Is scenedesmus unicellular or multicellular

Are humans unicellular or multicellular. Can be unicellular or multicellular. Is nostoc unicellular or multicellular.

This seaweed, Ulva flax, would only exist as undifferentiated cells if not by bacterial signals.The second in our series of blog posts on Celebrating Basic Plant Science is written by Juliet Coates, Professor of Molecular Genetics at the University of Birmingham. Living organisms can be categorized in a number of ways, but a very obvious distinction âoâ is between organisms that are made up of a single cell â single-celled organisms â and those that are many-optimal, or multicellular. The multicellular state has arisen many times during evolution: animals, plants, algae, amoebae, fungi and bacteria can all be multicellular. Multicellular organisms fully support life on Earth as we know it today â and all must have evolved from mono-optimal ancestors. We understand a bit of why they could have done so, as being multicellular gives a number of competitive advantages: larger size and better nutrient collection being only two. However, how multicellular organisms came to be is a key biological problem that is still largely uninformed. I'm a plant scientist, so I'm particularly interested in the origins of multicellular green things: plants and algae. Without becoming multicellular, plants would never have colonized the earth, and the evolution of multicellular plants and algae was the key to shaping our climate, our ecosystems and our oxygen-rich atmosphere. How green multicellularity was born seems to me to be a really fundamental thing to understand, but it's a little-dressed question. Here I will give an overview of the important findings to date on the evolution of multicellularity. Message for the House 1: If you are unicell, you might find it quite easy to evolve multicellularity. Recent research shows that the yeast we use in bread and beer, which is traditionally considered unicellular, can spontaneously In a laboratory culture, and in a relatively few generations, they begin to form multicellular colonies. Colonies can be selected simply using gravity, as they sink faster than unicell. In the green world, there are many species of small algae (microalgae) that usually exist as individual cells, but can become multicellular if they detect toxins, predators or competitors, or if they are hungry. Excitingly, this gives us a wonderful system to explore multicellular mechanisms very easily in the lab, as we can turn multicellularity on and off; with the right signals these species make colonies pretty much as you look. Message for the House 2: Interactions with other organisms can drive multicellularity. As mentioned above, becoming multicellular can be a response to competition or predation by other organisms. In addition, some multicellular cells may require interactions with more "benign" organisms. Nicole King's laboratory at the University of California (Berkeley, USA) studies a strange and wonderful collection of organisms called choanoflagellates, which share a common ancestor with all animals. Choanoflagellates Choanoflagellatesboth unicellular and multicellular species and, rather like microalgae, some species can exist in both unicellular and multicellular states during their life cycle (for example see here and here). Researchers have shown that a signal from a bacterium associated with cholanoflagellate induces the switch to multicellularity. Similarly, in the green realm, we find that multicellular algae (macroalgae), otherwise known as seaweed, simply cannot grow properly in their multicellular-looking blade structures. family unless they receive signals from the bacteria with which the algae are naturally associated. Take the message home 3: Genome sequencing does not easily distinguish unicells from multicellular organisms. Recent advances in DNA sequencing technology have allowed scientists to categorize the entire gene list into a multitude of single- and multi-cellular species. The initial hypothesis was that this would show us which genes need to become multicellular â you might expect some genes to be present in multicellular species, and absent in unicellular ones. In fact, the results suggest that genes needed for multicellularity are also present in unicellules, including genes for cell adhesion (adherent together) and cell signaling (cells that speak to each other within a multicellular structure). This suggests that multicellularity can be evolved from the mechanisms that single-celled organisms use to regulate their interaction with unrelated organisms or their surroundings, which in fact supports our home messages of socket 1 and 2. Where can we go from here? If the genes needed to be many-celled are present in unicellules, then the fundamental difference between unicell and multicellular organisms has to lie elsewhere. I believe that with the