

CONFIDENTIAL

TO: DR. J.W. BARRETT.

6th December 1955

DVNH/MEB

AROCLORS -
TOXICOLOGICAL
EXAMINATION

c.c. Dr. J.A. Gardner.
Dr. W.McG. Morgan.
Mr. W.E. Hamer.
Mr. C.G. Wickham
Dr. H.R. Newman
Dr. D.S.P. Roebuck
Mr. J.S. Hunter
Mr. E.L. Pixton
Mr. H.G.H. Thomas.
Mr. J.A. Brindle.

Since my communication of 19th August 1955, when I summed up the position confronting us following the receipt of the reports of the Kettering Laboratory, Dr. Newman has discussed with Dr. Kelly the significance of the Kettering results in relation to M.C.C. thought and policy.

M.C.C.'s immediate action is to submit the reports to the American Conference of Governmental Industrial Hygienists in support of a claim that the official table of maximum permissible vapours concentrations should include the items:-

42% Chlorinated Diphenyl (Aroclor 1242)	2 agrm./m ³
54% " " (Aroclor 1254)	1 agrm./m ³

The Kettering results indicated in brief that prolonged exposure to Aroclor 1242 vapour at 1.9 agrm./m³ gave no sign of damage to the test animals but that Aroclor 1254 at 1.5 agrm./m³ caused slight but positive signs of injury. You will note that M.C.C. do not introduce a safety factor in translating these animal test results to human beings, and in fact regard such a factor as unnecessary in animal tests of such thoroughness as those carried out at Kettering.

It will be sometime before we know the decision. In my view it would not be unrealistic to assign a value of 2 agrm./m³ to Aroclor 1242 but the case for setting the limit at 1 agrm./m³ for Aroclor 1254 is not so logical. After all 1254 can cause slight but perceptible damage at 1.6 agrm./m³ and who can say whether it would be harmless at

CA.No. B-84-1103-CA 048751

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1 $\mu\text{g}/\text{m}^3$. However, if the M.C.C. recommendations are accepted there will be an implication that Aroclor toxicity increases with chlorine content, a reversal of the position suggested in M.C.C. technical literature. M.C.C. Application Data Bulletin No. P-115 states "If Aroclors are used at elevated temperatures such as 200° or 300°C. in open systems methods must be designed to exhaust any vapours arising from these open systems. This applies especially to lower chlorinated Aroclors where experimental work on animals indicates that the maximum safe concentration in workrooms is in the range of 0.5 - 1.0 milligrams per cubic meter of air. In the case of more highly chlorinated Aroclors such as Aroclor 1268 the allowable limit is about 10 milligrams per cubic meter of air and accordingly. Aroclors of this type are believed to be of a much lower order of toxicity.

Whatever the outcome, there will be no impact on M.C.C. policy regarding the use of Aroclors in paints since M.C.C. have long ceased to recommend the use of Aroclors for this purpose. However, M.C.L. has continued to offer Aroclors for use in paints on the basis that the evidence for rejection was slim, and that the risk is reduced by resorting to the use of more highly chlorinated Aroclors. This was thought to have the dual advantage of using a material of (a) lower intrinsic toxicity (b) lower vapour pressure. It is now clear that toxicity increases with degree of chlorination and that this effect may cancel or even outweigh the advantage due to decreased vapour pressure.

We have tended to draw a distinction between the use of Aroclors in latex paints on the one hand and in conventional paints on the other, the consensus of opinion being that the rate of volatilisation from the former is greater than from the latter, and as a result we are no longer recommending Aroclors for latex paints. The decision now before us is whether we should continue to sell Aroclors for use in conventional paints.

On this issue, the recent decision by I.C.I. to discontinue their usage of Aroclors in ordinary paints is considered to be an indication of the line that may well be taken by our other customers. Broadly speaking the main objections are that the paint manufacturer cannot control the paint user who may apply in the form of spray, and may use on hot surfaces. In either case a degree of risk must be admitted. As to how serious the risk may be it depends naturally on the total time for which any individual is exposed during his life time. There must clearly be circumstances under which the use of Aroclor containing paints will constitute a health hazard, particularly to individuals who for one reason or another are constitutionally less resistant than the norm. The I.C.I. decision must have been influenced quite materially by a letter from Dr. Kelly to Mr. Roy Witterschein (dated 15.7.55.), a copy of which reached them through Canadian Industries Ltd. The relevant passages are as follows:-

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"Aroclor should not be sprayed on the job in an industrial plant where there are plant personnel who can breathe the vapours. There is no danger at all if the material is brushed on, and there is no danger in spraying it if the workers use a booth or use an approved respirator and no one inhales the spray.

"Aroclor fumes at room temperature very probably would not present any hazards. Mist or spray, however, is another problem entirely and that is the reason for the above recommendation. After all, the toxicity of Aroclor must take into consideration how much can get into the air. It is our belief that at room temperature not enough can get into the air to cause any trouble. At elevated temperatures and if the material is dispersed as a mist or aerosol a different interpretation has to be placed on its toxicity".

