Monsanto

FROM (NAME & LOCATION): H.A. Vodden, Ruabon

DATE: 17th August, 1970

SUBJECT: BIODEGRADATION

REFERENCE: HAV/mch

TO : W.B. PAPAGEORGE - St. Louis

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The attached schedule outlines the current and projected work plan for environmental and biodegradation studies on PCBs and related products in Europe. It is assumed that the overall Monsanto objective in this field is to continue in the electrical and heat exchange businesses with fluids of the Aroclor type, by developing modified new products which are biodegradable, or by demonstrating that, in certain controlled applications, the product does not accumulate in the biosphere.

Specifically we plan to

(1) Find biodegradable Aroclors

(2) Demonstrate that, under use conditions, Aroclors which we continue to sell do not accumulate.

The financial status concerning Ruabon R & D effort is as follows :-

| | 1970 | 1970 Prospect | 1971 Budget |
|---|---|---|---|
| Directs | $13,020 | $19,200 | $14,319 |
| Shared | $ 7,540 | $ 7,540 | $ 5,285 |
| | $20,560 | $26,740 | $20,640 |

The manpower commitment during 1970 is as follows :-

| | Analytical | Biological | Co-ordination |
|---|---|---|---|
| Graduate | 2 months | 2 months | 2 months |
| Technician | 12 months | 6 months | |

H.A. Vodden

H.A. VODDEN

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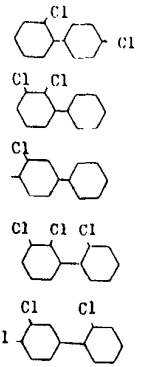
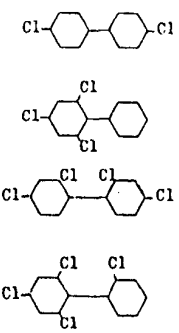
Environmental Studies - Europe. August 1970

| Objective | Status |
|---|---|
| To provide technical assistance for the implementation of the CMC plan for PCBs by assisting customers in pollution control through advice and effluent analysis. | Analytical service provided by Ruabon R & D and by Newport TSD. Advice offered to customers through technical contacts from TSD (Newport) and R & D (Ruabon). Continuing through 1971. |
| To provide technical support for incineration trials. | Scrubber liquor analyses from Furle incinerator have indicated no residual PCBs. Support will be continued whilst incineration of Newport and Customer waste is instituted. Target 31/12/70. |
| To maintain liaison with Government and other official European bodies, concerned with environmental pollution, to ensure that Monsanto management is kept informed of official views and actions, and to assure these official bodies of Monsanto's co-operation. | Active co-operation has been achieved with NERC and Ministry of Agriculture, Fisheries & Food in UK and with limited number of bodies in Europe (Netherlands & Scandinavia). Continuing through 1971. |

## Biodegradation

| | |
|---|---|
| To assess the effect of biodegradation by biphenyl-active soil culture ($C_2$) on Aroclor 1242. | Chromatograms indicate degradation of all major GLC peaks after 83 days exposure. |
| To identify and quantify residues after degradation. | Utilisation of mass spectrometer necessary. Coupling of GLC/mass spectrometer expected to be operational by 30/9/70. Work on establishing technique and necessary calibration/interpretation targetted for 31/3/71. |
| Assess effect of biodegradation by $C_2$ on MCS 1016. | Short term tests indicate greater degree of degradation of major peaks than in Aroclor 1242. Long term (83 days) tests in progress (completion anticipated 30/9/70). |
| Assess effect of biodegradation by $C_2$ on Pyralene 1500. | Chromatograms of degraded Pyralene 1500 look similar to those of degraded Aroclor 1242 (37 days) although initial chromatograms differ significantly. |

Biodegradation (Cont'd.)

| Objective | Status |
|---|---|
| Assess the degradation by $C_2$ of individual PCB isomers. | Degradable:-  Not degradable:-  |
| To confirm hypothesis defining which isomers will degrade, by synthesising key isomers and studying their degradation by $C_2$. | Key hexa- and penta-dichlorinated biphenyls synthesised. Initial tests failed to show degradation. Further work in hand to attempt to produce degradation by improvement in technique (31/8/70 |

Biodegradation (Cont'd.)

| Objective | Status |
|---|---|
| Assess the effect of biodegradation of MCS 717 and MCS 762 by $C_2$. | Short term results due 31/8/70. Longer term residue determination will be made if initial results are encouraging. |
| To compare GLC chromatograms for wild-life extracts - e.g. fish, bird, with degraded Aroclor residues. | Wild-life specimens not yet examined at Ruabon. Arrangement with Ministry of Agriculture Lab. to exchange results on fish samples not yet effective. Target 31/12/70. |
| To assess degradation of HB40 by $C_2$. | Exposed sample awaiting analysis - due 31/8/70. Other cultures may need to be examined if $C_2$ is not successful. |
| To elucidate degradation pathways and select cultures specifically for degrading chlorinated biphenyls. | Bangor University Project Student selected for starting on 1/9/70. Target 31/8/71. |
| To assess effectiveness and provide analytical back-up on interesting cultures selected at Bangor. | Culture selected at Bangor as active on Aroclors 1242 and 1254 ($C_3$) has so far failed to show degradation of Aroclor 1242 in tests at Ruabon. Continuing. |
| To assess biodegradation of potential Aroclor replacements using appropriate cultures. | Some chlorinated diphenyl ethers (ex St. Lo are awaiting biodegradation tests. Priorit has not yet been allocated to this product. |
| To assess the biodegradation of chlorinated terphenyls, particularly of those recommended as PCB replacements. | Analytical problem being considered. Continuing 1971. |
| To examine alternative degradation processes - e.g. ultra-violet irradiation, and relate to environmental conditions. | Preliminary look at U.V. irradiation of Aroclor 1242 indicated substantial decay of major peaks in chromatogram. |