B) Herbicides

$4 billion/year industry
Agriculture is dependent on them

1) Triazines

2) Chloracetamides

3) Phosphonates

Roundup-Ready crops

4) Phenoxy herbicides

2,4-D - Auxin-like (growth regulator)

LD_{50} = (764 mg/kg)

Agent orange

Inadvertent dioxin production

Toxic Organic Chemicals - others

A) Dioxin

Not commercially manufactured, is a by-product of …

A number of congeners can be formed, depending on the chlorinated precursors. One congener is one of the most toxic synthetic chemicals known (table 7-4).

Congener –

Log K_{OW}s range from 4.2 - 8.2

2, 3, 7, 8-TCDD has a log K_{OW} of 6.8 (DDT = 6.2)

Problem 8-4 [What dioxin congener is formed during 2,4-D production if starting with 2,4-dichlorophenol?]

B) PCBs (Polychlorinated biphenyls)

C) Toxicity of dioxins, furans and PCBs

For PCBs, those lacking ortho Cl are most toxic

For furans and dioxins, those lacking alpha Cl are most toxic

[Table 8-1]

Long-term problems -

Mechanisms

TCDD

Epoxidation

D) PAHs

Found in oil-based products
Not typically synthesized

exception:

[Problem 8-13] Draw phenanthrene with all atoms and bonds.

[Problem 8-14] Show that 2 3-ring compounds (Phen and another) are not isomers.

Routes into the environment

Toxicity

- Increases with number of fused rings

- Carcinogenicity generally requires activation

  - Epoxides

  - Bay regions

Transport

- Atmospheric transport is dependent on vapor pressure, condensation temp., reactivity [Table 8-3]