

Fact Sheet Compiled by: Taina Strike BVSc MSc MRCVS Last Updated: September 2021

Fact Sheet Reviewed by: Yedra Feltrer; Henk Bertshinger; Isabel Callealta

Contraceptive methods	GnRH agonist (implant) RECOMMENDED
Contraceptive Product:	Deslorelin acetate
Commercial Name:	Suprelorin ®
Product Availbility:	4.7mg ('Suprelorin 6') and 9.4 mg ('Suprelorin 12') widely available the veterinary drug distributors in the EU.
Restrictions and/or permit required by Importing Country:	The EAZA RMG reccommends: always check with your local licencing au
Mechanism of action:	GnRH agonist suppresses the reproductive endocrine system, prever production of pituitary and gonadal hormones. As an agonist of the Gi initially stimulates the reproductive system -which can result in oestru ovulation in females or temporary enhancement of testosterone a spermatogenesis in males- therefore additional contraception is needed this time. Please, see below and refer to Deslorelin datasheet in our Pi Recommendations section for detailed information.
Insertion/Placement:	Subcutaneous, in a place where it can be easily detected or seen for rem later date (e.g. proximal medial aspect of forelimb or hindlimb; inner umbilical area, loose fleshy skin at base of pinna; side of neck ). Refer to S Product Recommendation sheet for effective method of implant place (tunnelisation).
Females	RECOMMENDED
Dose:	Dosages and duration of efficacy are not well established for all species. dosing recommendations are a single implant for felids up to and inclucheetah/leopard size; and 2 implants for the larger species. Most tiger su should receive 2 implants unless overconditioned or very large <sup>9</sup> . 4.7mg i are effective for a minimum of 6 months and 9.4mg for a minimum of 12 However, evidence from lions, leopards, tigers, and cheetah indicate the average duration of efficacy however is about 1 year for 4.7mg and 2-3 y the 9.4 implant <sup>1,4,9</sup> .
Latency to effectiveness:	3 weeks average as GnRH agonist initially stimulates the reproductive s please, refer to Deslorelin datasheet on this website for detailed inforr Additional contraception is needed during this time in order to suppres t stimulation phase (see product data sheet. ~2-5mg/kg Megestrol aceta /Ovarid® or oral birth control pills daily, 7 days before and 7 days af implantation has been used to suppress inital stimulation phase). supplementation of the first bout is not possible, sexes should be separ prevent pregnancy during this time. Note that this will not prevent any effects of sustained elevations in progesterone during the stimulation should ovulation occurs. Treatment MUST commence when the femal anoestrus or dioestrus (i.e. non-pregnant luteal phase).
Oestrous cycles during contraceptive treatment:	Initial oestrus and ovulation (during the 3 first weeks of stimulation) ma and then cycling is supressed. To avoid the initial oestrus and ovulatio subsequent progesterone production, and the associated deletereous e this, you MUST follow the megestrol acetate protocol mentioned ab
Use during pregnancy:	To date: not recommended.
Use during lactation:	No contraindications once lactation established.

## Animal name: Felidae

## We would recommend assessing any contraceptive bout with behavioural and hormone monitoring. For more information on this, please contact contraception@chesterzoo.org

