

## **Puregon®**

**solution for injection**

**follitropin beta**

### **1. NAME OF THE MEDICINAL PRODUCT**

Puregon 150 IU/0.18 mL, 300 IU/0.36 mL, 600 IU/0.72 mL or 900 IU/1.08 mL solution for injection.

### **2. QUALITATIVE AND QUANTITATIVE COMPOSITION**

One cartridge contains a net total dose of 150 IU, 300 IU, 600 IU or 900 IU recombinant follicle-stimulating hormone (FSH) activity in 0.18, 0.36, 0.72 or 1.08 mL aqueous solution.

The solution for injection contains the active substance recombinant follicle-stimulating hormone (FSH) (follitropin beta), in a concentration of 833 IU/mL aqueous solution. This strength corresponds to 83.3 microgram of protein/mL (specific in vivo bioactivity equal to approximately 10 000 IU FSH/mg protein).

For a full list of excipients, see section 6.1.

### **3. PHARMACEUTICAL FORM**

Solution for injection.

Clear and colorless solution.

In cartridges, designed to be used in conjunction with a pen injector.

### **4. CLINICAL PARTICULARS**

#### **4.1 Therapeutic indications**

*In the female*

Puregon is indicated for the treatment of female infertility in the following clinical situations

- Anovulation (including polycystic ovarian syndrome, PCOS) in women who have been unresponsive to treatment with clomifene citrate.
- Controlled ovarian hyperstimulation to induce the development of multiple follicles in medically assisted reproduction programs [e.g., *in vitro* fertilization/embryo transfer (IVF/ET), gamete intra-fallopian transfer (GIFT) and intracytoplasmic sperm injection (ICSI)].

#### *In the male*

- Deficient spermatogenesis due to hypogonadotropic hypogonadism.

## **4.2 Posology and method of administration**

Treatment with Puregon should be initiated under the supervision of a physician experienced in the treatment of fertility problems.

The first injection of Puregon should be performed under direct medical supervision.

#### *Posology*

When using the pen injector, it should be realized that the pen is a precision device that accurately delivers the dose to which it is set. It was shown that on average an 18% higher amount of FSH is given with the pen compared with a conventional syringe. This may be of particular relevance when switching between the pen-injector and a conventional syringe within one treatment cycle. Especially when switching from a syringe to the pen, small dose adjustments may be needed to prevent too high a dose being given.

#### *Dosage in the female*

There are great inter- and intra-individual variations in the response of the ovaries to exogenous gonadotrophins. This makes it impossible to set a uniform dosage scheme. The dosage should, therefore, be adjusted individually depending on the ovarian response. This requires ultrasound assessment of follicular development. The concurrent determination of serum estradiol levels may also be useful.

In comparative clinical studies with Puregon and urinary FSH it was shown that Puregon is more effective than urinary FSH in terms of a lower total dose and a shorter treatment period needed to achieve pre-ovulatory conditions. Therefore, it is considered appropriate to give a lower dosage of Puregon than generally used for urinary FSH, not only in order to optimize follicular development but also to reduce the risk of unwanted ovarian hyperstimulation.

Clinical experience with Puregon is based on up to three treatment cycles in both indications. Overall experience with IVF indicates that in general the treatment success rate remains stable during the first four attempts and gradually declines thereafter.

- Anovulation

A sequential treatment scheme is recommended starting with daily administration of 50 IU Puregon. The starting dose is maintained for at least seven days. If there is no ovarian response, the daily dose is then gradually increased until follicle growth and/or plasma estradiol levels indicate an adequate pharmacodynamic response. A daily increase of estradiol levels of 40-100% is considered to be optimal. The daily dose is then maintained until pre-ovulatory conditions are reached. Pre-ovulatory conditions are reached when there is ultrasonographic evidence of a dominant follicle of at least 18 mm in diameter and/or when plasma estradiol levels of 300-900 picograms/mL (1000-3000 pmol/L) are attained. Usually, 7 to 14 days of treatment is sufficient to reach this state. The administration of Puregon is

then discontinued and ovulation can be induced by administering human chorionic gonadotrophin (hCG). If the number of responding follicles is too high or estradiol levels increase too rapidly, i.e. more than a daily doubling for estradiol for two or three consecutive days, the daily dose should be decreased. Since follicles of over 14 mm may lead to pregnancies, multiple pre-ovulatory follicles exceeding 14 mm carry the risk of multiple gestations. In that case hCG should be withheld and pregnancy should be avoided in order to prevent multiple gestations.

