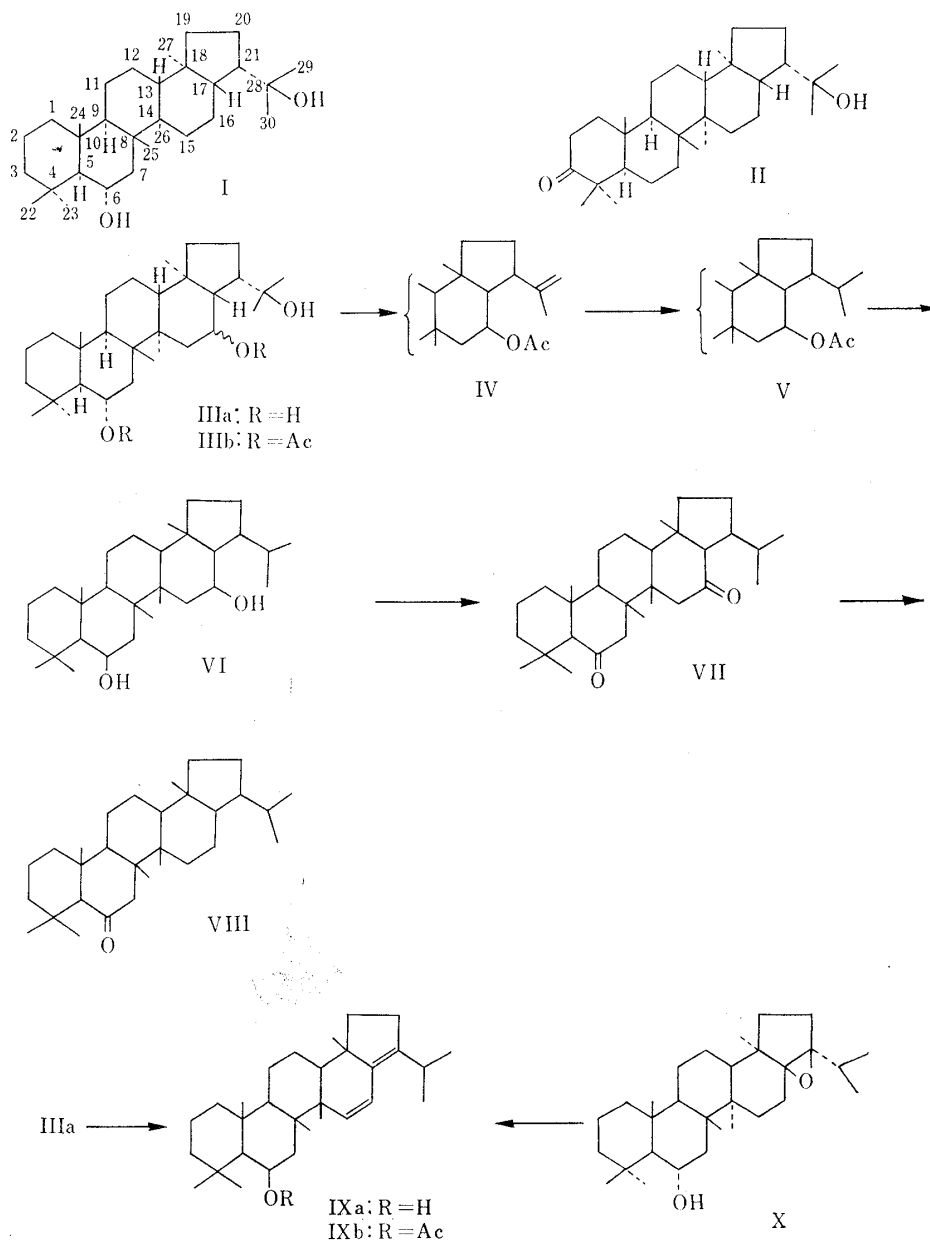


Structure of Leucotylin

Leucotylin, $C_{30}H_{52}O_3$, m.p. 333° ; $[\alpha]_D +48.4^\circ$, was first isolated by Asahina and Akagi¹⁾ from *Parmelia leucotyliza* NYL., along with zeorin and reported to have two secondary and one tertiary hydroxyls

In 1958, Barton, de Mayo and Orr²⁾ proposed the structure (I) to zeorin as a new type of triterpene.

Hydroxyhopanone, the second triterpene of this type was investigated by Fazakerley, Halsall and Jones³⁾ and its structure was presented as II by them.



1) Y. Asahina, H. Akagi: Ber., **71**, 980 (1938).

2) D.H.R. Barton, P. de Mayo, J.C. Orr: J. Chem. Soc., **1958**, 2239.

3) W.J. Dustan, H. Fazakerley, T.G. Halsall, E.R.H. Jones: Croat. Chim. Acta, **29**, 173 (1957), [C. A., **53**, 1400i (1959)]; J. Chem. Soc., **1959**, 1877.

