

TABLE V.
Insensible Perspiration in Post-inflammatory Scaling.

Date	Name	Age	Sex	Region	I.P. in mg		Room temp., F°	Increase in scaling area	Remarks
					Normal area	Scaling area			
3-10-44	M.M.	19	F	Abdomen	19.5	44.8	77	2.3x	Measured 4 days after U.V.L. irradiation. No erythema. Moderate fine scaling.
4-31	S.R.	50	M	"	19.0	42.1	71	2.2x	Measured 9 days after U.V.L. irradiation. Lamellous scaling. Skin temp. of scaling area same as that of normal area.

insensible perspiration (Table IV). A marked increase is noted after the onset of scaling when the inflammation has subsided (Table V).

Conclusions. Hyperproduction of keratin in the epidermis causes an increase of insensi-

ble perspiration. It seems probable that physiologically, too, one part of the insensible perspiration is contributed by the keratinization process in consequence to the dehydration of Malpighian cells.

14625

Germicidal Potency and Tissue Toxicity of Surface Active Saline Mixture of Azochloramid.

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In previous communications^{1,2} results were reported on the germicidal efficiency of the organic chlorine compound Azochloramid. The germicide was tested for its effect on living embryonic chick heart tissue fragments cultivated *in vitro* as well as for its ability to kill the test organisms *Staphylococcus aureus* and *Eberthella typhosa*. The tissue fragments and bacteria were exposed separately to the germicidal dilutions for 10 minutes at 37°C in the presence of a standard amount of organic matter. The organic matter was composed

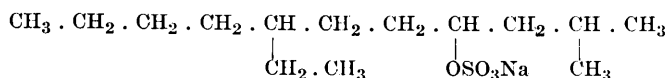
of a mixture of 3 parts embryonic extract and 1 part horse serum. A number known as the toxicity index was calculated which was defined as the highest dilution of germicide required to kill the tissue cells in 10 minutes to the highest dilution required to kill the test organisms in the same period of time under identical conditions. Theoretically, an index less than 1 means that the germicide is more toxic to the bacteria than to the embryonic chick heart tissue fragments; an index greater than 1 means that the germicide is more toxic to the tissue cells than to the bacteria.

Recently Azochloramid has been improved by the addition of sodium tetradecyl sulfate, a negatively charged (anionic) surface active or wetting agent. Chemically it is the sodium

¹ Salle, A. J., McOmie, W. A., Sheehmeister, I. L., and Foord, D. C., *J. Bact.*, 1939, **37**, 639.

² Salle, A. J., Sheehmeister, I. L., and McOmie, W. A., *Proc. Soc. Exp. Biol. and Med.*, 1940, **45**, 614.

salt of the sulfuric acid ester of the aliphatic alcohol, 2-methyl-7-ethylundecanol-4. Its structural formula is as follows:



Sodium 7-ethyl-2-methyl-undecyl-4 sulfate

Sodium tetradecyl sulfate is a transparent, colorless and odorless, waxy substance. A saturated aqueous solution of the compound has a surface tension of 30 dynes/cm as compared to 72 dynes/cm for pure water. The fact that sulfates are derivatives of much stronger acids than soaps explains why sodium tetradecyl sulfate is neutral and remains active in acidic and strong salt solutions where soaps cannot be used.

The combination of sodium tetradecyl sulfate with Azochloramid produces a solution that gives greater penetration into recesses and crypts of infected tissue and clumps of bacteria. The wetting agent is effective in establishing close contact between Azochloramid and bacteria.

It was considered of great interest and importance to determine what effect the addition of the wetting agent would have on the germicidal potency and tissue toxicity of Azochloramid. The same method was employed as previously reported.³

Effect of Wetting Agent on Tissue. The wetting agent produced no inhibitory effect on the growth of embryonic chick heart tissue fragments when used in dilutions of from 1:500 to 1:2500 in a period of 10 minutes at 37°C and in the presence of a standard amount of organic matter. The most convenient and generally useful preparation recommended by

the manufacturer* is one that contains Azochloramid in a concentration of 1:3300 and sodium tetradecyl sulfate in a concentration

of 1:1000.

It may be concluded that the concentration of wetting agent present in such a preparation is insufficient to produce any tissue toxicity when applied clinically.

Effect of Azochloramid on Tissue and Bacteria. The highest dilution of Azochloramid with wetting agent that killed embryonic chick heart tissue at 37°C in the presence of a standard amount of organic matter was found to be 1:18,000. The highest dilution of Azochloramid with wetting agent that killed *Staphylococcus aureus* and *Eberthella typhosa* under the same conditions was 1:70,000 and 1:108,000 respectively. The results give toxicity indexes of 0.26 for *Staphylococcus aureus* and 0.17 for *Eberthella typhosa*. The toxicity indexes previously reported for Azochloramid without wetting agent were 0.3 for *Staphylococcus aureus* and 0.08 for *Eberthella typhosa*. The results are recorded in Table I.

