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Vertical migration, nitrate uptake and denitrification: survival mechanisms of foraminifers (Globobulimina turgida) under low oxygen conditions

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$15NO_3$- isotope labelling experiments were carried out to study foraminiferal nitrate uptake strategies and the role of pseudopodial networks in nitrate uptake. Globobulimina turgida were placed below the nitrate penetration depth in homogenised sediment cores, which were subsequently incubated in artificial seawater containing the label. The physical migration of foraminifera to strata containing nitrate and oxygen was prevented by a nylon net, however, potential access to such strata by extension of pseudopods was still possible. As no $15NO_3$- was found in G. turgida in the experimental cores, we concluded that foraminifera cannot extend their pseudopods for nitrate uptake through several millimetres of sediment. In stead they must physically migrate upwards closer to nitrate-containing strata. The foraminiferal migration patterns in the control cores (with no nylon net) were observed to be erratic, suggesting that individuals move in random orientations until they find favourable conditions (i.e. free nitrate or oxygen).
A second experiment showed that foraminifera actively collect nitrate in both the presence and absence of oxygen, although uptake was initiated faster if oxygen was absent from the environment. However, no systematic influence of the size of the intracellular nitrate pool on nitrate uptake was observed, as specimens containing a large range of intracellular nitrate (636-19992 pmol/cell) were measured to take up $15NO_3$- at comparable rates.