Environmental contaminants

Exhibit 11–1 Toxic Chemicals in Foods

NATURAL

- normal components of natural food products
- natural contaminants of natural food products
  - –microbiological origin: toxins
  - –nonmicrobiological origin: toxicants (e.g., Hg, Se) consumed in feeds by animals used as food sources

MAN-MADE

- agricultural chemicals (e.g., pesticides, fertilizers)
- food additives
- chemicals derived from food packaging materials
- chemicals produced in processing of foods (e.g., by heat, ionizing radiation, smoking)
- inadvertent or accidental contaminants
  - –food preparation accidents or mistakes
  - –contamination from food utensils
  - –environmental pollution
  - –contamination during storage or transport

Environmental contaminants

- PAH
- Pesticides
- PCBs
- Dioxin
- Mercury

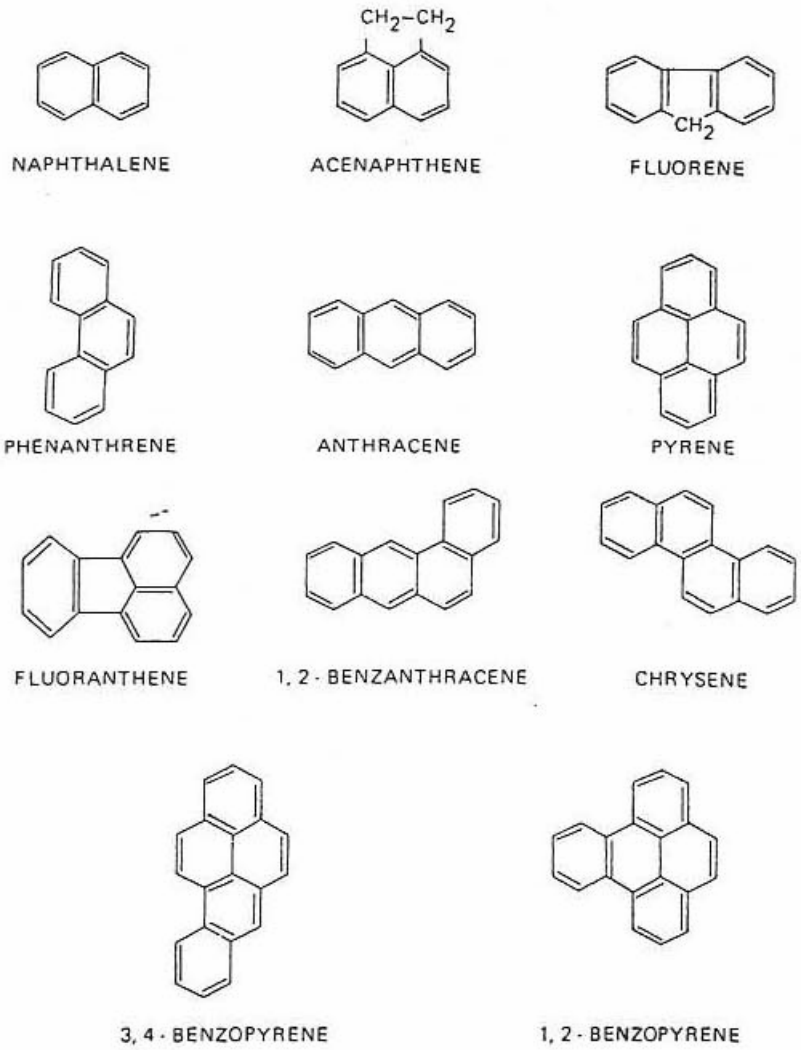
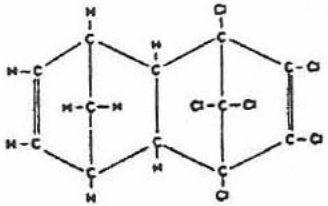
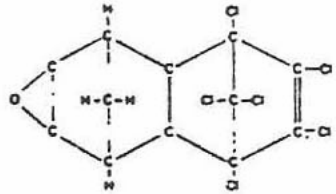


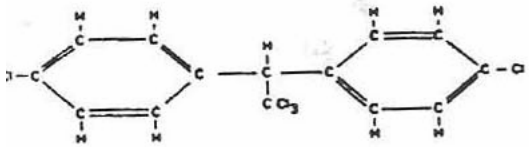
Figure 11–15 Chemical Structure of Some Polycyclic Aromatic Hydrocarbons



