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Class X – Biology **Ms Nidhi Rana** **Date : 11.11.2024**

Ch 14 Human Evolution

Evolution can be defined as the formation of more complex organisms from pre-existing simpler organisms over a certain period. It is a slow, but progressive, natural, sequential development or transformation of animals and plants from ancestors of different forms and functions.

Variation and heredity are the two basic factors of evolution. The selection of variants by environmental factors forms the basis of evolutionary processes.

Theories of Evolution

Two modern theories have been put forward to explain the mode of evolution.

Theory of Lamarckism

According to the theory of inheritance of acquired characters, 'the changes in structure or function of any organ acquired during the life-time of an individual in response to changes in the surrounding environment are inherited by offspring and keep on adding over a period of time.

The Theory of Lamarckism was revived with new facts which led to the theory of Neo-Lamarckism which stated that the acquired characters which become incorporated in the germplasm are heritable and accumulate generation after generation resulting in the origin of new species.

Vestigial Organs Organs which are found in reduced or rudimentary condition and do not perform any function in the possessor are called vestigial organs or non-functional organs. They help in understanding the history of evolution and continuity of life.

Man does not have a tail like monkeys but he possesses a rudimentary tail bone.

Wisdom teeth appear last at an age of 17-20 years and are hardly used for chewing food.

Verniform appendix is a function-less organ in humans but is helpful for ruminants for digesting cellulose

Pinna is another vestigial organ that provides passage from auditory canal leading to ear drum. But it is poorly developed in human beings.

Darwin's theory of Natural Selection

All organisms have the capacity to reproduce at a very high rate.

Overproduction of organisms results in the struggle for existence among organisms. The struggle is to obtain food, space and mate.

Only those organisms which are fit for the changing environment have the right to survive.

Organisms which are unfit are eliminated and ultimately die.

In the struggle for existence, the organisms which develop new favourable characteristics will survive in the long run. This idea is called survival of the fittest. Organisms who survive will transmit the favourable characters to their offspring. These characters get accumulated and give rise to a new species.

Human Evolution Evolution of modern-day man has been the greatest progress made in the history of evolution. Human evolution has been studied using various tools of tracing evolutionary relationships such as excavating, carbon-dating, studying fossils and determining DNA sequences.

A vast diversity has always been observed with respect to the human body and its features. Research reveals that the early members of Homo sapiens came from Africa. About hundred years ago, some of our ancestors left Africa, while the others stayed back. So irrespective of where we live, all human species are natives of Africa. The earliest fossils of human beings include the genus Australopithecus, followed by Homo habilis, H. erectus, H. heidelbergensis and finally modern-day man H. sapiens. About 25–30 million years ago, ape-humans or hominoid stock started descending from the trees and gradually became ground dwellers who evolved into apes and men. Subsequent separation of ape and human ancestors is regarded to begin about 5 million years ago which led to the evolution of Pongidae (apes) and Hominidae (men).

Ramapithecus It was the earliest man-like fossil obtained from Africa and Asia about 10–15 million years ago. They could walk erect on the feet, had small canines and had a short face and small brain.

Australopithecus afarensis They appeared in South Africa and had human and ape features. He was about 1.05 metres high and was mainly a terrestrial creature with bipedal locomotion. His cranial capacity was 500 cubic centimetres Australopithecus africanus They appeared 2.5 million years ago in Africa. He had a low forehead, protruding face, lack of chin and low brain capacity (350–450 cubic centimetres).

Homo habilis He lived in Africa 2 million years ago and was about 1.5 to 1.8 metres tall. His cranial cavity or brain volume was between 650–800 cubic centimetres, larger than that of Australopithecus.

Homo erectus They evolved from Homo habilis or Australopithecus about 1.7 million years ago and their fossils have been obtained from Java, Peking and Heidelberg and Europe. He was about 5.5 feet tall with a bowl-shaped pelvis. His foot was arched to support the body weight, and the grasping ability of the foot was completely lost. The size of the cranial cavity ranged from 750 to 1100 cc.
Neanderthal man These early men arose 1,00,000 years ago and flourished in Europe and Asia but became extinct about 25,000 years ago. They had a flat cranium, sloping forehead, protruding jaws, strong mandibles and no chin. They were intelligent, good hunters and used animal skin for clothing and buried the dead.

Cro-Magnon man was 1.8 metres tall with a sturdy body and less hair. The cranial capacity was about 1650 cc.

Homo sapiens sapiens (Modern Man) The living modern men have evolved from the Cro-Magnon man about 25,000 years ago. They had undergone minor morphological changes such as thinning of skull bones and slight reduction in cranial capacity (1300–1600 cc).