	GnRH agonist (injection)	GnRH vaccine (injection)	Progestagen (injection) CAUTION	Progestagen (oral) CAUTION	Progestagen (injection) NOT RECOMMENDED	Progestagen (implant) NOT RECOMMENDED	Progestagen (implant) NOT RECOMMENDED	Surgical/Permanent
	Luprolide acetate	GnRH protein conjugate	Medroxyprogesterone acetate 150 mg/ml	Megestrol acetate	Proligestrone 100mg/ml	Levonorgestrel 2x 75mg	Etonogestrel 68 mg	N/A
	Lupron®	Improvac®	Depo-Provera <sup>®</sup> , Depo-Progevera <sup>®</sup> , Cenavul <sup>®</sup>	Ovarid/Megace <sup>®</sup>	Delvosteron <sup>®</sup> Covinan <sup>®</sup>	Jadelle®	Implanon <sup>®</sup> Nexplanon <sup>®</sup>	N/A
ough	Luprolide acetate licenced for human use.	Available through veterinary drug distributors.	Manufactured by Pfizer. Widely avilable throughout Europe through human drug distributors.	Manufactured by Virbac, available through veterinary distributors.	Manufactured by MSD animal Health UK, Intervet Europe. Licensed for use in female dogs, cats, and ferrets; available through veterinary distributors.	Manufactured by Organon. Available through human drug distributors.	Manufactured by Bayer Schering Pharma AG. Available through human drug distributors.	N/A
thority.	Data deficient.	Widely available throughout European countries. The EAZA RMG recommends: always check with your local licencing authority	The EAZA RMG reccommends: always check with your local licencing authority.	The EAZA RMG reccommends: always check with your local licencing authority.	The EAZA RMG reccommends: always check with your local licencing authority.	The EAZA RMG recommends: always check with your local licencing authority.	The EAZA RMG reccommends: always check with your local licencing authority.	N/A
ting nRH, it s and nd I during oduct	GnRH agonist suppresses the reproductive endocrine system, preventing production of pituitary and gonadal hormones.	Production of anti-GnRH antibodies by the immune system, neutralising endogenous GnRH activity. This results in a reduction of FSH and LH production by the anterior pituitary and, ultimately, in a reduction of ovarian follicular development and /or inhibition of testosterone secretion from the testes and spermatogenesis.	Anti-oestrogenic activity. Interference with fertilization by thickening cervical mucus, interrupting gamete transport, disruption of implantation, inhibition of LH surge necessary for ovulation. In felids, progestagen contraceptives are associated with progressive uterine growth and degeneration (i.e. endometrial hyperplasia) that can result in infertility, infection, and sometimes uterine neoplasia. Mammary tissue stimulation due to long-term progestagen exposure also can result in mammary gland neoplasia.	Anti-oestrogenic activity. Interference with fertilization by thickening cervical mucus, interrupting gamete transport, disruption of implantation, inhibition of LH surge necessary for ovulation. In felids, progestagen contraceptives are associated with progressive uterine growth and degeneration (i.e. endometrial hyperplasia) that can result in infertility, infection, and sometimes uterine neoplasia; mammary tissue stimulation due to long-term progestagen exposure also can result in mammary gland neoplasia.	Anti-oestrogenic activity. Interference with fertilization by thickening cervical mucus, interrupting gamete transport, disruption of implantation, inhibition of LH surge necessary for ovulation.	Anti-oestrogenic activity. Interference with fertilization by thickening cervical mucus, interrupting gamete transport, disruption of implantation, inhibition of LH surge necessary for ovulation.	Anti-oestrogenic activity. Interference with fertilization by thickening cervical mucus, interrupting gamete transport, disruption of implantation, inhibition of LH surge necessary for ovulation.	<ul> <li>Castration: surgical removal of the testes.</li> <li>Vasectomy (caution): surgical procedure in which the ductus deferens are cut, tied, cauterized, or otherwise interrupted.</li> <li>Ovariohysterectomy: removal of one or both ovaries and the uterus.</li> <li>Ovariectomy: removal of both ovaries.</li> </ul>
oval at a high; uprelorin ment	Injectable.	Injectable intramuscular or subcutaneously.	Injectable (intramuscular).	Orally (daily).	Injectable (subcutaneous - do not inject intradermally or into subcutaneous fat or scar tissue).	Intramuscular or subcutaneous. The EAZA RMG recommends subcutaneous, upper inner arm for visibility (aid for later removal).	Intramuscular or subcutaneous. The EAZA RMG recommends subcutaneous, upper inner arm for visibility (aid for later removal).	N/A
	Data deficient	Data deficient	CAUTION - see side effect below	CAUTION - see side effects below	Not recommneded	Not recommended	Not recommended	Ovariohysterectomy/ovariectomy - recommended
Current Iding bspecies mplants months. at the ears for		Data deficient. In lionesses, two injections of 600ug are given 5 weeks apart and boosters are usually administered every 4-6 months. Each dose should be split into two parts, injected on either side to achieve a better immune response. Doses for other species have not been well established.	2.5-5 mg/kg body weight every 2 months, <b>no</b> <b>more than 2 consecutive seasons</b> . If a progestin is used, treatment should only be short term, because of the increased likelihood of side effects with prolonged exposure.	2-5 mg/kg daily orally for seasonal breeders, no more than for 2 consecutive seasons or <b>used to avoid</b> <b>the stimulation phase associated with</b> <b>GnRH implant</b> (see GnRH recommendations).				N/A
hation. he initial te pills ter of ated to dverse ohase, e is in		Latency to effectiveness can be up to 6 weeks, so separation of the sexes is recommended if possible.	If a progestin is used in felids, treatment should start well BEFORE any signs of prooestrus, since the elevated endogenous oestrogen can exacerbate side effects of the progestin.	If a progestin is used in felids, treatment should start well BEFORE any signs of prooestrus, since the elevated endogenous oestrogen can exacerbate side effects of the progestin.				Immediate.
y occur n, the fects of ove.		<b>Data deficient,</b> but cycling should be suppressed.						
		Unknown.	Not recommended. Progestins should not be used in pregnant animals, since they may suppress natural signals and mechanisms necessary for normal parturition (e.g. uterine contractions). Thus, progestins should only be administered to females CONFIRMED non-	Not recommended. Progestins should not be used in pregnant animals, since they may suppress natural signals and mechanisms necessary for normal parturition (e.g. uterine contractions). Thus, progestins should only be administered to females CONFIRMED				
			pregnant.	non-pregnant.				