- Controlled ovarian hyperstimulation in medically assisted reproduction programs

Various stimulation protocols are applied. A starting dose of 100-225 IU is recommended for at least the first four days. Thereafter, the dose may be adjusted individually, based upon ovarian response. In clinical studies, it was shown that maintenance dosages ranging from 75-375 IU for six to twelve days are sufficient, although longer treatment may be necessary. Puregon can be given either alone, or, to prevent premature luteinisation, in combination with a GnRH agonist or antagonist. When using a GnRH agonist, a higher total treatment dose of Puregon may be required to achieve an adequate follicular response. Ovarian response is monitored by ultrasound assessment. The concurrent determination of serum estradiol levels may be useful. When ultrasound assessment indicates the presence of at least three follicles of 16-20 mm, and there is evidence of a good estradiol response (plasma levels of about 300-400 picogram/mL (1000-1300 pmol/L) for each follicle with a diameter greater than 18 mm), the final phase of maturation of the follicles is induced by administration of hCG. Oocyte retrieval is performed 34-35 hours later.

### *Dosage in the male*

Puregon should be given at a dosage of 450 IU/week, preferably divided in 3 dosages of 150 IU, concomitantly with hCG. Treatment with Puregon and hCG should be continued for at least 3 to 4 months before any improvement in spermatogenesis can be expected. To assess the response, semen analysis is recommended 4 to 6 months after the beginning of treatment. If a patient has not responded after this period, the combination therapy may be continued; current clinical experience indicates that treatment for up to 18 months or longer may be necessary to achieve spermatogenesis.

There is no relevant indication for use of Puregon in children.

#### *Method of administration*

Puregon solution for injection in cartridges has been developed for use in the Puregon Pen and should be administered subcutaneously. The injection site should be alternated to prevent lipoatrophy.

Using the pen injector, injection of Puregon can be carried out by the patient or partner, provided that proper instructions are given by the physician. Self administration of Puregon should only be performed by patients who are well-motivated, adequately trained and with access to expert advice.

### **4.3 Contraindications**

#### *For males and females*

- Hypersensitivity to the active substance or any of the excipients.
- Tumors of the ovary, breast, uterus, testis, pituitary or hypothalamus.
- Primary gonadal failure.

#### *Additionally for females*

- Pregnancy or lactation.
- Undiagnosed vaginal bleeding.

- Ovarian cysts or enlarged ovaries, not related to polycystic ovarian syndrome (PCOS).
- Malformations of the reproductive organs incompatible with pregnancy.
- Fibroid tumors of the uterus incompatible with pregnancy.

#### **4.4 Special warnings and precautions for use**

- Puregon may contain traces of streptomycin and/or neomycin. These antibiotics may cause hypersensitivity reactions in susceptible persons.
- Before starting treatment, the couple's infertility should be assessed as appropriate. In particular, patients should be evaluated for hypothyroidism, adrenocortical insufficiency, hyperprolactinemia and pituitary or hypothalamic tumors, and appropriate specific treatment given.

##### *In females*

- Ovarian Hyperstimulation Syndrome (OHSS) is a medical event distinct from uncomplicated ovarian enlargement. Clinical signs and symptoms of mild and moderate OHSS are abdominal pain, nausea, diarrhea, mild to moderate enlargement of ovaries and ovarian cysts. Severe OHSS may be life-threatening. Clinical signs and symptoms of severe OHSS are large ovarian cysts, acute abdominal pain, ascites, pleural effusion, hydrothorax, dyspnea, oliguria, hematological abnormalities and weight gain. In rare instances, venous or arterial thromboembolism may occur in association with OHSS. Transient liver function test abnormalities suggestive of hepatic dysfunction with or without morphologic changes on liver biopsy have also been reported in association with OHSS.

OHSS may be caused by administration of human Chorionic Gonadotropin (hCG) and by pregnancy (endogenous hCG). Early OHSS usually occurs within 10 days after hCG administration and may be associated with an excessive ovarian response to gonadotropin stimulation. Late OHSS occurs more than 10 days after hCG administration, as a consequence of the

hormonal changes with pregnancy. Because of the risk of developing OHSS, patients should be monitored for at least two weeks after hCG administration.

