Ovarian down regulation by GnRF vaccination decreases reproductive tract tumor size in female white and greater one-horned rhinoceroses

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Reproductive tract tumors, specifically leiomyoma, are commonly found in female rhinoceroses. Similar to humans, tumor growth in rhinoceroses is thought to be sex hormone dependent. Tumors can form and expand from the onset of ovarian activity at puberty until the cessation of sex-steroid influences at senescence. Extensive tumor growth results in infertility. The aim of this study was to down regulate reproductive function of tumor diseased and infertile females to stop further tumor growth using a Gonadotropin releasing factor (GnRF) vaccine. Four infertile southern white (*Ceratotherium simum simum*) and three Greater one-horned rhinoceroses (*rhinoceros unicornis*) with active ovaries and 2.7 ± 0.9 and 14.0 ± 1.5 reproductive tract tumors respectively were vaccinated against GnRF (Improvac®, Zoetis, Germany) at 0, 4 and 16 weeks and re-boostered every 6 – 8 months thereafter. After GnRF vaccination the ovarian and luteal activity was suppressed in all treated females. Three months after vaccination the size of the ovaries, the number of follicles and the size of the largest follicle were significantly reduced ($P<0.03$). Reproductive tract tumors decreased significantly in diameter (Greater-one horned rhino: $P<0.0001$; white rhino: $P<0.01$), presumably as a result of reduced sex-steroid influence. The calculated tumor volumes were reduced by 50.8 ± 10.9 % in Greater one-horned and 48.6 ± 12.9 % in white rhinoceroses. In conclusion, GnRF vaccine effectively down regulated reproductive function and decreased the size of reproductive tract tumors in female rhinoceros. Our work is the first to use down regulation of reproductive function as a symptomatic treatment against benign reproductive tumor disease in a wildlife species. Nonetheless, full reversibility and rhinoceros fertility following GnRF vaccination warrants further evaluation.

Human-elephant conflict reduction via deterrents, understanding ecological correlates, and climate smart agriculture practices

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Human-Elephant Conflict (HEC) is an increasingly prevalent problem that exacerbates difficulties in the conservation of African (*Loxodonta africana*) and Asian (*Elephas maximus*) elephants. In addition to ethical justification, the importance of elephants as ecological engineers and charismatic megafauna for ecotourism stands against the option of population reduction as a viable means of HEC resolution. Crop raiding is the major form of HEC that directly impacts the livelihoods and welfare of humans who share habitat with elephants. Our goal is to determine a multi-faceted approach to HEC reduction by (1) experimentally assaying deterrents to reduce crop raiding, (2) improving habitat quality to provide natural