

aufteilen. Einzig bei den Gemischen 7, 8 und 9 überlappten sich einzelne Zonen teilweise. Die übrigen Trennungen verliefen vollständig.

*Laboratorium der Interkantonalen Kontrollstelle für Heilmittel,
Bern (Schweiz)*

M. SAHLI
M. OESCH

¹ M. SAHLI UND M. HUBER, *Sci. Pharm.*, 27 (1959) 271.

² E. STAHL, *Pharmazie*, 11 (1956) 633; *Chemiker-Ztg.*, 82 (1958) 323; *Pharm. Rundschau*, 2 (1959) 1.

³ G. MACHATA, *Mikrochim. Acta*, (1960) 79.

⁴ J. BÄUMLER UND S. RIPPSTEIN, *Pharm. Acta Helv.*, 36 (1961) 382.

⁵ M. FRAHM, A. GOTTESLEBEN UND K. SOEHRING, *Arzneimittel-Forsch.*, 11 (1961) 1008.

⁶ H. EBERHARDT, K. J. FREUNDT UND J. W. LANGBEIN, *Arzneimittel-Forsch.*, 12 (1962) 1087.

⁸ G. MACHATA UND W. KISSER, *Arch. Toxikol.*, 19 (1962) 327.

⁷ J. REISCH, H. BORNFLETH UND J. RHEINBAY, *Pharm. Ztg., Ver. Apotheker-Ztg.*, (1963) 1182.

⁹ H. P. KLÖCKING, *Arch. Toxikol.*, 19 (1961) 79.

Eingegangen den 21. November 1963

J. Chromatog., 14 (1964) 526-529

A method for the isolation of mono- and di-hydric alcohols from complex mixtures

In natural and synthetic mixtures, long chain saturated mono- and di-hydric alcohols are usually found associated with other classes of compounds of comparable polarity. Consequently, methods for the isolation of gram-amounts of these substances by column chromatography are time consuming and often require the use of elaborate equipment. In contrast, fatty alcohols are more conveniently separated from complex mixtures as their nitrate derivatives.

Nitrate derivatives of saturated alcohols may be rapidly prepared at room temperature by reaction of the hydroxyl group with acetyl nitrate¹. These derivatives are quantitatively denitrated to the parent hydroxy compounds by hydrogenation or by reduction with lithium aluminum hydride².

The nitrates, which are slightly more polar than the corresponding hydrocarbons, have little affinity for polar adsorbents (*e.g.*, silicic acid). They are, therefore, more readily separable from complex mixtures than are the alcohols. Acetyl nitrate also reacts with olefinic compounds to form relatively polar products that do not interfere with the chromatography of fatty nitrates³. Consequently, saturated alcohols are readily fractionated as their nitrates from all olefinic compounds.

In the present work, a simple and rapid method is reported for the isolation of gram-amounts of saturated mono- and di-hydric alcohols by chromatography of their nitrate derivatives. Mixtures containing the alcohols are dissolved in a solution of acetyl nitrate in acetic anhydride-acetic acid. The crude products of the reaction are then placed on a column of silicic acid, and the nitrates are eluted with petroleum hydrocarbons. After removal of the solvent, the nitrates are converted to the parent hydroxy compounds.

J. Chromatog., 14 (1964) 529-531

Specific example

A fraction of alcohols (*n*-octadecyl alcohol, 1,2-octadecanediol, and 1,10-decanediol) was isolated from a model mixture (Table I) that contained a variety of other polar compounds as well as 11-tricosene. The procedure was as follows: 21 ml (0.34 mole) of colorless nitric acid was added slowly to 294 ml of acetic anhydride. The temperature

TABLE I
MODEL MIXTURE CONTAINING MONO- AND DI-HYDRIC ALCOHOLS.

<i>Compound</i>	<i>% Composition</i>
<i>n</i> -Octadecyl alcohol	33.71
1,2-Octadecanediol	7.08
1,10-Decanediol	13.49
Monostearin	8.43
Dipalmitin	2.90
DL-9,10-Dihydroxystearic acid	7.42
Methyl 12-hydroxystearate	7.76
2-Hydroxystearic acid	3.03
11-Tricosene	3.37
Methyl palmitate	9.44
Azelaic acid	3.37

was maintained at 25° by use of an ice bath and by controlling the rate of addition of the nitric acid. The model mixture (15.0 g), dissolved in glacial acetic acid, was added over a period of 20 min to the acetyl nitrate solution. The reaction was allowed to continue for 30 min at 25°. It was then stopped by pouring the reaction mixture over 300 g of crushed ice. After hydrolysis was complete, the products were extracted with diethyl ether and the resulting solution was washed until neutral. The solution was then dried over anhydrous sodium sulfate and the crude product was obtained by evaporation of the solvent.

