scale contains 10 items designed to assess the severity of sensory and motor symptoms, sleep disturbance, daytime somnolence, and impact on activities of daily living and mood associated with RLS. The range of scores is 0 to 40, with 0 being absence of

RLS symptoms and 40 the most severe symptoms. The CGI-I is designed to assess clinical progress (global improvement) on a 7-point scale.

## Clinical Trials in Patients with Restless Legs Syndrome

### Study Demographics and Trial Design

**Table 11 Summary of Patient Demographics for Clinical Trials in Patients with Restless Legs Syndrome**

Study	Trial design and duration	Dosage	Study subjects (n=number)	Mean age (Range)	Gender
North American Trial	Multicenter, randomized, double-blind, placebo-controlled, 5-arm, parallel-group, fixed-dose  29 weeks	NEUPRO: 0.5mg/24h, 1 mg/24h, 2 mg/24h, 3 mg/24h	405	52 years (19-77)	39% male  61% female
		Placebo	100		
Multinational Trial	Multicenter, multinational, randomized, double-blind, placebo-controlled, 4-arm, parallel-group, fixed-dose  28 weeks	NEUPRO: 1 mg/24h, 2 mg/24h, and 3 mg/24h	341	58 years (23-78)	27% male  73% female
		Placebo	117		

Across the two studies, the mean duration of RLS was 2.1 to 3.1 years, mean age was approximately 55 years (range of 19 to 78 years), approximately 67% were women, and 97% were Caucasian. A total of 746 patients were treated with NEUPRO in these two studies.

### ***North American Trial***

This trial was a multicenter, 5-arm, parallel-group fixed-dose trial of NEUPRO in subjects with moderate-to-severe RLS. A total of 505 subjects were randomized in this trial, participating at approximately 50 sites in the U.S. Subjects received placebo or NEUPRO (0.5 mg/24h, 1 mg/24h, 2 mg/24h, 3 mg/24h). Subjects began treatment at a daily dosage of 0.5 mg/24 h NEUPRO and were titrated over a 4 week period to their assigned daily dose followed by a 6 month maintenance period and 7 day down titration period.

Mean baseline IRLS sum scores were similar among all treatment groups (23.5, 23.1, 23.2, 23.3, and 23.6 for the placebo, NEUPRO 0.5 mg/24h, 1 mg/24h, 2 mg/24h, and 3 mg/24h groups, respectively). Patients experienced a mean change in the IRLS sum score from baseline to the end of treatment for each of the 4 NEUPRO dose groups. The mean changes from baseline and differences from placebo in IRLS sum score are shown for each treatment group in Table 12. The difference between the 2 highest treatment groups (2 mg/24h and 3 mg/24h) and placebo were statistically significant. Symptomatic improvement started to appear as titration progressed. The CGI-I results were consistent with the IRLS sum score results. The IRLS responder rates, based on a 50% reduction on the primary endpoint ranged from 48% - 67% for the groups on NEUPRO versus 37% on placebo.

**Table 12 North American Trial: ANCOVA Results for Co-Primary Endpoint: Change from Baseline to End of Maintenance Period (FAS with LOCF)**

Variable	Treatment	Mean Change From Baseline	Difference from placebo
IRLS sum score	Placebo (n=99)	-9.0	NA
	0.5 mg/24h (n=98)	-11.1	-2.2
	1 mg/24h (n=99)	-11.2	-2.3
	2 mg/24h (n=95)	-13.5	-4.5*
	3 mg/24h (n=103)	-14.2	-5.2**

\*p=0.0002; \*\*p<0.0001

**Multinational Trial**

This trial was a multicenter, 4-arm, parallel-group trial of NEUPRO in subjects with moderate-to-severe RLS. A total of 458 subjects were randomized in this trial, participating at approximately 50 sites in 8 European countries. Subjects received placebo or NEUPRO (1 mg/24h, 2 mg/24h, 3 mg/24h). Subjects began treatment at a daily dosage of 1 mg/24h NEUPRO and were titrated over a 3 week period to their assigned daily dose followed by a 6 month maintenance period and 7 day down-titration period.

