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Review Note on Trans-genesis in Aquaculture

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Description

Trans-genesis has evolved as a major tool for biologists and the vast majority of GM animals are produced for basic research. For practical reasons, farm animals have so far played only a minor role in medical research but the genome-sequencing projects have shown that cattle and pigs are, in many cases, better models of human physiology than rodents, which have accumulated massive genetic drift due to their short generation time.

The recently completed sequencing of bovine genome was an important advance for this reason. Although their size and generation time makes them expensive research subjects, it is expected that farm animals will be better models in which to study certain human diseases and therapies for these diseases. At the same time, research on the influence of various alleles at quantitative trait loci will play an important future role in animal breeding. These studies will provide researchers with genetic markers for diagnosis and genetic selection and will identify genes that can be transferred to improve animal production.

Transgene

A transgene is a gene that has been transferred naturally, or by any of a number of genetic engineering techniques, from one organism to another. The introduction of a transgene, in a process known as trans-genesis, has the potential to change the phenotype of an organism. Transgene describes a segment of DNA containing a gene sequence that has been isolated from one organism and is introduced into a different organism. This non-native segment of DNA may either retain the ability to produce RNA or protein in the transgenic organism or alter the normal function of the transgenic organism's genetic code. In general, the DNA is incorporated into the organism's germ line. For example, in higher vertebrates this can be accomplished by injecting the foreign DNA into the nucleus of a fertilized ovum. This technique is routinely used to introduce human disease genes or other genes of interest into strains of laboratory mice to study the function or pathology involved with that particular gene.

Trans-genesis clearly provides great opportunities to explore the molecular basis for aspects of wheat grain quality and to make changes in grain structure, composition, and properties that cannot be readily made by conventional approaches. However, whether these opportunities will be exploited depends as much on the attitudes of consumers as on the advantages that trans-genesis provides to grain producers and utilizers.

Because of this, it will be important to focus on traits of clear interest to consumers, for example in relation to diet and health and environmental sustainability, as well as those of economic importance. The construction of a transgene requires the assembly of a few main parts. The transgene must contain a promoter, which is a regulatory sequence that will determine where and when the transgene is active, an exon, a protein coding sequence (usually derived from the cDNA for the protein of interest), and a stop sequence. These are typically combined in a bacterial plasmid and the coding sequences are typically chosen from transgenes with previously known functions.

Transgenic Modification

Transgenic or genetically modified organisms, be they bacteria, viruses or fungi, serve many research purposes. Transgenic plants, insects, fish and mammals (including humans) have been bred. Transgenic plants such as corn and soybean have replaced wild strains in agriculture in some

Trans-genesis is an extremely powerful tool for the genetic analysis and manipulation of mice and other animals. As defined above, a transgene is an experimentally introduced DNA segment carried in the genome of a host animal. A transgene can be designed to encode a new gene product in the transgenic animal, or it can be introduced with the intent of altering or disrupting a host gene at its site of insertion. In many cases, a transgene will do both, for example, disrupt an endogenous gene while expressing a new gene product. Thus, the applications of trans-genesis take advantage of its ability to induce both loss-of-function and gain-of-function genetic alterations. Transgene escape has been documented for GMO crops since 2001 with persistence and invasiveness. Trans-genetic organisms pose ethical questions and may cause biosafety problems.

The idea of shaping an organism to fit a specific need isn't a new science. However, until the late 1900s farmers and scientist could breed new strains of a plant or organism only from closely related species, because the DNA had to be compatible for offspring to be able to reproduce another generation.

In the 1970 and 1980s, scientists passed this hurdle by inventing procedures for combining the DNA of two vastly different species with genetic engineering. The organisms produced by these procedures were termed transgenic. Transgenesis is the same as gene therapy in the sense that they both transform cells for a specific purpose. However, they are completely different in their purposes, as gene therapy aims to cure a defect in cells, and trans-genesis seeks to produce a genetically modified organism by incorporating the specific transgene into every cell and changing the genome. Transgenesis will therefore change the germ cells, not only the somatic cells, in order to ensure that the transgenes are passed down to the offspring when the organisms reproduce. Transgenes alter the genome by blocking the function of a host gene; they can either replace the host gene with one that codes for a different protein, or introduce an additional gene.

The first transgenic organism was created in 1974 when Annie Chang and Stanley Cohen expressed Staphylococcus aureus genes in Escherichia coli. In 1978, yeast cells were the first eukaryotic organisms to undergo gene transfer. Mouse cells were first transformed in 1979, followed by mouse embryos in 1980. Most of the very first transmutations were performed by microinjection of DNA directly into cells. Scientists were able to develop other methods to perform the transformations, such as incorporating transgenes into retroviruses and then infecting cells, using electro infusion which takes advantage of an electric current to pass foreign DNA through the cell wall, biolistic which is the procedure of shooting DNA bullets into cells, and also delivering DNA into the egg that has just been fertilized. The first transgenic animals were only intended for genetic research to study the specific function of a gene, and by 2003, thousands of genes had been studied.