Use in prepubertals or juveniles:	<b>Data deficient</b> in this group, see product information sheet. Deslorelin sugonadal steroids, its use may delay epiphyseal closure of the long bones, in taller individuals, similar to the effects of pre-pubertal spaying and neu domestic cats and lions. GnRH agonist use in prepubertal domestic cats of puberty onset about 9 month <sup>10,11</sup> , but was followed by reproductive cycl treatment ceased. However, species differences may occur.
Use in seasonal breeders:	<b>Data deficient.</b> Should start at least 1 months prior the breeding seaso females, GnRH agonists can induce initial oestrus and ovulation even due non-breeding season in some taxa.
Duration:	Duration of efficacy has not been well established in all species. As a guid mg implants will suppress cyclicity for a minimum of 6 months; 9.4mg welfective for a minimum of 12 months. The average duration of efficacy how about 1 year for 4.7mg and 2-3 years for the 9.4 mg implant <sup>1,4,9</sup> . Individual variation may occur, but duration of effect tends to be regular for a par individual's contraceptive bout.
Reversibilty:	Considered reversible, but every species has not been tested. Reversibil been demonstrated on average 3 years after implantation with this pro- female felids. Reversals in tigers were seen on average 3 years after im- placement for 4.7 mg implants and 4 years after placement with 9.4 mg ir Cheetah and leopards have been seen to reverse 2 years after a single 4 implant. In the database, we have records of reversal in African lions, 7 leopards, Amur tigers, black-footed cats, lynx, clouded leopards, jaguars, snow leopards, and Sumatran tigers. Data from studies of domestic cats a African lions have identified a transition phase of about 6 months durin process of reversal, when follicles grow and produce oestrogen sufficies stimulate recurring signs of oestrus and even mating behaviour, but wi ovulation. These observations indicate that reversal is a process that may for 6 months, when abnormal or irregular cycles may be seen in female period of increased aggression may be seen in males. Reversal time is dep on the individual and the age at reversal; some animals will reverse earlies than others. Implants should be removed to facilitate reversibility. They
Effects on behaviour:	Similar to those seen with gonadectomy, but should be reversible. Low oestrogenic activity might occur, resulting in female receptivity or male in
Effects on sexual physical characteristics:	Similar to those seen with gonadectomy, but should be reversible. Weight been observed.
Males	
Males Dose:	<b>Data deficient.</b> Usually higher doses are required in males than in fem particularly if used to manage aggression. In cheetah, 4.7 mg implants o repeated at 12 month intervals to successfully stop breeding.
Males Dose: Latency to effectiveness:	<ul> <li>Data deficient. Usually higher doses are required in males than in fem particularly if used to manage aggression. In cheetah, 4.7 mg implants or repeated at 12 month intervals to successfully stop breeding.</li> <li>Depending on the species there may be fertile sperm present in vas defee 6-8 weeks post treatment or even longer. Testosterone decreases after weeks, but sperm can stay fertile for many weeks after. Generally, addit contraception in the females or separation of the sexes for 2 month recommended as in vasectomy.</li> </ul>
Males         Dose:         Latency to         effectiveness:         Use in prepubertals or         juveniles:	<ul> <li>Data deficient. Usually higher doses are required in males than in fem particularly if used to manage aggression. In cheetah, 4.7 mg implants or repeated at 12 month intervals to successfully stop breeding.</li> <li>Depending on the species there may be fertile sperm present in vas defe 6-8 weeks post treatment or even longer. Testosterone decreases after weeks, but sperm can stay fertile for many weeks after. Generally, addit contraception in the females or separation of the sexes for 2 month recommended as in vasectomy.</li> <li>Data deficient in this group, see product information sheet. Deslorelin sugonadal steroids, its use may delay epiphyseal closure of the long bones, in taller individuals, similar to the effects of pre-pubertal spaying and neu domestic cats. GnRH agonist use in prepubertal domestic cats was follow reproductive cycles after treatment ceased. However, species difference occur. There appear not be be any such problems in cheetahs.</li> </ul>
