

Fact Sheet Compiled by: Veronica Cowl, PhD
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Fact Sheet Reviewed by: EAZA RMG
We would recommend assessing any contraceptive bout with behavioural and hormone monitoring. For more information on this, please contact contraception@chesterzoo.org

Animal name: Visayan spotted deer (*Rusa alfredi*)

Contraceptive methods	GnRH agonist (implant)	GnRH agonist (injection)	GnRH vaccine (injection)	Progestagen (implants)	Progestagen (injection)	Progestagen (oral)	PZP vaccine	Surgical/Permanent
Contraceptive Product:	Deslorelin acetate	Luprolide acetate	GnRH protein conjugate	Etonogestrel 68 mg	medroxyprogesterone acetate;	Altrenogest	PZP vaccine main components are antigens derived from porcine zona pellucida glycoproteins and an adjuvant to stimulate the immune response (Freund's modified complete adjuvant for primary vaccination and Freund's incomplete adjuvant for boosters).	-
Commercial Name:	Suprelorin ®	Lupron ®	Improvac®	Implanon® Nexplanon®	Depo-Provera®, Depo-Progevera®	Regu-mate®	Porcine Zona Pellucida	Castration; Vasectomy
Product Availability:	4.7mg ('Suprelorin 6') and 9.4 mg ('Suprelorin 12') widely available through veterinary drug distributors in the EU.	Luprolide acetate licenced for human use	Available through veterinary drug distributors.	Manufactured by Bayer Schering Pharma AG. Available through human drug distributors	Manufactured by Pfizer. Widely available throughout Europe through human drug distributors.	Regu-mate® Equine 2.2ml/mg oral solution and Regu-mate® Porcine 0.4% w/v oral solution widely available through veterinary drug distributors.	Not commercially available in Europe. PZP is available to ship to Europe. It is advised that you check with the licensing authority that manages the import of veterinary drugs to obtain a permit to import PZP. Once all necessary authorisations and approvals have been completed, you can order PZP from: Kimberly M. Frank The Science and Conservation Center 2100 S. Shiloh Road Billings, MT 59106 phone 406-652-9718 fax 406-652-9733 e-mail sccpzp@hotmail.com	-
Restrictions and/or permit required by Importing Country:	The EAZA RMG recommends: always check with your local licencing authority	Data deficient	Current knowledge: widely available throughout European countries. The EAZA RMG recommends: always check with your local licencing authority	The EAZA RMG recommends: always check with your local licencing authority	The EAZA RMG recommends: always check with your local licencing authority	The EAZA RMG recommends: always checking with your local licencing authority	License required UK and France; all other Countries unknown. The EAZA RMG recommends always checking with local licencing authority	-
Mechanism of action:	GnRH agonist suppress the reproductive endocrine system, preventing production of pituitary and gonadal hormones. As an agonist of the GnRH initially stimulates the reproductive system -which can result in oestrus and ovulation in females or temporary enhancement of testosterone and spermatogenesis in males- therefore additional contraception needed during this time. Please see below and refer to Deslorelin datasheet for detailed information	GnRH agonist suppress 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.	Interference with fertilization by thickening cervical mucus, interrupting gamete transport, disruption of implantation, inhibition of LH surge necessary for ovulation	Anti-estrogenic activity. Interference with fertilization by thickening cervical mucus, interrupting gamete transport, disruption of implantation, inhibition of LH surge necessary for ovulation	Interference with fertilization by thickening cervical mucus, interrupting gamete transport, disruption of implantation, inhibition of LH surge necessary for ovulation	The PZP antibodies interfere with fertilisation by binding to the ZP glycoprotein receptors that surround the egg of the vaccinated female, blocking the binding and subsequent penetration of sperm.	Castration: Surgical procedure in which the testes are removed; Vasectomy: Surgical procedure in which the ductus deferens are cut, tied, cauterized, or otherwise interrupted
Insertion/Placement:	Sub-cutaneous, in a place where it can be easily detected or seen for removal at a later date (i.e. Upper inner arm); refer Suprelorin fact sheet for effective method of implant placement (tunnellisation)	Injectable	Injectable intramuscular	Intramuscular or subcutaneous. The EAZA RMG recommends sub-cutaneous, upper inner arm for visibility (aid for later removal)	Injectable intramuscular	Administered orally in feed or by syringe. Gloves must be worn when administering Regu-mate® (absorption through the skin can cause disruption to the menstrual cycle and prolongation of pregnancies in humans).	Injectable Intramuscular	Surgical
Females	Recommended for females that are older or less likely to be given breeding recommendations		Recommended for females that are older or less likely to be given breeding recommendations	Data deficient	Recommended for females who are likely to breed in future	Recommended for females who are likely to breed in future		