Women with known risk factors for a high ovarian response may be especially prone to the development of OHSS during or following treatment with Puregon. For women having their first cycle of ovarian stimulation, for whom risk factors are only partially known, close observation for early signs and symptoms of OHSS is recommended.

Follow current clinical practice for reducing the risk of OHSS during Assisted Reproductive Technology (ART). Adherence to the recommended Puregon dose and treatment regimen and careful monitoring of ovarian response is important to reduce the risk of OHSS. To monitor the risk of OHSS, ultrasound assessments of follicular development should be performed prior to treatment and at regular intervals during treatment; the concurrent determination of serum estradiol levels may also be useful. In ART there is an increased risk of OHSS with 18 or more follicles of 11 mm or more in diameter. If OHSS develops, standard and appropriate management of OHSS should be implemented and followed.

- Ovarian torsion has been reported after treatment with gonadotropins, including Puregon. Ovarian torsion may be associated with other risk factors such as OHSS, pregnancy, previous abdominal surgery, past history of ovarian torsion, previous or current ovarian cyst and polycystic ovaries. Damage to the ovary due to reduced blood supply can be limited by early diagnosis and immediate detorsion.
- Thromboembolic events, both in association with and separate from OHSS, have been reported following treatment with gonadotropins, including Puregon. Intravascular thrombosis, which may originate in venous or arterial vessels, can result in reduced blood flow to vital organs or the extremities.

In women with generally recognised risk factors for thromboembolic events, such as a personal or family history, severe obesity or thrombophilia, treatment with gonadotropins, including Puregon, may further increase this risk. In these women the benefits of gonadotropin administration, including Puregon, need to be weighed against the risks. It should be noted, however, that pregnancy itself also carries an increased risk of thrombosis.

- Multiple pregnancies and births have been reported for all gonadotropin treatments, including Puregon. Multiple gestations, especially high order, carry an increased risk of adverse maternal (pregnancy and delivery complications) and perinatal (low birth weight) outcomes. For anovulatory women undergoing ovulation induction, monitoring follicular development with transvaginal ultrasonography is important for minimizing the risk of multi-fetal gestations. The concurrent determination of serum estradiol levels may also be useful. The patients should be advised of the potential risks of multiple births before starting treatment.

In women undergoing ART procedures, the risk of a multiple pregnancy is mainly related to the number of embryos transferred. When used for an ovulation induction cycle, appropriate FSH dose adjustment(s) should prevent multiple follicle development.

- Infertile women undergoing ART have an increased incidence of ectopic pregnancies. Early ultrasound confirmation that a pregnancy is intrauterine is therefore important.
- The incidence of congenital malformations after ART may be slightly higher than after spontaneous conceptions. This slightly higher incidence is thought to be related to differences in parental characteristics (e.g., maternal age, sperm characteristics) and to the higher incidence of multiple gestations after ART.
- There have been reports of ovarian and other reproductive system neoplasms, both benign and malignant, in women who have undergone multiple treatment regimens for infertility treatment. It is not established



whether or not treatment with gonadotropins increases the risk of these tumors in infertile women.

- Medical conditions that contraindicate pregnancy should be evaluated before starting treatment with Puregon.
- Rates of pregnancy loss in women undergoing assisted reproduction techniques are higher than in the normal population.

#### *In males*

- Elevated endogenous FSH levels in men are indicative of primary testicular failure. Such patients are unresponsive to Puregon/hCG therapy. In men with deficient spermatogenesis due to hypogonadotropic hypogonadism, consider treatment with Puregon in combination with hCG only after treatment with hCG alone for at least 16 weeks has failed to restore spermatogenesis.

#### **4.5 Interaction with other medicinal products and other forms of interaction**

Concomitant use of Puregon and clomifene citrate may enhance the follicular response. After pituitary desensitization induced by a GnRH agonist, a higher dose of Puregon may be necessary to achieve an adequate follicular response.