Later, Schaffner, Caglioti, Arigoni and Jeger⁴⁾ confirmed the structure of II by partial synthesis of hopene-I from onocerine. In that report, they presumed that leucotylin would have an additional hydroxyl at C-3 of zeorin based on the biogenetical view point.

Huneck⁵⁾ tried to elucidate the structure of leucotylin obtained from *Lecanora muralis* var. *muralis*, and supported the presumption of Jeger, *et al.*

The authors now wish to propose the structure of leucotylin (IIIa) from the following evidences.

On oxidation with chromic anhydride in acetic acid or pyridine, leucotylin gave monoketone, m.p. 288~290°, IR $\nu_{\text{max}}^{\text{Nujol}}$ cm^{-1} : 3205 (OH), 1702 (six-membered ketone) (*Anal.* Calcd. for $\text{C}_{30}\text{H}_{50}\text{O}_3$: C, 78.55; H, 10.99. Found: C, 78.32; H, 10.89), whose carbonyl did not form oxime. Although Huneck⁵⁾ reported that leucotylin could be oxidized to diketoleucotylin with chromic anhydride in sulfuric acid, we have been unable to furnish diketone, but only monoketone, in poor yield.

Leucotylin diacetate (IIIb) was dehydrated by treatment with phosphoryl chloride in pyridine to IV, m.p. 177~179°, IR $\nu_{\text{max}}^{\text{Nujol}}$ cm^{-1} : 1730, 1241 (acetate), 1629, 887 (exocyclic methylene) (*Anal.* Calcd. for $\text{C}_{34}\text{H}_{54}\text{O}_4$: C, 77.52; H, 10.33. Found: C, 77.39; H, 10.28), which was hydrogenated to deoxyleucotylin diacetate (V), m.p. 212~214.5° (*Anal.* Calcd. for $\text{C}_{34}\text{H}_{56}\text{O}_4$: C, 77.22; H, 10.67. Found: C, 77.35; H, 10.71), with platinum catalyst. Deoxyleucotylin (VI), m.p. 246~248°, IR $\nu_{\text{max}}^{\text{Nujol}}$ cm^{-1} : 3425 (OH) (*Anal.* Calcd. for $\text{C}_{30}\text{H}_{52}\text{O}_2$: C, 81.02; H, 11.79. Found: C, 81.29; H, 11.91), the hydrolysis product of V, gave on oxidation with chromic anhydride in acetic acid, deoxyleucotylin-dione (VII), m.p. 269~272°, IR $\nu_{\text{max}}^{\text{CHCl}_3}$ cm^{-1} : 1701, 1690 (shoulder) (six-membered ketone) (*Anal.* Calcd. for $\text{C}_{30}\text{H}_{48}\text{O}_2$: C, 81.76; H, 10.98. Found: C, 81.66; H, 10.88), in good yield. VII showed negative Zimmermann color test, suggesting the absence of hydroxyl at C-3 of triterpene nucleus. VII was reduced by Wolff-Kishner method to monoketone, m.p. 184~188°, IR: $\nu_{\text{max}}^{\text{Nujol}}$ 1701 cm^{-1} (*Anal.* Calcd. for $\text{C}_{30}\text{H}_{50}\text{O}$: C, 84.45; H, 11.80. Found: C, 84.41; H, 11.61), which was proved to be identical with deoxyzeorinone⁶⁾ (VIII) by mixed fusion, infrared spectra and optical rotatory dispersion.

The possibility that hydrogen at C-17 of VIII is converted during the reaction from β - to α -configuration, and consequently leucotylin and zeorin have different carbon skeleton in regard to D/E ring juncture, can not be ruled out. But from the biogenetical consideration, it is reasonable to assume that both substances have same carbon skeleton, since leucotylin is always obtained from lichens concomitant with zeorin.

Leucotylin (IIIa) was treated with methanolic hydrochloric acid as for the preparation of zeorinin from zeorin⁷⁾ to give conjugated diene (IXa), m.p. 167.5~168.5°, IR $\nu_{\text{max}}^{\text{Nujol}}$ cm^{-1} : 3482 (OH), 1637, 787, 772 (double bond), UV $\lambda_{\text{max}}^{\text{EtOH}}$ $\text{m}\mu$ (log ϵ): 244 (4.60), 252 (4.66), 261 (4.48), $[\alpha]_{\text{D}} +79.3^\circ$ (CHCl_3) (*Anal.* Calcd. for $\text{C}_{30}\text{H}_{48}\text{O}$: C, 84.84; H, 11.39. Found: C, 84.68; H, 11.64), showing ultraviolet absorption characteristic to heteroannular conjugated diene. Diene acetate (IXb), m.p. 223~226°, $[\alpha]_{\text{D}} +73.5^\circ$ (CHCl_3) (*Anal.* Calcd. for $\text{C}_{32}\text{H}_{50}\text{O}_2$: C, 82.34; H, 10.80. Found: C, 82.04; H, 10.86), showed no depression of melting point on admixture with dehydrozeorinin acetate prepared from zeorinin oxide (X) by earlier workers^{2,7)} and their infrared and ultraviolet spectra were superimposable.

