USE OF NUCLEAR TECHNIQUES IN STUDIES OF UPTAKE AND METABOLIC FATE OF XENOBIOTICS IN PLANTS[1]

(Abstract)

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The use of municipal sewage sludge as a fertilizer in agriculture is a convenient method of disposal. However, sludge is often contaminated with toxic organic compounds such as dioxins, polychlorinated biphenyls (PCBs), and polycyclic aromatic hydrocarbons (PAHs), with implications for soil fertility and quality of crops for human and animal consumption. These compounds can be assimilated by intact plants or in-vitro cell-lulture systems. The amount of uptake depends on the plant species and on the physico-chemical conditions that influence, for example, molecular configuration; uptake rates are higher with low-molecular-weight and polar compounds. The xenobiotic can be converted to polar conjugates and hydroxylated metabolites that may also be toxic. In some cases, large amounts of the compound and/or its metabolic products are incorporated into non-extractable residues. The bound residues, especially those associated with carbohydrate fractions of the cell wall, are partly degradable enzymatically, therefore the association and type of binding to cellular polymers enables conclusions to be drawn on their bioavailability. Although the amounts of uptake and degradation of a compound differed between whole-plant and in-vitro cell-culture systems, the patterns of metabolite formation were similar. Therefore, cell cultures provide a convenient, rapid means of evaluating the metabolic fate of xenobiotic compounds.

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