ment with the authentic 4-thiouridine that was synthesized by the procedure described by Fox, *et al.*[8] and purified by the method described by Kochetkov, *et al.*[4]

The compound IV was treated with 0.1N hydrochloric acid at 100° for 1 hr. The hydrolysate was proved to be the parent 5′-UMP by paper chromatography and UV absorption measurement. Then, IV was sealed in a tube with methanol saturated with ammonia at 0°. After the tube was heated for 5 hr at 70°—80°, the content was separated by paper chromatography with three solvent systems.

There was only one spot in either solvent system, the *Rf* values of which were identical with those of the cytidine 5′-phosphate (5′-CMP) marker, respectively. It was identical in UV absorptions in acid and alkaline media with those of 5′-CMP, respectively.

When 40% aqueous solution of methylamine was used instead of methanolic ammonia, N_4-methylcytidine 5′-phosphate was obtained, this product being confirmed with authentic specimen gifted by Dr. T. Ueda.[9]

It should be mentioned that the compound IV is very useful as a key intermediate for the synthesis of 4-substituted pyrimidine ribonucleoside 5′-phosphates. The application and modification of this method to various nucleotides and several enzymical studies are now under further investigation.

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8) J.J. Fox, D.V. Praag, I. Wempen, I.L. Doerr, L. Cheong, J.E. Knoll, M.L. Eidinoff, A. Bendich, and G.B. Brown, *J. Am. Chem. Soc.*, **81**, 3252 (1959).
9) M. Ikehara, T. Ueda, and K. Ikeda, *Chem. Pharm. Bull.* (Tokyo), **9**, 767 (1962).

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UDC 615.334.011

The Allylic Rearrangement of the Hydroxyl Group from C-9 to C-13 and the Absolute Configuration at C-9 of Leucomycin A_3

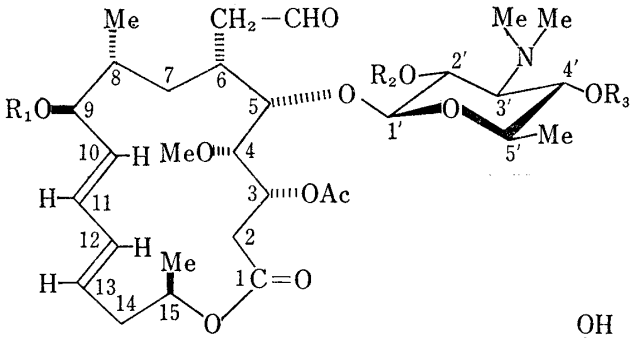
Structural determination has already been made on leucomycin A_3 (I) and seven other main components.[1] Later, Hiramatsu and others revealed, through X-ray crystal-structure analysis, the structure of the hydrobromide of demycaro compound (II), $C_{30}H_{49}O_{11}N$,[2] mp 199—202°, pK_a' 7.80, obtained during the hydrolysis of I with dilute hydrochloric acid (0.3 N).[3]

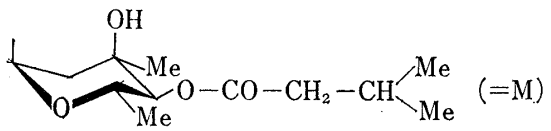
1) *a*) S. Ōmura, H. Ogura, and T. Hata, *Tetrahedron Letters*, **1967**, 609; *b*) *Idem*, *ibid.*, **1967**, 1267; *c*) T. Hata, S. Ōmura, M. Katagiri, H. Ogura, K. Naya, J. Abe, and T. Watanabe, *Chem. Pharm. Bull.* (Tokyo), **15**, 358 (1967); *d*) S. Ōmura, M. Katagiri, and T. Hata, *J. Antibiotics*, Ser. A **20**, 234 (1967).
2) Satisfactory analysis were obtained for all compounds which molecular formulae are given.
3) M. Hiramatsu, A. Furusaki, T. Noda, K. Naya, Y. Tomiie, I. Nitta, T. Watanabe, T. Take, and J. Abe, *Bull. Chem. Soc. Japan*, **40**, 2982 (1967).

