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Dictyostelium - Wikipedia

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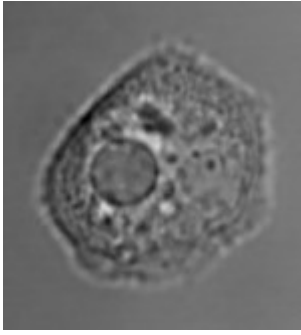
Dictyostelium aggregations on a culture plate



Dictyostelium colony in process of aggregation



Pseudoplasmodium or "slug" of a *Dictyostelium*



Single amoeboid cell of *Dictyostelium*, showing the contractile vacuole

Dictyostelium is a [genus](#) of single- and multi-celled [eukaryotic](#), [phagotrophic bacterivores](#). Though they are [Protista](#) and in no way [fungal](#), they traditionally are known as "[slime molds](#)". They are present in most terrestrial ecosystems as a normal and often abundant component of the soil [microflora](#), and play an important role in the maintenance of balanced bacterial populations in soils.^[1]

The genus *Dictyostelium* is in the [order](#) Dictyosteliida, the so-called cellular slime molds or **social amoebae**. In turn the order is in the [infraphylum Mycetozoa](#). Members of the order are Protista of great theoretical interest in biology because they have aspects of both unicellularity and multicellularity. The individual cells in their independent phase are common on organic [detritus](#) or in damp soils and caves. In this phase they are amoebae. Typically, the amoebal cells grow separately and wander independently, feeding mainly on bacteria. However, they interact to form multi-cellular structures following starvation. Groups of up to about 100,000 cells signal each other by releasing chemoattractants such as [cyclic AMP](#) (cAMP) or [glorin](#). They then coalesce by [chemotaxis](#) to form an aggregate

that becomes surrounded by an extracellular matrix. The aggregate forms a fruiting body, with cells differentiating individually into different components of the final structure.^[2] In some species, the whole aggregate may move collectively - forming a structure known as a grex or "slug" - before finally forming a fruiting body. Basic processes of development such as differential cell sorting, pattern formation, stimulus-induced gene expression, and cell-type regulation are common to *Dictyostelium* and [metazoans](#). For further detail see family [Dictyostelid](#).

Discovery^[edit]

The cellular slime molds were formerly considered to be fungi following their discovery in 1869 by Brefeld. Although they resemble fungi in some respects, they have been included in the kingdom Protista.^[3] Individual cells resemble small amoebae in their movement and feeding, and so are referred to as myxamoebae. *D. discoideum* is the most studied of the genus.

Importance^[edit]

Most of its life, this haploid social amoeba undergoes a vegetative cycle, preying upon bacteria in the soil, and periodically dividing mitotically. When food is scarce, either the sexual cycle or the social cycle begins. Under the social cycle, amoebae aggregate in response to [cAMP](#) by the thousands, and form a motile slug, which moves towards light. Ultimately the slug forms a fruiting body in which about

20% of the cells die to lift the remaining cells up to a better place for sporulation and dispersal.

When starved for their bacterial food supply and exposed to dark, moist conditions, heterothallic or homothallic strains can undergo sexual development that results in the formation of a diploid zygote.^[4] Heterothallic mating has been best studied in *Dictyostelium discoideum* and homothallic mating has been best studied in *Dictyostelium mucoroides* (strain DM7). In the heterothallic sexual cycle, *amoebae* aggregate in response to cAMP and sex pheromones, and two cells of opposite mating types fuse, and then begin consuming the other attracted cells. Before they are consumed, some of the prey cells form a cellulose wall around the entire group. When cannibalism is complete, the giant diploid cell is a hardy macrocyst which eventually undergoes recombination and meiosis, and hatches hundreds of recombinants.^{[5][6]} In *D. mucoroides* (DM7) homothallic mating, cells are directed towards sexual development by ethylene.^[4]

Professor [John Tyler Bonner](#) has spent a lifetime researching the slime molds and created a number of fascinating videos in the 1940s to show the life cycle; he has mostly studied *D. discoideum*. In the videos, intelligence appears to be observed as the single cells, after separation, regroup into a cellular mass. The time-lapse film captivated audiences; indeed, Bonner when giving conferences has stated that the film “always stole the show”.^[7] The video is available on YouTube.^[8]

Species[[edit](#)]

Taxonomy of *Dictyostelium* is complicated. It has also been confused by the different forms in the life cycle stages and by the similar *Polysphondylium* spp. Below are some reported examples.

- [*Dictyostelium caveatum*](#) (Wadell 1982)
- [*Dictyostelium discoideum*](#) [Raper](#) 1935^[9]
- [*Dictyostelium irregularis*](#) (Olive, Nelson and Stoianovitch 1967)^[10]
- [*Dictyostelium lacteum*](#)
- [*Dictyostelium minutum*](#)
- [*Dictyostelium mucoroides*](#)
- [*Dictyostelium polycephalum*](#)
- [*Dictyostelium purpureum*](#)
- [*Dictyostelium rosarium*](#)

References[[edit](#)]