Dose	A starting dose of 1 x 4.7 mg implant is recommended for a minimum duration of 6 months and 1 x 9.4 mg implant is recommended for a minimum duration of 12 months.	There are various formulations available lasting from 1-6 months. Dosing information is not available; extrapolation from human literature is likely the best place to start. Please contact the EAZA RMG with specific dosage advice.	Two injections of 400ug are given 35 days apart and boosters are usually administered every 6 months. Please note that the duration can vary between individuals and booster intervals have not been well established for this species.	1 implant (0.068g) is suggested for successful contraception in this species. As a guideline 1 implant/100kg.	As a guide 2.5-5mg/kg BW every 45-120 days. The mean dose in our database is 5mg/kg BW and were most frequently readministered every 3 months.	For contraception, 0.044mg/kg daily Regu-mate® Equine or Porcine daily.	100 µg protein is recommended. The first injection would consist of 0.5mL PZP + 0.5mL adjuvant and the second injection should be given no less than 14 days after this. In species with longer breeding season, if the vaccine is given at a time other than prior to the breeding season the primary vaccination course should be given at day 0, day 21 and day 45; booster should be administered every 7-8 months. If a seasonal breeder with a well defined and short breeding season (2-3 months) then it is 1-2 months before the breeding season.	-
Latency to effectiveness:	3 weeks average as GnRH agonists initially stimulates the reproductive system- please refer to the Deslorelin datasheet for detailed information - separation of the sexes OR supplementary contraception is recommended during this time (see product data sheet). Megestrol acetate pills daily 7 days before and 8 days after implant insertion have been used to suppress stimulation phase. The dose for domestic dogs is 2mg/kg, but must be extrapolated for other taxa. Oral altrenogest (Regumate) may be a viable alternative to megestrol acetate (0.044 mg/kg daily 7 days before and 8 days after implant placement to suppress the stimulation phase).	3 weeks average as GnRH agonists initially stimulates the reproductive system- please refer to the Deslorelin datasheet for detailed information - separation of the sexes OR supplementary contraception is recommended during this time (see product data sheet). Megestrol acetate pills daily 7 days before and 8 days after implant insertion have been used to suppress stimulation phase. The dose for domestic dogs is 2mg/kg, but must be extrapolated for other taxa. Oral altrenogest (Regumate) may be a viable alternative to megestrol acetate (0.04 mg/kg daily 7 days before and 8 days after implant placement to suppress the stimulation phase).	Latency to effectiveness can be up to 6 weeks so separation of the sexes is recommended if possible.	In general inhibition of ovulation after 1 day when inserted on day 1-5 of cycle or when replacing oral progestogen. As the right stage during oestrus cycle is often unknown, it is advised to use other contraceptive methods for at least 7-14 days after insertion of the implant depending on administration route (IM or SC).	1-3 days post injection. However, if the cycle stage is not known then extra time must be allowed; therefore, separation of the sexes or alternative contraception should be used for at least 1 week.	In mares, 95% treated with Regu-mate will be suppressed within 3 days ⁹ however separation of the sexes should be used for 7-14 days after contraceptive methods, if this not possible then other contraception methods should be used for this time.	Latency to effectiveness is approximately 2-3 weeks after the final injection in year 1 therefore separation of the sexes from the initial injection until 2 weeks after the final injection is recommended (primary course of vaccination 2 injections 2-4 weeks apart, preferable 3 injections).	-
Oestrus cycles during contraceptive treatment:	Initial oestrus and ovulation (during the 3 weeks of stimulation) then down-regulation. To prevent the stimulation phase, the megestrol acetate protocol described above is recommended.	Initial oestrus and ovulation (during the 3 weeks of stimulation) then down-regulation. To prevent the stimulation phase, the megestrol acetate protocol described above is recommended.	In a group of 57 mares, 80% were anoestrus after the primary vaccination and 100% after the booster vaccination, the interval from treatment to anoestrus was 2-3 weeks. ²	Oestrus behaviour may be observed. Cycling and even ovulation can occur in adequately contracepted individuals (but is unlikely and the degree of suppression is dose dependent).	Oestrus behaviour may be observed. Cycling and even ovulation can occur in adequately contracepted individuals (but is unlikely and the degree of suppression is dose dependent).	Oestrus in Inhibited	PZP should not suppress oestrous cycles and may extend the breeding season beyond what is considered typical, resulting in additional oestrous cycles.	-
