

## 7. Summary

### **Investigations on physiology of reproduction and methods of birth control in captive bears (*Ursidae*)**

The aim of this study was to improve the knowledge on the reproductive physiology of ursids in order to develop alternatives for a harmless and effective control of reproduction in captive bears. For this, endocrinological, ultrasonographical and pharmacological methods were modified and used.

The reproductive physiology of the examined brown and Asiatic black bears can be described as follows:

The mating period is regularly observed between April and July. The duration of oestrus varies individually from a few days to several weeks. Repeated oestrus cycles within one year have not been observed. After spontaneous ovulation, the fertilised ovum develops into a blastocyst and remains in this stage under extreme retardation of mitotic activity over several months (obligate embryonic diapause). In this stage of pregnancy, corpora lutea are dominated by small luteal cells which already synthesise slightly increased serum progesterone levels. The further, rapid embryonic development starts in autumn and is concomitant with an enlargement of corpora lutea (now dominated by large luteal cells with marked vacuoles) and a sharp increase of serum progesterone levels. Implantation occurs a few days after this increase. After a post-implantation period of approximately 54 days the blind and naked cubs are born with a weight of 300 to 400 g. The majority of births occur from mid of December to end of January, the implantation therefore from mid of October to late November. A prognosis on the time of implantation is only in multiparous individuals reliable, as the dates of consecutive births in one individual are nearly constant.

If the ovum is not fertilised, a corpus luteum pseudogaviditatis develops. Pseudopregnancy, lasts as long as physiological pregnancy. A differentiation of pregnant and pseudopregnant bears by means of progesterone monitoring is not clearly possible throughout the year, and an ultrasonographical diagnosis of pregnancy succeeds only after implantation.

These results were helpful in developing new methods to control reproduction in bears. The effectiveness of the antiprogestin J956 and the estrogen ethinylestradiol were studied. In a pharmacokinetic study the bioavailability and half life of J956 after oral and parenteral administration were determined. Thus, the suitability of this antiprogestin could be demonstrated, and conclusions on dosage and optimal mode of application were drawn.

Application of J956 can terminate pregnancy even after implantation (n=6), but in two bears with embryos of a crown-rump length of more than 20 mm, pathological alterations of the uterus were observed. Therefore, an application of J956 after implantation should be avoided, or carried out only until few days after implantation, if possible under ultrasonographical control.

The single intramuscular application of both J956 (10 or 7,5 mg/kg KM; n=6) and ethinylestradiol (10µg/kg KM; n=9) prior to implantation proved to be successful. Reversibility of both methods has not been proven yet because of management reasons, but there were no severe side-effects observed. All bears mated again in the breeding season following treatment. Because of the potential side-effects of estrogens, the use of antiprogestins should be preferred.

As long as there is no antiprogestin commercially available which is suitable for a remote application in bears (the availability of the antiprogestin J956 is very limited), the single use of ethinylestradiol in a low dosage (10 µg/kg body weight) prior to implantation (in the first half of October) can be recommended.

In contrast to other methods used to control reproduction in bears, the contraceptive methods presented in this study do not affect neither the oestrus cycle nor the sexual and social behaviour of the bears. A single and remote application terminates early pregnancy (during diapause) and is effective only one breeding season. Thus, you can decide to terminate pregnancy each and every year anew.