The fact that one of the two secondary hydroxyls of leucotylin is eliminated easily to form heteroannular diene suggested strongly the presence of hydroxyl at C-16.

This reaction could be explained as follows: On treatment with hydrochloric acid leucotylin lose its tertiary hydroxyl to form 17:21 double bond, then allylic hydroxyl at

4) K. Schaffner, L. Caglioti, D. Arigoni, O. Jeger: *Helv. Chim. Acta*, **41**, 152 (1958).

5) S. Huneck: *Chem. Ber.*, **94**, 614 (1961).

6) D. H. R. Barton, T. Bruun: *J. Chem. Soc.*, **1952**, 1683.

7) Y. Asahina, I. Yosioka: *Ber.*, **73**, 742 (1940).

C-16 is eliminated to give conjugated diene (IXa). Existence of hydroxyl at C-20, another allylic position of 17:21 double bond, is excluded, since both ketone in deoxy-leucotylin-dione are situated in six-membered ring [IR $\nu_{\max}$ cm^{-1} : 1701, 1690 (shoulder)].

Moreover, leucotylin showed intramolecular hydrogen bond between hydroxyls at C-16 and C-28 in its infrared spectrum (IR $\nu_{\max}^{\text{COH}}$ cm^{-1} : 3676 (free hydroxyl), 3413, 3247 (bonded hydroxyls) in concentration of $10^{-4}M$). This phenomenon afforded further proof of the existence of hydroxyl at C-16, but not at C-15.

Therefore, leucotylin must have the structure represented as IIIa.

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A New Synthetic Method of Nucleosides

Recently, attention has been drawn to some of nucleosides and its derivatives for their physiological and biogenetic roles. Many workers have taken a part in the synthesis of the nucleosides and various methods¹⁻⁵⁾ have been developed, however their scope is still limited. In this communication the authors intend to report a new synthetic procedure for natural and unnatural nucleosides, which is, in fact, a modification of Birkofer's method of N-acylation of heterocyclic bases, *via* their reactive trimethylsilyl derivatives.^{6,7)}

Trimethylsilyl derivatives of pyrimidines and purines were synthesized by usual method⁸⁻¹⁰⁾ and then applied for the preparation of several nucleosides by fusion with acylglycosyl halides. After condensation, the trimethylsilyl residue of III could be removed by the treatment with aq. ethanol, to afford IV.

Quite recently, Birkofer, *et al.* reported that the reaction of tetrakis(trimethylsilyl)-uric acid with tribenzoylribofuranosyl bromide gave 3-ribofuranosyluric acid.¹¹⁾

Treatment of uracil with trimethylchlorosilane and triethylamine in benzene gave I in 72% yield, whose structure was confirmed by infrared spectrum. Further the fusion of II with 2,3,5-O-tribenzoylribofuranosyl chloride¹²⁾ would produce 1-(2,3,5-tribenzoylribofuranosyl)trimethylsilyluracil (III), which was treated with aq. ethanol to afford IV

- 1) E. Fischer, B. Helferich : Chem. Ber., **47**, 210 (1914).
- 2) G.E. Hilbert, C.E. Rist : J. Biol. Chem., **117**, 371 (1937).
- 3) G.A. Howard, B. Lythgoe, A.R. Todd : J. Chem. Soc., **1947**, 1052.
- 4) J. Davoll, B.A. Lowy : J. Am. Chem. Soc., **73**, 1650 (1951).
- 5) G. Shaw, R.N. Warrener, M.H. Maguire : J. Chem. Soc., **1958**, 2294.
- 6) L. Birkofer, P. Richter, A. Ritter : Chem. Ber., **93**, 2804 (1960).
- 7) L. Birkofer, H.P. K  lthau, A. Ritter : *Ibid.*, **93**, 2810 (1960).
- 8) R. Fessenden, J.S. Fessenden : Chem. Rev., **61**, 361 (1961).
- 9) S.H. Langer, S. Connell, I. Wender : J. Org. Chem., **23**, 50 (1958).
- 10) R. Fessenden, D.F. Crowe : *Ibid.*, **25**, 598 (1960).
- 11) L. Birkofer, A.R. Ritter, H.P. K  lthau : Angew. Chem., **75**, 209 (1963).
- 12) H.M. Kissman, C. Pidacks, B.R. Baker : J. Am. Chem. Soc., **77**, 18 (1955).