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SPECIAL REPORT

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Skin Absorption and Irritation of Sodium Phenate

Tables of Protocols Attached

Carbide and Carbon Chemicals Corporation Industrial Fellowship 274-11

AUG 3 REC'D

Summary

A sample of sodium phenate procured on the open market was compared with phenol in its effects on rabbits by skin absorption. The sample was equivalent to 42.6% phenol compared to a theoretical of 81.0%. The LD_{50} for rabbits by skin absorption was found to be 2.35 gm./kg. of the sample received, or 1.00 gm./k in terms of contained phenol. The similar LD_{50} for pure phenol was found to be 0.63 gm./kg. Although the difference in skin absorption between phenol and its sodium salt is thus revealed to be appreciable, yet it is judged that the difference is for practical purposes so slight that sodium phenate must be handled with all the precautions demanded for safe handling of phenol.

Irritation and eye injury tests on rabbits demonstrate that these hazards of sodium phenate are similar and equivalent to those of phenol. The eyes must be protected from contact and contaminated skin must be washed promptly to prevent severe burns.

Inhalation of sodium phenate in the dry form was not investigated but it is obvious that this exposure must be prevented to avoid severe local injury to the nasal mucosae.

Sample

The sodium phenate was purchased from Boder Scientific Company of Pittsburgh under their label on 10-1-47. No identification accompanied the sample.

Our analysis of this compound reveals it to be of 57% purity. The theoretical phenol content is 81.06% and 42.6% phenol was found by analysis.

The phenol used for comparison was a Merck product (S-7457).

CONTAINS NO CBI

Single Oral Doses

No single oral doses of this compound were administered to rats because the study was done to determine the irritative and skin penetration activity. of this compound.

However, the LD_{50} for phenol administered to rats by mouth as a 5% aqueous solution is 1.03 (0.94 to 1.12) gm./kg. It is anticipated that the toxicity of sodium phenate would be proportional to the phenol content of the phenate sample being used. For this particular sample, we would estimate an oral toxicity about 1/2 that of phenol.

Skin Penetration

The LD_{50} for sodium phenate applied to the clipped trunk of the rabbit as a 50% solution in water, under "Vinylite" sheeting for 24 hours is 2.35 (1.88 to 2.94) gm./kg. This value is based upon a 14 day observation period of the animals used. Sodium phenate, like phenol, burns the skin quite severely. Marked erythema, hemorrhage, edema and necrosis of the skin resulted from these doses. The kidneys, liver, intestine and occasionally the lungs showed signs of damage upon autopsy.

A similar test with 10% aqueous dispersion of phenol resulted in an LD_{50} of 0.63 (0.565 to 0.701) gm./kg.

The relationship between phenol concentration of the sodium phenate and its toxicity as referred to phenol holds fairly well for skin application.

Irritation

A 10% solution of sodium phenate produced marked erythema, mild erythema, and marked capillary injection on 2, 1, and 2 rabbits respectively.

A 10% solution of phenol in acetone produced substantially the same reactions. Three rabbits had mild erythema an 2 markedcapillary injection.

A 15% aqueous solution of sodium phenate, applied in excess to rabbit eyes produced internal congestion, dense necrosis of the cornea, and injury to the conjunctiva. A 5% solution produced minimial injury.

Phenol, as a 15% solution in propylene glycol, produced reactions similar to that of 15% sodium phenate. With 5% solutions of phenol the injury produced was slightly more severe than comparable strength phenate. Both of these compounds are relegated to Grade 8, of which formaldehyde is representative. Workers should use caution when handling solutions of these compounds to prevent severe eye burns.

