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RABBIT EYE AND SKIN INJURY TESTING ON SEVEN SILICA COMPOUNDS		
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Silica Compounds

Eye and skin injury data upon 7 previously unstudied silica compounds are listed below, with some older data for comparison. In most cases where vapors produced injury noted as severe, some injury to the eye was evident without staining immediately.

	Eye Injury		Skin Injury (Rabbit belly vesicant test)
	Fluid Injury Grade	Vapor injury in <u>3 minutes exposure</u> PPM. Degree	
* Ethyl triethoxy silane	1	960 Minor	Erythema
* Phenyl triethoxy silane	1	600 Moderate	Erythema
Triethoxy silane	5	-	-
* Diethyl dichloro silane	8	919 Severe	Necrosis
* Amyl amino silane	9	418 Minor	Erythema
Silico chloroform	>5	900 Moderate	Erythema
Ethyl silicon trichloride	>5	1350 Moderate	Necrosis
Amyl silicon trichloride	>5	600 Severe	Necrosis
Dimethyl silicon dichloride	>5	950 Severe	Necrosis
Silicon tetrachloride	>5	720 Severe	Erythema
Silicon tetrafluoride	-	1180 Severe	-
* Phenyl trichloro silane	9	695 Severe	Necrosis
* Hexachlorodisilane	9	455 Severe	Erythema
* Diethoxy chlorosilane	9	650 Severe	Erythema

\* Previously unreported data

A recent accident with a silane has increased the interest in delayed or progressive eye burns, which are symptom-free shortly after the exposure but are severe by the next day. The classical example is the S. Charleston experience with methyl silicate, but we have no protocols of animal experiments which establish the existence of the phenomenon beyond question. In an attempt to remedy this lack rabbit eyes were exposed to known concentrations of methyl silicate vapors, using an eye cup applicator. Two eyes were used for each exposure time at each concentration. To define the conditions for a delayed burn precisely a greater number of eyes would be required. The results are tabulated below. To avoid any removal of injurant by extraneous fluids the eyes were not stained with fluorescein until three hours after the exposure.

PPM. Vapor	Minutes Exposed	Immediate Unstained Result	Percentage of Cornea Staining After			
			3 hr.	24 hr.	48 hr.	7 day
10,000	3	Congestion	60	60-90*	30-90*	scar
	5	Congestion	60	60-70*	10-50*	scar
1,000	3	Normal	1-2	20-30	5-20	2-5
	5	Normal	1-2	25-30	5-15	1-5
750	5	Normal	1-3	15-25	20-25	0-10
	10	Normal	1-5	20-25	20-25	scar
500	5	Normal	0-1	2-5	2	1
	10	Normal	1-3	20-60	20	1

\* Extreme congestion within the eye ball

A concentration of 10,000 ppm. for 3 minutes produces immediate congestion, a considerable area of fluorescein staining in 3 hours, a more severe injury involving the interior of the eye in 24 hours, and a permanent corneal scar in a week. Such an exposure in a human would undoubtedly be painful at once and would demand first aid treatment.

The rabbit results indicate the probability that exposures to 1000 ppm. for 5 minutes would not be made evident by any pain but that in 3 hours a small area of corneal staining would be evident and by the next day appreciable staining and probably pain would result.

In only one eye did we obtain no staining whatever in 3 hours, and that eye never did take stain over any great area. In view of the known difference in healing rate between rabbit and human eyes, and uncertainties about their respective sensitivities, we cannot apply these results in a strict quantitative sense to humans. However, we have established the existence of delayed burns from methyl silicate and hence have justified the histories of three human injuries known to us. In these the men were conscious of no injury when they left work, but felt increasing pain during the evening.

We are uncertain how many chemicals are capable of producing severe eye injury after a symptom-free period. From time to time more work will be done upon the question.

The question has been raised as to whether the presence of hydrolyzable chlorine compounds may not account for the eye injury produced by methyl silicate. Our reference sample of this ester was received from Charleston in December 1937. It has been redistilled at least twice since that time. Boiling in the presence of 1% aqueous sodium hydroxide produced chloride equivalent to 0.11% combined chlorine, or 0.13% of silicon tetrachloride in the sample. We judge this amount of impurity is inadequate to account for the injury produced in animal eyes by the sample.