



# Multiple Sclerosis

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## Why in News?

[Deoxyribonucleic Acid \(DNA\)](#) obtained from the bones and teeth of ancient Europeans who lived up to **34,000 years** ago provides insight into the origin of the often-disabling neurological disease [Multiple Sclerosis](#).

- The findings stemmed from research involving ancient DNA sequenced from **1,664 people** from various sites across **Western Europe** and **Asia**.

## What are the Key Observations?

- These ancient genomes were then compared with modern DNA from the UK Biobank, comprising about 410,000 self-identified "white-British" people, and more than 24,000 others born outside the United Kingdom.
- One striking discovery related to **Multiple Sclerosis**, a chronic disease of the brain and spinal cord that is considered an autoimmune disorder.
- The researchers identified a pivotal migration event about 5,000 years ago at the start of the Bronze Age when livestock herders called the Yamnaya people moved into Western Europe from an area that includes modern Ukraine and southern Russia.
- They carried genetic traits that at the time were beneficial, and protective against infections that could arise from their sheep and cattle.
- As sanitary conditions improved over the millennia, these same variants increased Multiple Sclerosis risk.

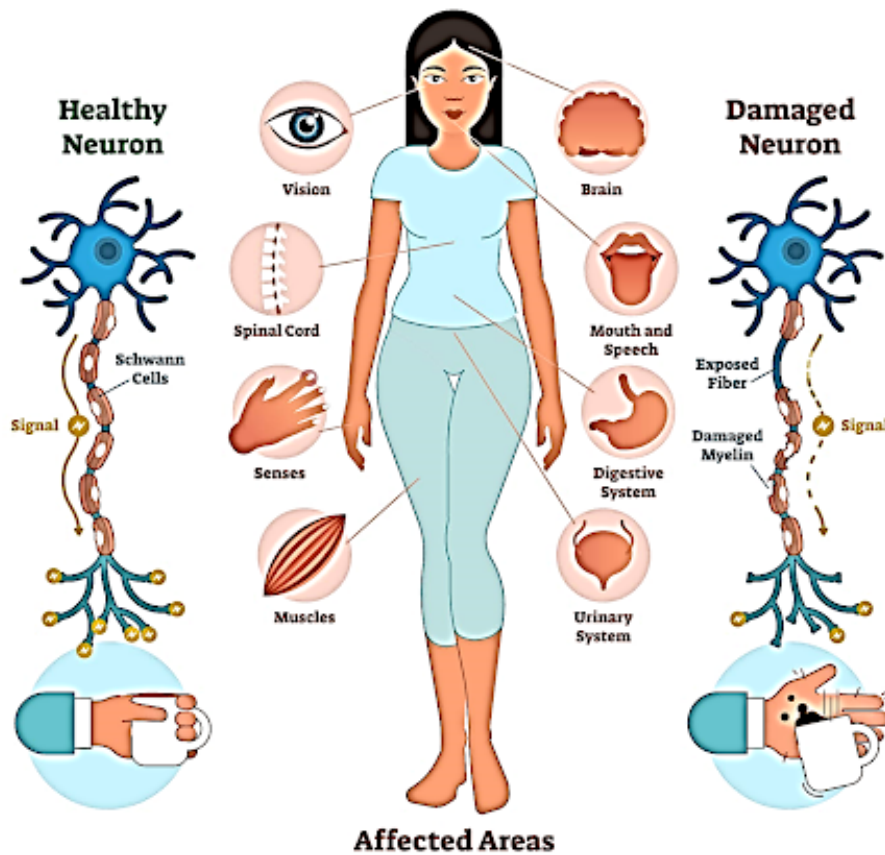
## What is Multiple Sclerosis?

- **About:**
  - **Multiple Sclerosis (MS)** is a chronic autoimmune disease, a condition in which the body attacks itself by mistake. It affects the [central nervous system \(CNS\)](#).
    - In **MS**, the immune system attacks and damages the **myelin sheath**, a protective covering that surrounds the **nerve fibres** in the brain and [spinal cord](#), causing a range of symptoms.
- **Symptoms:**
  - Muscle weakness and Numbness
  - A person may have difficulty emptying their bladder or need to urinate frequently or suddenly
  - Bowel problems, Fatigue, Dizziness, and damaged nerve fibers in the spinal cord.
  - Since symptoms are common, people don't often recognise the disease early and often it takes many years for someone to be diagnosed, as it is impossible to determine a specific cause or trigger.
- **Causes:**
  - The exact cause of the disease is unknown, but it could be a combination of:
    - Genetic factors may pass down in the genes
    - Smoking and Stress