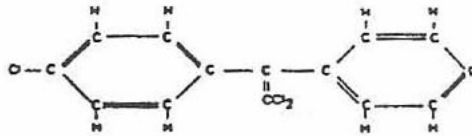
ALDRIN



DIELDRIN



pp' – DDT



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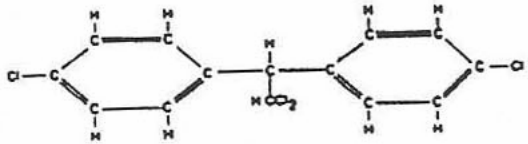
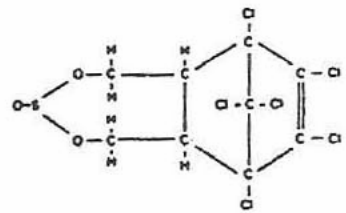
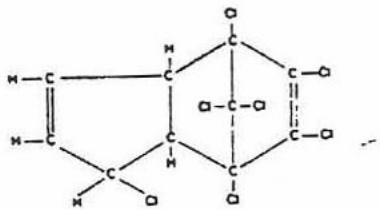


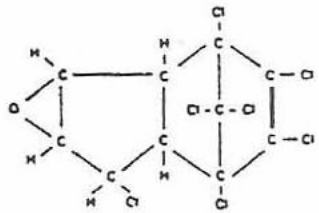
TDE (RHOTHANE)



ENDOSULFAN



HEPTACHLOR



HEPTACHLOR EPOXIDE

Figure 11–7 Structure of Some Chlorinated Hydrocarbon Pesticides

Table 11–7 Dietary Intake of Pesticide Chemicals

	Milligrams/Kilogram Body Weight/Day		
Pesticide Chemical	*WHO-FAO Acceptable Daily Intake*	*Average 1965–1969*	*Range*
Aldrin-dieldrin	0.0001	0.00008	(0.00006–0.00013)
Carbaryl	0.02	0.0005	(None–0.0021)
DDT, DDE, TDE	0.01 (0.005)[1]	0.0008	(0.0005–0.0010)
Lindane	0.012	0.00005	(0.00002–0.00007)
Heptachlor-heptachlor epoxide	0.0005	0.00003	(0.00002–0.00005)
Malathion	0.02	0.0001	(0.0001–0.0004)
Parathion	0.005	0.00001	(0.000001–0.00001)
Diazinon	0.002	0.00001	(0.000001–0.00002)
All chlorinated organics		0.001	(0.0008–0.0016)
All organophosphates		0.0002	(0.00007–0.00025)
All herbicides		0.0001	(0.00005–0.0001)

[1]Current value accepted 1969 Meeting

Source: From J.R. Wessel, Pesticide Residues in Foods, in *Environmental Contaminants in Foods*, Special Report No. 9, 1972, Cornell University.