Use during pregnancy:	Not recommended as may cause abortion	Not recommended as may cause abortion.	Data deficient. Studies in elk ³ and bison ⁴ have demonstrated that females who were vaccinated with the GnRH vaccine GonaCon while pregnant, delivered healthy calves.	Progestagens are not recommended in pregnant animals because of the possibility of prolonged gestation leading to dystocia, stillbirth and abortion in some species, although the effect may depend on dose.	Not recommended for use in pregnant animals because of the risk of prolonged gestation, stillbirth or abortion, etc. in some species, although the effect may depend on dose.	Not recommended for use in pregnant animals because of the risk of prolonged gestation, stillbirth or abortion.	Does not interrupt pregnancy or affect foetus.	-

Use during lactation:	No known contraindications once lactation has been established; however, treatment during pregnancy may impede proper mammary development.	No contraindications once lactation established; however, treatment during pregnancy may impede proper mammary development.	Data deficient. In dairy cattle, lactation and milk production were unaffected by vaccination with Improvac. ⁵	Considered safe for nursing; Does not affect lactation, but etonogestrel is excreted in milk.	Considered safe for nursing infant.	Considered safe for nursing infant.	No known contraindications.	-
Use in prepubertals or juveniles:	As deslorelin suppresses gonadal steroids, its use may delay epiphyseal closure of the long bones, resulting in taller individuals, similar to the effects of pre-pubertal spaying and neutering in domestic dogs and cats. GnRH agonist use in prepubertal domestic cats was followed by reproductive cycles after treatment ceased. However, species differences may occur.	Lupron® may prevent epiphyseal closure of the long bones, resulting in taller individuals.	Unknown	The use of synthetic progestagens in pre-pubertals or juveniles has not been fully assessed. Possible long-term effects on fertility are not known.	The use of synthetic progestagens in pre-pubertals or juveniles has not been fully assessed. Possible long-term effects on fertility are not known.	The use of synthetic progestagens in pre-pubertals or juveniles has not been fully assessed. Possible long-term effects on fertility are not known.	PZP-treated prepubertal white-tailed deer and feral horses were fertile as adults, but there is little data for other species.	-
Use in seasonal breeders:	Treatment should be given more than 2 months prior to expected breeding season.	Data deficient. Should start at least 2 months before start of breeding season.	Unknown but if used should be done at least 6 weeks prior to the breeding season. Effective in the horse. Use before cycling starts at the onset of the breeding season.		Should be injected at least 1 week before the breeding season starts.	Treatment should begin at least one month before the anticipated onset of the breeding season.	Can be used in seasonal breeders but initial treatment and annual boosters should be carried out 2 and 1 months before the start of the breeding season respectively.	-
Duration	Duration of efficacy has not been well established. As a guide: 4.7 mg implants will suppress for a minimum of 6 months; 9.4mg will be effective for a minimum of 12 months. All reindeer treated with Suprelorin in the Contraception Database have been treated with 3x9.4mg implants; all implants were replaced after approximately 12 months.	Lupron® is available in various formulations lasting from 1 to 6 months, but because the release of hormone from the depot formulation varies by individual, actual duration of efficacy can vary considerably.	Unknown for most of species. Improvac® induces an immune response that generates short-lived antibodies in the domestic pig (antibody production starts to decline ~7-8 weeks following second injection). Suppresses oestrus for a full season in mares after the first booster.	The duration of this product can last 2.5 to 3 years.	Dose dependant: 45-90 days in general. However, effects could last 1-2 years in some individuals.	No more than one dose each day. Regu-mate® must be given daily to maintain suppression of oestrus.	Species -dependant: most species 1 year	Permanent
Reversibility	Deslorelin is designed to be fully reversible, however there are currently no reversals reported in this species. Reversibility have been demonstrated in other cervids, with time to conception ranging from 1.1-4.3 years after the placement of 9.4mg implants. In no cases were implants removed. We would advise that implants are removed to facilitate reversibility and that they should therefore be placed in locations with thinner skin e.g. the inner thigh, umbilicus, or armpit.	Lupron® is designed to be fully reversible however there are no current cases of reversal in cervids.	It must be taken in to consideration that younger individuals will take longer to reverse in comparison to older individuals. Improvac is not designed to be reversible, but reversibility has been demonstrated in some wild animal species. We do not have any records of Improvac use in this species and no other cervids treated with this product have been given breeding opportunities.	