

# Transgenic Organisms

- A transgenic organism is one into which a gene from some other species has been transferred.
- Transgenic organisms are examples of genetically modified organisms (GMO's).
- The transferred gene is called a transgene.
- A transgene, like any other gene, indirectly codes for a protein, which corresponds to a particular trait.
- Because of the universality of the genetic code, a transgene will allow the transgenic organism to produce the same protein (and therefore exhibit the same trait) as the original, "donor" organism.
- Transgenes are introduced into the recipient organism's germ line.

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# Transgenic Animals

- Most transgenic animals are fruit flies and mice, but others are produced, including rabbits, pigs, goats, cattle, and sheep.
- There are two predominate reasons for producing transgenic animals:
  - Economic benefit
  - Models for disease
- Transgenic animals are produced by one of three primary methods:
  - Microinjection of DNA
  - Retrovirus mediation
  - Embryonic stem-cell mediation

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# Microinjection of DNA

- DNA containing the transgene is injected into the pronucleus of a gamete.
- The transgenic gamete is used for *in vitro* fertilization.
- The resulting embryo is implanted into a female.
- Transgenic animals are then mated to increase the chance of offspring containing the transgene.
- Microinjection has a fairly low success rate.

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# Retrovirus-mediated Gene Transfer

- A retrovirus genome is RNA rather than DNA.
- The code in the viral RNA is “reverse transcribed” to produce DNA, which is then incorporated into the host cell.
- For use in transgenesis, viral RNA is modified and the viri are introduced into an animal.
- The invading viri cause the animal cells to produce and incorporate DNA corresponding to the viral RNA.
- Transgenic animals produced using retrovirus-mediated gene transfer are chimeras.

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# Embryonic Stem-cell-mediated Gene Transfer

- Embryonic stem cells are totipotent.
- The DNA of certain stem cells is modified.
- The DNA of the modified stem cells is passed on to the embryonic cells that develop from those stem cells.
- Transgenic animals produced using embryonic stem-cell-mediated gene transfer are chimeras.
- This method has the advantage of allowing detection of transgenesis at the embryonic level.