THE POTENTIAL UTILITY OF THERMOGRAPHY TO DIFFERENTIATE PREGNANCY AND PSEUDOPREGNANCY IN BEARS

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Thermography has been used for a variety of medical applications in humans and animals, including monitoring pregnancy. Operating on the principle that blood perfusion increases the thermal signature of organs or structures, warmer temperatures indicated greater blood supply. A Flir® ThermaCAM PM545 was used to create an image of the San Diego Zoo's adult female giant panda (Ailuropoda melanoleuca) on the day of artificial insemination on March 27, 2002. No significant temperature differential was observed near the ovaries, but a midline structure in the area of the uterus was warmer than the surrounding abdomen. On June 5, a thermal scan revealed the enlargement of the structure seen at artificial insemination; indicating increased blood supply to the uterus. A scan on June 21 revealed a dramatically expanded heat signature on both sides of the abdomen, perhaps reflective of the perfusion of blood to both uterine horns in preparation for implantation. Particularly notable was the intensely warm area of the left uterine horn. By July 5, the differential heat signatures between the two presumptive uterine horns were pronounced, suggesting that implantation may have occurred in the left horn and the blood supply to the right horn was receding. This finding was correlated with increased urinary progesterone metabolites signaling reactivation of the corpus luteum at the end of embryonic diapause. An increase in the size and intensity of the heat structure is expected at implantation due to the proliferation of blood vessels in the area of a developing placenta. On August 21, a diminished heat signature in the area of the left uterine horn was suggestive of a regression of blood supply associated with pregnancy loss or the end of pseudopregnancy. Falling progesterone levels at this time supported the theory of failed pregnancy or conclusion of pseudopregnancy, and no cub was born. A final thermal scan on December 6 revealed a complete regression of blood supply to the uterus. Imaging in 2003 revealed similar heat signatures at the time of implantation followed by two distinct, intensely warm regions, one in each uterine horn. Ultrasound imaging confirmed the presence of a viable fetus in each horn at the same location as the most intense thermal signatures, thereby validating thermography for pregnancy diagnosis in this species. This technology may have field application for the differentiation of pregnancy and pseudopregnancy in bears.