technologies now available to us, understanding the problem of multicellularity is an exciting and achievable goal for the future. What impacts could this very basic, blue-sky research have (as well as being fascinating, of course)? Well, if we understand multicellularity, we can manipulate it. From my 'green' point of view, I think first of all that this can have profound effects on ecosystems. For example, the embossing microalgae discussed above are diffused in ponds and lakes. Their unicells live close to the surface of the water, while the colonies sink. So changing the balance of these two states could have enormous knock-on effects on the food chain. Moreover, if we understand multicellularity, we will also begin to understand much more about how organisms of different species interact with each other, and perhaps we will learn more about the widespread phenomenon of self-recognition. Another example of note that has enjoyed recent publicity is green algae: these can be significant ecological parasites such as 'green tides', but the silver lining of this is that they are also a great source of food and nutrition. We understandnothing on the multicellularity of marine algae at the moment: new knowledge will help us prevent environmental numbness, maximizing their useful potential. This leads me to a second point: biomass. We are entirely dependent on multicellular green organisms (traditionally mainly terrestrial plants) for food/feedstock and both for fossil fuels and biofuels. Micro- and macroalgae represent an exciting and relatively little exploited source of new food and fuels, and provide a source of biomass that can be cultivated on water, rather than on earth, where resources are already elongated. An example of this is in practice on a small scale is in Scotland, but the lack of understanding of multicellular algal development is an important bottleneck in the development of scale and mass culture methods. So, even if I am not offering you an immediate high efficiency or stress-resistant food product, or a completely finished alternative to oil or climate change solution, I have actually hoped that in the search for a fundamental and unresponsive question about biology and evolution there will almost certainly be paving the way for massive (and perhaps even without thinking about!) long-term social benefit. References related to this post: William C. Ratcliff, R. Ford Denison, Mark Borrello and Michael Travisano. 2012. 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Current biology 20: R875-R876, doi:10.1016/j.cub.2010.09.014 Image credits: Scenedesmus sp. in unicellular and multicellular states of the Culture Collection of Algae and Protozoa, managed by the Scottish Association of Marine Science: images Salpingoeca rosetta monocellular and multicellular courtesy of Nicole King and Mark Dayel (more can be found in the Choanoflagellate Gallery) Genre of green algae Scenedesmus bijunga Viridiplantae Phylum: Clorophyta Class: Clorophyceae Order: Sphaeropleales Family: Scenedesmaceae Genre: ScenedesmusMeyen, 1829 Species Scenedesmus obtusMeyen, 1829 Species Scenedesmus dimorphus Scenedesmus acuminatus 72 Other (see text) Scenedesmus is a genus of green algae,class Chlorophyceae. They're colonial and non-motilian. Taxonomy Currently, there are 74 taxonomically acceptedof Scenesmus. [1] Furthermore, different sub-purposes have been identified, but vary depending on the source. Hegewald denotes acutodesmus, desmodesmus, and scenesmus as the three main categories. Acutodeshm is characterized by acute cell poly phones, while Desmodesmo and Scenesmo have optusi / truncated poly phones (differentiated respectively by the presence or absence of plugs). The fossil findings dating scenesmo from 70 to 100 million years ago, with Desmodesmo suspected of being the youngest of these three groups. [2] Basic Biology Scenesmus is one of the most popular freshwater algae genres; However, extremely different morphologies present within species make identification difficult. [3] While most species find themselves all over the world, some species exist only in local populations such as S. Intermedius and S. Serratus, who are in New Zealand. [3] Coinobia and cell growth Scenesmo can exist as a unicell; They are also often in a cenobia of four or eight cells [3] at the inside of a mother wall. Different Cenobic Architectures have been described, including Linear, Coastal, irregular, alternating or lifting patterns (Figure 1). [3] Cenobia training depends on a number of factors. A higher percentage of unicellular organisms has been found at high luminous intensity and temperatures, suggesting that at higher growth rates the organisms prefer to be non-colonized. [3] The success of the growth and division of algae depends on the balance between the maintenance of buoyabilità in the euphotic area (containing optimal conditions of light and nutrition) and