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RANGE FINDING TESTS ON METHYLTRIMETHOXYSILANE		
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Report 26-10

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MELLON INSTITUTE

Special Report

Range Finding Tests on Methyl TrimethoxysilaneUnion Carbide Chemicals Co., U.C.C.Industrial Fellowship 274-26SummaryStomach Intubation, rat - LD₅₀ = 12.3 ml./kg.Skin Penetration, rabbit - LD₅₀ > 10 ml./kg.

Inhalation, rat -

Concentrated vapor generated at approx. 17°C.

8 hours killed 5 of 6 (approx. 22,500 ppm.)

4 hours killed 3 of 6 (approx. 27,000 ppm.)

2 hours killed 1 of 6 (approx. 22,000 ppm.)

Metered Concentrations - 4 Hours

24,000 ppm. killed 0 of 6

26,000 ppm. killed 0 of 6

Uncovered Skin Irritation, rabbit - minor, Grade 3

Eye Injury, rabbit - trace, Grade 2.

Methyl trimethoxysilane has slight acute toxicity when administered by either the peroral or the skin penetration route. Rabbit skin and eyes are irritated to only a minor degree by contact with the undiluted material. Some hazard exists by the inhalation route because 50% mortality among rats resulted from 4-hour inhalation periods in a conc. vapor atmosphere generated at room temperature. However, in metered concentrations, no mortality occurred after 4-hour periods in 24,000 ppm. and 26,000 ppm. which is very near saturation. These inhalation results have been verified on a second sample.

The following table summarizes acute toxicity data for 6 trimethoxysilane compounds that have been studied earlier this year by this laboratory for the Silicones Division. Methanol is also included for comparison purposes.

<u>Material</u>	<u>Peroral</u> <u>LD₅₀</u> <u>ml./kg.</u>	<u>Skin Pene-</u> <u>tration LD₅₀</u> <u>ml./kg.</u>	<u>Inhalation</u> <u>of Concen-</u> <u>trated Vapor</u>	<u>Uncovered</u> <u>Skin</u> <u>Irritation</u>	<u>Eye</u> <u>Injury</u>	<u>Report</u> <u>Number</u>
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<u>Material</u>	<u>Peroral LD₅₀ Ml./kg.</u>	<u>Skin Penetration LD₅₀ Ml./kg.</u>	<u>Inhalation of Concentrated Vapor</u>	<u>Uncovered Skin Irritation</u>	<u>Eye Injury</u>	<u>Report Number</u>
Epoxy Cyclohexyl-ethyl Tri-methoxysilane	12.3	6.30	8 hrs. killed 0/6	Minor	None	25-51
Methyl Tri-methoxysilane	12.3	>10	8 hrs. killed 5/6; 4 hrs. killed 3/6; 2 hrs. killed 1/6 (approx. 25,000 ppm.)	Minor	Trace	This Report (26-10)
Methanol	15.4	20.0	8 hrs. killed 5/6; 4 hrs. killed 0/6	None	Minor	14-68 19-132

Sample

On October 16, 1962, one quart of methyl trimethoxysilane (Lot No. 294101 662) was received from Sistersville, West Virginia for toxicological evaluation as requested by R. C. Maier, Silicones Division, Long Reach Plant.

Single Peroral Doses

Methyl trimethoxysilane has an acute LD₅₀ of 12.3 (9.98 to 15.3) ml./kg. when administered undiluted by stomach intubation to male albino rats.

Carworth Farms-Elies nonfasted rats, 5 to 6 weeks of age and 90-120 grams in weight were dosed at levels differing by a factor of 2.0 in a geometric series. The rats were reared in our own colony and maintained from time of weaning on Rockland rat diet (complete). The method of moving average for calculating the median-effective dose (LD₅₀) was applied to the 14-day mortality data.

The animals were sluggish and unsteady in gait soon after dosing. Most deaths occurred within the next several hours. At autopsy, gross examination revealed congested lungs, mottled livers with prominent acini, and some hemorrhage and congestion of the gastrointestinal tract.

Skin Penetration

In the skin penetration test, a group of 4 rabbits survived a dosage level of 10 ml./kg. applied undiluted. Little skin irritation was observed but some desquamation was found after 14 days. Two of the 4 animals lost weight (24 and 112 grams) during the 2-week observation period.

Male albino New Zealand strain rabbits, 3 to 5 months of age and averaging 2.5 kg. in weight were immobilized during the 24-hour skin contact period. Thereafter, the VINYLITE or polyethylene sheeting used to retain the dose in contact with the clipped skin of the trunk was removed and the animals were caged for the remainder of the 14-day observation period. The rabbits were procured locally and maintained on Rockland rabbit ration.

