PS6.23 — MO

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LETHAL EFFECT OF EITHER $^{64}CuCl_2$ OR ^{64}Cu-TMPyP INCORPORATED IN HUMAN MALIGNANT CELLS

This study was performed with A549 human malignant cells. The cells were in contact with the radioactive compound for 14, 24 or 43 hours, then washed and numerated. The incorporated radioactivity was determined as well as the Cloning Forming Capability (C.F.C) of the cells. A clear lethal effect was observed. When the survival is expressed as a function of the radioactivity present in the growth medium (uCi/ml) at the beginning of the contact period, exponential curves were obtained either for $^{64}CuCl_2$ or for ^{64}Cu-TMPyP (TMPyP = Tetra methyl pyridine porphine). The slope of the curve obtained when ^{64}Cu-TMPyP was used is 1.5 time greater than that with $^{64}CuCl_2$.

This study and control experiments show that:

1) The lethal effect observed is not a consequence of the irradiation by the particules emitted by ^{64}Cu but a consequence of the decay itself.

2) Each survival curve is characterized as a single exponential curve although the cells are in non-synchronized growth conditions. This result implies that the incorporation of ^{64}Cu in the compartment implicated in the lethal effect is independent of DNA synthesis.

3) All experiments performed to study the lethal effect of intracellular decay of radioactive isotopes have shown that an exponential survival curve is always related to decays occuring inside the DNA molecule only.

4) We detected ^{64}Cu bound to DNA whatever $^{64}CuCl_2$ or ^{64}Cu-TMPyP was used. Experiments are still in progress in order to evaluate the number of ^{64}Cu atoms bound to the DNA molecule and to evidence a relationship with the different lethal efficiency of this two compounds.

A lethal effect of ^{65}Zn via decay has been also observed for A549 cells labelled with $^{65}ZnCl_2$.

7. *Chemical Elements in Living Organisms*

PS7.1 — MO

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REDUCTION OF VANADIUM BY HIGHER PLANT ROOTS

INTRODUCTION

The mobilisation of metals in soils and their subsequent uptake by plants is a complex process. Within the soil there is a wide range of processes both biotic and abiotic which can alter the chemical form of the metal and hence its pattern of translocation. Precipitation and solubilisation are markedly affected by both complex formations and by redox reactions; these processes are themselves substantially affected by pH changes. Consequently, it is essential to consider such changes when attempting to examine the uptake of metals from soils by plants, since availability depends on chemical form. However, even if it is possible to establish the nature of the chemical species within the soil solution, there is no assurance that the same species will exist within the plant. Changes in both complex structure and redox state of the metal ion both occur readily and indeed, as is known for iron, the latter may play a significant part in the uptake process [1,2].

By using solution culture techniques it is possible to remove the effect of the soil components and to focus attention on the effect of plant roots on the uptake of the metal.

Vanadium is an element which exhibits a multiplicity of forms in soil systems. In parent materials, it is generally present as the reduced trivalent form, where it replaces Fe(III). Weathering of the parent material will lead to release of vanadium in the fully oxidized pentavalent form. This fully oxidized form (VO_3^-) is generally considered to be a mobile form of vanadium in soil solutions. There is, however, strong evidence of reduction, $V^V \rightarrow V^{IV}$, by soil organic matter [3]. This reduced vanadium is thought to exist as an anionic complex [4]; its presence in an uncomplexed form is highly unlikely since the VO^{2+} entity is only stable at pHs below 2.4 [5].

Previous studies on the uptake of vanadium utilizing excised roots and whole plants [6] have revealed a striking similarity between the uptake patterns of the two vanadium forms (V^{IV}, V^V). Such similarities would not be expected because of the dissimilarity of the ions. Vanadium injected into rats always adopts the V^{IV} state independent of injected form [7]. Thus it might be that vanadium in plants could always have a common form. This paper describes some initial work examining the form of vanadium in plants.

METHODS AND MATERIALS

Barley seeds (*Hordeum vulgare* L. cv. Maris Mink) were soaked for 12 hours in double distilled H_2O and then spread onto moistened tissue paper and allowed to germinate. After two days growth the seeds were transferred to beakers containing the appropriate uptake solution. The seeds were supported in glass tubes with a slight constriction at the neck. All solutions were aerated and changed every two days. Solution 1 contained 0.5 mM $CaCl_2$, solution 2 0.5 mM $CaCl_2$ and 0.1 mM VO^{2+}, solution 3 0.5 mM $CaCl_2$ and 0.1 mM VO_3^-. After 9 days growth the roots were removed from the solution, blotted and freeze dried to a constant weight.
Plant material was analysed using a Bruker EPR spectrophotometer.