cc: W. W. Miller
Fabrics & Finishes Dept.

October 18, 1971

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D 7010

TOXICITY OF LEAD IN INTERIOR PAINT

The enclosed information has been assembled in reply to your request to C. F. Reinhardt for toxicity information pertinent to the possible lowering of the current 1% limit for lead in interior paints.

There is evidence that relatively insoluble lead oxide has a lower oral toxicity than more soluble lead compounds such as lead acetate and lead nitrate. Haskell Laboratory experiments indicate the following oral $LD_{50}$'s for male rats:

| Compound | $LD_{50}$ mg/kg as Pb | Haskell Report Number |
|---|---|---|
| Lead Nitrate | 3130 | 105-60 |
| Lead Acetate Trihydrate | 5023 | 47-66 |
| Lead Oxide | 23200 | 104-66 |

A study by Georg Tartler (1941) reports the smallest lethal single dose of a series of lead compounds fed by mouth to guinea pigs. A lethal dose of 500 mg/kg body weight was obtained for lead nitrate while the value obtained for red lead (lead oxide) was twice this amount. (Letter from J. F. Morgan to P. D. Graham dated May 29, 1962).

No information was found on the chronic toxicity of lead oxide or lead chromate however, Hazleton Laboratories have conducted a series of studies on orally administered lead acetate which included two-year oral toxicity studies (rats, dogs, and monkeys), reproduction, teratology, carcinogenicity, behavioral, and metabolic studies. (Toxicity of Orally-Administered Lead, Program Summary, Hazleton Laboratory June 26, 1970). The conclusion of these studies is that 10 ppm of lead in the diet was a "no-effect" level while minimal, equivocal effects were apparent in some animals at 50 ppm.

On the basis of the Hazleton studies it is possible to calculate the amount of paint which would have to be eaten to constitute an equivalent dose of lead.

Average Food intake for Rat = 25 gm/day

10 ppm Pb in diet = .0025 gm Pb/day = No effect level

50 ppm Pb in diet = .0125 gm Pb/day = Minimal effect

A rat could eat .25 gm/day of paint containing 1% lead and remain at the no effect level while the ingestion of 1.25 gm/day would equal the minimal effect level. These values are based on data for rats and are considerably higher than values reported in the literature as safe for humans. Kehoe, in the Harben Lectures 1960, states that a "safe daily intake of lead is <0.5 mg."

Lehman has done some calculations for the amount of lead paint a child might eat safely based on Kehoe's data for adult ingestion of lead. He concludes that "0.3% lead or less could safely be labeled as nontoxic relative to lead" (Quart. Bull., A. Food & Drug Officials U.S. 20:36, 1956).

In an article on exposure of children to lead (Pediatrics 18:943-57, 1956) Chisolm reported finding no case of lead intoxication where the only source of lead contained less than 1% of lead in the dried paint surface. He considered however, that the accumulation of many layers of paints containing as little as 1% of lead could constitute a hazard to small children in the future. I spoke to Dr. Chisolm by phone to determine if he had more recent information on this subject. It seems that his early work was based on a blood lead level of 0.08 mg/100 gm as evidence of lead intoxication while now this value would be revised downward to about 0.06-0.08 mg/100 gm. Therefore, he thought that the permissible level of lead in interior paint should be lower than 1%.

According to Tyler (J. Env. Health 33:66, 1970) the limit of lead in interior paint was set at 1% in 1964 by the American Standards Association because of the belief that lead ingested in lesser amounts would be excreted and not stored by the body.

It is my understanding from a discussion with W. W. Miller that Du Pont's interest in the question of lead level in interior paint stems from problems in quality control if the limit is set lower rather than from the intentional use of lead in the paint formulations.

It would seem advisable to keep the lead level in interior paints as low as possible to minimize this source of lead exposure in children. No direct experimental data was found on the chronic oral toxicity of low

levels of the less soluble lead compounds likely to be found in paints. Therefore, if setting the lead limits in interior paint below 1% poses a serious quality control problem it may be advisable to conduct some chronic oral toxicity studies on the specific compounds of interest.

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Enclosures (3)

1. Letter P. D. Graham from J. F. Morgan dated May 29, 1962 (Lead Poisoning).

2. Lehman, A. J. "Lead in Decorative Paint for Children's Toys and Furniture." Quart. Bull., A. Food & Drug Officials U.S., 20:39, 1956.

3. Chisolm, J. J., Jr. "Exposure of Children to Lead." Pediatrics 18:943-957, 1956.