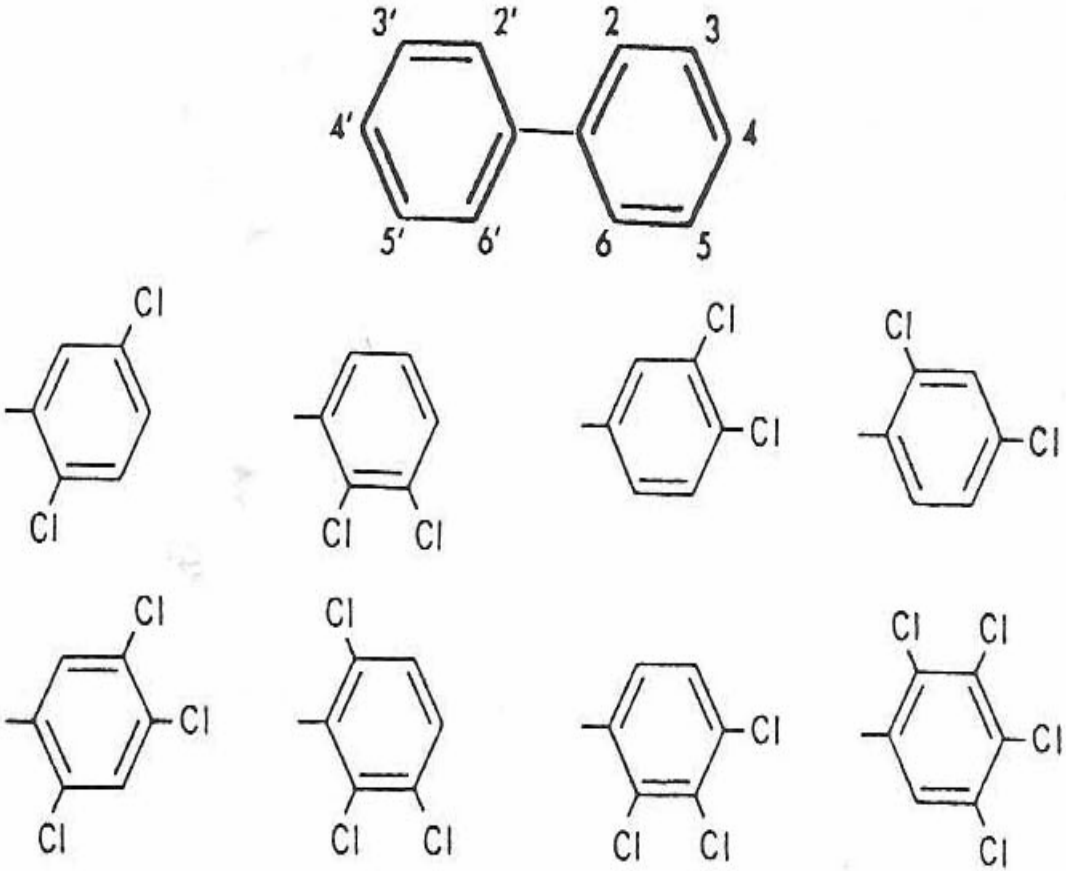


Figure 11–13 The Numbering System Used in PCBs and the Prevalent Substitution Pattern of Chlorine

Table 11–8 Information on Aroclor Preparations

Aroclor	*% Cl*	*Average Number of Cl per Molecule*	*Average Molecular Weight*
Aroclor 1221	21	1.15	192
Aroclor 1232	32	2.04	221
Aroclor 1242	42	3.10	261
Aroclor 1248	48	3.90	288
Aroclor 1254	54	4.96	327
Aroclor 1260	60	6.30	372
Aroclor 1262	62	6.80	389
Aroclor 1268	68	8.70	453

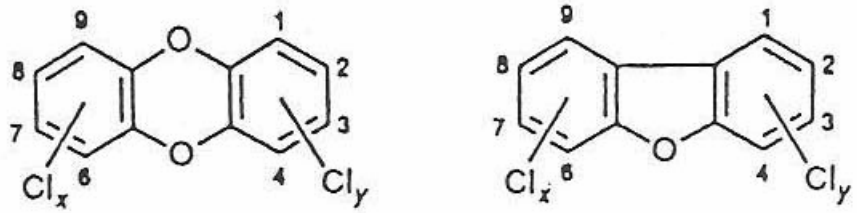


Figure 11–12 Chemical Structure of Polychlorinated Dibenzo-*p*-dioxins (PCDD) and Polychlorinated Dibenzofurans (PCDF)

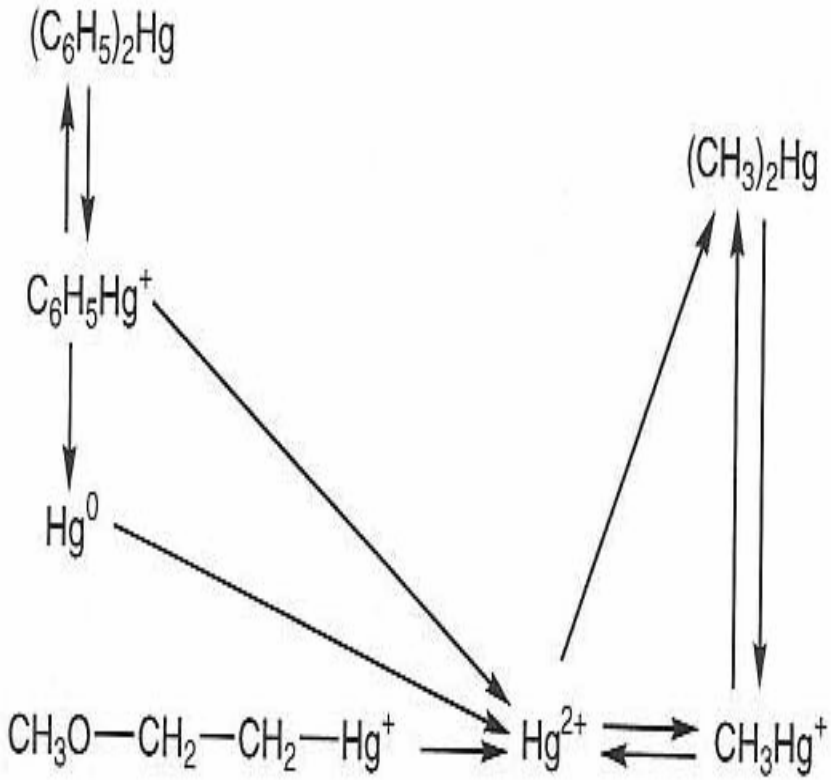


Figure 11–14 Conversion of Inorganic Mercury and Some Mercury-Containing Compounds to Methyl Mercury. *Source*: From N. Nelson, Hazards of Mercury, *Environmental Res.*, Vol. 4, pp. 41–50, 1971, Academic Press.