

Part II

Summary of Product Characteristics

1 NAME OF THE MEDICINAL PRODUCT

Relenza 5mg/dose, inhalation powder pre-dispensed.

2 QUALITATIVE AND QUANTITATIVE COMPOSITION

Each pre-dispensed quantity of inhalation powder (one blister) contains 5 mg zanamivir. Each delivered inhalation (the amount that leaves the mouthpiece of the Diskhaler) contains 4.0 mg zanamivir.

Excipients: Lactose monohydrate (approximately 20 mg which contains milk protein).

For a full list of excipients, see section 6.1.

3 PHARMACEUTICAL FORM

Inhalation powder, pre-dispensed. White to off-white powder.

4 CLINICAL PARTICULARS

4.1 Therapeutic Indications

Treatment of influenza

Relenza is indicated for treatment of both influenza A and B in adults and children (≥ 5 years) who present with symptoms typical of influenza when influenza is circulating in the community.

Prevention of influenza

Relenza is indicated for post-exposure prophylaxis of influenza A and B in adults and children (≥ 5 years) following contact with a clinically diagnosed case in a household (see section 5.1 for children aged 5-11 years). In exceptional circumstances, Relenza may be considered for seasonal prophylaxis of influenza A and B during a community outbreak (e.g. in case of a mismatch between circulating and vaccine strains and a pandemic situation).

Relenza is not a substitute for influenza vaccination. The appropriate use of Relenza for prevention of influenza should be determined on a case-by-case basis depending on the circumstances and the population requiring protection.

The use of antivirals for the treatment and prevention of influenza should take into consideration official recommendations, the variability of epidemiology, and the impact of the disease in different geographical areas and patient populations.

4.2 Posology and method of administration

Inhaled drugs, e.g. asthma medication, should be administered prior to administration of Relenza (see section 4.4).

Treatment of influenza

Treatment should begin as soon as possible, within 48 hours after onset of symptoms for adults, and within 36 hours after onset of symptoms for children.

Relenza is for administration to the respiratory tract by oral inhalation only, using the Diskhaler device provided. One blister should be utilised for each inhalation.

The recommended dose of Relenza for treatment of influenza in adults and children from the age of 5 years is two inhalations (2 x 5 mg) twice daily for five days, providing a total daily inhaled dose of 20 mg.

Prevention of influenza

Post-exposure prophylaxis

The recommended dose of Relenza for prevention of influenza, following close contact with an individual, is two inhalations (2 x 5 mg) once daily for 10 days. Therapy should begin as soon as possible and within 36 hours of exposure to an infected person.

Seasonal prophylaxis

The recommended dose of Relenza for prevention of influenza during a community outbreak is 2 inhalations (2 x 5 mg) once daily for up to 28 days.

Impaired Renal or Hepatic Function: No dose modification is required. (See section 5.2).

Elderly patients: No dose modification is required. (See section 5.2).

4.3 Contraindications

Hypersensitivity to the active substance or to any of the excipients.

4.4 Special warnings and precautions for use

Due to the limited number of patients with severe asthma or with other chronic respiratory disease, patients with unstable chronic illnesses or immunocompromised patients (see Section 5.1) who have been treated, it has not been possible to demonstrate the efficacy and safety of Relenza in these groups. Due to limited and inconclusive data, the efficacy of Relenza in the prevention of influenza in the nursing home setting has not been demonstrated.

The efficacy of zanamivir for the treatment of elderly patients ≥ 65 years has also not been established (see section 5.1).

There have been very rare reports of patients being treated with Relenza who have experienced bronchospasm and/or decline in respiratory function which may be acute and/or serious. Some of these patients did not have any previous history of respiratory disease. Any patients experiencing such reactions should discontinue Relenza and seek medical evaluation immediately.

Due to the limited experience, patients with severe asthma require a careful consideration of the risk in relation to the expected benefit, and Relenza should not be administered unless close medical monitoring and appropriate clinical facilities are available in case of bronchoconstriction. In patients with persistent asthma or severe COPD, management of the underlying disease should be optimised during therapy with Relenza.

Should zanamivir be considered appropriate for patients with asthma or chronic obstructive pulmonary disease, the patient should be informed of the potential risk of bronchospasm with Relenza and should have a fast acting bronchodilator available. Patients on maintenance inhaled bronchodilating therapy should be advised to use their bronchodilators before taking Relenza (see section 4.2).

