

Kappa particle in *Paramecium*

Q.What are the major inducing factors of Conjugation?

The factors inducing conjugation vary from species to species but some of them are given below:

1. Conjugation occurs usually under un-favourable living conditions; starvation or shortage of food and particular bacterial diet or certain chemicals are said to induce the process of conjugation in certain species of *Paramecium*.
2. Conjugation occurs after about 300 asexual generations of binary fission, or it alternates with binary fission at long intervals to rejuvenate the dying clone, i.e., it occurs in the individuals which must have passed through desirable number of asexual generations, said to be the period of immaturity, and then they become sexually mature to conjugate.
3. Conjugation occurs when there is a change in the physiological condition of paramecia, then it occurs between such individuals which are somewhat smaller in size (210 microns long) and they are at a stage which may be regarded as a period of unhealthy old age; the paramecia of this condition will die if not allowed to conjugate.
4. Sudden darkness in light conditions and low temperatures are said to induce the process of conjugation in some species.
5. Conjugation does not take place during night or darkness; it starts in early morning and continues till afternoon.
6. A proteinaceous substance in the cilia of mating type individuals is said to induce conjugation.

Q.What is the significance of conjugation in *Paramecium*?

The significance of conjugation has been summarised below:

1. Conjugation serves as a process of rejuvenation and re-organisation by which the vitality of the race is restored. If conjugation does not occur for long periods, the paramecia weaken and die. (Woodruff's claim of keeping paramecia healthy for 22,000 generations without conjugation is disproved by Sonneborn, because he showed that all of Woodruff's paramecia belonged to the same mating type).
2. There is no distinction of sex in conjugants though only paramecia of two different mating types of the same variety will conjugate.
3. There is no distinction of sex, yet the active migratory pro-nucleus is regarded as male and the stationary pro-nucleus as the female.
4. Conjugation is only a temporary union, there is no fusion of cytoplasm and no zygote is produced, but the nucleus of each ex-conjugant contains hereditary material from two conjugating individuals.
5. Conjugation brings about replacement of the macronucleus with material from the synkaryon, this is an event of fundamental importance. In binary fission the chromosomes of the macronucleus were distributed at random to the daughter cells, continued binary fission had made the clone weak with some structural abnormalities. Conjugation brings about the formation of the correct number of chromosomes in the macronucleus, so that the race is renewed in vigour. The role of the micronucleus is to restore a balanced chromosome and gene complex.

Q.Give example on influence of the maternal genome in *Paramecium* with proper illustrations.

One of the most striking and spectacular cases of cytoplasmic inheritance occur in *Paramecium aurelia* in 1938. Tracy Morton Sonneborn reported that some strains contain **kappa particles** in the cytoplasm and are known as killer Kappa particles are about 2 μ in diameter and contain DNA and protein.



Tracy Morton Sonneborn