Implanon is designed to be fully reversible however, we do not have any records of use in this species.	Designed to be fully reversible but individual variation can occur. We have no reported reversals in this species, but several reversals in other cervids with time to conception ranging between 1-1.5 years after the end of treatment.	It should be reversible after cessation of treatment. Signs of oestrus in equids have been observed 5 days after the end of treatment but will vary depending on the individual. We do not have any records of Improvac use in this, or other cervid species.	Species differences on reversibility. Reversibility differs between species; however the longer PZP is given the longer it takes for a female to become fertile again. Treatment for over 5 years has been associated with ovarian failure in some cases. The possibility of ovarian damage makes this method unsuitable for animals highly valuable to captive breeding programmes or where reversibility is important. It is therefore suggested that an individual is on PZP for no longer than 3 years if you want the female to breed. We have one record of a reindeer conceiving 1.5 years after the start of her treatment. She gave birth to live young.	-
Effects on Behaviour	Deslorelin is likely to supress some hormonal related behaviours.	Data deficient but likely to have similar effects to deslorelin.	Similar to surgical castration but short-acting (duration of antibody effect). No oestrus behaviour in mares.	Data deficient	Effects on behaviour have not been studied; there may be individual variation in response. Medroxyprogesterone acetate binds readily to androgen receptors and are antiestrogenic; females may experience male-like qualities (increased aggression, development of male secondary sex characteristics, etc.) Further research in the subject is necessary.	Regu-mate® can be used to alleviate temperament changes and aggression. Synthetic progestins may not suppress follicle growth and some signs of oestrus behaviour may be present.	Since usually the vaccine doesn't suppress oestrus cycles it has almost no effects on social behaviour, and no undesirable behavioural effects have been registered in free-ranging elephants treated for up to 9 years. In some species the failure to conceive can results in longer than usual breeding season and in some cases this can results in aggression and social disruption.	-
Effects on sexual physical characteristics	Similar to gonadectomy. GnRH agonists may cause the suppression of physical secondary sexual characteristics.	Similar to gonadectomy. GnRH agonists may cause the suppression of physical secondary sexual characteristics.	Similar to surgical castration but short-acting (duration of antibody effect).		Because medroxyprogesterone acetate binds readily to androgen receptors and is antiestrogenic, females may experience male-like qualities (increased aggression, development of male secondary sex characteristics, etc.)	Data deficient	Data deficient	-
Males	Not recommended as GnRH agonists are seemingly not effective in male ungulates	Not recommended as GnRH agonists are seemingly not effective in male ungulates	Not recommended as GnRH vaccines can disrupt the antler cycle ⁶ and have been associated with irreversible testicular damage ⁷	Not recommended	Please note that medroxyprogesterone acetate will not affect fertility and semen quality but will reduce rut behaviours ⁸.	Not recommended	Not recommended	Not recommended in future breeding bulls
Dose	-	-	-	-	400mg for one breeding season (~ 3 months) in reindeer. 300mg has been used successfully in male deer weighing 38-50kg.	-	-	-
Latency to effectiveness:	-	-	-	-	-	-	-	Depending on species and individual, perhaps as long as 2 months or more
Use in prepubertals or juveniles:	-	-	-	-	-	-	-	Data deficient
Use in seasonal breeders:	-	-	-	-	Should be used a minimum of 2 weeks prior to the breeding season.	-	-	-
Duration and Reversibility	-	-	-	-	One 400mg injection will last approximately 3 months. Treatment with MPA is considered reversible in males after one season ⁸ .	-	-	The procedure should not be used in males likely to be recommended for subsequent breeding as reversal is unlikely
Effects on Behaviour	-	-	-	-	-	-	-	Vasectomy will not affect androgen-dependant behaviours
Effects on sexual physical characteristics	-	-	-	-	-	-	-	-
General:								
