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MASS D 0,35 mm MASS E 1,0 mm MASS F 6,0 mm MASS G 0,65 mm Example Technical information Control Code Type: Laetus Min

Study A

## powder, hard capsule

## **Spiriva**®

**18**μ**g, inhalation** powder, hard capsule



## **Spiriva**®

**18**μ**g**, inhalation powder, hard capsule



1 capsule for inhalation contains tiotropium equivalent to 22.5 mcg tiotropium bromide monohydrate (INN =

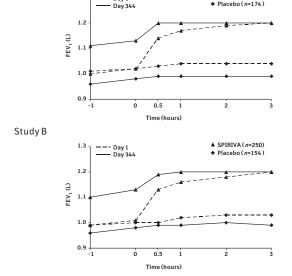
tiotropium bromide)

Lactose monohydrate (Lactose H.O. 200M): Lactose monohydrate (Lactose H<sub>2</sub>O); Capsule (Titanium dioxide; Yellow iron oxide; Indigo

Pharmacological properties Tiotropium is a long-acting, specific antimuscarinic agent, in clinical subtypes of muscarinic receptors M<sub>1</sub> to M<sub>5</sub>. In the airways, inhibition of M<sub>3</sub>-receptors at the smooth muscle results in relaxation. The competitive and reversible nature of antagonism was shown with human and animal origin receptors and isolated organ preparations. In non-clinical in vitro as well as in vivo studies bronchoprotective effects were dose-dependent and lasted longer than 24 hours. The long duration of effect is likely to be due to its very slow dissociation from M<sub>2</sub>-receptors, exhibiting a significantly longer dissociation half-life than that seen with ipratropium. As an N-quaternary anticholinergic otropium is topically (broncho-) selective when administered by inhalation, demonstrating an acceptable therapeutic range before giving rise to systemic anticholinergic effects. Dissociation from M<sub>2</sub>eceptors is faster than from M<sub>3</sub>, which in functional *in vitro* studies, elicited (kinetically controlled) receptor subtype selectivity of M<sub>3</sub> over

The high potency and slow receptor dissociation found its clinical orrelate in significant and long-acting bronchodilation in patients he bronchodilation following inhalation of tiotropium is primarily a ocal effect (on the airways) not a systemic one. The clinical development program included four one-year and two sixmonth randomised, double-blind studies in 2663 patients with COPD (1308 receiving SPIRIVA). The one-year program consisted of two placebo-controlled and two ipratropium-controlled trials. The sixonth trials were both salmeterol- and placebo-controlled. These studies included evaluation of lung function, dyspnoea, exacerbations of COPD and patients assessments of their health-related quality of n the aforementioned studies. SPIRIVA administered once daily. provided significant improvement in lung function (forced expiratory olume in one second, FEV, and forced vital capacity, FVC) within 30 inutes following the first dose and was maintained for 24 hours armacodynamic steady state was reached within one week with the najority of bronchodilation observed by the third day. SPIRIVA gnificantly improved morning and evening peak expiratory flow rate EFR) as measured by patient's daily recordings

Figure 1: Mean FEV. Over Time (prior to and after administration of study drug) on Days 1 and 344 in Two 1-Year Placebo-Controlled Trials\*



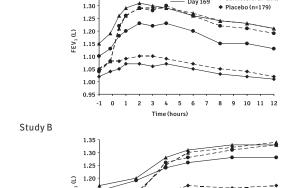
\*Means are adjusted for centre and baseline effects Figure 2: Mean FEV, OverTime (prior to and after administration of study drug) on Days 1 and 364 in Two 1-Year Ipratropium-Controlled

----Study B

Means are adjusted for centre and baseline effects.

18 mcg

Figure 3: Mean FEV1 OverTime (prior to and after administration of study drug) on Days 1 and 169 in Two 6-Month Salmeterol- and Placebo

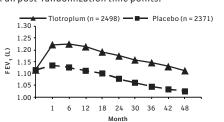


—— Day 169

\*Means are adjusted for centre and baseline effects. A randomised, placebo-controlled clinical study in 105 patients with COPD demonstrated that bronchodilation was maintained throughou the 24 hour dosing interval in comparison to placebo regardless of hether SPIRIVA was administered in the morning or in the evening. The following health outcome effects were demonstrated in COPI The improvement in lung function with SPIRIVA was demonstrated throughout the period of administration in the six long-term trials trials with a duration of up to one year. SPIRIVA significantly improved dyspnoea (as evaluated using the (Figures 1-3). These improvements were maintained with no evidence Transition Dysphoea Index). This improvement was maintained hroughout the treatment period. SPIRIVA significantly reduced the number of COPD exacerbations and delayed the time to first exacerbation in comparison to placebo.