Charles P. Carpenter

SENIOR INDUSTRIAL FELLOW

Charles P. Carpenter

Typed: March 3, 1948 - mrc

Table 11-46

SODIUM PHENATE

Single Doses to Rabbits by Skin Absorption

Administered as a 50% Aqueous Solution under "Vinylite" dam for 24 hours

Rabbit No.	Date Clipped	Date Applied	Gm. Wt.	Weight Change in 14 Days	Dosage Ml. per Kilo	Dose in ml.	Days to Death
60969	10-16-47	10-16-47	2528	-	5.0	25.3	1
62061	"	"	2824	-	5.0	28.2	2
62062	"	"	2640	-	5.0	26.4	1
62063	"	"	2930	-	5.0	29.3	1
62064	"	"	2458	-	5.0	24.6	1
67881	11-20-47	11-20-47	2770	-	5.0	27.7	1
69013	2-12-48	2-12-48	2706	-	5.0	27.1	0
69014	"	"	2014	-	5.0	20.1	0
69015	2-12-48	2-13-48	2306	-	5.0	23.1	1
69016	"	"	2342	-	5.0	23.4	1
67967	2-2-48	2-2-48	2864	-	2.52	14.4	1
67969	"	"	2628	-	2.52	13.2	1
67972	"	"	2280	-	2.52	11.5	2
69006	2-11-48	2-21-48	2062	-	2.52	10.4	5
69001	2-12-48	"	2756	-	2.52	13.9	0
69012	"	"	2626	-	2.52	13.2	1
67968	2-2-48	2-2-48	2330	- 384	2.52	11.7	-
67970	"	"	2260	- 250	2.52	11.4	-
67971	"	"	2380	- 16	2.52	12.0	-
69005	2-11-48	2-12-48	2068	-	2.52	10.4	-
64253	11-20-47	11-20-47	3280	- 300	1.26	8.3	-
64255	"	"	2580	+ 250	1.26	6.5	-
64256	"	"	2564	- 230	1.26	6.5	-
64257	"	"	2624	+ 34	1.26	6.6	-
64259	"	"	2508	- 176	1.26	6.3	-
64260	2-11-48	2-12-48	2354	+ 16	1.26	6.7	-
68995	"	"	2256	- 31	1.26	5.7	-
68997	"	"	2920	- 04	1.26	7.4	-
68998	"	"	2194	- 95	1.26	5.5	-
69002	"	"	2426	+ 506	1.26	6.1	-
63675	11-6-47	11-6-47	2598	- 42	0.63	3.3	-
63676	"	"	2276	+ 42	0.63	2.9	-
63677	"	"	2912	- 72	0.63	3.7	-
63678	"	"	2406	+ 158	0.63	3.0	-
63679	"	"	2684	+ 460	0.63	3.4	-
63680	"	"	2604	+ 162	0.63	2.3	-
68921	2-11-48	2-12-48	2546	- 152	0.63	3.2	-
68928	"	"	2412	- 612	0.63	3.0	-
68933	"	"	2366	- 20	0.63	3.0	-
68994	"	"	2510	- 48	0.63	3.2	-

Table 11-47

PHENOL

Single Doses to Male Albino Rabbits by Skin Absorption

Administered as a 10% dispersion under "Vinylite" dam for 24 hrs.

Rabbit No.	Date Clipped	Date Applied	Gm. Wt.	Weight Change in 14 Days	Dosage; ml. per Kilo	Dose in ml.	Days to Death
66599	1-5-48	1-5-48	2474	-	1.0	24.7	0
66604	"	"	2248	-	1.0	22.5	0
64268	11-20-47	11-20-47	2976	-	1.0	29.8	7
64270	"	"	2836	-	1.0	28.4	1
64267	"	"	2470	- 276	1.0	27.5	-
66614	1-5-48	1-5-48	2026	-	0.795	16.1	0
66622	"	"	2182	-	0.795	17.3	0
66623	"	"	2244	-	0.795	17.8	1
666617	1-9-48	1-9-48	2938	-	0.795	23.4	0
66619	"	"	2190	-	0.795	25.4	0
67156	"	"	2120	-	0.795	16.8	0
67155	"	"	2200	-	0.795	17.5	0
67936	1-26-48	1-26-48	2164	-	0.795	17.2	0
67030	"	"	2452	-	0.795	19.5	0
67053	1-14-48	1-15-48	2144	-	0,63	13.5	1
67247	"	"	2112	- -	0.63	13.3	0
67257	"	"	2126	-	0.63	13.4	0
67275	1-20-48	1-20-48	2075	-	0.63	13.1	1
67256	1-14-48	1-15-48	1952	+ 284	0.63	12.3	-
67253	1-20-48	1-20-48	2416	- 206	0.63	15.2	-
67634	"	"	2604	- 294	0.63	16.4	-
67647	"	"	3192	- 322	0.63	20.1	-
67653	"	"	2224	- 234	0.63	14.0	-
67659	"	"	2468	- 216	0.63	15.5	-
67872	1-20-48	1-20-48	2388	-	0.50	11.9	5
67661	"	"	2328	- 128	0.50	11.6	-
67662	"	"	2270	+ 74	0.50	11.4	-
67870	1-20-48	1-20-48	2150	+ 140	0.50	10.8	-
67935	1-26-48	1-26-48	2038	- 138	0.50	10.2	-
65779	12-30-47	12-31-47	2710	+ 18	0.50	13.5	-
65780	12-31-47	12-31-47	2444	+ 60	0.50	12.2	-
65784	"	"	2550	+ 156	0.50	12.7	-
65803	"	"	2364	- 22	0.50	11.8	-
65814	"	"	2520	+ 204	0.50	12.6	-

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