Mean baseline IRLS sum scores were similar among all treatment groups (28.1, 28.1, 28.2, and 28.0 for the placebo, NEUPRO 1 mg/24h, 2 mg/24h, and 3 mg/24h groups, respectively). Patients experienced a mean change in the IRLS sum score from baseline to the end of treatment for each of the 3 NEUPRO dose groups. The mean changes from baseline and differences from placebo in IRLS sum score are shown for each treatment group in Table 13. The difference between all 3 treatment groups (1 mg/24h, 2 mg/24h, and 3 mg/24h) and placebo were statistically significant (p<0.0001). Symptomatic improvement started to appear as titration progressed. The CGI-I results were consistent with the IRLS sum score results. The IRLS responder rates, based on a 50% reduction on the primary endpoint ranged from 52% - 55% for the groups on NEUPRO versus 25% on placebo.

**Table 13 Multinational Trial: ANCOVA Results for Co-Primary Endpoint: Change from Baseline to End of Maintenance Period (FAS with LOCF)**

Variable	Treatment	Mean Change From Baseline	Difference from placebo
IRLS sum score	Placebo (n=114)	-8.6	NA
	1 mg/24h (n=112)	-13.7	-5.1*
	2 mg/24h (n=109)	-16.2	-7.5*
	3 mg/24h (n=112)	-16.8	-8.2*

\*p<0.0001

## DETAILED PHARMACOLOGY

### Receptor Binding Studies

In functional assays, rotigotine was characterized as a dopamine receptor agonist, acting as a D<sub>2</sub> and D<sub>3</sub> receptor agonist and also on D<sub>1</sub>, D<sub>4</sub> and D<sub>5</sub> receptors. Rotigotine also shows affinities and activities at some non-dopaminergic receptors, notably antagonism at alpha<sub>2B</sub> and agonism at 5HT<sub>1A</sub> receptor subtypes. The significance of these non-dopaminergic interactions to its efficacy profile *in vivo* is unknown. There is no affinity of rotigotine for the 5HT<sub>2B</sub> receptor.

Rotigotine was shown not to interact with enzymes of dopamine metabolism or with catecholamine transporters at clinically relevant doses.

### Safety Pharmacology

Safety pharmacology studies have been conducted in the central nervous, cardiovascular and respiratory systems. In addition to the core battery of studies, supplemental safety pharmacology studies have been performed in the renal and gastrointestinal systems.

Rotigotine induced dose-dependent effects on neurobehavior, spontaneous motility and nociception in mice and rats. Rotigotine tended to facilitate proconvulsive effects and showed no anticonvulsive activity.

The influence of rotigotine on hemodynamic and electrocardiograph (ECG) parameters has been investigated in animal studies with anesthetized and conscious rats and monkeys. Rotigotine appeared to have relatively little or no consistent effects on blood pressure and heart rate.

In rats, a decrease in urinary volume was observed after subcutaneous administration at doses of 0.1, 0.5 and 1mg/kg and a reduction in electrolyte excretion at doses of 0.5 and 1mg/kg. In mice, there was no compound-related effect on intestinal transit time and in the guinea pig isolated ileum, rotigotine exerted nonspecific antagonistic effects against several neurotransmitters and barium chloride at micromolar concentrations.

As has been reported with other dopamine agonists, binding to melanin-containing tissues (i.e. eyes) in the pigmented rat and monkey was evident after a single dose of rotigotine, but was slowly cleared over the 14-day observation period.

## TOXICOLOGY

### Repeat Dose Studies

In repeated dose and long-term toxicity studies with rotigotine, conducted in mice, rats and monkeys with duration up to 3 months in mice, 6 months in rats and 12 months in monkeys, major effects were associated with dopamine agonist related pharmacodynamic effects including the decrease of prolactin secretion. The major effects of rotigotine included behavioral changes, such as restlessness or changes in motility, and rough fur. Additionally, body weight was significantly reduced, but was not dose-related and food consumption was increased in the same manner.

