History of cytology

Definition:

a branch of biology dealing with cell structure and function.

It complements histology, which studies cells as components of tissues. The purpose of cytology, a branch of biology dealing with cell structure and function. It complements histology, which studies cells as components of tissues. The aim of cytology is to understand the structure and activities of the various cellular elements, the mechanism of cell division, the development of sex cells, fertilization and embryo formation, cellular dysfunctions such as cancer, cellular immunity and various aspects of heredity.

Boveri, Theodor, (1862-1915), German zoologist, one of the founders of modern cytology. His research also focused on the mechanisms of evolution and the determination of sex. He was the first to put forward the hypothesis of a chromosomal origin of cancer.

Zernike, Frits (1888-1966). Dutch physicist Frits Zernike was awarded the Nobel Prize in Physics in 1953 for his invention of the phase-contrast microscope.

This microscope, which reveals details indiscernible with a conventional microscope, contributed to the development of microscopic anatomy, cytology and microbiology.

History of genetics

1. Definition:

Genetics is the study of the transmission of genes from parents to offspring, and their expression, the appearance of physical, biochemical and sometimes behavioral characteristics.

2. Gregor Mendel and the beginnings of genetics

Around 1865, the Czech monk Gregor Mendel (1822-1884) began artificially pollinating white pea flowers with pollen from red-flowered peas, and observing the color of the peas in subsequent generations. He thus laid the foundations of a new science, genetics.

3. The double helix structure of DNA

In 1953, the most revolutionary biological publication since Charles Darwin's Origin of Species appeared in the English journal Nature. This short publication presents the double-helix model for the structure of deoxyribonucleic acid, or DNA, and outlines in a few lines the genetic consequences of this structure. It was the work of two young researchers, the Englishman Francis Crick and the American James Watson, and earned them the Nobel Prize for Physiology or Medicine in 1962.

This discovery was of the utmost importance, not only because DNA is the molecule that transmits hereditary information from generation to generation, but also because its structure enables us to understand the mechanism of this transmission. DNA is a helical molecule with two strands, linked together by hydrogen bonds at the bases adenine (A), guanine (G), cytosine (C) and thymine (T). In this structure, adenine is always associated with thymine, and guanine with cytosine. When DNA replicates, the two strands separate and each reconstitutes a complete two-stranded helix in which the information is faithfully reproduced. In this way, the hereditary information that governs the properties of the cell and the organism is transmitted to daughter cells each time a cell divides.

Francis Harry Compton Crick (1916-2004), British biophysicist who won the Nobel Prize for his contribution to the discovery of the double-helix structure of deoxyribonucleic acid (DNA), the molecule that contains an organism's genetic information. Crick went on to study the genetic code and viruses. In 1976, he joined the Salk Institute for Biological Studies in California, to take part in research into brain function.

James Dewey Watson (b. 1928), Nobel Prize-winning American biologist, who helped determine the structure of deoxyribonucleic acid, or DNA. In 1968, Watson became director of the Laboratory of Quantitative Biology at Cold Spring Harbor, New York. He is the author of The Double Helix (1968), which tells the story of the discovery of the structure of DNA. From 1988 to 1992, at the National Institutes of Heath, Watson directed the ambitious Human Genome Project, whose aim was to map the entire human DNA sequence and identify every single gene.

History of embryology

Definition: a scientific discipline which studies the development of living beings from conception to birth.

The origins of embryology can be traced back to antiquity, when numerous philosophers were interested in the evolution of the embryo. Their technical resources were limited, limited to observing the eggs of various animals, especially hens.

Speculation and hypothesis took the place of technique. The most varied and erroneous doctrines were put forward in an attempt to explain the formation of beings.

Aristotle (322-384 B.C.) wrote the first known treatise on embryology. embryology, as well as the first classification of animals into oviparous oviparous, viviparous and ovoviviparous species.

In the 17th and 18th centuries, the theory in vogue to explain embryonic development was that of preformationism, according to which the theory, the developing animal was always present in the egg, but so small and transparent. small and transparent. When it begins to develop, the miniature

animal only grows, its tissues becoming denser and more visible. Hartsocker (1694), Malpighi (1673), Harvey (1651).

In Arab-Muslim civilization, it was widely believed that the embryo forms in stages, starting with the meeting of 2 gametes, one female and the other male, according to the Koran in the 6th century. Western scientists didn't take this into consideration, because for them, these were religious beliefs and not scientific theories. They didn't have an answer until the 17th century, when the theory of epigenesis appeared, stipulating that the embryo develops in increasingly complex ways in direct relation to its environment, and that cells divide to form organs. Among the scientists who supported this theory were Wolff (1769), Spallanzani (1775), Prévost (1824) and Von Baer (1827).