The passages of particular significance to I.C.I. Paints are underlined and may be considered to be reflected in their conclusions which I now quote below:-

"In brief

(a) The spraying of Aroclor paints appears to involve precautions which would be so inconvenient as to limit unduly their application by this method.

(b) Apart from questions of spraying there appear to be cases where Aroclor-containing paints would involve toxic hazards either during application or subsequently, and where cautionary advice would be appropriate. The need for special precautions would limit the use of Aroclor paints in these cases.

(c) As far as the paints in question are concerned it is impossible to know how any particular can may be eventually used, so every can would need to show the warnings and precautions for all foreseeable eventualities. The presence of these warnings would tend to deter people from using the paints even in cases where no special precautions were needed."

With reference to the impression generally given that cold Aroclors are safe, recent determinations of vapour pressure (Southern Research Institute Final Report to M.C.C. on Project 526 by W.M. Nolan) permit the saturated vapour concentrations to be calculated as follows:-

Vapour Concentration (grm./m³)

	<u>20°C.</u>	<u>25°C.</u>
Aroclor 1242	4.7	8.2
Aroclor 1248	2.1	3.0
Aroclor 1254	0.8	1.1

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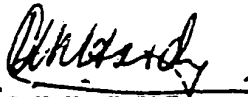
Hence air saturated with cold Aroclor is at or above the maximum permissible concentration.

In general we have to accept Dr. Kelly's leading remarks and the conclusions of I.C.I. Paints, but any consideration of the risk under a given set of conditions must involve the total exposure factor as well as the concentration. It is in this area that constructive answers could be made if the necessary background of data were available. However, the issue before us is whether M.C.L. should align its policy on the use of Aroclors in paint with that of M.C.C., and as I see it we have little alternative when M.C.C. can be quoted against us.

The use of Aroclors in paints based on chlorinated rubber warrants special consideration in view of the following circumstances (a) Aroclors are of such value for the purpose that the manufacturers might well be embarrassed if we withdraw our recommendation (b) they are not used for ordinary decorative and protective purposes in domestic and industrial premises, but to protect metals from corrosion, (c) they are not applied to hot surfaces under conditions which would constitute a hazard to nearby personnel.

My recommendations are accordingly as follows:-

1. M.C.L. continues to sell Aroclors for use in the manufacture of paints based on chlorinated rubber.
2. M.C.L. continues to sell Aroclors for production of paints intended for exterior application.
3. M.C.L. discontinues the sale of Aroclors for use in the manufacture of all other paints.


D.V.N. HAREY

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DR. J. W. BARRETT - London.

27.2.54.

WEH/OK.

AROCLOR TOXICITY.
Your memo of February 23rd.

c.c. Dr. D.V.N. Hardy ✓
Dr. W.M.G. Morgan.
Dr. H.R. Newman.

After going through our files at Ruxton and Newport we have only been able to find one Aroclor report containing data on Aroclor Toxicity.

This report No. 2215, Final Report on "Aroclor Data Book", by R.R. Knight, dated April 27th, 1948 has a small section on physiological effects.

The first deals with skin effects and is based on information from BIOS reports. It indicates how such troubles as chloracne and internal sickness experienced in the early days when people were handling chlorinated hydrocarbons could be avoided by adoption of suitable methods of hygiene, and the use of a suitable barrier cream.

*Chlorinated
chlorinated*

The second section which is taken from The Journal of Industrial Hygiene and Toxicology, Volume 20, Number 2, February 1938, gives a brief description of the systemic toxicity effect which chlorinated hydrocarbons including chlorinated biphenols can cause. Liver damage is of course the outstanding effect and of the various hydrocarbons tested, diphenyl gave evidence as being the most toxic. It is indicated that in white rats breathing air containing around 0.57 mgms. per cu. m. over a period of 134 - 143 days caused liver injury.

W. E. HAMER.

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C O P Y

Dr. H.R. Newman.

February 12th, 1974.

Newport, England.

We do not know what the maximum allowable concentration of Aroclor is. One milligram per cubic meter has been set up. We have run animals for about 60 days at 7 times this and found some liver damage. We are now running this at a lower level.

We have never found any liver trouble in any of the workers in our plant, but we watch the control of the fumes in our customers' plants and always recommend exhaust ventilation. I am sure you realize that 1 mg per cubic meter is recommended for an 8-hour day for indefinite periods of time. In painting a room we have found 1 - 2 mg for a day or so, but after that the level drops down to nothing.

What we were really worrying about was the possibility that a man would develop hepatitis on an ^{independent} idiopathic, viral, or serum basis and on questioning would recall that he had painted a room with Aroclor paint and state that he had smelled it very strongly. I am afraid then we might be convicted by association even though we were sure one could not get a level high enough to cause trouble. We have, however, been concerned with the level of Aroclor during spray painting, but I think that level can only be determined by actual measurements.

Please do not worry about asking me these questions because we certainly want you to have the entire picture about Aroclor toxicity. As soon as I get a report on the work at Kettering, I will let you know.

R. Emmet Kelly, M.D.

REK/MFL.

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