## **Carcinogenicity**

Two-year subcutaneous carcinogenicity studies of rotigotine were conducted in CD-1 mice at doses of 0, 3, 10 and 30 mg/kg and in Sprague-Dawley rats at doses of 0, 0.3, 1, and 3 mg/kg; in both studies rotigotine was administered once every 48 hours. No significant increases in tumors occurred in the mouse study at doses up to 9 times the maximum recommended human dose (MRHD) of 8 mg/24h for the treatment of early-stage Parkinson's disease on a mg/m<sup>2</sup> basis, up to 4.5 times the MRHD of 16 mg/24h for advanced-stage Parkinson's disease and up to 48 times the MRHD of 3 mg/24h for Restless Legs Syndrome.

In rats, there were significant increases in Leydig cell tumors in males and uterine tumors (adenocarcinomas, squamous cell carcinomas) in females. The endocrine mechanisms believed to be involved in the production of Leydig cell and uterine tumors in rats are not considered relevant to humans. Therefore, there were no significant tumor findings considered relevant to humans at plasma exposures (AUC) up to 12 times the plasma AUC in humans at the MRHD of 8 mg/24h (early-stage Parkinson's disease), up to 5.5 times the plasma AUC in humans at the MRHD of 16 mg/24h (advanced-stage Parkinson's disease) and up to 25 times the plasma AUC in humans at the MRHD of 3 mg/24h (Restless Legs Syndrome).

## **Reproductive Toxicology**

When rotigotine was administered subcutaneously (1.5, 5, or 15 mg/kg/day) to female rats prior to and during mating and continuing through gestation day 7, an absence of implantation was observed at all doses. The lowest dose tested was 2 times the MRHD on a mg/m<sup>2</sup> basis. In male rats treated from 70 days prior to and during mating, there was no effect on fertility; however, a decrease in epididymal sperm motility was observed at the highest dose tested. The no-effect dose (5 mg/kg/day) was 3 times the MRHD on a mg/m<sup>2</sup> basis. When rotigotine was administered subcutaneously to female mice at doses of 10, 30, and 90 mg/kg/day from 2 weeks until 4 days before mating and then at a dose of 6 mg/kg/day (all groups) (approximately 4 times the MRHD on a mg/m<sup>2</sup> basis) from 3 days before mating until gestation day 7, a markedly reduced (low dose) or complete absence of implantation (mid and high doses) was observed. The effects on implantation in rodents are thought to be due to the prolactin-lowering effect of rotigotine. In humans, chorionic gonadotropin, not prolactin, is essential for implantation.

In subcutaneous studies in Sprague-Dawley rats and CD-1 mice, rotigotine was shown to have adverse effects on embryo-fetal development. Rotigotine given to pregnant rats during organogenesis (0.5, 1.5 or 5 mg/kg/day on gestation days 6 through 17) resulted in increased fetal death at all doses. The lowest effect dose was 0.6 times the MRHD for early-stage Parkinson's disease, 0.3 times the MRHD for advanced-stage Parkinson's disease and 1.6 times the MRHD for Restless Legs Syndrome, on a mg/m<sup>2</sup> basis. This effect is thought to be due to the prolactin-lowering effect of rotigotine. Rotigotine given to pregnant mice during organogenesis (10, 30 or 90 mg/kg/day on gestation days 6 through 15) resulted in an increased incidence of skeletal retardation at 10, 30 and 90 mg/kg/day, and an increase in fetal death at 90 mg/kg/day. There were no effects below 10 mg/kg/day (6 times the MRHD for early-stage Parkinson's disease, 3 times the MRHD for advanced-stage Parkinson's disease and 16.2 times the MRHD for Restless Legs Syndrome, on a mg/m<sup>2</sup> basis). Rotigotine given to pregnant Himalayan rabbits during organogenesis (up to 30 mg/kg/day,

