January 21, 1969

Aroclor(Wildlife)
vs. Pesticides

cc S. Tucker - JFQ
H. Bergen - HBERG
R. E. Keller - JFQ
W. K. Johnson
C. Paton - CPATO
K. A. Wells - KWELL
R. E. Kelly - RKELL

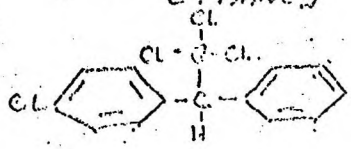
TO : W. R. Richard
WRICH

Recently I asked Jack Garrett to put on paper the formulae for common chlorinated hydrocarbon insecticides since many of us have wondered whether or not any of them were likely candidates for metabolizing to PCBs. Jack's comments follow:

"As you know, Mr. A. Richardson of Shell in Great Britain did some work on the extracts of marine bird eggs (using the specimen shag or phalacrocorax aristotelis). Mass spectroscopy of a fraction from a silica gel column showed the presence of a compound of molecular weight 426. Gas-liquid chromatography-mass analysis indicated compounds of mass 324, 358, 392 and 426. These molecular weights correspond to 5, 6, 7 and 8 chlorinated biphenyl. The Swedish work indicated the same results, however all workers suggested that the material found in non pre-treated specimens was the higher chlorinated biphenyl.

There are a great many peaks that fall close to the so-called PCB peaks in the GLC-EC readouts that are identified as chlorinated pesticides and/or their identified metabolites. I have listed below several pesticides and pesticide metabolites along with their structure and molecular weight:

1. DDT [1,1,1 trichloro 2,2-bis (p-chlorophenyl) ethane]



M.W. = 354.5

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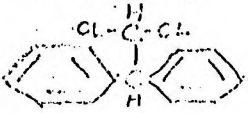
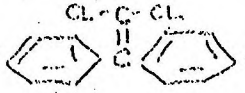
2. DDD [1,1-dichloro 2,2 bis(p-chlorophenyl) ethane]



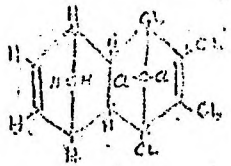
M.W. = 320

3. pp' DDE [1,1 dichloro 2,2 bis(p-chlorophenyl) ethene]



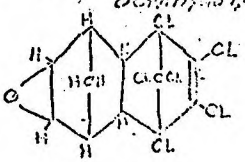
M.W = 318

4. Aldrin [1,2,3,4,10,10 hexachloro 1,4,4a,5,8 8a hexahydro-1,4 endo exo 5,8-dimethanonaphthalene (not less than 95%)]



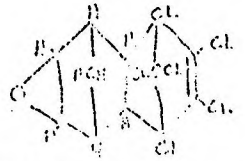
MW = 365

5. Dieldrin [1,2,3,4,10,10 hexachloro 6,7 epoxy 1,4,4a,5,6,7,8,8a octahydro 1,4 endo exo 5,8 dimethanonaphthalene (at least 85%)]



M.W = 381

6. Endrin [1,2,3,4,10,10 hexachloro 6,7 epoxy 1,4,4a,5,6,7,8,8a octahydro 1,4-endo endo 5,8 dimethanonaphthalene]



M.W = 381

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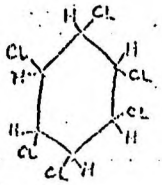
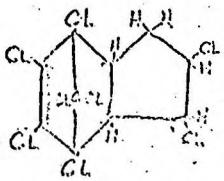
7. BHC or Lindane [1,2,3,4,5,6 hexachlorocyclohexane (alpha, beta, & gamma isomers – isomeric distribution dictates common name, for example, the gamma isomer is Lindane)]



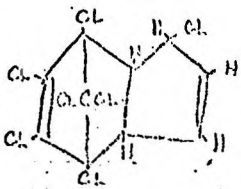
M.W = 291

8. Chlorodane [1,2,4,5,6,7,8,8 octachloro 3a,4,7,7 tetrahydro 4,7 methanoindane]



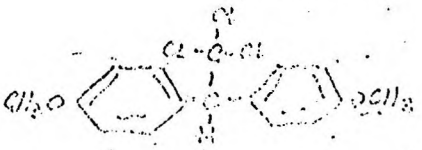
M.W. = 398

9. Heptachlor [1,4,5,6,7,8,8 heptachloro, 3a,4,7,7a tetrahydro 4,7 methanoindane]



M.W = 361.5

10. Methoxychlor [1,1,1 trichloro 2,2 bis (methoxyphenyl) ethane]



M.W = 345.5

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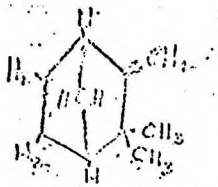
11. Toxaphene [chlorinated camphes having 67-69% chlorine content]



MW = 412

Plus 8 Chlorines

The molecular weights are only approximate based on C=12, H=1, O=16, Cl=35.5.

We are not sure what happens to these pesticides--at least not all of them-- in the avarian metabolism. It is possible that some metabolites form in marine birds from chlorinated pesticides that correspond to the peaks found by GLC-EC and also to the molecular weights. The more confusing aspect of this problem is the chance that the ultimate problem is the result of the metabolism of marine food species (fish and other marine bird food organisms) possibly further metabolized by the bird itself."

EPW

Elmer P. Wheeler

EPW:cjs

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