#### **4.6 Pregnancy and lactation**

##### *Pregnancy*

The use of Puregon during pregnancy and lactation is contraindicated. In case of inadvertent exposure during pregnancy, clinical data are not sufficient to exclude a teratogenic effect of recombinant FSH.

##### *Lactation*

There is no information available from clinical or animal studies on the excretion of follitropin beta in milk. It is unlikely that follitropin beta is excreted in human milk due to its high molecular weight. If follitropin beta would be excreted in human milk,

it would be degraded in the gastrointestinal tract of the child. Follitropin beta may affect milk production.

#### **4.7 Effects on ability to drive and use machines**

No effects on the ability to drive and use machines have been observed.

#### **4.8 Undesirable effects**

Clinical use of Puregon by the intramuscular or subcutaneous routes may lead to local reactions at the site of injection (3% of all patients treated). The majority of these local reactions are mild and transient in nature. Generalized hypersensitivity reactions have been observed uncommonly (approximately 0.2% of all patients treated with Puregon).

##### *Treatment of females*

In approximately 4% of the women treated with Puregon in clinical trials, signs and symptoms related to ovarian hyperstimulation syndrome (OHSS) have been reported (see section 4.4). Undesirable effects related to this syndrome include pelvic pain and/or congestion, abdominal pain and/or distension, breast complaints and ovarian enlargement.

The table below lists the adverse reactions with Puregon reported in clinical trials in females according to system organ class and frequency; common ( $\geq 1/100$  to  $< 1/10$ ), uncommon ( $\geq 1/1,000$  to  $< 1/100$ ).

<b>SOC</b>	<b>Frequency</b>	<b>Adverse reaction</b>
Nervous system disorders	Common	Headache
Gastrointestinal disorders	Common	Abdominal distension Abdominal pain

	Uncommon	Abdominal discomfort Constipation Diarrhea Nausea
Reproductive system and breast disorders	Common	OHSS Pelvic pain
	Uncommon	Breast complaints <sup>1</sup> Metrorrhagia Ovarian cyst Ovarian enlargement Ovarian torsion Uterine enlargement Vaginal hemorrhage
General disorders and administration site conditions	Common	Injection site reaction <sup>2</sup>
	Uncommon	Generalised Hypersensitivity reaction <sup>3</sup>

1. Breast complaints include tenderness, pain and/or engorgement and nipple pain

2. Local reactions at the site of injection include: bruising, pain, redness, swelling and itching

3. Generalised hypersensitivity reaction include erythema, urticaria, rash and pruritus

In addition, ectopic pregnancy, miscarriage and multiple gestations have been reported. These are considered to be related to ART or subsequent pregnancy.

In rare instances, thromboembolism has been associated with Puregon/hCG treatment, as with other gonadotropins.

#### *Treatment of males*

The table below lists the adverse reactions with Puregon reported in a clinical trial in males (30 patients dosed) according to system organ class and frequency; common ( $\geq 1/100$  to  $< 1/10$ ).

SOC	Frequency <sup>1</sup>	Adverse reaction
Nervous system disorders	Common	Headache
Skin and subcutaneous tissue disorders	Common	Acne Rash
Reproductive system and breast disorders	Common	Epididymal cyst Gynecomastia
General disorders and administration site conditions	Common	Injection site induration

1. Adverse reactions that are reported only once are listed as common because a single report raises the frequency above 1%.

#### **4.9 Overdose**

No data on acute toxicity of Puregon in humans is available, but the acute toxicity of Puregon and of urinary gonadotrophin preparations in animal studies has been shown to be very low. Too high a dosage of FSH may lead to hyperstimulation of the ovaries (see section 4.4).

## 5. PHARMACOLOGICAL PROPERTIES

### 5.1 Pharmacodynamic properties

Pharmacotherapeutic group: gonadotrophins; ATC code: G03G A06.

Puregon contains a recombinant FSH. This is produced by recombinant DNA technology, using a Chinese hamster ovary cell line transfected with the human FSH subunit genes. The primary amino acid sequence is identical to that of natural human FSH. Small differences in the carbohydrate chain structure are known to exist.

