Mr. T.S. Foley - New York
Mr. Paul Logue - St. Louis
Dr. R.L. Jenkins - Anniston
Messrs. Edgar E. Hardy
J.F. Reeves (2)
A.M. Ellenburg
R.P. Loewen

December 30, 1947

Celanese Corporation of America
Central Research Laboratory
Summit, New Jersey

Dr. L. S. Birnbaum

Gentlemen:

As suggested by Dr. R. L. Jenkins in his letter to you on December 23, we are pleased to write about Aroclor toxicity considerations.

The best published information about the toxicity of Aroclor vapors with reference to possible damage to the liver is in a series of three articles written for the Journal of Industrial Hygiene and Toxicology. The first article appearing in the September 1937 issue, Vol. 19, No. 7 and the second article published in the February 1938 issue, Vol. 20, No. 2 were written by C. K. Drinker, M. F. Warren, and G. A. Bennet and cover only Aroclor 4465. The third article written by Dr. Drinker alone is more complete as it gives information about Aroclors 4465, 1254, 1268 and 5460. We particularly wish to refer you to this article entitled, "Further Observations on the Possible Systemic Toxicity of Certain of the Chlorinated Hydrocarbons with suggestions for Permissible Concentrations in the Air of Workrooms", by Cecil K. Drinker, The Journal of Industrial Hygiene and Toxicology, Vol. 21, No. 5, May, 1939.

In this article Dr. Drinker tabulates the permissible limits of the compounds in mg. per cubic meter of air in workrooms. The following data is an excerpt pertaining to permissible limits of various Aroclors:

Material		Permissible Limit Mg. per Cu. M.
No. 6	Aroclor 4465	0.5
No. 9	Aroclor 1254	0.5
No. 13	Aroclor 1268	10.0
No. 14	Aroclor 5460	0.5

From this, it is noted that there is a marked variation in the toxicity of the vapors of different Aroclors. To quote Dr. Drinker, "Aroclors 1268 is almost non-toxic". The vapors of the other Aroclors studied are toxic and should be avoided. In general, the more highly chlorinated biphenyls are less toxic than the lower chlorinated derivatives, proba-

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bly due to decreased solubility. The chlorinated terphenyls appear to be more toxic than corresponding chlorinated biphenyls.

Here the cold or solvent method is used for the impregnation of Aroclors usually only normal precautions or ordinary cleanliness of commercial plant practice are followed. When the Aroclors are applied by hot methods, 300° F. or higher, the workrooms should be ventilated by intake and exhaust fans of sufficient volume and velocity to remove the majority of the fumes. Where ever drying ovens are used, the vapors must be removed. Two sections about this are given in the article entitled, "Observations on the Toxic Effects Resulting from Exposure to Chlorinated Naphthalene and Chlorinated Phenyls with Suggestions for Prevention", by Dr. H. Von Wedel, Dr. Wm. A. Hollo and Dr. James Denton, published in the Rubber Age, Vol. 53, No. 5, August 1943.

In general, it is believed that the maximum permissible amount of Aroclor vapor in the workroom is evident to the workmen because of an irritating influence on the eye membranes. It therefore becomes a self-revealing signal when dangerous levels are reached.

If you desire, we will be glad to lend you an instrument which we have with full instructions for its operation to measure Aroclor vapors in your workroom atmospheres. This would be the most certain method to determine that your working conditions are safe.

In your letter of December 19 to Dr. Jenkins, you asked whether studies have been made of the possible toxicity or dermatitis due to finished manufactured items containing Aroclors as an ingredient.

It was determined by the skin patch test procedure given by Dr. Louis Schwartz and Dr. Samuel M. Peck in reprint No. 2552 from the Public Health Reports, Vol. 59, No. 17 (April 28, 1944) that canvas painted with Aroclor 5460 and an oil modified alkyd resin in such a manner that each square inch of fabric contained 10.5 mg. of Aroclor 5460, was neither a skin irritant nor a sensitizer.

The following commercial applications are some typical large current outlets for Aroclors and to our knowledge, there is no instance of difficulty about toxicity even though in a number of these applications elevated temperatures are used and consumers come in rather close contact with the finished commodity containing Aroclor.

1. Actuating fluid for thermostats.
2. Heat transfer medium.
3. Non-flammable hydraulic fluid, especially for die casting machines.
4. Adhesives for many purposes.
5. Wood preservative and sealer treatments.
6. [illegible] lubricant.
7. Plasticizer for nitrocellulose, ethyl cellulose and polyvinylchloride coatings. (In a number of applications of this type the consumer comes in

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intimate contact with the coating compositions.
[illegible] is [illegible] shoes).

8. Plasticizer for Parlon and Pliolite paints and [illegible].
9. Plasticizer for wire insulating compounds.
10. In transformers and capacitors.
11. As an impregnant for paper products.
12. Pressure sensitive sealers.
13. In fire retardant paints and coatings.
14. Impregnant for textiles.
15. Industrial printing inks.
16. Stop-off lacquers for electroplating.
17. Ceramic, glaze printing.
18. Plasticizer for asphalt compositions.
19. In the manufacture of dentures.

Based on our practical experience in the manufacture and sale of millions of pounds of Aroclors annually, the point that we would emphasize is that workers should not be exposed to Aroclor vapors and that the men working with Aroclors should observe "good house-keeping" rules about keeping their clothing and skins free of the material and avoid ingestion of it.

Adequate ventilation has proved successful in keeping the atmosphere free from harmful amounts of Aroclors around machinery and in plants.

When you have had opportunity to give consideration to our above comments, please let us have your thoughts and let us know if we can be of further assistance to you.

Yours very truly,

P. G. Benignus
Development Department

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