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# Biological models for Environmental and Health risks assessment ;

*Use of flora in studying the impacts of contaminated soils.*


Mr MANIER Nicolas

Institut Lillois d'Ingénierie de la Santé (ILIS)

Laboratoire de Botanique; Faculté de Pharmacie (Lille II)

EA 2690 Toxiques et Cancérogènes Professionnels et Environnementaux


ILIS

Lille 2 Université du Droit et de la Santé

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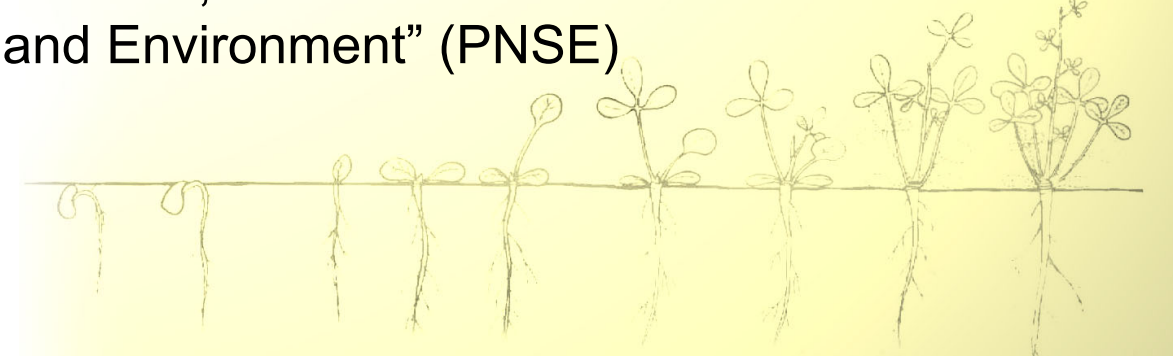
# Context

- 7 to 20 % of cancers can be due to environmental pollutants (PNSE 2004>2008)

- Historical pollution and new diffuse pollution

- Showing and evaluating the impacts of this pollution on human health is a major current issue, within the framework of the “French Programme for Health and Environment” (PNSE)



# Context

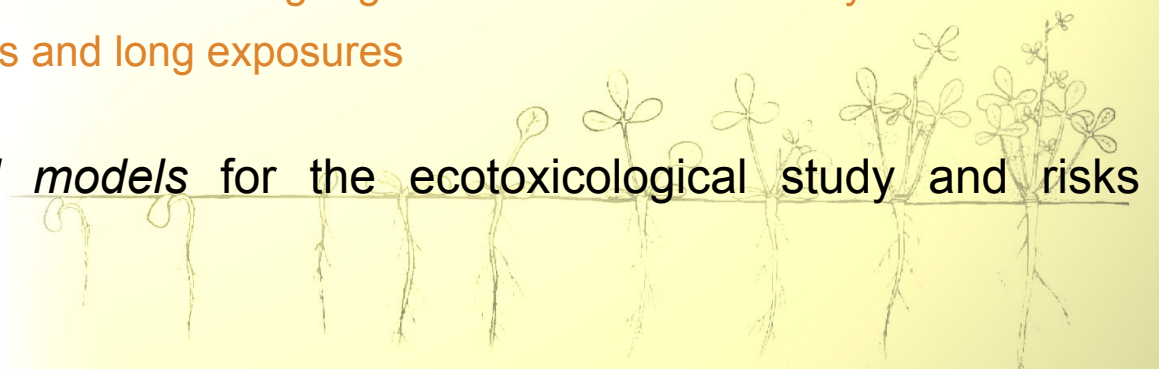
• Rules applied to contaminated soils are principally based on an analytic and *physico-chemical* approach .

This approach gives a response in term of evaluation, but is not sufficient for the environmental diagnostic (Vasseur, 1991)

• We need to measure the *general quality* of ecosystems and assess the impact of pollutants on living organisms for health risk assessment.

- Pollutant in the environment (known and unknown substances)
- Bioavailable fraction
- Potentially harmful effects on living organisms and natural ecosystems
- Low concentrations and long exposures

• The use of *biological models* for the ecotoxicological study and risks assessment