Inhalation

Concentrated Vapor Generated at Room Temperature

Concentrated vapor, generated at a bubbler temperature of approximately 17°C. by passing dried air at the rate of 2.5 liters/minute through a fritted glass disc immersed to a depth of at least one inch in 50 ml. of methyl trimethoxysilane, produced the following results among groups of CFE, female albino rats:

8 hours killed 5 of 6, approx. 22,500 ppm. (128 mg./l.)
4 hours killed 3 of 6, approx. 27,000 ppm. (150 mg./l.)
2 hours killed 1 of 6, approx. 22,000 ppm. (121 mg./l.)

All animals appeared to be anesthetized when removed from the 9-liter inhalation chambers and most deaths occurred within the ensuing 24-hour period. However, several animals had died before termination of the inhalation periods. At autopsy, the victims had diffuse hemorrhage of the lungs. Most of the survivors gained weight during the subsequent 2-week observation period and had no gross pathology evident at sacrifice on the 14th day.

Metered Concentrations

Metered concentrations of either 25,000 ppm. or 24,000 ppm. caused no mortality among groups of female rats after 4-hour inhalation periods. The animals appeared to be anesthetized when removed from the chambers but most gained weight (at a subnormal rate) during the ensuing 2-week observation period. Little gross pathology was found at sacrifice on the 14th day.

These concentrations are very near to saturation for this silane.

24-Hour Irritation Tests

Uncovered application of 0.01 ml. amounts of methyl trimethoxysilane to the clipped skin of the rabbit belly caused moderate erythema on one animal and from moderate to marked capillary injection on 4 others. Grade 3 in our ten-grade rating system.

One rabbit eye was unharmed and 4 others had traces of diffuse corneal necrosis following instillation of an excess (0.5 ml.) of the undiluted chemical. Grade 2 in our ten-grade rating system.


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Acknowledgments
Skin Penetration, Irritation Tests

Inhalation Studies

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Typed: February 20, 1963 - md

Table 26-28

Methyl Trimethoxysilane (25-223)

Single Doses to Male Albino Rats Fed Undiluted by Stomach Tube

Rat Number	1962 Date Dosed	Grams Weight	Weight Change in 14 Days	Dosage; ML. Per Kilo	Dose in ML.	Days to Death
65231	10-23	114	-	16.0	1.8	0
65322	10-23	119	-	16.0	1.9	0
65323	10-23	120	-	16.0	1.9	0
65325	10-23	118	-	16.0	1.9	1
65234	10-23	118	+57	16.0	1.9	-
65338	10-23	114	+80	8.0	0.91	-
65329	10-23	109	+78	8.0	0.87	-
65324	10-23	99	+67	8.0	0.79	-
65328	10-23	112	+79	8.0	0.90	-
65327	10-23	102	+81	8.0	0.82	-

LD₅₀ = 12.3 (9.98 to 15.3) ml./kg.

Table 26-29

Methyl Trimethoxysilane (25-223)

Single Inhalation by Groups of Female Albino Rats of Concentrated Vapor Evolved at a Bubbler Temperature of Approximately 17°C.

Rat Number	Date and Duration of Inhalation	Conc. Mg./L.	Initial Weight Grams	Weight Change in 14 Days	Time to Death in Chamber	Days to Death
65994			132	-	-	1
65997	11-2-62	124.7	138	-	-	1
65998	8 Hours in	approx.	144	-	-	1
65999	9-Liter	22,421	148	-	-	1
65996	Chamber	ppm.	174	-	-	3
65993			148	+34	-	-
66059			156	-	50 mins.	0
66060	11-7-62	149.58	162	-	3 hrs., 10 mins.	0
66061	4 Hours in	approx.	162	-	3 hrs., 10 mins.	0
66057	9-Liter	26,898	150	+36	-	-
66058	Chamber	ppm.	148	+28	-	-
66062			149	+43	-	-
66255			180	-	1 hr., 20 mins.	0
66244	11-14-62	121	176	+25	-	-
66245	2 Hours in	approx.	162	+62	-	-
66246	9-Liter	21,755	156	+15	-	-
66247	Chamber	ppm.	142	- 5	-	-
66249			144	+23	-	-

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Table 26-30

Methyl Trimethoxysilane (25-223)

Single Inhalation by Groups of Female Albino Rats
of Metered Concentrations

<u>Rat Number</u>	<u>Date and Duration of Inhalation</u>	<u>Conc. PPM.</u>	<u>Initial Weight Grams</u>	<u>Weight Change in 14 Days</u>
66482			164	+ 6
66484	12-4-62		188	+14
66485	3 Hours, 45 Mins. in	26,000	174	+18
66488	9-Liter		168	-46
66496	Chamber		190	+18
66715			194	+23
66081			164	-10
66301	11-19-62		170	+23
66302	4 Hours in	24,000	156	+30
66303	9-Liter		161	+25
66304	Chamber		144	+33
66316			148	+26