- Vitamin D and B12 deficiency

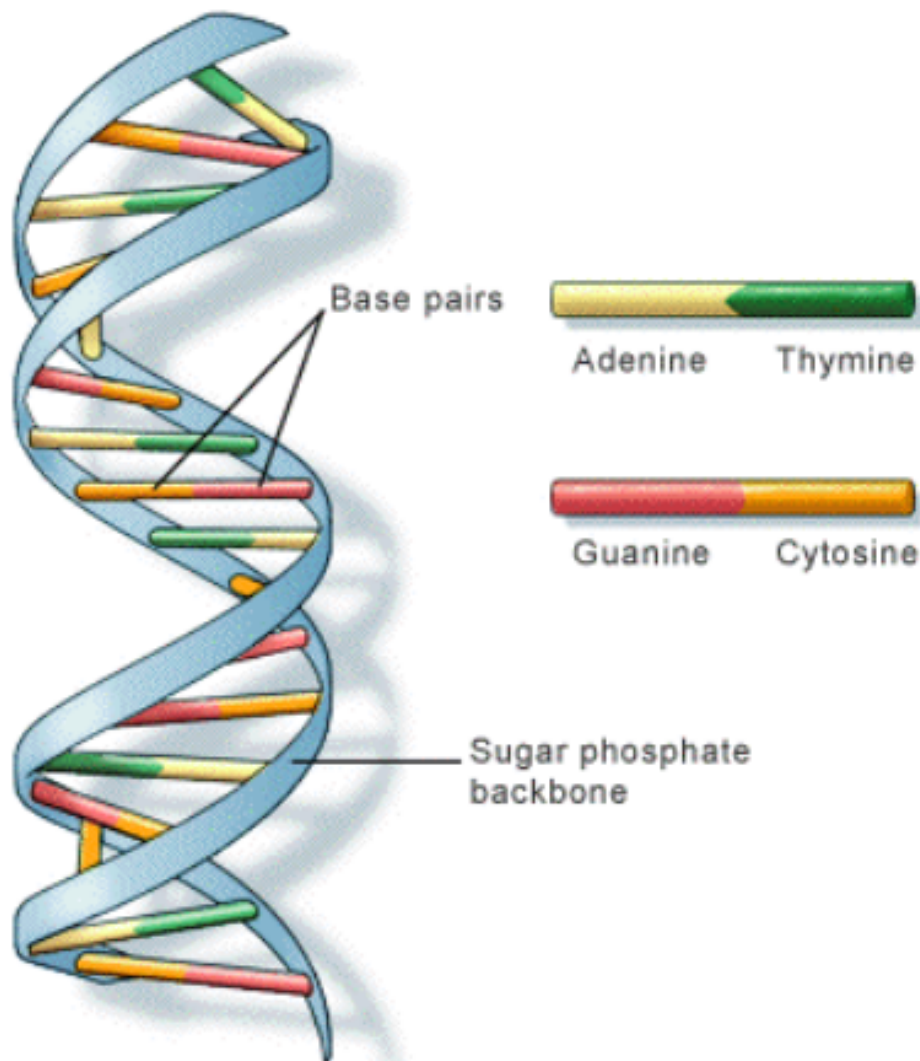
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## MULTIPLE SCLEROSIS



## What is Deoxyribonucleic Acid (DNA)?

- **Deoxyribonucleic acid (DNA)** is an organic molecule with a complex molecular structure.
  - DNA molecule's strands are made up of a **long chain of monomer nucleotides**. It is arranged in a double helix structure.
- **James Watson** and **Francis Crick** discovered that DNA is a **double-helix polymer** in **1953**.
- It is essential for the transfer of the genetic characteristic of the living being from one generation to the other generation.
- The majority of DNA is found in the **cell nucleus** so it is called nuclear DNA.



### UPSC Civil Services Examination Previous Year Question

**Q. Consider the following statements:**

1. Genetic changes can be introduced in the cells that produce eggs or sperms of a prospective parent.
2. A person's genome can be edited before birth at the early embryonic stage.
3. Human induced pluripotent stem cells can be injected into the embryo of a pig.

**Which of the statements given above is/are correct?**

- (a) 1 only  
(b) 2 and 3 only  
(c) 2 only  
(d) 1, 2 and 3

**Ans: (d)**

**Exp:**

- Germline gene therapy is the replacement of genes in egg or sperm cells with which an offspring inherits a new trait. It allows for the correction of disease-causing gene variants that are certain to be passed down from generation to generation. Hence, statement 1 is correct.

- CRISPR (Clustered Regularly Interspaced Short Palindromic Repeats) technology is employed to modify human embryos before they are transferred into women's uterus. Recently, researchers had successfully created the world's first genetically edited baby. By using CRISPR technology, the genomes of embryos were edited to disable a gene, CCR5, which allows HIV to infect cells. Hence, statement 2 is correct.
- Due to certain anatomical and physiological features shared with humans, the pig is considered an important animal model of human diseases with unique advantages in surgery and xenotransplantation studies. Hence, statement 3 is correct.

**Therefore, option (d) is the correct answer.**

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