the absence of predators to grazing. [3] Bigger colonies have a lower surface-volume relationship, which limits nutrient absorption and lightweight collection, and the great mass favors sinking. However, in the presence of herbivores, such as Daphnia, who threaten to consume unicellular algae, the larger colonies offer significant safety. [3] This threat can be so significant that the cells come together in these colonies of 8 cells even in highly limited growth conditions to reduce the vulnerability to grazing or in terms of nutrients. [3] [4] Defense mechanisms In addition to colonization, cells have other self-defense mechanisms. Scenesmus can be divided into two underweers, non-spiny scenesmus and thorny desmodesmus. Although free of spine, the cells of the scenesmus subgenere have thick cell walls and mucilage, which can make them resistant to digestion. Some chemical compounds in Scenesmus could also be toxic for some organisms once consumed. Bristles up to 100ã, UM can form a network both in the thorny varieties and unpannous to further discourage the predation. [3] Cells form these bristles in defensive when kairomones are detected, an infochemical released by Daphnia that Scenedesmo evolved to recognize as a warning sign.[3][4] Reproduction and Colony Formation During replication, the stem cell enlarges and becomes multinucleate after multiple divisions. The cytoplasm is then split into uninculated daughter cells, usually developing as non-mobile autospora. These daughter cells typically connect with other daughter cells to form a colony within the wall of parental cells to be subsequently released. [5] The cells progress through a typical mythical cycle similar to other members of chlorophyceae, with the cytoplasm of the daughter cells that become very dense. [5] In the end, the wall of the mother cell breaks and releases the spores that adopt a normal cell appearance. [5] The cells of both ends of the coenobium are different in morphology from those of the center [5]. As cells adhere to each other during development are not yet clear, but it is known that a trilaminal sheath (TLS), composed of Algaenan, is one of the first external structures to form, developing in patches before growing to connect in a continuous layer. [5] The ornate layer is the last component to develop. [5] Cellular Ornaments and External Layers The external ornamentation is highly variable within the genus Scenedesmus. Staehelin et al. characterized two species in detail: S. Pannonico and S. Longus. S. Pannonico assembles a "warty" layer adhering to the loose "reticoated" layer found on S. Longus. [6] A shared feature between the two is a TLS found at the intersection of the nearby cells that helps to cement them together. [6] An additional pectic layer observed on S. Pannonico forms a thick mesh of thin filaments originating in the wart layer [6]. Another characteristic of the external coenobial surface of S. Pannico is a combination of single peaks (apparently connected to warts) and small spighetti that merge to form zigzag combs along the cell. [6] An overview of these structures can be seen in Figure 2. The last main category of ornaments is rosettes that are common to many species of ScenedesMus. [6] The rosettes are ring-shaped structures that enclose small mounds on the cell surface and are usually sitting on a thicker layer of cell wall than the surrounding areas [6]. No potential function has been suggested for these structures. While S. Longus was not observed with the comb structures of S. Pannonico, he had two variants of spikelets forming between the TLS and the reticulated level to keep the two apart. [6] The SCenedesMus Obliquus mitochondrial DNA is remarkable for the non-standard coding of its mitochondrial DNA that can represent an intermediate form in the evolution of green algal mitochondrial DNA. [7] This code is represented by the NCBI 22 translation table, ScenedesMus Obliqus' Code of Conduct. [8] The production of biofuels although ScenedesMus is able to produce many types of biofuels such as bio-hydrogen, biodiesel, bioethanol andof drop-in, the widest research was done on the use of ScenedesMus for bio-diesel production. Like all algae systems, the implementation of ScenedesMus integrated biofuel production of lab results has challenges in large-scale production. Majorinclude nutrient feeding and recycling, gas transfer and exchange, PAR (Photosynthetically Active Radiation) delivery, cultural integrity, environmental control, land and water availability, harvesting and genetic and metabolic engineering[9] See also: Biological Hydrogen Production In 1942, Gaffron and Rubin can be credited with conducting an experiment that triggered research into H_2 production in green algae using Scenedesmus obliquus. [10] Algae produce H_2 gas under anaerobic conditions by providing hydrogenases with hydrogen ions derived from the cleavage of water molecules by photosynthesis.