Side effects	In general weight gain as would be seen with ovariectomy or castration. Increased appetite will result in weight gain, especially in females. Males may lose muscle and overall weight if not replaced by fat. Males may become the size (weight) of females. The EAZA RMG recommends always reading the manufacturer's data sheet	In general weight gain as would be seen with ovariectomy or castration. Increased appetite will result in weight gain, especially in females. Males may lose muscle and overall weight if not replaced by fat. Males may become the size (weight) of females. The EAZA RMG recommends always reading the manufacturer's data sheet	Occasional swelling at the vaccination site - need to inject deep intramuscular in elephants and horses. The EAZA RMG recommends always reading the manufacturer's data sheet		Possible deleterious effects on the endometrium following prolonged use. Progestins are likely to cause weight gain in all species. In the human literature, Depo-Provera® has been linked to mood changes. Because it binds readily to androgen receptors and is anti-estrogenic, females may experience masculinisation (increased aggression, development of male secondary sex characteristics, in dichromatic species, aspects of male colouration, etc.) The EAZA RMG recommends always reading the manufacturer's data sheet	Progestagens likely cause weight gain in all species. Possible deleterious effects on uterine and mammary tissues vary greatly by species. Can cause endometritis in domestic horses and cystic follicles in suids at low doses. The EAZA RMG recommends always reading the manufacturers' data sheet.	Treatment for over 5 years has been associated with ovarian failure in some species (species differences). Significant ovarian disruption has been noted in dogs, rabbits, mice and domestic sheep. Oophoritis unknown if transient or permanent. In some species the failure to conceive can results in longer than usual breeding season (aggression and social disruption)	-

Warnings	Causes initial gonadal stimulation. Duration may be reduced if implant is broken. Do not cut the implant. If implant is not completely removed at the end of treatment, residual circulating levels of deslorelin may affect time to reversal. Should not be used in conjunction with Depo-Provera.	Causes initial gonadal stimulation	It should be handled with extreme care to avoid handler accidents. The EAZA RMG recommends always reading the manufacturer's data sheet	Interaction with other drugs are known to occur and may influence protection against pregnancy. In some diabetic animals progestagens has led to an increased insulin requirement, it is advised that the product be used with caution in diabetic animals and that urine glucose levels are carefully monitored during the month after dosing. The EAZA RMG recommends always reading the manufacturer's data sheet.	This product is contraindicated for use in females with a previous or current history of uterine inflammation. The EAZA RMG recommends always reading the manufacturer's data sheet	The only adjuvant used with PZP is Freund's Modified adjuvant, which DOES NOT CAUSE TB+ TEST RESULTS, and injection site reactions are less than 0.05%. Following the initial treatments, boosters are required, using only Freund's Incomplete adjuvant.	The procedure should always be carried out under sterile conditions, potential for infection of the surgical wound.
Reporting Requirements: In order to increase our knowledge of the efficacy of contraception methods in oryx it is recommended that all individuals on contraception be reported to the EAZA RMG							
<p>References:</p> <p>1) Asa, C.S. & Porton, I.J. (eds.) (2005) Wildlife Contraception: Issues, Methods, and Applications. The Johns Hopkins University press: Baltimore.</p> <p>2) Botha, A. E., Schulman, M. L., Muenscher, S., Bertschinger, H. J., Guthrie, A. J. (2010) The reversibility of GnRH vaccination to suppress ovarian activity in a large group of mares over a two-year period. Anim. Reprod. Sci. 121:62</p> <p>3) Powers J, Baker DL, Davis TL, Conner MM, Lothridge AH, Nett TM (2011) Effects of gonadotropin-releasing hormone immunization on reproductive function and behavior in captive female Rocky Mountain elk (Cervus elaphus nelsoni). Biol Reprod 85:1152–1160.</p> <p>4) Miller LA, Rhyhan JC, Drew M (2004) Contraception of bison by GnRH vaccine: a possible means of decreasing transmission of brucellosis in bison. J Wildl Dis 40:725–730.</p> <p>5) Balet, L., Janett, F., Hüsler, J., Piechotta, M., Howard, R., Amatayakul-Chantler, S., ... & Hirsbrunner, G. (2014). Immunization against gonadotropin-releasing hormone in dairy cattle: Antibody titres, ovarian function, hormonal levels, and reversibility. Journal of dairy science, 97(4), 2193-2203.</p> <p>6) Killian, G., Wagner, D., Miller, L. (2005) Observations on the use of the GnRH vaccine GonaconTM in male white-tailed deer (Odocoileus virginianus). Proceedings of the 11th Wildlife Damage Management Conference. Eds: D.L. Nolte, K.A. Fagerstone. 133.</p> <p>7) Curtis, P.D., Richmond, M.E., Miller, L.A., and Quimby, F.W. (2008). Physiological Effects of Gonadotropin-Releasing Hormone Immunocontraception on White-Tailed Deer. <i>Human–Wildlife Interactions</i> . Paper 68.</p> <p>8) Rowell, J., Geary, T., Blake, J., Zezeski, A. L., & Shipka, M. (2019). The effects of short-term medroxyprogesterone acetate on rut related behaviors, semen characteristics and fertility in farmed reindeer bulls. <i>Theriogenology</i> , 140, 201-209.</p> <p>9) Card, C. (2009) Hormone therapy in the mare IN Equine Breeding Management and Artificial Insemination. Samper, J.C. Saunders: St. Louis.</p>							
Disclaimer: The EAZA RMG endeavours to provide correct and current information on contraception 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							