This medicinal product contains lactose. Patients with rare hereditary problems of galactose intolerance, the Lapp lactase deficiency or glucose-galactose malabsorption should not take this medicine.

Relenza is not a substitute for influenza vaccination and the use of Relenza must not affect the evaluation of individuals for annual vaccination. The protection against influenza only lasts as long as Relenza is administered. Relenza should be used for the treatment and prevention of influenza only when reliable epidemiological data indicate that influenza is circulating in the community.

Relenza is effective only against illness caused by influenza viruses. There is no evidence for the efficacy of Relenza in any illness caused by agents other than influenza viruses.

4.5 Interaction with other medicinal products and other forms of interaction

Zanamivir is not protein bound and not hepatically metabolised or modified. Clinically significant drug interactions are unlikely. Zanamivir, when given for 28 days, did not impair the immune response to influenza vaccine.

4.6 Pregnancy and lactation

Pregnancy: The safe use of Relenza during pregnancy has not been established.

In rats and rabbits zanamivir has been shown to cross the placenta. High doses of zanamivir were not associated with malformations in rats or rabbits and only minor alterations were reported. The potential risk for humans is unknown. Relenza should not be used in pregnancy unless the expected benefit to the mother is thought to outweigh any possible risk to the foetus.

Lactation: In rats zanamivir has been shown to be secreted into milk. There is no information on secretion into breast milk in humans.

The use of zanamivir is not recommended in mothers who are breast feeding.

4.7 Effects on ability to drive and use machines

Zanamivir has no or negligible effect on ability to drive and use machines.

4.8 Undesirable effects

There have been rare reports of patients with previous history of respiratory disease (asthma, COPD) and very rare reports of patients without previous history of respiratory disease, who have experienced acute bronchospasm and/or serious decline in respiratory function after use of Relenza (see section 4.4).

The adverse events considered at least possibly related to the treatment are listed below by body system, organ class and absolute frequency. Frequencies are defined as very common (>1/10), common (>1/100, <1/10), uncommon (>1/1000, <1/100), rare (>1/10,000, <1/1000), very rare (<1/10,000).

Within each frequency grouping, undesirable effects are presented in order of decreasing seriousness.

Immune system disorders

Very rare: allergic-type reaction including facial and oropharyngeal oedema

Respiratory, thoracic and mediastinal disorders:

Very rare: bronchospasm, dyspnea, throat tightness or constriction

Skin and subcutaneous tissue disorders:

Very rare: rash, urticaria

Psychiatric and nervous system disorders:

Convulsions and psychiatric events such as depressed level of consciousness, abnormal behaviour, hallucinations and delirium have been reported during Relenza administration in patients with influenza. The symptoms were mainly reported in children and adolescents. Convulsions and psychiatric symptoms have also been reported in patients with influenza not taking Relenza.

4.9 Overdose

Accidental overdose is unlikely due to the physical limitations of the presentation, the route of administration and the poor oral bioavailability (2 to 3%) of zanamivir. Doses of zanamivir up to 64 mg/day (approximately 3 times the maximum daily recommended dose) have been administered by oral inhalation (by nebuliser) without adverse effects. Additionally, systemic exposure by intravenous administration of up to 1200 mg/day for five days showed no adverse effect.

5 PHARMACOLOGICAL PROPERTIES

5.1 Pharmacodynamic properties

Pharmacotherapeutic group: Antiviral, neuraminidase inhibitor

ATC code J05AH01

Mechanism of action

Zanamivir is a selective inhibitor of neuraminidase, the influenza virus surface enzyme. Neuraminidase inhibition occurred *in vitro* at very low zanamivir concentrations (50% inhibition at 0.64nM – 7.9nM against influenza A and B strains). Viral neuraminidase aids the release of newly formed virus particles from infected cells, and may facilitate access of virus through mucus to epithelial cell surfaces, to allow viral infection of other cells. The inhibition of this enzyme is reflected in both *in vitro* and *in vivo* activity against influenza A and B virus replication, and encompasses all of the known neuraminidase subtypes of influenza A viruses.

The activity of zanamivir is extracellular. It reduces the propagation of both influenza A and B viruses by inhibiting the release of infectious influenza virions from the epithelial cells of the respiratory tract. Influenza viral replication occurs in the superficial epithelium of the respiratory tract. The efficacy of topical administration of zanamivir to this site has been confirmed in clinical studies. To date, virus with reduced susceptibility to zanamivir has not been detected in samples obtained pre and post treatment from patients in clinical studies.

