Goldschmidt 2023 Abstract
https://doi.org/10.7185/gold2023.19427

Radioactive ^{90}Sr uptake by the green microalga *Tetraselmis chui* and its potential application as a bioremediation agent

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Many species of green microalgae within the class Chlorodendrophyceae form intracellular mineral inclusions of amorphous calcium carbonate (ACC) that can be highly enriched in strontium (Sr) [1][2]. This suggests that these species may have evolved cellular mechanisms to specifically absorb Sr from their living medium. Stable Sr is naturally present in the environment and shows low toxicity. However, radioactive 90Sr is an artificial unstable isotope (t1/2 = 28.8 years) produced by nuclear fission that can be released into the environment in the event of a nuclear accident and that poses a major health risk. The capacity of Chlorodendrophyceae to absorb this radionuclide and the effect of the ionizing radiation on cell viability had never been tested. Here we investigated the capacity of the species *Tetraselmis chui* (within the class Chlorodendrophyceae) to sequester radioactive 90Sr.

Experiments were performed with laboratory cultures of *T. chui* containing a range of 90Sr concentrations. The assessment of the 90Sr uptake capacity of *T. chui* cells was performed by following the variation over time of the radioactivity of the culture media using liquid scintillation counting (LSC). We demonstrated that *T. chui*cells cultured in seawater with concentrations of ^{90}Sr similar to those measured in the environment after a nuclear accident show a high ^{90}Sr absorption. The ^{90}Sr removal from the growth medium was correlated to the cell density of the cultures. The growth of *T. chui* cultures was further optimized in bubble column photobioreactors using seawater amended with natural Sr, showing an almost complete removal of Sr in less than one week of growth. This type of photobioreactors can be reproduced on a very large scale indicating the suitability of this culture system to implement new bioremediation techniques for ^{90}Sr decontamination.

References

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