Conclusions. The addition of sodium tetradecyl sulfate to Azochloramid increased the efficiency of the germicide for *Staphylococcus aureus* and decreased it for *Eberthella typhosa*. Since *Staphylococcus aureus* is likely to be the better test organism it may be concluded that the addition of wetter probably improved the germicidal efficiency of Azochloramid. Certainly the addition of wetter greatly improved Azochloramid by decreasing the concentration

TABLE I.
Effect of Sodium Tetradecyl Sulfate on Germicidal Efficiency of Azochloramid.

Highest killing dilution and toxicity index of Azochloramid without wetting agent				Highest killing dilution and toxicity index of Azochloramid with wetting agent			
Tissue (A)	<i>Staphylococcus aureus</i> (B)	<i>Eberthella typhosa</i> (B)	Toxicity index (A/B)	Tissue (A)	<i>Staphylococcus aureus</i> (B)	<i>Eberthella typhosa</i> (B)	Toxicity index (A/B)
1:7800	1:26,000		0.3	1:18,000	1:70,000		0.26
1:7800		1:101,000	0.08	1:18,000		1:108,000	0.17

³ See papers referred to above for method of performing the test.

* Wallace and Tiernan Products, Inc., Belleville, N.J.

TABLE II.
Effect of Germicides on Embryonic Chick Heart Tissue and Bacteria.
Highest killing dilution for tissue and bacteria and corresponding toxicity index.

<i>Staphylococcus aureus</i>				<i>Eberthella typhosa</i>			
Germicide	Tissue (A)	Bacteria (B)	Toxicity index (A/B)	Germicide	Tissue (A)	Bacteria (B)	Toxicity index (A/B)
Halogens:				Halogens:			
Iodine	1:650	1:3,520	0.2	Azochloramid	1:18,000	1:108,000	0.17
Azochloramid	1:18,000	1:70,000	0.26	Iodine	1:650	1:3,370	0.20
Chloramine	1:900	1:2,000	0.45	Chloramine	1:900	1:2,000	0.45
Phenols:				Silver compounds:			
Hexylresorcinol	1:1,450	1:1,620	0.9	Silver lactate	1:100	1:690	0.15
P-hydroxyphenyl-n-amyl sulfide	1:2,800	1:2,700	1.0	" citrate	1:610	1:4,500	0.14
O-n-hexylphenol	1:3,125	1:2,900	1.1	" nitrate	1:140	1:1,250	0.11
P-hydroxy-diphenyl sulfide	1:3,125	1:2,500	1.3	" protein strong	1:25	1:175	0.14
Amphyl	1:350	1:300	1.15	Silver protein mild	1:30	1:70	0.43
Phenol	1:224	1:110	2.0	Silver pierate	1:250	1:350	0.71
Silver compounds:				Phenols:			
Silver lactate	1:100	1:110	0.9	Hexylresorcinol	1:1,450	1:1,770	0.8
" citrate	1:610	1:600	1.0	P-hydroxyphenyl-n-amyl sulfide	1:2,800	1:2,700	1.0
" pierate	1:250	1:225	1.1	O-n-hexylphenol	1:3,125	1:2,800	1.1
" nitrate	1:140	1:80	1.8	P-hydroxy-diphenyl sulfide	1:3,125	1:3,125	1.0
" protein strong	1:25	1:15	1.7	Amphyl	1:350	1:300	1.15
Silver protein mild	1:30	1:12*	2.5+	Phenol	1:224	1:186	1.2
Mercurials:				Mercurials:			
Metaphen	1:2,070	1:1,370	1.5	Metaphen	1:2,070	1:5,660	0.4
Mercurochrome	1:90	1:12½*	7.2+	Mercurochrome	1:90	1:140	0.6
Merthiolate	1:4,220	1:25*	169.0+	Merthiolate	1:4,220	1:2,660	1.6
Dyes:				Dyes:			
Brilliant green	1:33,600	1:5,500	6.0	Brilliant green	1:33,600	1:208	161.0
Crystal violet	1:60,800	1:2,800	21.8	Crystal violet	1:60,800	*	—
Methyl " B	1:25,000	1:1,200	20.8	Methyl " B	1:25,000	*	—
" " 6B	1:25,000	1:1,150	21.4	" " 6B	1:25,000	*	—
Methylene blue	1:7,000	*	—	Methylene blue	1:7,000	*	—
Proflavine	1:3,200	*	—	Proflavine	1:3,200	*	—
Acridine base	1:3,000	*	—	Acridine base	1:3,000	*	—
" HCl	1:2,700	*	—	" HCl	1:2,700	*	—

* Failed to kill.

required to produce the same effect as germicide without wetter. This results in a considerably more potent and economical preparation.

For purposes of comparison all germicides tested to date are included in Table II. The halogens gave the lowest toxicity indexes when

tested against both *Staphylococcus aureus* (Gram positive) and *Eberthella typhosa* (Gram negative). Since *Staphylococcus aureus* is likely to be the better test organism the halogens were followed by the phenols, the silver compounds, the mercurials, and lastly the dyes in the order named.