up to 73 times the MRHD for early-stage Parkinson's disease, 36 times the MRHD for advanced-stage Parkinson's disease and 194 times the MRHD for Restless Legs Syndrome, on a mg/m<sup>2</sup> basis) had no effects on embryo-fetal development. In a pre- and postnatal development study, Sprague-Dawley rats were administered 0.1, 0.3 or 1 mg/kg/day from gestation day 6 through postnatal day 21. Rotigotine impaired growth and development of offspring during lactation and produced neurobehavioral abnormalities in offspring at 1 mg/kg/day. When offspring were mated, growth and survival of their offspring were adversely affected. No adverse effects were observed at 0.3 mg/kg/day (0.4 times the MRHD for early-stage Parkinson's disease, 0.15 times the MRHD for advanced-stage Parkinson's disease and 1 times the MRHD for Restless Legs Syndrome, on a mg/m<sup>2</sup> basis).

### **Mutagenicity**

Rotigotine was not mutagenic in the *in vitro* Ames test or the *in vivo* Unscheduled DNA Synthesis test in hepatocytes from male Fisher rats. In the *in vitro* mouse lymphoma assay, rotigotine was mutagenic and clastogenic in the presence and absence of metabolic activation. Rotigotine was not clastogenic in the *in vivo* mouse micronucleus test.

### **Retinal Pathology in Albino Rats**

Retinal degeneration was observed by transmission microscopy in albino rats at the 3-month timepoint in a 6-month toxicity study at the highest dose of rotigotine at plasma exposures at least 7 times that of the maximum recommended human dose (MRHD). Retinal degeneration was not observed in the 2-year carcinogenicity studies in albino rat or albino mouse, or in monkeys treated for 1 year (plasma exposures up to 5-14 times that of the MRHD).

The potential significance of this effect in humans has not been established, but cannot be disregarded because disruption of a mechanism that is universally present in vertebrates (i.e., disk shedding) may be involved.

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**PART III: CONSUMER INFORMATION**

**PrNEUPRO®**  
**(rotigotine)**  
**Transdermal System**

This leaflet is part III of a three-part "Product Monograph" published when NEUPRO was approved for sale in Canada and is designed specifically for Consumers. This leaflet is a summary and will not tell you everything about NEUPRO. Contact your doctor or pharmacist if you have any questions about the drug.

**ABOUT THIS MEDICATION****What the medication is used for:**

NEUPRO is a prescription medicine used to treat adults 18 years and older for:

- the signs and symptoms of Parkinson's disease either alone or in combination with the drug levodopa.
- the signs and symptoms of moderate to severe Restless Legs Syndrome (RLS), a condition that is characterized by an irresistible urge to move the legs.

NEUPRO is a patch that is applied to the skin.

**What it does:**

NEUPRO belongs to a group of medicines called dopamine agonists which stimulate a certain type of cells that bind with dopamine receptors in the brain.

**When it should not be used:**

Do not use NEUPRO if you:

- are allergic (hypersensitive) to rotigotine or any of the other ingredients in NEUPRO listed in the "nonmedicinal ingredients" section below.

**What the medicinal ingredient is:**

rotigotine

**What the nonmedicinal ingredients are:**

The other ingredients are poly(dimethylsiloxane, trimethylsilyl silicate)-copolymerisate, povidoneK90, sodium metabisulphite (E223), ascorbyl palmitate (E304) and DL- $\alpha$ -tocopherol (E307).

Backing layer: Polyester film, siliconized, aluminized, colour coated with a pigment (titanium dioxide (E171), pigment yellow 95, pigment red 166) layer and imprinted (pigment red 144, pigment yellow 95, pigment black 7).

Protective Release liner: Transparent fluoropolymer coated polyester film.

**What dosage forms it comes as:**

A transdermal system (patch) in beige to light brown colour. It is thin and has three layers. It is square-shaped with rounded edges. NEUPRO is available in six strengths: 1 mg/24h, 2 mg/24h, 3 mg/24h, 4 mg/24h, 6 mg/24h and 8 mg/24h.