The crude product was then dissolved in 35 ml of petroleum hydrocarbons and the resulting solution was placed on a column that contained a 3:1 ratio of silicic acid (Mallinckrodt, chromatographic grade) to crude mixture. The nitrates (10.0 g) were then recovered by elution with 350 ml of petroleum hydrocarbons. Thin-layer chromatography (TLC)⁴ and infrared spectrometry⁵ indicated that the fraction was composed only of nitrate derivatives of the original alcohols (Fig. 1).

This fraction was further resolved into its components by column chromatography using a ratio of 10:1 silicic acid to nitrates. The *n*-octadecyl nitrate was obtained by elution with 160 ml of petroleum hydrocarbons. The two dinitrate derivatives were isolated together in one fraction by elution with a slightly more polar solvent system: petroleum hydrocarbons (30–60°)–diethyl ether (90:10). Complete separation of the 1,10-dinitrato-decane from the 1,2-dinitrato-octadecane was obtained by preparative TLC⁴.

The nitrate derivatives were dissolved in ethyl acetate and hydrogenated for 2 h at 2 atm over a platinum oxide catalyst. TLC of the hydrogenated products indicated complete denitration to the parent alcohols.

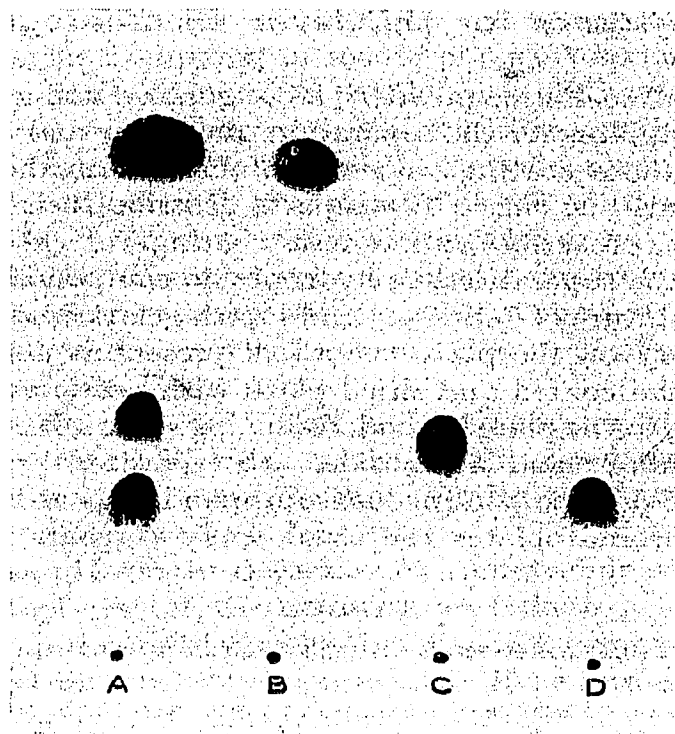


Fig. 1. Thin-layer chromatogram of fraction of nitrate derivatives of mono- and di-hydric alcohols obtained by column chromatography. (A)-Fraction of nitrates; (B) *n*-octadecyl nitrate; (C) 1,2-dinitrato-octadecane; (D) 1,10-dinitrato-decane. Adsorbent: Silica Gel G. Eluent: petroleum hydrocarbons (30-60°). Indicator: 50% sulfuric acid, charring.

Discussion

The method described has been successfully applied to the fractionation of gram-amounts of mono- and di-hydric alcohols from complex mixtures. In addition, it should be adaptable to the purification of polyhydroxy alcohols containing more than two hydroxyl groups on the hydrocarbon chain. Isomeric diols have been nitrated and denitrated without change in configuration². The present method, therefore, could be applied to the isolation of configurational isomers from natural and synthetic mixtures.

Bureau of Commercial Fisheries Technological Laboratory,
U.S. Fish and Wildlife Service,
Seattle, Wash. (U.S.A.)

JOHN C. WEKELL
CLIFFORD R. HOULE
DONALD C. MALINS

¹ D. C. MALINS, J. C. WEKELL AND C. R. HOULE, *J. Am. Oil Chemists' Soc.*, 41 (1964) 44.

² L. M. SOFFER, E. W. PARROTTA AND J. DIDOMENICO, *J. Am. Chem. Soc.*, 74 (1952) 5301.

³ D. C. MALINS AND C. R. HOULE, *J. Am. Oil Chemists' Soc.*, 40 (1963) 43.

⁴ H. K. MANGOLD, *J. Am. Oil Chemists' Soc.*, 38 (1961) 708.

⁵ D. C. MALINS, J. C. WEKELL AND C. R. HOULE, *Anal. Chem.*, 36 (1964) 658.

Received December 9th, 1963