Transgenic Animals

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What are the Transgenic Animals?

- Organisms containing **integrated sequences of cloned DNA (transgenes)**, transferred using **techniques of genetic engineering** (to include those of gene transfer and gene substitution) are called transgenic animals.
- Transgenesis is the phenomenon in which a f**oreign gene with desired characteristics** is introduced into the genome of the target animal. The foreign gene that is introduced is known as the **transgene,** and the animal whose genome is altered is known as **transgenic**.
- These genes are p**assed on to successive generations.**

Transgenic Animals Methods of Creating

- **Chemical Transfection:** In this method, the target DNA is taken up in the presence of calcium phosphate. The DNA and calcium phosphate co-precipitates, which facilitates DNA uptake. The mammalian cells possess the ability to take up foreign DNA from the culture medium.
- **Retrovirus-Mediated Gene Transfer:**The gene is transferred by means of a vector. Since retroviruses have the ability to infect the host cell, they are used as vectors to transfect the gene of interest into the target genome.
- **Bactofection:**It is the process by which the gene of interest is transferred into the target gene with the help of bacteria.
- **Viral Vectors:**Viruses are used to transfect rDNA into the animal cell. The viruses possess the ability to infect the host cell, express well and replicate efficiently.
- **Physical Transfection:**
    - The gene of interest is directly injected into the

pronucleus of a fertilized ovum. It is the very first method that proved to be effective in mammals.

- Other methods of physical transfection include particle bombardment, ultrasound and electroporation.

Applications of transgenic animals:

- Transgenic animals can be prepared by keeping in view the **economically significant traits**, such as efficient feed utilization, faster growth rate, production of lean meat, increased production and enhanced immune-competence.
- Attempts have been made for exploiting the mammary gland to produce pharmaceutical **proteins in milk.**
- Transgenic sheep armed with genes involved in cysteine synthesis from dietary serine exhibited significant positive effect on **wool production.**
- **A heterologous protein**, such as a variant of human tissue plasminogen activator has also been produced in goat which is being used in patients suffering from thrombosis, for dissolving blood clots.
- The long term goal of companies developing transgenic animals is to create a **new generation of medicines** based on gene products, rather than on drugs engineered by chemicals.
- Transgenic processes have been adopted t**o increase the disease resistance in animals**, such as genetic immunization with recombinant plasmid containing gene for antigen of interest has been attempted for prevention of infectious diseases, e.g., rabies, pseudorabies virus, etc.
- Breeding of pigs with humanized organs for use in **xenotransplantation** has become an important application of transgenic approach.The gene construct used to create the transgenic pigs containing the human beta-globin

locus control gene may be suitable substitute for obtaining blood.

- Transgenic animals are also used fo**r testing drugs or to undertake studies** which is always not possible on human beings.
- Transgenic animals have also been produced to s**erve as models to understand particular diseases like cystic fibrosis**. This is caused by a defective gene which can be mimicked in a transgenic mouse. Such transgenic animals allow the testing of drugs or to undertake studies not always possible on humans.