**WARNINGS AND PRECAUTIONS**

**You are warned of a sudden onset of sleep condition which may occur without warning, while taking NEUPRO. You should not drive, operate machinery or engage in activities that require alertness, as you may put yourself and others at risk of serious injury or death. This sudden onset of sleep condition has also been reported in patients taking other anti-Parkinson drugs of the same class.**

**Monitoring Your Blood Pressure:**

This medicine may affect your blood pressure, so it should be measured regularly, especially at the beginning of your treatment.

**Withdrawal Syndrome:**

Abruptly stopping the use of NEUPRO may cause withdrawal symptoms. A reduction of dosage or termination of therapy should be carefully considered. The dosage of NEUPRO must be tapered down if discontinuation is required. Consult your doctor on how and when to reduce your dose.

**Melanoma:**

Studies of people with Parkinson's disease show that they may be at an increased risk of developing melanoma (a form of skin cancer) when compared to people without Parkinson's disease. It is not known if this problem is associated with Parkinson's disease or the drugs used to treat Parkinson's disease. NEUPRO is one of the drugs used to treat Parkinson's disease; therefore, patients treated with NEUPRO should have periodic skin examinations.

**Augmentation and Rebound in RLS:**

If you are taking NEUPRO for Restless Legs Syndrome, you may experience that symptoms of Restless Legs Syndrome start earlier than usual in the morning (augmentation), or when the drug effect of NEUPRO is wearing off (rebound). Symptoms may be more intense and involve other limbs. Consult your doctor or pharmacist regarding how to manage this condition.

**Eye Examination:**

Eye examinations are recommended at regular intervals while using NEUPRO. However, if you notice any problems with your sight in-between examinations, you should contact your doctor immediately.

**Psychiatric Reactions:**

NEUPRO may cause hallucinations (seeing or hearing things that are not real). If you notice such effects, please contact your doctor.

As with other medicines in this class, NEUPRO may cause excessive gambling and increased sex drive, or other behaviours that appear to be unusual and excessive. If you notice such effects, please contact your doctor.

**Skin Reactions:**

NEUPRO can cause skin reactions, such as reddening and itching. They are usually mild or moderate, and only affect the area of skin the patch has been on. The reactions normally disappear after a few hours when you remove the patch. Contact your doctor if you have a skin reaction which lasts for more than a few days, which is severe, or spreads outside the area of skin that was covered by the patch. Put the patch on a different area of skin every day, and only use the same area again after 14 days to avoid skin reactions.

**Sulfites Hypersensitivity:**

NEUPRO contains sodium metabisulphite (E223), a substance that may rarely cause severe allergic reactions and bronchospasm.

**Before Magnetic Resonance Image Testing or Cardioversion:**

If you are about to have magnetic resonance imaging (method to visualise internal organs and tissues of the body) or cardioversion (treatment of abnormal heart rhythm), you must take your NEUPRO patch off before such procedures. You can put a new patch on after the procedure.

**Heat Application:**

Heat may cause too much medicine from a NEUPRO patch to pass through your skin.

While you are wearing a NEUPRO patch, do not:

- apply a heating pad to the application site area
- take a hot bath
- use a sauna
- expose the application site to direct sunlight

**BEFORE you use NEUPRO, talk to your doctor or pharmacist if you:**

- have a heart or kidney condition
- have severe liver or kidney problems
- have a history of dizzy spells when going from sitting to standing position, or short fainting spells
- are pregnant or plan to become pregnant
- are breast-feeding or intend to breast feed. NEUPRO may pass into your breast milk and affect your baby, and is likely to reduce the amount of milk you produce.
- are less than 18 years of age

Ask your doctor or pharmacist for advice before taking any medicine.

**INTERACTIONS WITH THIS MEDICATION**

As with most medicines, interactions with other drugs are

possible. Tell your doctor, nurse, or pharmacist about all the medicines you take, including drugs prescribed by other doctors, vitamins, minerals, natural supplements, or alternative medicines.

