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FABRICS AND FINISHES DEPARTMENT
FINISHES DIVISION

July 15, 1955

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DIRECTOR, HASKELL LABORATORY

TOXICITY OF PHENYL MERCURY OLEATE IN PAINTS

We need to know the tolerance limit of P. M. O. in a number of specific paint products. More than a million gallons per year of production is involved and our management believes the problem merits study. We are hopeful that as discussed later, you will be able to give us a general specification, applicable to all paints or at least applicable to all paints with a given type of vehicle.

We are assuming that the possibility of dermatitis is the limiting toxicity factor when using P. M. O. in paints. A toxicity study made for us by Dr. H. F. Smyth in 1933 (you have a copy of this) approved the use of a paint containing 0.046 pounds of phenyl mercury hydroxide per gallon. This approval covered acute and chronic toxicity by ingestion and the hazard of spray painting but no investigation of skin irritation was made. Since this paint contained much more mercury than we are now considering, we believe we are reasonably well covered except for the dermatitis angle. An investigation of the hazard of burning of paints that contain mercurials is planned for a separate study.

We have examined Medical Research Project #MR-132, Possibility of Dermatitis from Phenyl Mercury Oleate in Mildew Resistant Paints, Possible Skin Effects of Phenyl Mercury Oleate Mildew Inhibitor in Paints by Allan J. Fleming, M. D. and also Phenyl Mercury Oleate, Skin Irritant Properties, C. P. McCord et al Journal of Industrial Hygiene and Toxicology 23, 466-69 (1941) and find that several points important in our work are not covered adequately.

MR-132 deals with paints at a considerably higher concentration of PMO than we are now using. Also the products tested are emulsion paints which are not our primary concern at present. In C. P. McCord's work, volatile solvents were used to dilute the PMO and it seems to us that this amounted to testing the effect of PMO at very much higher concentrations than the initial strength of his solutions. In both studies, the concentration of PMO is stated as % by weight of total material.

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This practice of measuring PMO concentration as per cent by weight of total material is inappropriate in our field. The gallon weight range of our paint products is from 7.5 to 15 pounds. This alone could result in a 100% variation in PMO concentration if tolerance limits are specified on a per cent by weight basis.

In addition to this, the pigment occupies a larger percentage of the volume of the heavier paints. This results in an even higher concentration of PMO in the vehicle portion of the paint. The pigment in our products may make up from 0% to 40% of the volume.

Paint products contain from 0% to about 70% volatile solvent. When this solvent evaporates the concentration of PMO in the remaining liquid is increased proportionately.

Thus when PMO is added to our paints on the basis of a maximum allowable % by weight, all these effects together can result in extreme variations in the actual effective concentration of PMO in the non-volatile liquid portion of the paint.

If the tolerance limit of PMO were determined and expressed on the basis of weight of PMO per gallon of non-volatile paint vehicle the limit could be applied to a wide variety of paint products with greater safety and significance.

Of course, weight of PMO per gallon of non-volatile liquids is not the only factor involved in the toxicity of paints treated with PMO. We have listed below the possibilities which occur to us. From your experience, you may be able to add to the list.

Other factors which may affect the toxicity of a given concentration of P.M.O. in a paint vehicle:

1. The type of vehicle: oleoresinous, alkyd, synthetic polymers, emulsions, etc.
2. The rate of dry: PMO bound in a dry film is probably less likely to cause dermatitis than when the PMO solution is still wet.
3. Quantity and type of solvent: Some solvents may increase the rate of absorption of PMO.
4. Amount and type of pigment: Pigment would be expected to slow the rate of diffusion of the PMO from the paint to the skin.
5. Relative solubility of PMO in the paint vehicle and in human tissue.
6. Synergistic effect of other ingredients in the paint.

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We believe that the effect of these factors is probably less in magnitude than the actual concentration of PMO in the non-volatile liquid and, unless you have contrary evidence, we would be willing to omit them in a study of the problem.

For the tests we can supply you with several types of vehicle containing a reasonable percentage of solvent but no drier thus avoiding whatever mitigating effect there might be from fast dry or pigment in the film. This procedure would give us results with a slight margin of safety.

Can you arrange a meeting to discuss with us the design and cost of a program to put us on a sound footing with respect to the use of PMO in our paints? If a generally applicable tolerance limit, along the lines we have suggested, cannot be set, will you make us a cost estimate on testing six different products (with controls for each) on a per product basis so that we may consider the economics of increasing or decreasing the list?

As an initial step we have enclosed a table showing the concentration of PMO per gallon of non-volatile liquid of the products we are concerned about and of those paints tested for MR-132.

In case more information is needed, call the writer, Howard 5-3000, Ext. 309.

SALES DEVELOPMENT

W. J. MC CONEGHEY

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PMO CONCENTRATION OF VARIOUS PAINTS

<u>Code</u>	<u>Name</u>	<u>% PMO by wt.</u>	<u>Lbs PMO per gallon of non- volatile liquid</u>	<u>Type of Vehicle</u>
P-100-P-13217	*Cement & Stucco Paint	0.5%	0.208	Alkyd resin emulsion
<u>P-100-P-19855</u>	*	0.5%	0.214	" "
301-918	Outside White House Paint	0.05%	0.013	linseed oil
Exptl A	" "	0.5%	0.134	" "
301-898	Two Purpose "	0.075%	0.020	" "
87-894	Trim & Shutter White	0.20	0.047	Alkyd resin
Exptl B	" "	0.50	0.117	" "
Exptl C	**" "	0.15	0.035	" "
387-301	***Cement & Stucco Paint	0.02	0.010	Polyvinyl acetate emulsion

*These two paints and their mercury free controls were tested in MR-132. They contain about 0.045 lbs of sodium fluoride per gallon of paint. In the water phase the concentration of NaF was about 0.090 lbs. per gallon. This may help to account for the slight skin irritation caused by the control paints in this test. Possible synergistic effect with PMO.

**This paint contains 0.026 lbs of Dovicide #6, per gallon of non-volatile liquid in addition to the PMO.

***This paint contains 0.857# of tricresyl phosphate per gallon of non-volatile liquid. Note also that this paint dries in about one hour.