SPIRIVA significantly improved health-related quality of life as demonstrated by the disease-specific St. George's Respiratory Questionnaire. This improvement was maintained throughout the Additionally, in the one-year placeho controlled trials SPIRIVA ignificantly reduced the number of hospitalisations associated with PD exacerbations and delayed the time to first hospitalisation. he impact of improvement in dyspnea on functional activities was nvestigated in two randomised double blind placebo controlled trials n COPD patients. In these trials SPIRIVA significantly improved symptom limited exercise tolerance by 19.7% and 28.3% compared In a dedicated QT study involving 53 healthy volunteers, SPIRIVA 18 mcg and 54 mcg (i.e. three times the therapeutic dose) over 12 days did not prolong QTintervals of the ECG. In a 4-year trial of 5,993 patients SPIRIVA maintained improvements in FEV, throughout 4 years but did not alter the annualized rate of decline

Figure 4. Morning pre-dose FEV1 (i.e. trough) in the tiotropium and placebo groups over 4 years. P<0.001 for all post-randomization time points.



During treatment, there was a 16% reduction in the risk of death. The incidence rate of death was 4.78 per 100 patient years in the placebo atio (tiotropium/placebo) = 0.84, 95% CI = 0.73, 0.97). Treatment with tiotropium reduced the risk of respiratory failure by 19% (2.09 vs. 1.68 cases per 100 patient years, relative risk (tiotropium/placebo) = 0.81,

A one-year randomised, double-blind, double-dummy, parallel-group trial compared the effect of treatment with 18 mcg of SPIRIVA once daily with that of 50 mcg of salmeterol HFA pMDI twice daily on the cidence of moderate and severe exacerbations in 7,376 patients with COPD and a history of exacerbations in the preceding year.

Figure 5: Kaplan-Meier estimates of the time to the first COPD exacerbation /Treated Set

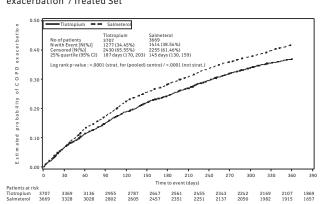
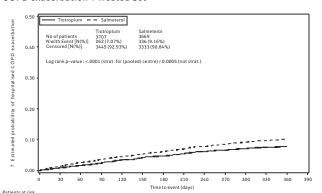


Figure 6: Kaplan-Meier estimates of the time to the first hospitalized



 
 Valents at risk
 To Trotropium
 3107
 3564
 3453
 3359
 3285
 3217
 3177
 3125
 3066
 3017
 2977
 2948
 2663

 Salmeterol
 3669
 3502
 3362
 3244
 3172
 3080
 3032
 2982
 2921
 2870
 2834
 2806
 2489
Table 1: Summary of exacerbation endpoints

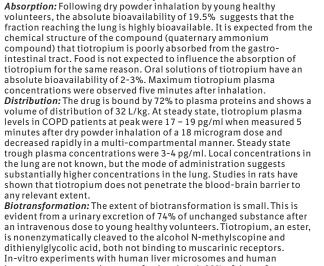
Enapoint	18 microgram (HandiHaler) 3,707	50 microgram (HFA pMDI) N = 3,669	(95% CI)	<0.001	
Time[days] to first exacerbation <sup>†</sup>	187	145	0.83 (0.77-0.90)		
Time to first severe (hospitalised) exacerbation <sup>§</sup>	-	-	0.72 (0.61-0.85)		
Patients with ≥ 1 exacerbation, n (%)*	1,277 (34.4)	1,414 (38.5)	0.90 <0.00 (0.85-0.95)		
Patients with ≥ 1 severe (hospitalised) exacerbation, n (%)*	262 (7.1)	262 (7.1) 336 (9.2)		<0.001	
Mean exacerbation incidence rate per patient year*	0.64	0.72		=0.002	
Mean severe (hospitalised) exacerbation incidence rate per patient year*	0.09	0.13	0.73 (0.66-0.82)	<0.001	

†Time [days] refers to 1st quartile of patients. Time to event analysis was done using Cox's proportional hazards regression model with pooled) centre and treatment as covariate; ratio refers to hazard Dosage and administration

Time to event analysis was done using Cox's proportional hazards regression model with (pooled) centre and treatment as covariate: ratio refers to hazard ratio. Time [days] for the 1st quartile of patients annot be calculated, because proportion of patients with severe exacerbation is too low. Number of patients with event were analysed using Cochran-Mantel-Haenszel test stratified by pooled centre: ratio refers to risk ratio. # Number of event analysis was done using Poisson regression correcting for overdispersion and adjusting for treatment exposure; ratio refers to rate ratio.