Males Dose: Latency to effectiveness: Use in prepubertals or juveniles: Use in seasonal breeders:	<ul> <li>Data deficient. Usually higher doses are required in males than in fem particularly if used to manage aggression. In cheetah, 4.7 mg implants or repeated at 12 month intervals to successfully stop breeding.</li> <li>Depending on the species there may be fertile sperm present in vas defe 6-8 weeks post treatment or even longer. Testosterone decreases after weeks, but sperm can stay fertile for many weeks after. Generally, addi contraception in the females or separation of the sexes for 2 month: recommended as in vasectomy.</li> <li>Data deficient in this group, see product information sheet. Deslorelin suggonadal steroids, its use may delay epiphyseal closure of the long bones, in taller individuals, similar to the effects of pre-pubertal spaying and neu domestic cats. GnRH agonist use in prepubertal domestic cats was follow reproductive cycles after treatment ceased. However, species difference occur. There appear not be be any such problems in cheetahs.</li> <li>Data deficient. In males, GnRH agonists can transiently stimulate testos production even during the non-breeding season. Treatment should beg than two months prior the anticipated breeding season to prevent initia spermatogenesis, because it appears that suppression of sperm production even during the non-breeding season to prevent initia spermatogenesis, because it appears that suppression of sperm production even during he non-breeding season to prevent initia spermatogenesis, because it appears that suppression of sperm production even during he non-breeding season to prevent initia spermatogenesis, because it appears that suppression of sperm production evendure.</li> </ul>
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		It may delay epiphyseal closure of the long bones, resulting in taller individuals, as observed in domestic cats and lions.
		Irreversible.
		Irreversible; procedures should only be carried out with the full apporval and knowledge of the species coordinator.
		Reproductive behaviour supressed.
		Weight gain has been observed.
d	Not recommended	
	Not recommended	N/A
		N/A Allow 6-8 weeks post surgery to ensure no viable sperm in ejaculate. Keep sexes appart during this period or keep females contracepted.
		N/A Allow 6-8 weeks post surgery to ensure no viable sperm in ejaculate. Keep sexes appart during this period or keep females contracepted. It may delay epiphyseal closure of the long bones, resulting in taller individuals, as observed in domestic cats and lions.
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Side effects	Deslorelin first stimulates then suppresses oestrus in females. Species induced ovulation (e.g., felids, some mustelids, and bears) may ovulate become pseudo-pregnant (which also occurs in canids) when first treat males, initial stimulation may be accompanied by increased aggression o interest. Oestrous behaviour or even copulation may occur during a tran phase near the end of the period of contraceptive efficacy. Pseudopreg endometrial hyperplasia, and pyometra may be associated with the use of agonist as a result of high progesteron levels during the stimulation phase oestrus and ovulation induction. A more recently developed Suprelon (deslorelin) protocol using Ovarid® (megestrol acetate) to prevent the stimulation phase, followed by implant removal when reversal is desired, safer contraceptive option.
Warnings	Causes initial gonadal stimulation that MUST be suppressed to avoid ne effects of long-term exposure to progesteron (see above); correct admini is essential - see product information sheet.
Reporting Requirements	: In order to increase our knowledge of the efficacy of contraception met
<ul> <li>References:</li> <li>1) Bertschinger, HJ, de Ba</li> <li>2) Dematteo, KE. (2005) (</li> <li>3) Bertschinger, HJ, Jago,</li> <li>4) Bertschinger, HJ, Jago,</li> <li>4) Bertschinger, HJ, Asa (</li> <li>5) Bertschinger, HJ, Trigg</li> <li>6) Bertschinger, HJ, Trigg</li> <li>6) Bertschinger, HJ, Sills,</li> <li>7) Putman, SB, Brown, JL,</li> <li>8) Braga, DPDAF, Pizzutto</li> <li>9) Guthrie, A, Strike, T, Pa</li> <li>10) Risso A, Corrada Y, Ba</li> <li>11) Cecchetto M, Salata F</li> </ul>	Arros Vaz Guimarães, MA, Trigg, TE, Human, A. (2008) The use of deslorelin Contraception in Carnivores in <i>Wildlife Contraception: Issues, Methods, and</i> M. Nöthling, JO, Human, A. (2006). Repeated use of the GnRH analogue de CS, Calle PP, Long JA, Bauman K, DeMatteo K, Jöchle W, Trigg TE, Human AJ , TE, Jöchle, W, Human, A. (2002). Induction of contraception in some Afric ES. (2013) Contraceptive applications of GnRH-analogues and vaccines for , Franklin, AD, Schneider, EC, Boisseau, NP, Asa, CS, & Pukazhenthi, BS (201 o, CS, Rosenfield, DA, Furtado, PV, Oliveira, CA, Corrêa, SHR, & Guimarãe atterson, S, Walker, C, Cowl, V, Franklin, AD, Powell, DM. (2021) The past, p arbeito C, Diaz JD, Gobello C. (2012) Long-term-release GnRH agonists post P, Baldan A, Milani C, Mollo A, Fontaine C, et al. (2017) Postponement of pu