Cross-resistance has been observed between some zanamivir-resistant and some oseltamivir-resistant influenza virus mutants generated *in vitro*. No studies have been performed to assess risk of emergence of cross-resistance during clinical use.

Clinical experience

Treatment of influenza

Relenza alleviates the symptoms of influenza and reduces their median duration by 1.5 days (range 1.0 – 2.5 days) in adults as detailed in the table below. The median time to alleviation of influenza symptoms in elderly subjects (≥ 65 years) and in children aged 5-6 years, was not significantly reduced. The efficacy of Relenza has been demonstrated in otherwise healthy adults when treatment is initiated within 48 hours, and in otherwise healthy children when treatment is initiated within 36 hours, after the onset of symptoms. No treatment benefit has been documented for patients with afebrile disease ($< 37.8^{\circ}\text{C}$).

1. Six key Phase III randomised, placebo-controlled, parallel-group, multicentre treatment studies (NAIB3001, NAIA3002, NAIB3002, NAI30008, NAI30012 and NAI30009) have been conducted with zanamivir for the treatment of naturally acquired influenza A and B. Study NAI30008 recruited only patients with asthma (n=399), COPD (n=87), or asthma and COPD (n=32), study NAI30012 recruited only elderly (≥ 65 years) patients (n=358) and study NAI30009 (n=471) recruited paediatric patients, 5-12 years. The Intent to Treat population of these six studies comprised 2942 patients of which 1490 received 10 mg zanamivir b.i.d by oral inhalation. The primary endpoint was identical for all six Phase III studies, i.e. time to alleviation of clinically significant signs and symptoms of influenza. For all six phase III studies, alleviation was defined as no fever, i.e. temperature $< 37.8^{\circ}\text{C}$ and feverishness score of 'none' ('same as normal/none' in NAI30012), and headache, myalgia, cough and sore throat recorded as 'none' ('same as normal/none' in NAI30012) or 'mild' and maintained for 24 hours.

*Comparison of Median Time (Days) to Alleviation of Influenza Symptoms:
Influenza Positive Population*

Study	Placebo	Zanamivir 10mg inhaled twice daily	Difference in Days	(95% CI) p-value
NAIB3001	n=160 6.0	n=161 4.5	1.5	(0.5, 2.5) 0.004
NAIA3002	n=257 6.0	n=312 5.0	1.0	(0.0, 1.5) 0.078
NAIB3002	n=141 7.5	n=136 5.0	2.5	(1.0, 4.0) <0.001
Combined analysis of NAIB3001, NAIA3002, and NAIB3002	n=558 6.5	n=609 5.0	1.5	(1.0, 2.0) <0.001
Asthma/COPD study				
NAI30008	n=153 7.0	n=160 5.5	1.5	(0.5, 3.25) 0.009
Elderly study				
NAI30012	n=114 7.5	n=120 7.25	0.25	(-2.0 to 3.25) 0.609
Paediatric study				
NAI30009	n=182 5.0	n=164 4.0	1.0	(0.5, 2.0) <0.001

In the Intent to Treat (ITT) population the difference in time to alleviation of symptoms was 1.0 day (95% CI: 0.5 to 1.5) in the combined analysis of NAIB3001, NAIA3002 and NAIB3002, 1.0 day (95% CI: 0 to 2) in study NAI30008, 1.0 day (95% CI -1.0 to 3.0) in study NAI30012 and 0.5 days (95% CI: 0 to 1.5) in study NAI30009. There are limited data in high risk children.

In a combined analysis of patients with influenza B (n=163), including 79 treated with zanamivir, a 2.0 day treatment benefit was observed (95% CI: 0.50 to 3.50).

In the pooled analysis of 3 phase III studies in influenza positive, predominantly healthy adults, the incidence of complications was 152/558 (27%) in placebo recipients and 119/609 (20%) in zanamivir recipients (relative risk zanamivir:placebo 0.73; 95% CI 0.59 to 0.90, p=0.004). In study NAI30008 enrolling patients with asthma and COPD the incidence of complications was 56/153 (37%) in influenza-positive placebo recipients and 52/160 (33%) in influenza positive zanamivir recipients (relative risk zanamivir:placebo 0.89; 95% CI: 0.65 to 1.21, p=0.520).