# « Biosurveillance » and risks assessment

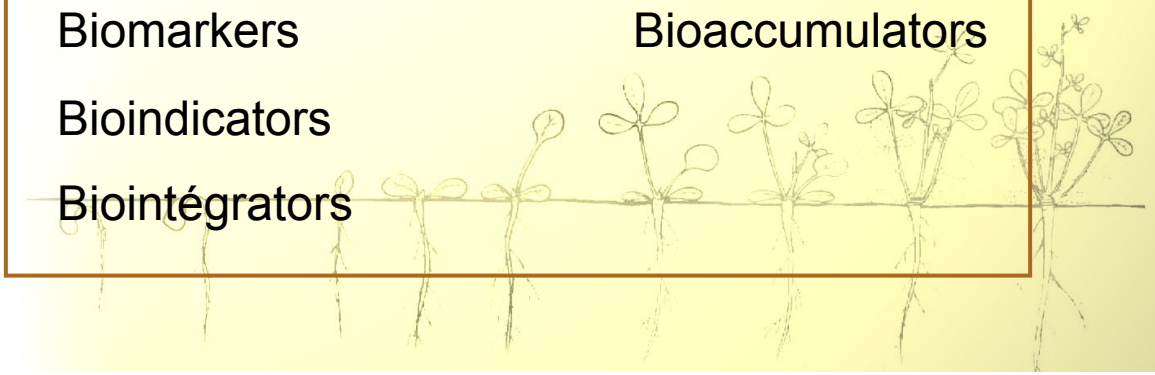
## *1) What is « Biosurveillance » ?*

*Biosurveillance:*

*« It is the **study of responses** at different levels of organisation (molecular, biochemical, cellular, physiological, tissue, morphological, ecological) of an organism or of a goupe of organisms, to **envisage** and/or **reveal** a deterioration of the environment and to follow its evolution. »* (Garrec et Van Haluwyn, 2002)

*Four concepts :*

- Biomarkers
- Bioaccumulators
- Bioindicators
- Biointégrators



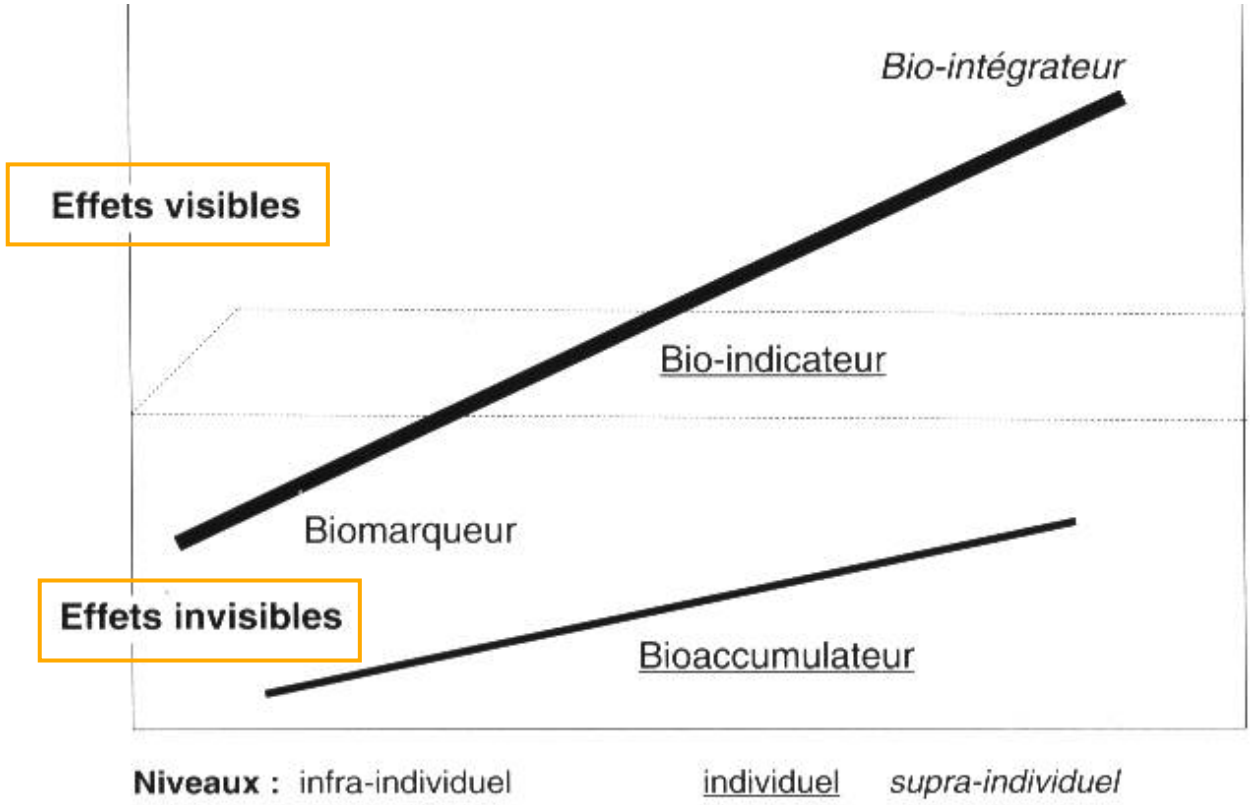



*Figure 1* ■ Présentation des différents concepts de la biosurveillance de la qualité de l'air en fonction des niveaux d'organisation biologique et de lisibilité des effets.

