Commentary

Biotechnological Implications of Microorganism Genomics on Eukaryotic Genes

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DESCRIPTION

Biotechnology represents a fundamental shift in how drug discovery, research and development, disease diagnosis, and disease management are approached in the medical/pharmaceutical sector. The foundation for recombinant DNA technology, replication, transcription, translation, and the creation of changed genes is defined. Vaccines, monoclonal antibodies, cytokines, enzymes or regulators of enzyme activity, hormones or hormone-like growth factors, and human gene transfer are examples of biopharmaceuticals. But as of late, it has become clear that variations in gene expression, rather than alterations in the nucleotide sequence of the cell's genome, are the main drivers of cell differentiation.

When a frog egg's nucleus is removed and the nucleus of a fully formed frog cell is inserted into the empty space, the donor nucleus can instruct the recipient egg to develop a healthy tadpole. It follows that the differentiated donor cell cannot have lost any significant DNA sequences as the tadpole contains a full variety of differentiated cells that derived their DNA sequences from the nucleus of the original donor cell. In studies with several plants, a comparable conclusion was drawn. These comprise many of the proteins that make up the cytoskeleton as well as RNA polymerases, DNA repair enzymes, ribosomal proteins, enzymes involved in the main metabolic activities, and structural proteins of chromosomes.

Some of these variations are glaring, like the hemoglobin difference mentioned above, but the majority is considerably minute. Since mRNA abundance patterns are so indicative of cell type, they can be utilized to classify human cancer cells with unknown tissue origins. A complete family of proteins can also be produced from a single gene by alternative splicing. Finally, after they have been created, proteins can undergo covalent modifications. Therefore, using two-dimensional gel electrophoresis, where protein levels are directly measured and some of the most prevalent post-translational modifications are presented, provides a better way to understand the drastic changes in gene expression between cell types.

During times of starvation or vigorous exercise, the body releases glucocorticoids, which tell the liver to increase the production of glucose from amino acids and other small molecules. Among the set of proteins whose production is induced are enzymes like tyrosine aminotransferase, which helps convert tyrosine to glucose. They are the encoded instructions that an organism utilizes to create the proteins that make up the living things' structures and carry out their tasks.

One example is breeding with the help of markers. Early identification of plants or animals for inclusion in a breeding program uses genetic markers for desired features like color or disease resistance. Algae and plants contain chloroplasts with a chloroplast genome, and nearly all eukaryotes have mitochondria with a mitochondrial genome. Determining eukaryotic genomes is far more difficult because nearly all eukaryotic animals have nuclear chromosomes as well as extra DNA molecules in the mitochondria.

The majority of eukaryotes are diploid, which means that while each chromosome has two copies in the nucleus, there is only one copy of each chromosome in the genome. Furthermore, it is believed that a major factor contributing to genomic instability in cancer is the disruption of DNA replication brought on by oncogenes, a phenomenon known as replication stress. It is believed that uncontrolled control of origin activation, in particular, is what causes oncogene-induced genomic instability during the early phases of tumor genesis. These ectopic replication origins are activated by an early G1-S transition brought on by oncogene activity, which results in transcription-replication conflicts and genomic instability. Replication stress may result from loss of tumor suppressors like P53 and Cyclin-Dependent Kinase Inhibitor 1A (CDKN1A)/P21 however this has not been proven.

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