with e and ed. In r sexual nsition rancy, of GnRH e, after in® nitial may be a	Occasional swelling at the vaccination site - vaccination site abscess may occur. The EAZA RMG recommends always reading the manufacturer's data sheet.	In felids, progestagen com associated with progressive u degeneration (i.e. endometria can result in infertility, infection uterine neoplasia. Mammary due to long-term progestagen result in mammary gland n pseudopregancy, endometria pyometra increases with expo circulating proges
gative stration	It should be handled with extreme care to avoid handler accidents. The EAZA RMG recommends always reading the manufacturer's data sheet.	SHOULD NOT BE USED PE IMPLANT PLACEMENT. Depo not replace megestrol acetate high levels and prolonged rel with Suprelorin <sup>®</sup> e
hods in the felidae family it is rec	commended that all individuals on contracept	ion be reported to the EAZA R

in implants for the long-term contraception of lionesses and tigers *Wildlife Research* 35(6) 525–530 http://dx.doi.org/10.1071/WR07141 and *Applications*. Asa, C.S. & Porton, I.J. (eds.) ; pg 105-118. The Johns Hopkins University press: Baltimore. lesionelin to down-regulate reproduction in male cheetahs (*Acinonyx jubatus*) *Theriogenology*, 66(6):1762-1767. J. (2001). Control of reproduction and sex related behaviour in exotic wild carnivores with the GnRH analogue deslorelin: preliminary observations. *Reprod Fertil Suppl*, 57:275-283 can wild carnivores by down-regulation of LH and FSH secretion using the GnRH analogue deslorelin. *Reproduction Supplement* 60: 41-52 wildlife mammals of southern Africa: Current experience and future challenges. In: Gonadotropin-releasing hormone (GnRH). Production, structure and function. ES Sills (ed). Nova Science Publishers Inc., New York, ISBN: 978-1-62808-478-8. 278 pp: 85-107 15). Characterization of ovarian steroid patterns in female African lions (*Panthera leo*), and the effects of contraception on reproductive function. *PloS one*, 10(10), e0140373. es, MADBV. (2020). Suppression of ovarian activity in a captive African Lion (*Panthera leo*) after deslorelin treatment. *Journal of Threatened Taxa*, 12(11), 16469-16477. present and future of hormonal contraceptive use in managed captive female tiger populations with a focus on the current use of deslorelin acetate. *Zoo Biology*, 1-14. doi: 10.1002/zoo.21601. tpone puberty in domestic cats. *Reprod Domest Anim*;47:936–8. doi:10.1111/j.1439-0531.2012.01994.x. uberty in queens treated with deslorelin. *J Feline Med Surg*. doi:10.1117/1098612X16688406.

tion from various sources. As these are prescription only medicines it is the responsibility of the veterinarian to determine the dosage and best treatment for an individual.

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ged exposure to prolonged gens. circulating progestagens. s	ormonal pseudo-pregnancy that follows ovulation in most felids. Endogenous teroids and steroid contraceptives cause similar side effects.
fe ເ ແ a dis lig	Precautions - Vasectomy is not recommended for species with induced ovulation because mating will result in male pseudopregnancies with prolonged periods of progesterone elevation, which can cause pathology of uterine and ammary tissue. Endogenous progesterone nd progestin contraceptives cause similar ease. We would <b>strongly discourage</b> tubal gation in felidae due to the associated risk of developing uterine pathology.