The following may interact with NEUPRO:

- Anti-psychotics (used to treat certain mental conditions): the effect of NEUPRO may be decreased when used concurrently.
- Metoclopramide (used to treat nausea and vomiting): the effects of NEUPRO may be decreased when used concurrently.
- Levodopa: the side effects from NEUPRO or levodopa, e.g. hallucinations, dyskinesia (movement disorder) and swelling of legs and feet may get more serious.
- Sedative medications (e.g. benzodiazepines) or central nervous system depressants: these agents may increase the sedative effects of NEUPRO.
- Alcohol: in combination with NEUPRO, may increase the sedative effects of NEUPRO.

**PROPER USE OF THIS MEDICATION**

Since NEUPRO is absorbed through your skin, its effects are not affected by the intake of food or drink. However, you should discuss with your doctor if it is safe for you to drink alcohol while using NEUPRO.

Always use NEUPRO exactly as your doctor has told you. You should check with your doctor or pharmacist if you are not sure.

NEUPRO is generally used as a long term treatment. You will start your treatment with a low dose and, if necessary, increase it week by week, as told by your doctor, until reaching the right dose for you. You will then continue treatment with this dose, also called the maintenance dose.

You should change your NEUPRO patch once a day. For reaching the needed doses, different strengths of NEUPRO are available, each releasing a different amount of the active substance per day: 1 mg/24h, 2 mg/24h, 3 mg/24h, 4 mg/24h, 6 mg/24h and 8 mg/24h. For higher doses, multiple patches must be applied. For example a daily dose of 10 mg may be reached by applying one patch of 6 mg/24h and one patch of 4 mg/24h.

**Usual adult dose:**

**Treatment of Parkinson's disease**

*Patients not taking levodopa (early stage of Parkinson's disease):*

Start using one NEUPRO 2 mg/24h patch daily. From the second week, the daily dose will be increased by 2 mg, on a weekly basis, until reaching the maintenance dose. For most patients, the right dose is either 6 mg or 8 mg per day (reached within 3 to 4 weeks).

The maximum dose is 8 mg per day.

Patients taking levodopa (advanced stage of Parkinson's disease):

Start using one NEUPRO 4 mg/24h patch daily. From the second week, the daily dose will be increased by 2 mg, on a weekly basis, until reaching the maintenance dose. For most patients, the right dose is between 8 mg and 16 mg per day (reached within 3 to 7 weeks).

The maximum dose is 16 mg per day.

**Treatment of Restless Legs Syndrome**

Start using one NEUPRO 1 mg/24h patch daily. If necessary, this daily dose may be increased by 1 mg, on a weekly basis, until reaching the maintenance dose.

The maximum dose is 3 mg per day.

**Do not stop using NEUPRO suddenly without talking to your doctor.**

A sudden stop could cause you to develop a medical condition called neuroleptic malignant syndrome which may represent a major health risk. The symptoms include: akinesia (loss of muscle movement), rigid muscles, fever, unstable blood pressure, tachycardia (increased heart rate), confusion, depressed level of consciousness (e.g. coma).

If you stop using NEUPRO, your daily dose of NEUPRO should be reduced gradually as follows:

- For treatment of Restless Legs Syndrome: reduce by 1 mg/24h every other day until complete discontinuation.
- For treatment of Parkinson's disease: reduce by 2 mg/24h every other day until complete discontinuation.

If you have any further questions on the use of this product, ask your doctor or pharmacist.

**Overdose:**

If you think you have used more patches of NEUPRO than you are told, contact a health care practitioner, hospital emergency department or regional Poison Control Centre immediately, even if there are no symptoms.

Using higher doses of NEUPRO than your doctor has prescribed may cause side effects such as nausea (feeling sick), vomiting, low blood pressure, hallucinations (seeing or hearing things that are not real), confusion, extreme sleepiness, involuntary movements and convulsions.

**Missed Dose:**

If you have forgotten to change the patch at your usual time,

change it as soon as you remember:

Remove the old patch and use a new one. If you have forgotten to stick on a new patch after removing the old one, use a new patch as soon as you remember.

In both cases, on the following day you should use a new patch at the usual time. Do not use a double dose to make up for a forgotten dose.

