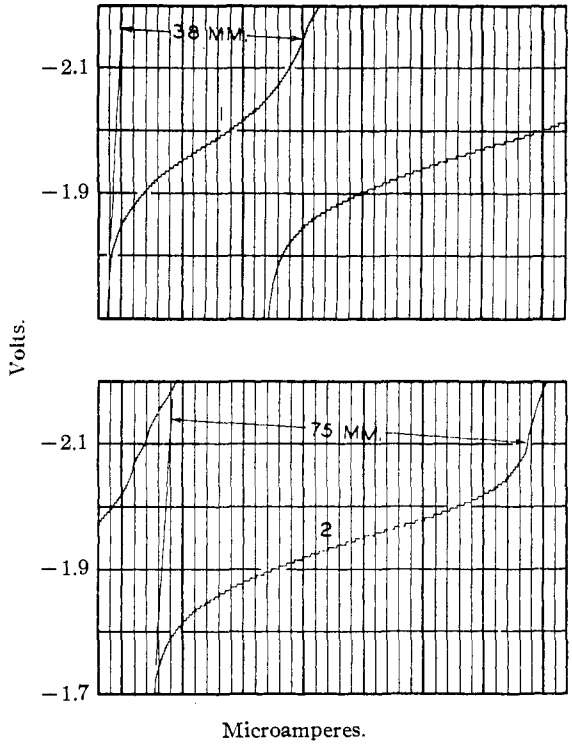

Fig. 2.—Heart poisons polarographed in 0.5 cc. of isopropanol, 0.5 cc. of 0.2 *N* tetraethylammonium hydroxide and 1 cc. of water at sensitivity C. Curve 1: Digitoxin, 0.979 mg., molecular weight 764.95. Curve 2: Digitoxigenin, 0.975 mg., molecular weight 374.50.

For samples of some of the pure cardiotonic principles examined we are indebted to Professor R. P. Linstead, Dr. W. S. Johnson, and Mr. R. C. Jones.

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On the Nature of Haslewood's Hepatols

BY H. B. MACPHILLAMY

Considerable attention has recently been given to investigating the steroids found in various types of animal tissues. One of the most interesting is the report by Haslewood,[1] in which he described the isolation from ox liver of β-7-hydroxycholesterol and of two alcohols of possible steroid nature, the hepatols. I have applied his procedure to hog liver and have also been able to isolate β-7-hydroxycholesterol and the hepatol melting at 277–279°.

However, during the procedure several steps seemed to warrant closer investigation. It appeared unusual that dissolving in pyridine and precipitation with ether according to Schoenheimer[2] should not be sufficient to split the hepatol digitonide, while boiling xylene was effective. The digitonin residue after this xylene extraction showed considerable charring, indicating that possibly the hepatol might be a decomposition product of digitonin.

In Haslewood's procedure the cholesterol present in the digitonide precipitate was removed by the addition of an excess of bromine. A separate experiment carried out with cholesterol digitonide showed that it was not possible to remove all of the cholesterol by this procedure. More important yet, the digitonides treated with bromine showed a positive Beilstein test in spite of several washings with ether, indicating the possible presence of cholesterol dibromide. In order to study the effect of this impurity on digitonin, a mixture of 1 g. of digitonin (Hoffmann–La Roche) and 100 mg. of cholesterol dibromide was heated in boiling xylene. On working up the xylene solution about 200 mg. of a compound melting at 278–279° was obtained. Acetylation with acetic anhydride in pyridine solution yielded a diacetate with a melting point of 227–228°. The substance seemed to be identical with the hepatol obtained from liver and gave the same analysis as that reported by Haslewood for one of his hepatols.

Digitogenin would seem to be the most likely digitonin decomposition product present. The melting point of the pure hepatol given by Haslewood, 284–285°, corresponds quite closely with that given for purified digitogenin, 280–283°. Digitogenin forms a triacetate melting at 190° obtained by acetylation with boiling acetic anhydride and sodium acetate. A sample of digitogenin, prepared by the acid hydrolysis of digitonin, was acetylated by heating with acetic anhydride in pyridine solution. A diacetate with a melting point of 231–233° and identical with "hepatol acetate" was obtained. It is possible to form either a diacetate or a triacetate from digitogenin depending upon the acetylation conditions.

The analytical data given below are quite consistent with those for digitogenin considering that it was obtained from an impure digitonin.

Anal. Calcd. for digitogenin, $C_{27}H_{44}O_3$: C, 72.28; H, 9.89. Found by Haslewood for hepatol: C, 71.8, 71.2; H, 9.7, 9.9. Found in this work for hepatol: C, 71.7, 71.8; H, 9.9, 9.8. Calcd. for digitogenin diacetate,

(1) Haslewood, *Biochem. J.*, **33**, 709 (1933).