In study NAI30012 enrolling elderly patients the incidence of complications was 46/114 (40%) in influenza positive placebo recipients and 39/120 (33%) in influenza positive zanamivir recipients (relative risk zanamivir:placebo 0.80, 95% CI: 0.57 to 1.13, p=0.256). In the paediatric study NAI30009, the incidence of complications was 41/182 (23%) in influenza-positive placebo recipients and 26/164 (16%) in influenza-positive zanamivir recipients (relative risk zanamivir:placebo 0.70; 95% CI: 0.45 to 1.10, p=0.151).

In a placebo controlled study in patients with predominantly mild/moderate asthma and/or Chronic Obstructive Pulmonary Disease (COPD) there was no clinically significant difference between zanamivir and placebo in forced expiratory volume in one second (FEV₁) or peak expiratory flow rate (PEFR) measured during treatment or after the end of treatment.

Prevention of influenza

The efficacy of Relenza in preventing naturally occurring influenza illness has been demonstrated in two post-exposure prophylaxis studies in households and two seasonal prophylaxis studies during community outbreaks of influenza. The primary efficacy endpoint in these studies was the incidence of symptomatic, laboratory-confirmed influenza, defined as the presence of two or more of the following symptoms: oral temperature 37.8C or feverishness, cough, headache, sore throat, and myalgia; and laboratory confirmation of influenza by culture, PCR, or seroconversion (defined as a 4-fold increase in convalescent antibody titer from baseline).

Post exposure prophylaxis

Two studies assessed post-exposure prophylaxis in household contacts of an index case. Within 1.5 days of onset of symptoms in an index case, each household (including all family members ≥ 5 years of age) was randomized to Relenza 10 mg or placebo inhaled once daily for 10 days. In the first study only, each index case was randomized to the same treatment (Relenza or placebo) as the other household members. In this study, the proportion of households with at least one new case of symptomatic influenza was reduced from 19% (32 of 168 households) with placebo to 4% (7 of 169 households) with Relenza (79% protective efficacy; 95% CI: 57% to 89%, $p < 0.001$). In the second study, index cases were not treated and the incidence of symptomatic influenza was reduced from 19% (46 of 242 households) with placebo to 4% (10 of 245 households) with Relenza (81% protective efficacy; 95% CI: 64% to 90%, $p < 0.001$). Results were similar in the subgroups with influenza A or B. In these studies, which included a total of 2128 contact cases, 553 children were aged 5-11 years, of which 123 children were 5-6 years. The incidence of symptomatic laboratory confirmed influenza in the 5- to 6-year-old group (placebo vs. zanamivir) was 4/33 (12%) vs. 1/28 (4%) in the first study and 4/26 (15%) vs. 1/36 (3%) in the second study, which seems to be consistent with older age categories. However, as the studies were not powered to establish protective efficacy in individual age categories, a formal subgroup analysis has not been performed.

Seasonal Prophylaxis

Two seasonal prophylaxis studies assessed Relenza 10 mg versus placebo inhaled once daily for 28 days during community outbreaks. In the first study, which involved unvaccinated, otherwise healthy adults aged ≥ 18 years, the incidence of symptomatic influenza was reduced from 6.1% (34 of 554) with placebo to 2.0% (11 of 553) with Relenza (67% protective efficacy; 95% CI: 39% to 83%, $p < 0.001$). The second study involved community-dwelling subjects aged ≥ 12 years at high risk of complications from influenza, where 67% of participants had received vaccine in the season of the study. High risk was defined as subjects ≥ 65 years of age and subjects with chronic disorders of the pulmonary or cardiovascular systems or with diabetes mellitus. In this study, the incidence of symptomatic influenza was reduced from 1.4% (23 of 1,685) with placebo to 0.2% (4 of 1,678) with Relenza (83% protective efficacy; 95% CI: 56% to 93%, $p < 0.001$).

Due to limited and inconclusive data, the efficacy of Relenza in the prevention of influenza in the nursing home setting has not been established.

5.2 Pharmacokinetic properties

Absorption: Pharmacokinetic studies in humans have shown that the absolute oral bioavailability of the drug is low (mean (min, max) is 2%(1%, 5%)). Similar studies of orally inhaled zanamivir indicate that approximately 10-20% of the dose is systemically absorbed, with serum concentrations generally peaking within 1-2 hours. The poor absorption of the drug results in low systemic concentrations and therefore there is no significant systemic exposure to zanamivir after oral inhalation. There is no evidence of modification in the kinetics after repeated dosing with oral inhaled administration.

