

**DEVELOPMENT OF STERILITY VACCINE FOR POPULATION CONTROL OF PEST
BOSELAPHUS TRAGOCAMELUS (NILGAI) TO PROTECT CROP DAMAGES IN STATE OF MADHYA PRADESH**

BACKGROUND

- Crop damage by pest wild animals (Nilgai and blackbuck) has been widely reported from almost all corners of India.
- In terms of monetary value, Indian agriculture suffers an annual loss of about rupees 28 billion due to pest wild animals.
- Nilgai population has been successful in adjusting to the man altered habitats and in many places such species have become serious pests of agricultural crops.
- Hence, rural societies existing on subsistence agriculture cannot afford huge losses in their cultivations raided by these animals.
- Realizing the seriousness of the problem, poor farmers are now becoming increasingly intolerant and adopting hostile attitudes.
- Wild pests have become a major problem in agricultural areas of Madhya Pradesh, Haryana, Uttar Pradesh, Rajasthan and Gujarat.
- According to the Madhya Pradesh Forest department, there are more than 35,000 grazing Nilgai on standing crops.



FACTS

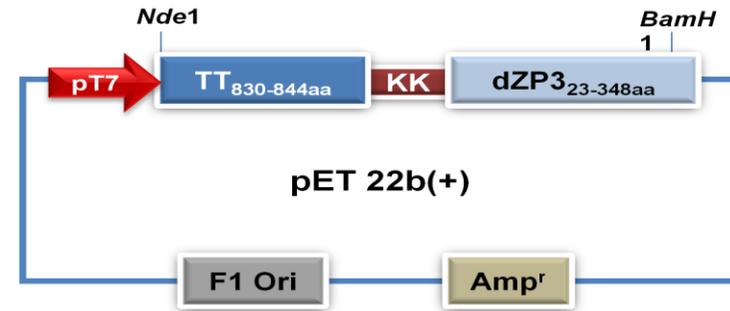
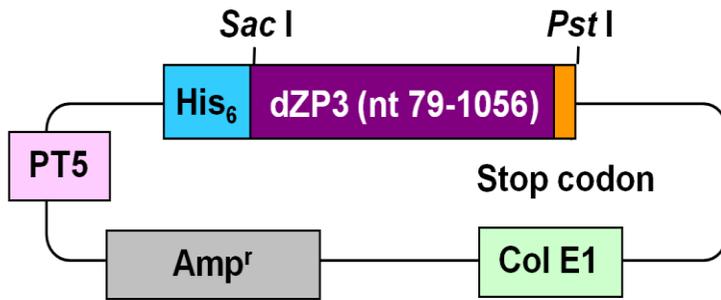
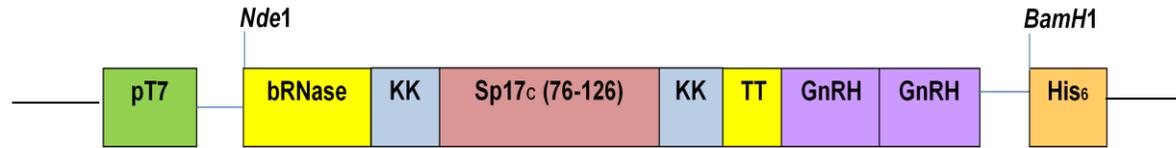
- Scientific name: *Boselaphus tragocamelus* - Asia's largest antelope
- Nilgai is categorized as Schedule III of Wildlife (Protection) Act, 1972.
- It is estimated that the Indian population of Nilgai could exceed 1,00,000 with densities of 0.2-11.4 individuals/km² area across India
- Till date, no effective vaccine for sterilization has been developed for control of Nilgai population.

OBJECTIVES

1. Development of recombinant construct against candidate gene (GnRH, ZP gene) affecting the fertilizing ability of oocytes, sequence analysis of candidate genes and their expression in different cell lines.
2. To generate anti-sera against different zona pellucida and GnRH proteins in laboratory animals and testing of efficacy of antisera by western blot assays.
3. *In-vitro* analysis for testing the efficacy of generated antisera on inhibition of fertilizing ability of oocytes of Nilgai and related species using IVF technology.
4. Development of suitable nano-particle based drug delivery system to prolong the release of antigen *in-vivo*.
5. To test the efficacy of nano-particle based vaccine on fertilizing ability of Nilgai oocyte *in-vivo*.
6. To perform field trial of developed formulation in captive Nilgai.

IMPLEMENTATION STRATEGY/ TECHNICAL PROGRAM

- Characterization of the zona pellucida and GnRH protein and their genes in Nilgai
- Cloning and expression of ZP and GnRH gene sequences in suitable cell lines.
- Development of polyvalent antibody
- Development and evaluation of nanoparticle agents for efficient slow antibody delivery system.
- In-vitro analysis by IVF technology to evaluate the efficacy of the entrapped antibody on interference in fertilization process.
- Comparative evaluation of immune responses following intramuscular immunization



Proposed Genetic Map of Constructs for development of sterility vaccine

COLLABORATIVE PARTNERS

S.No	Collaborating institute	Responsibilities
1.	School of Wildlife Forensic and Health, NDVSU, Jabalpur (MP)	Molecular characterization of candidate genes Construction of vectors and expression of candidate genes, raising antibodies in laboratory animals against recombinant protein <i>In vitro</i> studies for interference in fertilization process by IVF technology <i>In vivo</i> confirmation for efficacy of vaccine in captive Nilgai population
2.	National Institute of Immunology, New Delhi	Supply of already available constructs, vectors Guidance for final construct development for Nilgai sterility
3.	ISF College of Pharmacy, Moga (Punjab)	Development of nanoparticle based carrier molecules for slow release of antibody Development of site directed delivery system in testes and ovaries
3.	Private companies	In case of <i>in vivo</i> studies, suitable biotechnology companies in India will be collaborated on profit sharing basis.

EXPECTED OUTCOME

- The nanoparticle encapsulated antibodies generated against Zona pelucida, GnRH proteins will be used for slow release of the antibodies for long lasting effect of the vaccine by site directed delivery system.
- Zona pellucida based vaccine molecule will be used for creating sterility in females.
- GnRH based vaccine will be used for creating sterility in both males and females, thus leading to mass sterility of pest Nilgai.