Compared with salmeterol, SPIRIVA increased the time to the first exacerbation (187 days vs. 145 days), with a 17% reduction in risk (hazard ratio, 0.83; 95% confidence interval [CI], 0.77 to 0.90; P<0.001). SPIRIVA also increased the time to the first severe nospitalised) exacerbation (hazard ratio, 0.72; 95% CI, 0.61 to 0.85; P<0.001), reduced the annual number of moderate or severe (hospitalised) exacerbations (0.64 vs. 0.72; rate ratio, 0.89; 95% CI, 0.83 to 0.96; P=0.002), and reduced the annual number of severe hospitalised) exacerbations (0.09 vs. 0.13; rate ratio, 0.73; 95% CI, 0.66 to 0.82; P<0.001).

Pharmacokinetics iotropium is a non-chiral quaternary ammonium compound and is sparingly soluble in water. Tiotropium is administered by dry powder inhalation. Generally with the inhaled route of administration, the majority of the delivered dose is deposited in the gastro-intestinal tract, and to a lesser extent in the intended organ of the lung. Many of the pharmacokinetic data described below were obtained with higher doses as recommended for therapy.



hepatocytes suggest that some further drug (<20% of dose after ntravenous administration) is metabolised by cytochrome P450 dependent oxidation and subsequent glutathione conjugation to variety of Phase II-metabolites. This enzymatic pathway can be nhibited by the CYP450 2D6 (and 3A4) inhibitors, quinidine, ketoconazole and gestodene. Thus CYP450 2D6 and 3A4 are involved in the metabolic pathway that is responsible for the elimination of a smaller part of the dose. Tiotropium even in supra-therapeutic oncentrations does not inhibit cytochrome P450 1A1, 1A2, 2B6, 2C9,

2C19, 2D6, 2E1 or 3A in human liver microsomes. Elimination: The terminal elimination half-life of tiotropium is between 5 and 6 days following inhalation. Total clearance was 880 ml/min after an ntravenous dose in young healthy volunteers with an interindividual variability of 22%. Intravenously administered tiotropium is mainly excreted unchanged in urine (74%). After dry powder inhalation urinary xcretion is 14% of the dose, the remainder being mainly non-absorbed drug in gut that is eliminated via the faeces. The renal clearance of otropium exceeds the creatinine clearance, indicating secretion into the urine. After chronic once daily inhalation by COPD patients. pharmacokinetic steady state was reached after 2-3 weeks with no accumulation thereafter.

inearity/nonlinearity: Tiotropium demonstrates linear pharmacokinetics in the therapeutic range after both intravenous inistration and dry powder inhalation. Elderly Patients: As expected for all predominantly renally excreted drugs, advanced age was associated with a decrease of tiotropium renal clearance (326 ml/min in COPD patients < 58 years to 163 ml/min n COPD patients > 70 years) which may be explained by decreased enal function. Tiotropium excretion in urine after inhalation decreased from 14% (young healthy volunteers) to about 7% (COPD patients), however plasma concentrations did not change significantly with advancing age within COPD patients if compared to inter- and intra-individual variability (43% increase in AUC<sub>0-4h</sub> after dry powder

Renally Impaired Patients: In common with all other drugs that undergo predominantly renal excretion, renal impairment was associated with increased plasma drug concentrations and reduced enal drug clearance after both intravenous infusion and dry powder inhalations. Mild renal impairment (CL<sub>co</sub> 50-80 ml/min) which is often seen in elderly patients increased tiotropium plasma concentrations slightly (39% increase in AUC, after intravenous infusion). In COPD patients with moderate to severe renal impairment (CL<sub>co</sub> <50 ml/min) the intravenous administration of tiotropium resulted in doubling of the plasma concentrations (82% increase in AUC<sub>0-4h</sub>), which was Hepatically Impaired Patients: Liver insufficiency is not expected to have any relevant influence on tiotropium pharmacokinetics. Fiotropium is predominantly cleared by renal elimination (74% in young healthy volunteers) and by simple non-enzymatic ester cleavage to products that do not bind to muscarinic receptors.

