

# E-Content

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### “Conjugation in *Paramecium caudatum* and its Significance”

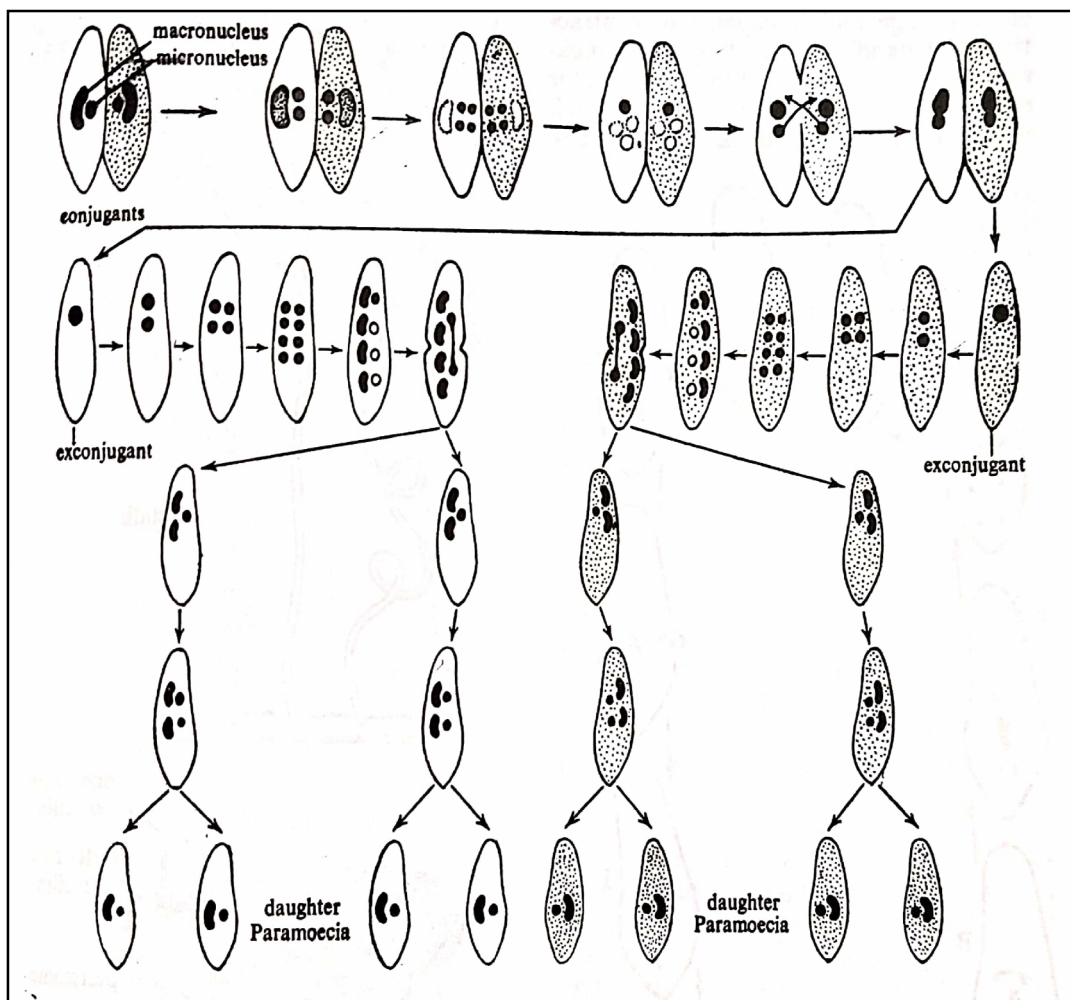
Conjugation is defined as the temporary union of two individuals which mutually exchange micronuclear material. It is the unique type of sexual process in which two organisms separate soon after exchange of nuclear material.

#### **Conjugation Process in *Paramecium caudatum***

In conjugation, two *Paramecium* from two different mating types come in contact ventrally and unite by their oral grooves. They stop feeding and their structure disappears, pellicle and ectoplasm degenerate at the point of contact and a protoplasmic bridge is formed between two individuals. Now these individuals are called conjugants. In this condition, the conjugating pair swims actively and simultaneously a series of nuclear changes takes place in each conjugant.

- These nuclear changes are of the following-
- 1. The macronucleus undergoes gradual disintegration and ultimately disappears.
- 2. The micronucleus undergoes two successive divisions forming four micronuclei in each of the conjugants.
- 3. Three of these four micronuclei in each conjugant degenerate and the remaining one undergo an unequal division to form two gamete nuclei. One of the gamete nuclei is large and is called the stationary nucleus while the small one is called the migratory nucleus.
- 4. The migratory nucleus of one conjugant goes to the stationary nucleus of the other and vice versa through the protoplasmic bridge.
- 5. The migratory nucleus of one conjugant ultimately unites with the stationary nucleus of the other and forms the zygote nucleus.
- 6. The conjugants with the zygote nucleus now separate and are called ex-conjugants.
- 7. In each ex-conjugant, the zygote nucleus undergoes three successive divisions forming eight nuclei.

8. Of these eight nuclei, four become macronuclei and four become micronuclei. Later on three of the four micronuclei degenerate leaving behind one active micronucleus.
9. The micronucleus divides and cytoplasmic division follows resulting into two *Paramecia* from each ex-conjugant and each of the two *Paramecia* is provided with two macronuclei and one micronucleus.
10. The micronucleus divides again followed by the cytoplasmic division resulting four *Paramecia* each with one micronucleus and one macronucleus.
11. Thus from each ex-conjugant four *Paramecia* are formed (Fig. 1).



**Figure 1: Conjugation Process in *Paramecium caudatum***

## Significance of conjugation in Paramecium

The significance of conjugation in Paramecium are discussed below-

### 1. Rejuvenation:

If binary fission continues repeatedly for several generations, the Paramecium loses its vigour and enters upon a period of depressed physiological efficiency and senescence. The individual ceases to multiply, reduces in size, degenerates in organization and eventually dies off. To avoid this senile decay of race, conjugation is resorted to and the process seems to rejuvenate and revive the lost vigour for asexual reproduction.

### 2. Nuclear reorganization:

During conjugation, the nuclear apparatus is reorganized and a readjustment occurs between it and the cytoplasm. Probably the macronucleus loses its potentialities in performing its manifold metabolic activities. Its replacement by a new macronucleus brings renewed vigour and vitality to accelerate the metabolic activities.

### 3, Hereditary variation:

During asexual reproduction by fission, the hereditary material of the parent passes unchanged on to the progeny, so that all the descendants of one Paramecium have the same inheritance. The periodic occurrence of conjugation, however, ensures inherited variation. It brings about the blending of two lines of ancestry just as bisexual reproduction does.

### 4. Genetic consequences:

If conjugation takes place between two paramecia, one homozygous for a dominant gene (AA) and the other homozygous for its recessive gene (aa), the first generation would be heterozygous (Aa). If the two conjugants are already heterozygous (Aa), then the resulting progeny would be either homozygous or heterozygous, depending upon which gene gets eliminated at the stage of disintegration of three micronuclei in each conjugation.

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