(Van Haluwyn C. et Garrec JP., Biosurveillance végétale de la qualité de l'air,2002)

# « Biosurveillance » and risks assessment

*2) Why using biological models for environmental and health risks assessment?*

They give an integrated response

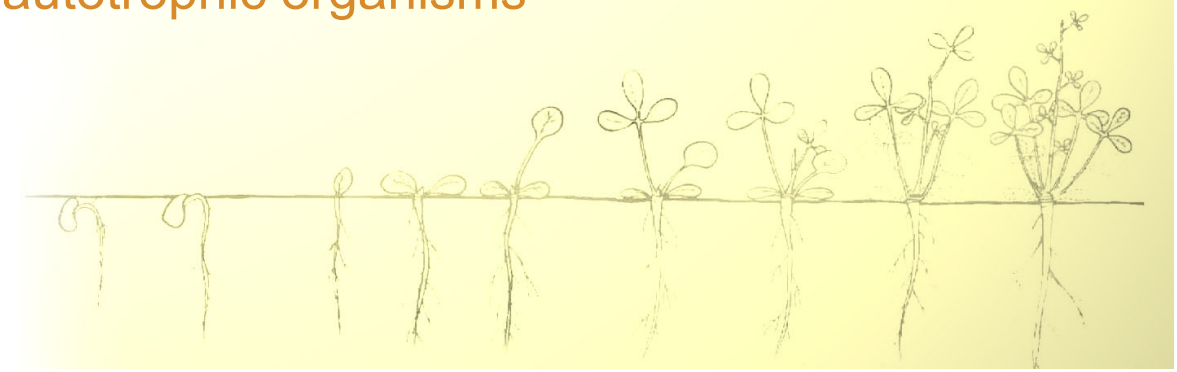
- Biotic and abiotic factors
- All pollutants in the environment (known and unknown substances)
- Antagonist and synergistic effects
- Bioavailable fractions

→ General reponse regarding the environment

# « Biosurveillance » and risks assessment

*3) Why using vegetal organisms for environmental and health risks assessment in polluted soils?*

- Close relation with the soil,
- Start of the food-chain
- No mobility
- Eucaryotes; autotrophic organisms



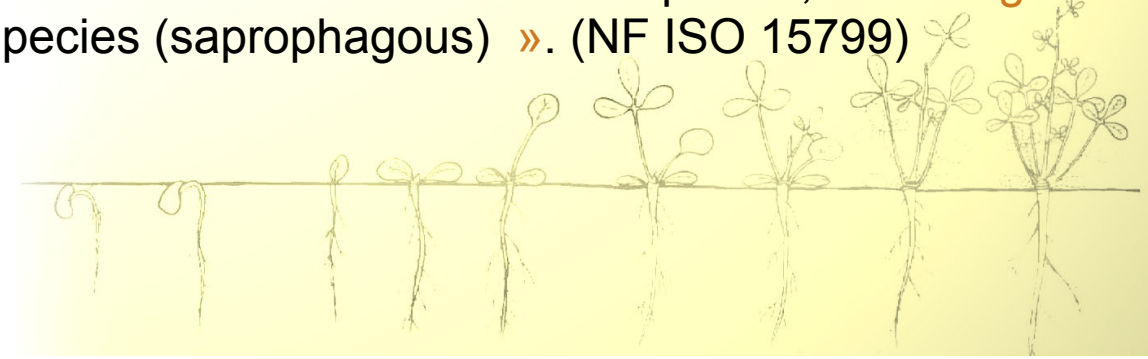
# « Biosurveillance » and risks assessment

*Optimisation of results*

Toxicity is *species-specific* and *chemical-specific*; hazard determinations should always be based on a battery of bioassays for the « biosurveillance »

- Different species
- Different trophic levels in ecosystems

« It is recommended to test at least one bacteria species, one vegetal species and one animal species (saprophagous) ». (NF ISO 15799)



# « Biosurveillance » and risks assessment

*4) Place of « biosurveillance » in the environmental and heath risks assessment*

- «Biosurveillance» is not a substitute to *physico-chemical* approach;

BUT

- It Gives indispensable, additional and complementary responses for risks assessment;

CHEMICAL ANALYSIS + «BIOSURVEILLANCE» = meaningful hazard assessment

# « Biosurveillance » and risks assessment

*standardised soil bioassays in France…*

- **Soil fauna** : *collembola* (reproduction), earthworms (reproduction and acute toxicity) …
- **Soil flora** : roots elongation test (barley), devellopment assays …
- **Soil bacteria** : mineralisation and nitrification test, biomass test, …

Thank you for your attention