FSH is indispensable in normal follicular growth and maturation, and gonadal steroid production. In the female the level of FSH is critical for the onset and duration of follicular development, and consequently for the timing and number of follicles reaching maturity. Puregon can thus be used to stimulate follicular development and steroid production in selected cases of disturbed gonadal function. Furthermore, Puregon can be used to promote multiple follicular development in medically assisted reproduction programs [e.g., *in vitro* fertilization/embryo transfer (IVF/ET), gamete intra-fallopian transfer (GIFT) and intracytoplasmic sperm injection (ICSI)]. Treatment with Puregon is generally followed by administration of hCG to induce the final phase of follicle maturation, resumption of meiosis and rupture of the follicle.

In men deficient in FSH, Puregon should be used concomitantly with hCG for at least four months to promote spermatogenesis.

### 5.2 Pharmacokinetic properties

After intramuscular or subcutaneous administration of Puregon, maximum concentrations of FSH are reached within about 12 hours. Due to the sustained release from the injection site and the elimination half-life of about 40 hours

(ranging from 12 to 70 hours), FSH levels remain increased for 24-48 hours. Due to the relatively long elimination half-life, repeated administration of the same dose will lead to plasma concentrations of FSH that are approximately 1.5-2.5 times higher than after single dose administration. This increase enables therapeutic FSH concentrations to be reached.

There are no significant pharmacokinetic differences between intramuscular and subcutaneous administration of Puregon. Both have an absolute bioavailability of approximately 77%. Recombinant FSH is biochemically very similar to urinary human FSH and is distributed, metabolized, and excreted in the same way.

### **5.3 Preclinical safety data**

Single-dose administration of Puregon to rats induced no toxicologically significant effects. In repeated-dose studies in rats (two weeks) and dogs (13 weeks) up to 100-fold the maximal human dose, Puregon induced no toxicologically significant effects. Puregon showed no mutagenic potential in the Ames test and in the in vitro chromosome aberration test with human lymphocytes.

## **6. PHARMACEUTICAL PARTICULARS**

### **6.1 List of excipients**

Puregon solution for injection contains:

sucrose

sodium citrate

L methionine

polysorbate 20

benzyl alcohol

water for injections

The pH may have been adjusted with sodium hydroxide and/or hydrochloric acid.

## **6.2 Incompatibilities**

In the absence of compatibility studies, this medicinal product must not be mixed with other medicinal products.

## **6.3 Shelf life**

3 years.

Once the rubber inlay of a cartridge has been pierced by a needle, the product may be used for a maximum of 28 days.

## **6.4 Special precautions for storage**

Keep out of reach and sight of children.

Do not use Puregon after the expiry date which is stated on the label after 'EXP'.

Storage by the pharmacist:

Store in a refrigerator (2°C – 8°C). Do not freeze.

Storage by the patient:

There are two options:

1. Store in a refrigerator (2°C – 8°C). Do not freeze.
2. Store at or below 25°C for a single period of not more than 3 months.

Keep the cartridge in the outer carton.

## **6.5 Nature and contents of container**

Boxes of Puregon solution for injection contain 1 cartridge of Puregon and 3 (150 IU cartridge), 6 (300 IU and 600 IU cartridges) or 9 (900 IU cartridges) needles to be used with the Puregon Pen.

(Not all presentations may be available locally.)

The cartridges are of colorless hydrolytic (class 1) glass, with a rubber piston and an aluminium crimp-cap with a rubber inlay.

Cartridges contain 833 IU of FSH activity per mL aqueous solution. Cartridges with a net dose of 150 IU contain a minimum of 225 IU in 0.270 mL; those of 300 IU contain a minimum of 400 IU in 0.480 mL; those of 600 IU contain a minimum of 700 IU in 0.840 mL; those of 900 IU contain a minimum of 1025 IU in 1.230 mL.

### **6.6 Special precautions for handling and disposal**

Do not use if the solution contains particles or if the solution is not clear.

Puregon solution for injection in cartridges is designed for use in conjunction with the Puregon Pen. The instructions for using the pen must be followed carefully.

Air bubbles must be removed from the cartridge before injection (see instructions for using the pen).

Empty cartridges must not be refilled.

Puregon cartridges are not designed to allow any other drug to be mixed in the cartridges.

Discard used needles immediately after injection.

Any unused product or waste material should be disposed of in accordance with local requirements.

<p>As this preparation contains benzyl alcohol, its use should be avoided in children under two years of age. Not to be used in neonates.</p>
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