[11] However, enzyme activity is transient due to inhibition of O_2 production by photosynthesis, a problem that continues to plague H_2 production. [12] S. obliquus is traditionally known to use a nickel iron hydrogenase, but the use of other iron hydrogenases in H_2 production is also reported. [13] The activity of the enzyme hydrogenase in Scenedesmus species is considered to be lower than that of Chlamydomonas reinhardtii.[14] Photosystem II-independent H_2 production in Scenedesmus was also performed using redox equivalents of fermentative metabolism under dark anaerobic incubation. [10][15] Research results suggest that a sulfur-depleted environment triggers an imbalance in the relationship between photosynthesis and respiration, resulting in net consumption of O_2, causing anaerobic diseases and switching to hydrogen production. [12] Ultrasonic pretreatment has been effective in increasing the production of fermentative bioenergy by Scenedesmus oliquus YSW15.[16] Biohydrogen production research using Scenedesmus is actively stimulated by its applications to wastewater treatment. (See next section on waste management by Scenedesmus). Production of biodiesel Scenedesmus is known for having high biomass productivity among green algae and has been actively sought for its use for the production of biodiesel. Its heterotrophic production of biomass and lipids under optimized conditions is reported to be more efficient than its autotrophic production.[17][18][19][20] Optimization of biomass productivity and lipid content through a variable concentration of additional nutrients has been done in numerous studies; currently, Scenedesmus yields lipid. after optimization reached ~60% dry cell weight, lower than other algae[18][18][18] . However, Scenedesmus is more efficient at capturing CO_2 than other algae.[20] Like many algae species, Scenedesmus required a nitrate-deficient condition to profoundly increase its lipid yield. [22] A significant improvement (up to six-fold) in feed yields was achieved by adding different ethanol concentrations a photoperiod of 12 hours and in the dark. [22] the most significant improvement in lipid production was achieved when stationary phase cultures were transferred to average nitrate lacking for 7 days and phosphate for 3 days, respectively. [18] extraction of oils with methanol orScenedesmus abundans has been isolated from Dal Lake, Kashmir and has been shown to be a suitable raw material for biodiesel production, and its lower lipid content increases production costs.[18] In a recent study[23] Scenedesmus abundans was isolated from Dal Lake, Kashmir. The algae significantly increased biomass and lipid content with a nitrogen concentration of 0.32 g/L. Two-stage transesterification was the most suitable for transesterification, while Folch extraction was the most suitable for lipid extraction.[23] Bioethanol See also: Fuel ethanol Scenedesmus and other microalgae such as chlorella, Dunaliella, Chlamydomonas and Spirulina contains large amounts of carbohydrates (> 50% dry weight), which makes them attractive candidates for bioethanol production.[24] In one study[25] Scenedesmus was used to produce high biomass productivity; its carbohydrate-rich biomass was then hydrolyzed. with 2% sulphuric acid and subjected to a SHF (Separate Hydrolysis and Fermentation) process to produce 8.55 g of LÃ¢Â¤1 ethanol and a maximum yield of 0.213 g of ethanol / g of biomass. within 4 hours of fermentation of the ethanol. Drop-in Fuels Isoprenoids are considered important metabolites that can be used as drop-in fuels, often as alkane chains. Scenedesmus conducts a non-mevalonated pyruvate/glyeraldehyde 3-phosphate pathway to synthesize isoprenoids. However, isoprene yields were too low (1.5 ~ 15 mg per 10 liters of Scenedesmus culture when cells reached 0.5-0.6 g LÃ¢Â¤1) to be considered vital for future declining fuel production.[26] Wastewater Management In a study comparing the efficiency of the removal Ammonia and phosphorus from agro-industrial wastewater by Chlorella vulgaris and Scenedesmus dimorphus, Scenedesmus showed greater efficiency in removing ammonia in cylindrical bioreactors, while both algae removed phosphorus from wastewater in the same measurement.[27]. Algal Turf Scrubber (ATS) is one of many technologies that use algae to treat a variety of waste and polluted industrial water.[28] In Florida, for example, an algal turf scrubber removed phosphorus at a cost of $24 per kg, while wetland processing processes removed phosphorus. borehole at $77 a kg. While removing metal waste and organic substrates, Scenedesmus' growing biomass could be used to produce livestock feed, organic fertilizers, paper, construction paper and biodiesel[9]. Image gallery Scenedesmus quadricauda Scenedesmus brasiliensis References

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