In 1672, De Graaf discovered follicles in the ovaries, still known as De Graaf follicles.

In 1674, Leeuwenhoek observed the human spermatozoon under a simple microscope.

In 1827, Karl Ernst Von Baer observed vertebrate embryos and formulated Baer's law of embryology, which stipulates that the general characteristics of embryos visible early in their development will gradually be replaced by increasingly specific characteristics. The embryos of a fish and a mammal, for example, will be similar in their early stages, then gradually differentiate as they develop their own specific characteristics.

In 1875, Hertwig discovered fertilization.

Descriptive embryology became experimental in 1880 with the work of Roux and Driesch.

In 1880, Roux burned one of the frog blastomeres at stage 2. The remaining frog blastomere developed into what appeared to be a half-embryo.

In 1891 Hans Driesch repeated Roux's experiment, but dissociated 2 blastomeres from sea urchins rather than frogs. Each of the isolated blastomeres developed into a complete larva. Driesch proposed the theory of regulatory development, noting that each sea urchin blastomere could regulate its own development.

In 1924, Hans Spemann and Hilde Mangold demonstrated the organizer, a region of the amphibian embryo capable of inducing the surrounding cells to form dorsal structures (S.N.).

History of molecular biology

Definition: a discipline that studies the structure, synthesis and degradation of macromolecules (very large molecules) in living cells, as well as their metabolic regulation (the control of their synthesis or degradation in their cells) and expression.

Macromolecules include nucleic acids, DNA (deoxyribonucleic acid) and RNA (ribonucleic acid), proteins (including enzymes), carbohydrates, carbohydrate-protein complexes and lipids. The term was first used by Oswald T.Avery in the late '40s and was associated from the outset with the study of nucleic acids.

In 1901, Tsvet discovered chromatography.

In 1901 Hopkins discovered the amino acid tryptophan, and in 1906 he discovered vitamins, the first being vitamin B.

Some of the equipment used in biochemistry and molecular biology:

Centrifuge, electrophoresis, magnometer, PH meter.....

History of cloning

Definition: a clone is a group of cells or individuals derived from a single unit. The members of a clone are in principle (barring mutations) genetically identical. In the laboratory, cloning is a technique for reproducing genes, cells or organisms from a single cell.

Generally speaking, cloning makes it possible to obtain genetically identical living beings without sexual reproduction, but by asexual reproduction.

Some research into cloning:

In 1880, Weismann gave the theory of genetic loss (loss of genetic material (genes) as cells differentiate and specialize).

In 1888, Roux confirmed this theory with his experiment on frog blastomeres.

In 1891, Hans Driesch found the opposite to be true with his experiment on sea urchin blastomeres, as he discovered that each urchin blastomere could regulate its development to give a complete larva.

In 1935, for the first time, Hans Spermann mentions the possibility of transplanting cell nuclei into oocytes (nuclear transfer). He considered experiments with frogs.

In 1939, artificial parthenogenesis was initiated in the rabbit, and the work of Pinkns and Shapiro led to the birth of 3 female rabbits by parthenogenesis.

In 1962, frogs were cloned by nucleus transfer from adult cells; British biologists J.B.Gurdon announced the cloning of a frog from a differentiated intestinal cell.

In 1984, a sheep was cloned by separating cells from an embryo (Steen Willadsen).

In 1996, the birth of Dolly, a sheep cloned from a mammary gland cell. Jan Wilmnt and his team at the Roslin Institute in Scotland witness the birth of Dolly the sheep, the first mammal obtained by transferring the nucleus of an adult cell. Dolly was euthanized in 2003 for lung problems.

After the birth of Dolly the sheep, attempts at human cloning began but were unsuccessful. Human cloning trials still exist, but under religious and social control.

History of gene therapy

Definition: a therapeutic method using genes and the information they carry to treat a genetic disease or modify cellular behavior.

Example of disease: cancer, which is becoming one of the main targets of gene therapy, type I diabetes.

Types of therapy: there are 2 types:

1). Germ-line gene therapy: this treatment involves modifying genes inside germ cells (sperm or eggs). (Currently banned for humans, but used for animals).

2).somatic gene therapy: replaces the defective gene in somatic cells and affects only the person treated.

Successful experiments:

The first gene therapy experiment was carried out on the little girl Ashanti, who was born with a genetic defect (she does not produce the enzyme Adenosinedeaminase), her deficiency causing the death of blood cells (T lymphocytes) which play a very important role in immunity.

In 1990, they injected Achanti, and the result was positive.