Distribution: After oral inhalation, zanamivir is widely deposited at high concentrations throughout the respiratory tract, thus delivering the drug to the site of influenza infection. Following a single 10mg dose the concentrations of zanamivir were measured in induced sputum. Zanamivir concentrations of 337 (range 58-1593) and 52 (range 17-286) fold above the median viral neuraminidase IC₅₀ were measured at 12h and 24h respectively. The high concentrations of zanamivir in the respiratory tract will result in the rapid onset of inhibition of the viral neuraminidase. The major immediate site of deposition is the oropharynx (mean 78%) from where zanamivir was rapidly eliminated to the GI-tract. The early deposition in total lungs ranged between 8 and 21%.

Metabolism: Zanamivir has been shown to be renally excreted as unchanged drug, and does not undergo metabolism. *In vitro* studies demonstrated that zanamivir did not affect the activity of a range of probe substrates for cytochrome P450 isoenzymes (CYP1A/2, A6, 2C9, 2C18, 2D6, 2E1, 3A4) in human hepatic microsomes, nor did it induce cytochrome P450 expression in rats, suggesting that metabolic interactions between zanamivir and other drugs are unlikely *in vivo*.

Elimination: The serum half-life of zanamivir following administration by oral inhalation ranges from 2.6 to 5.05 hours. It is entirely excreted unchanged in the urine. Total clearance ranges from 2.5 to 10.9 L/h as approximated by urinary clearance. Renal elimination is completed within 24 hours.

Patients with renal impairment: Inhaled zanamivir results in approximately 10%-20% of the inhaled dose being absorbed. In the severe renal impairment group from the single IV zanamivir dose trial subjects were sampled after a dose of 2 mg or twice to four times the expected exposure from inhalation. Using the normal dosing regimen (10mg bid), the predicted exposure at Day 5 is 40 fold lower than what was tolerated in healthy subjects after repeated iv administration. Given the importance of local concentrations, the low systemic exposure, and the previous tolerance of much higher exposures no dose adjustment is advised.

Patients with hepatic impairment: Zanamivir is not metabolised, therefore dose adjustment in patients with hepatic impairment is not required.

Elderly patients: At the therapeutic daily dose of 20mg, bioavailability is low (10-20%), and as a result there is no significant systemic exposure of patients to zanamivir. Any alteration of pharmacokinetics that may occur with age is unlikely to be of clinical consequence and no dose modification is recommended.

Paediatric patients: In an open-label single-dose study the pharmacokinetics of zanamivir was evaluated in 16 paediatric subjects, aged 6 to 12 years, using dry powder (10 mg) inhalation formulation (Diskhaler device). The systemic exposure was similar to 10 mg of inhaled powder in adults, but the variability was large in all age groups and more pronounced in the youngest children. Five patients were excluded due to undetectable serum concentrations at all time points or 1.5 hours post-dose, suggesting inadequate drug delivery.

5.3 Preclinical safety data

General toxicity studies did not indicate any significant toxicity of zanamivir. Zanamivir was not genotoxic and no clinically relevant findings were observed in long term carcinogenicity studies in rats and mice.

6 PHARMACEUTICAL PARTICULARS

6.1 List of excipients

Lactose monohydrate (which contains milk protein).

6.2 Incompatibilities

Not applicable.

6.3 Shelf Life

5 years

6.4 Special precautions for storage

Do not store above 30°C.

6.5 Nature and contents of container

Relenza inhalation powder is packed in a circular aluminium foil disk (a Rotadisk) with four regularly distributed blisters. An inspiration driven inhaler made of plastic (a Diskhaler) is used for administration of doses (the contents of 2 blisters constitute a dose) from these foil disks, and is provided in the pack.

The pack contains 1 or 5 foil disks and a Diskhaler.

6.6 Special precautions for disposal of a used medicinal product or waste materials derived from such medicinal product and other handling of the product

The inhaler (Diskhaler) is loaded with a disk containing inhalation powder packed in individual blisters. These blisters are pierced when the inhaler is used, and with a deep inhalation the powder can then be inhaled through the mouthpiece down into the respiratory tract. Detailed instructions for use are enclosed in the pack.

7 MARKETING AUTHORISATION HOLDER

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