(2) Schoenheimer and Dam, *Z. physiol. Chem.*, **215**, 59 (1933).

$C_{31}H_{48}O_7$: C, 69.89; H, 9.08; CH_3CO, 16.12. Found by Haslewood for hepatol diacetate: C, 71.2; H, 9.2. Found in this work for hepatol diacetate: C, 70.1, 70.2; H, 9.1, 9.2. Found for digitogenin diacetate: CH_3CO, 16.25.

In view of the evidence presented above it is suggested that the hepatols are decomposition products of digitonin. No further work has been done to determine the nature of the second hepatol, which has the properties of a more contaminated digitogenin. There also seems to be room for some doubt whether 7-hydroxycholesterol is a natural constituent of liver, or rather an autoxidation product of cholesterol.

I wish to thank Dr. E. Fernholz for his interest and advice during this investigation.

THE SQUIBB INSTITUTE FOR MEDICAL RESEARCH
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Preparation of "Siliconoyl Alcohol"

BY EDMUND L. NIEDZIELSKI

In the course of an investigation it was found necessary to have larger amounts of pure "siliconoyl alcohol" at our disposal. The literature reports only one vague and cumbersome description[1] for its preparation which does not contain either the analysis of the substance in question or data on yields. In order to justify the continued inclusion of this compound in the literature, the following procedure for its successful preparation may be suggested.

As starting material tetraethylsilane[2] was used which was transformed into triethyl-chloroethyl-monosilane according to Friedel and Crafts. Ten grams of the chloro compound was refluxed for three hours with 5 g. of fused potassium acetate and 1.5 g. of acetic acid. The reaction product was poured into excess of water, separated, dried and submitted to fractionation, yielding 3.2 g. of a fraction boiling between 208 and 214° which consisted of triethyl-acetoxyethyl-monosilane (yield 28%). Three and two-tenths grams of triethyl-acetoxyethyl-monosilane was refluxed with 10 cc. of a 22% solution of alcoholic potassium hydroxide. After three hours the product was transferred into excess of water and the isolation procedure given above for the acetate was applied. One and two-tenths grams of siliconoyl alcohol (b. p. 190° (uncor.)) was obtained amounting to a yield of 48%. Calcd. for $C_8H_{20}OSi$: C, 60.00; H, 12.50. Found: C, 58.26; H, 11.72.

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(1) C. Friedel and J. M. Crafts, *Ann.*, **138**, 19 (1866).
(2) S. Sugden and H. Wilkins, *J. Chem. Soc.*, 128 (1931).

Effect of Aging Cottonseed Meal on the Solubility of the Proteins

BY H. S. OLCOTT AND T. D. FONTAINE

A sample of ethyl ether-extracted cottonseed meal[1] was stored in a closed glass container at room temperature (75–92°F.). At three to five week intervals separate portions were extracted with water and 0.5 *N* sodium chloride solution according to the method previously described[2] for determining relative protein solubilities. Over a period of fifteen months, during which the meal, originally light yellow, acquired a brownish cast, there were no significant changes in solubility. The average percentage of the total nitrogen soluble in water was 26.5 ± 0.3; that soluble in 0.5 *N* sodium chloride solution was 79.1 ± 0.4. These findings are in marked contrast to the decrease in solubility described for the proteins of soy bean meal during storage.[3,4]

(1) The meal used contained 9.8% H_2O, 9.15% N (dry basis), and 1.9% residual oil (by chloroform extraction).
(2) H. S. Olcott and T. D. Fontaine, THIS JOURNAL, **61**, 2037 (1939); **62**, 1334 (1940).
(3) D. B. Jones and C. E. F. Gersdorff, *ibid.*, **60**, 723 (1938).
(4) A. K. Smith and S. J. Circle, *Ind. Eng. Chem.*, **30**, 1414 (1938).

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Note on the Heats of Dilution of Amino Acids

BY JULIAN M. STURTEVANT

Doehlemann and Lange[1] have pointed out that appreciable heat effects arising from disturbance of the water equilibrium may be encountered at very low concentrations in the dilution of various types of electrolytes. It is important to note that analogous effects should be encountered with amphoteric electrolytes, particularly amino acids.

An aliphatic amino acid at its isoelectric point in aqueous solution is almost entirely in the form of zwitter ions, $Z^{\pm}$. In the case of glycine, for example, only about 0.04% is present as positive and negative amino acid ions.[2] A solution of a pure amino acid in pure water is in general not isoelectric, though it becomes very nearly so at sufficiently high concentrations. At infinite dilution the solution is necessarily at *p*H 7, so that in the dilution of a concentrated solution,

(1) Doehlemann and Lange, *Z. physik. Chem.*, **170**, 391 (1934).
(2) Edsall and Blanchard [THIS JOURNAL, **55**, 2337 (1933)] have shown that an entirely negligible fraction of the amino acid is in the form NH_2RCOOH.