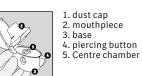
SPIRIVA is indicated for the maintenance treatment of patients with COPD (including chronic bronchitis and emphysema), and for reducing

product should be used by physician prescription. The recommended dosage of SPIRIVA is inhalation of the contents of one capsule once daily with the HandiHaler inhalation device at the same time of day (see Instructions for use). SPIRIVA capsules must not be swallowed. erly patients can use SPIRIVA at the recommended dose. Renally impaired patients can use SPIRIVA at the recommended dose. However, as with all predominantly renally excreted drugs, SPIRIVA use hould be monitored closely in patients with moderate to severe renal

Hepatically impaired patients can use SPIRIVA at the recommended There is no experience with SPIRIVA in infants and children and nerefore should not be used in this age group. Instructions for Use



for using SPIRIVA The HandiHaler is an inhalation device especially designed for inhalation from SPIRIVA capsules. You must not use it to take any other medication. You can use your HandiHaler for up to one year to take your medication.





1. To release the dust cap press the piercing button completely in and let go.



2. Open the dust cap completely by pulling it upwards. Then open the mouthpiece by pulling it upwards.



3. Remove a SPIRIVA capsule from the blister (only immediately before use, see blister handling) and place it in the centre chamber (5), as illustrated. I does not matter which way the capsule is placed in

4. Close the mouthpiece firmly until you hear a click, leaving the dust cap open.



i. Hold the HandiHaler device with the mouthpiece upwards and press the piercing button completely in only once, and release. This makes holes in the capsule and allows the medication to be released when you breathe in.



Important: Please avoid breathing into the mouthpiece at any time.



with respect to pregnancy, embryonal / foetal development, Raise the HandiHaler to your mouth and close your lips tightly around the mouthpiece. Keep your head parturition or postnatal development. in an upright position and breathe in slowly and deeply but at a rate sufficient to hear or feel the capsule vibrate. iotropium is excreted into breast milk. Breathe in until your lungs are full; then hold your breath as long as comfortable and at the same time take the HandiHaler out of your mouth. Resume child or the infant. Repeat steps 6 and 7 once, in order to empty the capsule completely. effect on fertility (please refer to section Toxicology).



A. Separate the blister strips by tearing along the

Cleaning the HandiHaler

Blister handlina

perforation.

Clean the HandiHaler once a month



Open the dust cap and mouthpiece. Then open the base by lifting the piercing button. Rinse the complete inhaler with warm water to remove any powder. Dry the HandiHaler thoroughly by tipping excess water out onto a paper towel and air-dry afterwards, leaving the dust cap, mouthpiece and base open. It takes 24 hours to air dry, so clean it immediately after use so that it will be may be cleaned with a moist but not wet tissue if needed.

Cardiac disorders: atrial fibrillation tachycardia

bronchospasm



tab until one capsule is fully visible. In case a second capsule is exposed to air inadvertently this capsule has to be discarded.



ne capsules should not be exposed to extreme temperatures. SPIRIVA capsules contain only a small amount of powder so that the capsule is only partially filled.

SPIRIVA inhalation powder is contraindicated in patients with a history of hypersensitivity to atropine or its derivatives, e.g. ipratropium or milk protein or to any component of this product.

Special warnings and precautions SPIRIVA, as a once daily maintenance bronchodilator, should not be used for the initial treatment of acute episodes of bronchospasm, i.e. Immediate hypersensitivity reactions may occur after administration of SPIRIVA inhalation powder. As with other anticholinergic drugs. SPIRIVA should be used with caution in patients with narrow-angle glaucoma, prostatic hyperplasia or bladder-neck obstruction.

Inhaled medicines may cause inhalation-induced bronchospasn As with all predominantly renally excreted drugs, SPIRIVA use should be monitored closely in patients with moderate to severe renal impairment (creatinine clearance of≤50 ml/min). Patients must be instructed in the correct administration of SPIRIVA capsules. Care must be taken not to allow the powder to enter into the eyes. Eye pain or discomfort, blurred vision, visual halos or coloured images in association with red eyes from conjunctival congestion and corneal oedema may be signs of acute narrow-angle glaucoma. Should any combination of these symptoms develop specialist advice should e sought immediately.