**FOLLOW THESE INSTRUCTIONS WHEN USING NEUPRO:**

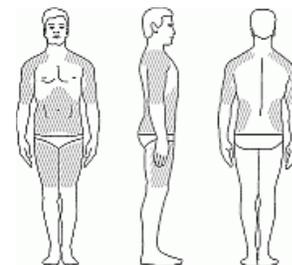
You should stick a new NEUPRO patch onto the skin **once a day**. Leave the patch on your skin for 24 hours, then remove it and apply a new one. **Make sure that you take the old patch off before applying a new one; place the new patch on a different area of skin.**

You should **change your patch** at around the **same time every day**.

Do not cut the NEUPRO patches into pieces.

Where to stick the patch:

Put the sticky side of the patch onto clean, dry, healthy skin on **one** of the following areas, as indicated by the grey areas in the picture:



- shoulder
- upper arm
- belly
- thigh
- hip
- flank (your side, between your ribs and your hip)

To help avoid skin irritation:

- Stick the patch onto a **different area of skin each day**, for example on the right side of your body one day, then on the left side the next day; on your upper body one day, then on your lower body.
- Do not stick NEUPRO on the same area of skin twice within 14 days.
- Do not stick the patch on broken or damaged skin or on skin that is red or irritated.

To prevent the patch becoming loose or falling off:

- Do not put the patch in an area where it can be rubbed by tight clothing.
- Do not use creams, oils, lotions, powders or other skin products

on the area of skin you will be sticking the patch on or near a patch you are already wearing.

- If you need to stick the patch to a hairy area of skin, you must shave the area at least 3 days before sticking the patch there.
- If the edges of the patch lift, the patch may be taped down with adhesive medical tape.

If the patch falls off, a new patch should be applied for the rest of the day, then replace the patch at the same time as usual.

**NOTE:**

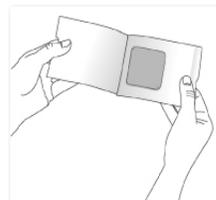
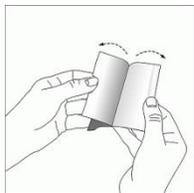
- Bathing, showering and exercising should not affect how NEUPRO works. Nevertheless, check that the patch has not fallen off afterwards.
- You should avoid external heat (for example excessive sunlight, saunas, hot bath, heating pads or hot-water bottles) on the area of the patch.
- If the patch has irritated your skin, you should keep that area protected from direct sunlight, as it may cause changes in the colour of the skin.

How to use the patch:

Each patch is packed in a separate pouch. You should stick NEUPRO onto your skin as soon as you have opened the pouch and removed the protective release liner.

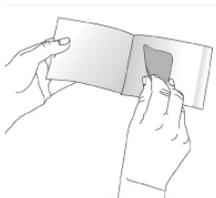
1.

To open the pouch, hold the two sides of the pouch. Peel apart the foil and open the pouch.



2.

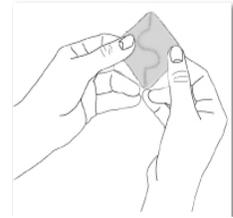
Take the patch out of the pouch.



3.

The sticky side of the patch is

covered by a transparent release liner. Hold the patch in both hands with the protective release liner facing you.



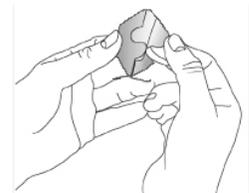
4.

Bend the patch in half so that the S-shaped break in the release liner opens.



5.

Peel off one side of the release liner. Don't touch the sticky side of the patch with your fingers.



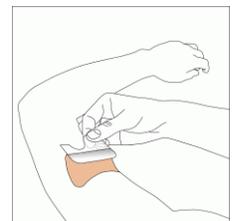
6.

Hold the other half of the rigid release liner and put the sticky surface of the patch onto your skin. Press the sticky side of the patch firmly into place.



7.

Fold back the other half of the patch and remove the other side of the release liner.



