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Long-term storage for immobilized microalgae

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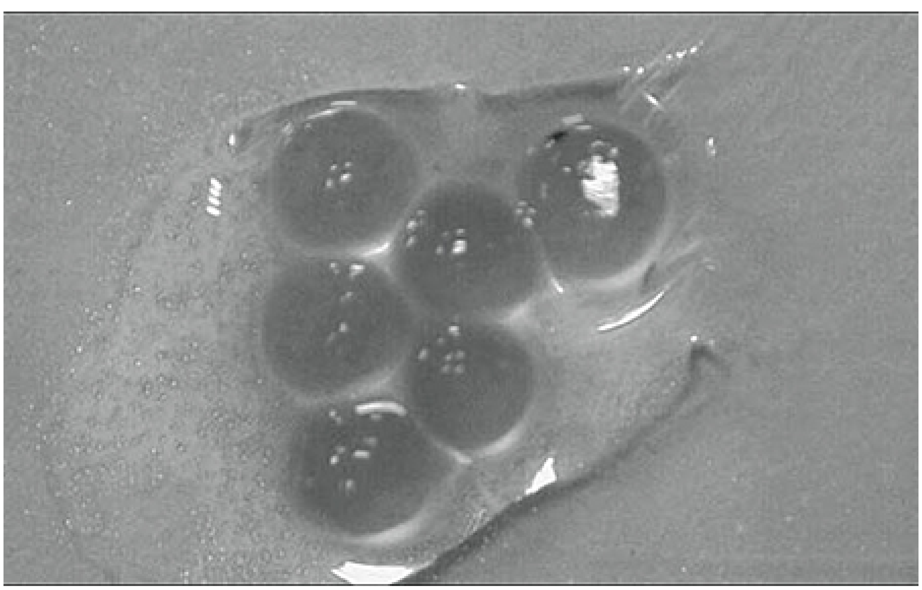
Ca-alginate appears to be an ideal gel for entrapment



Scenedesmus quadricauda cells entrapped in 4-mm alginate-beads.

Most economically important microalgae have been collected from nature and then cultivated and stocked in laboratories for future purposes. This often leads to species variations of microalgal colonies and even contamination by other unexpected algae, due to incubation in an unnatural environment. Therefore, it is important to develop a new technology for long-term storage of microalgae that maintains their original physiological activities in an uncontaminated environment.

Immobilizing cells and metabolism

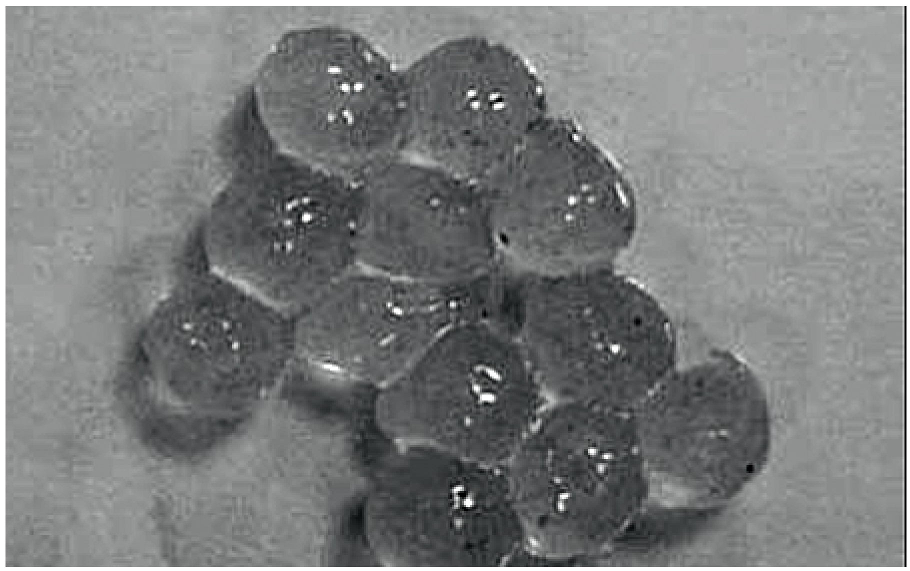
Numerous reports on immobilized cells in algae have supported the view that cell metabolic activities and efficiencies remain as they are in normal conditions. During immobilization, algal cells maintain their respiratory and photosynthetic activities.

Immobilization prevents algal cells from being washed out or grazed upon by herbivores. Immobilized algae can, when stored at low temperatures (4 degrees C) in darkness, resume normal growth after more than a year of immobilization.

Cell entrapment with Ca-alginate

In recent years, entrapment of cells within spheres of Ca-alginate has become the most widely used technique for immobilizing living cells. The advantages of alginate for cell immobilization include its low price and capacity to produce transparent beads ideal for entrapping whole photosynthetic cells.

Therefore, Ca-alginate appears to be an ideal gel for entrapment of the microalgae. The preparation of alginate- bead is easier, cheaper, and more readily available than such other methods as cryopreservation.



Isochrysis galbana in alginate beads.

Practical applications

Practical applications for immobilized algae include nutrient and heavy metal removal from wastewater, as well as water-quality control in fish culture. In my previous study entitled “Immobilized microalga *Scenedesmus quadricauda* for long-term storage and for application for water quality control in fish culture,” the alginate- entrapped microalga were still alive and maintained their physiological activities after three years of storage in darkness, at 4 degrees-C without culture medium.

The algal beads were also applied to water-quality control in fish culture. In those cultures with algal beads, the ammonium concentrations decreased markedly with the pH volume near 7.0 and high dissolved oxygen levels, resulting in the best growth of fish cultures. The “bead” (immobilized alga) can easily and immediately be removed from the water by just taking away its container to avoid algal respiratory effects.

Entrapment of other economically important species of freshwater and marine microalgae into the alginatebeads was also done. These included *Isochrysis galbana, Skeletonema costatum, Chlorella sp., Nannochloropsis oculata, Haematococcus pluvialis, Tetraselmis sp.* and the edible bluegreen *Spirulina platensis. I. galbana, N. oculata* and *Tetraselmis* are important feeds for clam and fish larvae cultures, while *S. costatum* is important for shrimp larvae rearing. However, *H. pluvialis* has the contribution for their astaxanthin (a red pigment) and S. platensis has high protein content (up to 75 percent).

Conclusion

The entrapment, storage, and processing of microalgae into alginate beads is a useful technology for stock culture management. This technique is very suitable for preserving microalgal species and the application of microalgae in aquaculture.

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