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## Transformation of pesticides and other organic pollutants in the soil

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BEHRA Ph. (COST 67)	Fr	(Please forward to P. AAGAARD (Nw) and Jan DOLFING (NL))	

Date : 12 Sept. 1996

Number of pages : 3 including this one

**COST 66 "Fate of Pesticides in the Soil and the Environment"**  
**Working Group "Transformations"**  
 Coordinators : F. ANDREUX, M. MANSOUR, D. SUETT & L. TORTENSSON

Dear Colleague,

I have the great pleasure to inform you that you have been suggested as invited participant to the Meeting of Working Group "Transformations" that will take place in Bled (Slovenia) on 28 and 29 October 1996. A tentative schedule, which appears on the following pages, was prepared by the coordinators. In order to encourage discussions between specialists of biological and non biological processes, it was decided not to have parallel sessions. For budget reasons, the Meeting will last only 1 1/2 days, after the last session of COST 66's 9th Management Committee Meeting.

You are kindly asked to answer as soon as possible, informing us about your acceptance, and sending the title of your contribution (15-20 mn talk + 3-5 pages of text, to publish in the Meeting Report). Please note that you were selected not only for your knowledge about pesticides, but also for your expertise in your own field. So you can select a topic that, in your opinion, can contribute to develop new research lines and collaborations in the area of pesticide biological or abiotic transformations.

A few days before the meeting, I will prepare the list of contributions, and a schedule that will include time for discussion.

If you do not accept the invitation, please inform us and suggest somebody else, so we could try to replace you.

In the name of COST 66 's Management Committee, I thank you very much in advance for your contribution.

Yours sincerely,

Francis Andreux

# **Transformation of pesticides and other organic pollutants in the soil.**

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## ***Research interests :***

Since 1992, my research interests have been focused on the biotransformation of xenobiotics (pesticides and organic industrial chemicals) in the soil.

Experiments were performed with (i) indigenous microflora : the objective is then a better understanding of the fate of organic chemicals in the environment ; (ii) filamentous fungi : the objective is the development of innovative technologies for the cleanup of organic pollutants in industrial soils, sludges, and liquid effluents.

The program is jointed around four topics :

### **1. Microbiological aspects of xenobiotic metabolism**

Transformation experiments are typically carried out in soils or in liquid cultures versus incubation parameters such as temperature, moisture, pH and nutrients for cellular growth. So, we are measuring the degradation rate of the chemicals, and we are attempting to determine their degradation pathway, and to identify the main metabolites produced.

An application of these studies was given by the carbofuran ring-test supervised by Dr. D. Suett.

The design of bioremediation treatment is conducted mainly with basidiomycetes and typically consists in three steps :

-a screening step in an inert solid matrix, to evidence a few efficient fungal strains able to transform selected xenobiotics,

-the inoculation of the selected fungi into the contaminated soils. This step needs the development of new tools such as growing supports, and new immunological or molecular methods to quantify the fungal biomass,

-soils experiments, which are carried out with the most effective fungi. The feasibility of the bioremediation process is evaluated regarding economical, technical and biological limits.

## **2. Biochemical aspects of xenobiotic metabolism**

The enzymatic systems involved in the biotransformation of organic pollutants are characterized and purified if necessary. For example, we are studying the enzymology of microsomal mixed-function oxidases (cytochromes P450s), as well as extracellular oxidoreductases (peroxidases, laccases,...).

## **3. Biotechnological aspects of xenobiotic metabolism**

Biotechnologies will allow us to obtain and stabilize strains which are able to overproduce selected enzymatic systems. Degradation experiments on larger scale pilots are constituting the final step for process optimization before application on industrial sites.

## **4. Analytical aspects of xenobiotic metabolism**

This part includes the development of rapid and efficient analytical methods for parent compound determination, and metabolites quantification and identification, in liquid cultures as well as in complex matrix.

The extraction of organic chemicals from soils is made by using supercritical fluids.

### ***Collaborations :***

#### **Public research :**

##### **INRA**

Dr. M. Asther

Laboratoire de biotechnologie des Champignons Filamenteux  
CESB/ESIL, Parc scientifique et technologique  
F-Marseille-Luminy

Dr. E. Barriuso

Laboratoire des Sols  
F-Thiverval-Grignon

##### **ENSCP (Ecole Nationale Supérieure de Chimie de Paris)**

Pr. F. le Goffic

Laboratoire de Bioorganique et de Biotechnologie  
F-Paris

#### **Industry :**

KREBS Réseau Eurysis, Division Réhabilitation de Sites  
F-Saint Quentin-en-Yvelines

*Selected publications :*

Mougin C., Laugero C., Asther M., Dubroca J., Frasse P. and Asther M. (1994) Biotransformation of the herbicide atrazine by the white rot fungus *Phanerochaete chrysosporium*. Appl. Environ. Microbiol. 60:705-708.

Mougin C., Pericaud C., Malosse C., Laugero C. and Asther M. (1996) Biotransformation of the insecticide lindane by the white rot basidiomycete *Phanerochaete chrysosporium*. Pestic. Sci. 47:51-59.

Mougin C., Dubroca J. and Barriuso E. On-line supercritical fluid extraction and high performance liquid chromatography for determination of triazine compounds in soil. J. High Resol. Chromatogr. (in press).

Mougin C., Laugero C., Asther M. and Chaplain V. Biotransformation of *s*-triazine herbicides and related degradation products in liquid cultures by the white rot fungus *Phanerochaete chrysosporium*. Pestic. Sci. (in press).