8.

Press the patch down firmly with the palm of your hand for 30 seconds to make sure the patch is touching the skin and the edges stick well.



Wash your hands with soap and water immediately after handling the patch.

How to remove a used patch:

Slowly and carefully peel off the used patch.

Gently washing the area with warm water and mild soap should remove any adhesive that stays on your skin after you remove

the patch. You can also use a small amount of baby oil to remove any adhesive that won't wash off.

Do not use alcohol or other dissolving liquids such as nail polish remover as these may irritate your skin.

Choose a new area of skin where you will apply a new patch, then follow the instructions above.

What to do with the used patches:

Used patches still contain active substance, which may be harmful to others. Fold the used patch with the sticky side inwards. Put the patch in an empty pouch and then throw it away safely, out of the reach of children and pets.

**SIDE EFFECTS AND WHAT TO DO ABOUT THEM**

The common side effects associated with the use of NEUPRO are:

- skin irritations under the patch such as redness and itching
- feeling sick (nausea)
- headache
- sleepiness

In patients with Parkinson's disease, side effects also include:

- vomiting
- dizziness
- trouble sleeping (insomnia)
- hands and legs swelling

When you are on NEUPRO, talk to your doctor, pharmacist or nurse if you find some new side effects.

**SERIOUS SIDE EFFECTS, HOW OFTEN THEY HAPPEN AND WHAT TO DO ABOUT THEM**

Symptom / effect		Talk with your doctor or pharmacist		Stop taking drug and seek immediate medical help
		Only if severe	In all cases	
Common	Falling asleep while doing normal activities		X	
	Hypotension: Low blood pressure that makes you feel dizzy, faint, sweaty or have nausea	X		

**SERIOUS SIDE EFFECTS, HOW OFTEN THEY HAPPEN AND WHAT TO DO ABOUT THEM**

Symptom / effect		Talk with your doctor or pharmacist		Stop taking drug and seek immediate medical help
		Only if severe	In all cases	
	Syncope: Fainting due to a fall in blood pressure		X	
	Hallucinations: Seeing, hearing or sensing things that are not real		X	
	Compulsive behavior and trouble controlling strong urges such as gambling too much, increased sexual desire, uncontrollable urge to eat or spend money, or repeating meaningless actions		X	
	Dyskinesia: difficulty performing voluntary movements	X		
Uncommon	Allergic skin reactions: symptoms including generalized redness, rash or swelling; red, itchy, blistering skin under the patch			X

*This is not a complete list of side effects. For any unexpected effects while taking NEUPRO, contact your doctor or pharmacist.*

**HOW TO STORE IT**

Keep NEUPRO and all medicines out of the reach and sight of children and pets.

- Do not use NEUPRO after the expiry date which is stated on the label and carton.
- Store NEUPRO at room temperature, 15°C to 30°C.
- Store in the original package.

### **REPORTING SUSPECTED SIDE EFFECTS**

You can report any suspected adverse reactions associated with the use of health products to the Canada Vigilance Program by one of the following 3 ways:

Report online at [www.healthcanada.gc.ca/medeffect](http://www.healthcanada.gc.ca/medeffect)

Call toll-free at 1-866-234-2345

Complete a Canada Vigilance Reporting Form and:

- Fax toll-free to 1-866-678-6789, or

- Mail to: Canada Vigilance Program

Health Canada

Postal Locator 0701E

Ottawa, Ontario

K1A 0K9

Postage paid labels, Canada Vigilance Reporting Form and the adverse reaction reporting guidelines are available on the MedEffect™ Canada Web site at [www.healthcanada.gc.ca/medeffect](http://www.healthcanada.gc.ca/medeffect).

*NOTE: Should you require information related to the management of side effects, contact your health professional. The Canada Vigilance Program does not provide medical advice.*

### **MORE INFORMATION**

This document plus the full product monograph, prepared for health professionals can be provided by contacting the sponsor, UCB Canada Inc., at 1-866-709-8444

This leaflet was prepared by UCB Canada Inc.

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