Miotic eye drops are not considered to be effective treatment. SPIRIVA should not be used more frequently than once daily. SPIRIVA capsules are to be used only with the HandiHaler device. his product contains 5.5 mg of lactose monohydrate per capsule

Although no formal drug interaction studies have been performed tiotropium bromide has been used concomitantly with other drugs commonly used in the treatment of COPD, including inhaled steroids without clinical evidence of drug interactions. Limited information about co-administration of other anticholiner drugs with SPIRIVA is available from two clinical trials: Acute single dose administration of ipratropium bromide with chronically dministered SPIRIVA in COPD patients (n=64) and healthy volunte (n= 35) was not associated with an increase in adverse events, change in vital signs or electrocardiographic findings. However, chronic costration of other anticholinergic drugs with SPIRIVA has not been studied and is, therefore, not recommended.

Effects on ability to drive and use machines No studies on the effects on the ability to drive and use machines have been performed. The occurrence of dizziness or blurred vision may influence the ability to drive and use machinery.

Fertility, Pregnancy and lactation For SPIRIVA, no clinical data on exposed pregnancies are available. Preclinical studies do not indicate direct or indirect harmful effects

inical data from nursing women exposed to tiotropium are not available. Based on lactating rodent studies, a small amount of Therefore, SPIRIVA should not be used in pregnant or nursing wome unless the expected benefit outweighs any possible risk to the unborn Clinical data on fertility are not available for tiotropium. A non-clinical study performed with tiotropium showed no indication of any adverse

Many of the listed undesirable effects can be assigned to the 20110629 anticholinergic properties of SPIRIVA. Adverse drug reactions were identified from data obtained in clinical trials and spontaneous reporting during post approval use of the drug The clinical trial database includes 9.647 tiotropium patients from 28 placebo-controlled clinical trials with treatment periods ranging between four weeks and four years, contributing 12,469 person years

Metabolism and nutrition disorders: Nervous system disorders: Eye disorders: vision blurred intraocular pressure increased

of exposure to tiotropium.

Respiratory, thoracic and mediastinal disorders: - pharyngitis

- laryngitis Gastrointestinal disorders - dry mouth, usually mild constipation gastrooesophageal reflux disease oropharyngeal candidiasis intestinal obstruction incl. ileus paralytic - dysphagia - gingivitis

Skin and subcutaneous tissue disorders, Immune system disorders: - angioedema hypersensitivity (including immediate reactions)

- dry skin kin infection and skin ulcer Musculoskeletal and connective tissue disorders: joint swelling Renal and urinary disorders: - urinary retention (usually in men with predisposing factors) - dysuria urinary tract infection

High doses of SPIRIVA may lead to anticholinergic signs and owever, there were no systemic anticholinergic adverse effects following a single inhaled dose of up to 282 micrograms tiotropium in Bilateral conjunctivitis in addition to dry mouth was seen in healthy volunteers following repeated once daily inhalation of 141 micrograms in healthy volunteers, which resolved while still under treatment. In a multiple dose study in COPD patients with a maximum daily dose of 36 micrograms tiotropium over four weeks dry mouth was the only

observed adverse event attributable to tiotropium. Acute intoxication by oral ingestion of tiotropium capsules is unlikely The acute inhalation and oral toxicity in mice, rats, and dogs was low; therefore, toxic effects from acute human drug over-dosage are unlikely. The single dose safety pharmacology studies showed the expected effects of an anticholinergic drug including mydriasis, increased heart rate and prolonged gastro-intestinal transit time. The side effects of the **repeated dose studies** in rats, mice and dogs were related to anticholinergic properties of tiotropium including mydriasis, increased heart rate, constipation, decreased body weigh gain, reduced salivary and lacrimal gland secretion. Other relevant changes noted were: mild irritancy of the upper respiratory tract in rate evinced by rhinitis and epithelial changes of the nasal cavity and

larynx, and prostatitis along with proteinaceous deposits and lithiasis in the bladder of male rats, increased lung weights in rats and In the reproduction studies in rabbits and rats harmful effects with respect to pregnancy, embryo/foetal development, parturition or dose levels. In a general reproduction and fertility study in rats, there was no indication of any adverse effect on fertility or mating performance of either treated parents or their offspring at any dosage. In a series of *in vivo* and *in vitro* **mutagenicity assays**, tiotropium bromide monohydrate did not cause gene mutations in prokaryotes and in eucaryotes, chromosomal damage in vitro and in vivo conditions or primary DNA damage.

2 - 1000 capsules for inhalation in aluminium blister with paper box.

After first opening of the blister, use within 9 days Store in a safe place out of the reach of children! Do not store above 25°C!

Do not freeze! Boehringer Ingelheim Pharma GmbH & Co. KG Binger Strasse 173 55216 Ingelheim am Rhein, Germany Boehringer Ingelheim International GmbH Ingelheim am Rhein, Germany