# Some results about the transfer of $^{32}P$ to copepods through contaminated bacteria*

*by*

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**Abstract**

The copepod *Euterpina acutifrons* is not able to take up $^{32}P$ through labelled bacteria, but it can accumulate radioactivity by means of its own microflora. If dead algae are present, labelled bacteria attached to them and the copepods are contaminated through ingestion of algae together with radioactive bacteria.

**Résumé**

Le copépode *Euterpina acutifrons* n'est pas à même d'accumuler $P^{32}$ par les bactéries marquées, mais il peut accumuler la radioactivité par sa propre microflore. S'il y a des algues mortes, les bactéries marquées s'attachent à elles et les copépodes se contaminent en ingérant les algues avec les bactéries radioactives.

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In the marine ecosystem microorganisms may function as a food source for certain higher trophic levels and therefore transfer energy and matter, including radioisotopes.

Owing to the scarcity of date in the literature, it has been necessary to carry on some preliminary experiments.

As a first step, we labelled a bacterial strain of our collection by incubation in a sea-water medium containing $32PO_4^{---}$ Different amounts of radioactive bacteria (generally $10^7$, $10^6$ and $10^5$) were then introduced into a radioactive sea-water medium together with 30 copepods which previously had been kept for 24 hours in sterile sea water containing 0.1 % penincillin. These copepods were called " sterile copepods " since penicillin inactivates markedly the copepod microflora. Controls were set up with " sterile copepods " incubated in the same radioactive sea water but without any addition of bacteria. Another control consisted of non " sterile copepods ", i.e., copepods with their own microflora, incubated in the radioactive sea-water medium also without addition of labelled bacteria.

Summarizing, the experiments were carried out under 3 different conditions : 1. " sterile copepods ", i.e., copepods kept previously in penicillin for 24 hours, incubated in radioactive sea-water medium with 3 different amounts of labelled bacteria; 2. " sterile copepods " incubated in radioactive sea-water medium without labelled bacteria; 3. non " sterile copepods ", i.e., copepods not subjected to a previous penicillin treatment, incubated in radioactive sea-water medium without labelled bacteria.

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After 18 hours incubation at 18° C, radioactivity was determined in the copepods.

The results show that *Euterpina* does not ingest the bacteria present in the medium. In fact, the radioactivity measured in the " sterile copepods " incubated with labelled bacteria is not higher than the activity counted in " sterile coepods " incubated without labelled bacteria. This indicates that *Euterpina* does not feed on single bacterial cells; probably because of the small size of bacteria, the copepod cannot separate the bacteria from the sea water. On the contrary, non " sterile copepods ", i.e., copepods with their own microflora in sterile sea water without labelled bacteria, accumulate 20 to 30 times more radioactivity from the water than the " sterile copepods ".

This indicates that the bacterial flora associated with the digestive tract or external surfaces of the copepods is responsible for the uptake unless the pre-experimental penicillin treatment of the copepods is responsible for the difference.

These results are in good agreement with those obtained by JOHANNES [1964] in *Lembos intermedius* with $^{32}P$ and by CHIPMAN & SCHOMMERS [1968] in $^{54}Mn$ uptake in *Tapes decussatus*.

In another set of experiments we investigated $^{32}PO_4^{---}$ uptake in SW medium without radioactive bacteria by non " sterile copepods ", i.e., copepods with their own microflora, by " sterile copepods ", i.e., copepods pretreated with penicillin, and by "UV copepods ", i.e., copepods subjected to UV radiations for 1 min in order to kill epizootic microflora. The " UV copepods " accumulate much less radioactivity than the non " sterile copepods " and about in the same range as penicillin-treated copepods. Therefore, microflora associated with external surfaces of copepods seems to be responsible for the uptake observed in the untreated copepods. However, it must be considered that UV may alter the filtration mechanism of copepods.

Since we know from these results that *Euterpina* is not able to ingest directly single bacterial cells, UV-inactivated algal cells (β2) have been added to the system : labelled bacteria + copepods in non radioactive medium. In this case, labelled bacteria added to the system represented the only radioactive source. As a control, the same system without algae has been considered.

The results show that, when algae are present, a significant uptake by copepods can be noted which is an order of magnitude higher than the control, where uptake is negligible.

Probably the bacteria attached to the dead algae and hence the copepods are contaminated by ingesting the algae together with labelled bacteria.

These results mean that in natural environment bacteria may play a more important role in the food chain that than which can be deduced from simplified laboratory experiments.

## References

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