It had been revealed[1b] that the allylic hydroxyl group is situated at the C–9 in I because the NMR absorption at 4.05 ppm, assigned to the allylic proton, underwent coupling with the tertiary proton at C–8 and olefinic proton at C–10 to appear as the double doublets, and because the ketone compound obtained by the oxidation of this hydroxyl group with active manganese dioxide was found identical with magnamycin B.[4] It follows, therefore, that the structure of II would be that formed by the rearrangement of the allylic hydroxyl group in I to the C–13 position. On the other hand, an isomer (III), $C_{30}H_{49}O_{11}N$, $[\alpha]_D^{25}$ −27.4° (c=1, methanol), pK_a' 7.81, in which the hydroxyl group had not undergone rearrangement had been obtained during this hydrolysis with dilute hydrochloric acid.[5]

Acid treatment of I under conditions (pH 2, 60°, 2 hr) which would not cleave the mycarose portion, successfully afforded isoleucomycin A_3 (IV), $C_{42}H_{69}O_{15}N$, mp 180—182°, $[\alpha]_D^{25}$ −52.1° (c=5, methanol), in which the allylic hydroxyl group at C–9 had undergone rearrangement to the C–13 position. The isomer (IV) was easily isolated from unreacted materials because, like II, it was very sparingly soluble in benzene. Comparison of the NMR spectrum (in $CDCl_3$) of IV with that of II showed that these spectra are almost completely identical except for the absorption due to the protons in the mycarose portion. The double doublets at 4.05 ppm in I[1b] disappeared in II and IV, and appears as a multiplet at around 4.15 ppm. This is due to the coupling of the olefinic proton at C–12 and the methylene proton at C–14, and this fact indicates that II is the demycaro compound of IV. Consequently, the absolute configuration of C–3, C–6, C–8, and C–15 positions in the lactone of I had been elucidated by the X-ray crystal structure analysis but not that of the C–9 position, which was later determined by the following method.

Application of acetic anhydride in acetone to I results in selective acetylation of the hydroxyl group at C–2′ position of mycaminose to form 2′–monoacetyl–leucomycin A_3 (V), $C_{44}H_{71}O_{16}N$, mp 132—135°, $[\alpha]_D^{25}$ −71.6° (c=5, methanol), pK_a' 5.70. Acetylation of the hydroxyl at C–2′ position is certain from the fact that there is no change in the absorption



I : R_1=R_2=H, R_3=  (=M)

III : R_1=R_2=R_3=H

V : R_1=H, R_2=−CO·CH_3, R_3=M

VI : R_1=H, R_2=−CO·CH_3, R_3=M, $(-CH_2-CH_2-CH_2-CH_2-)$ (13 12 11 10)

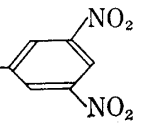
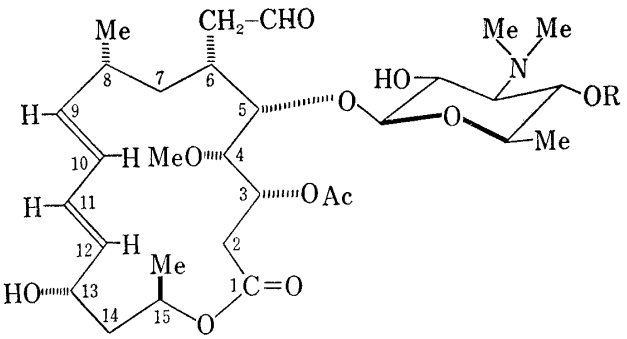
VII : R_1=  R_2=−CO·CH_3, R_3=M $(-CH_2-CH_2-CH_2-CH_2-)$ (13 12 11 10)

Chart 1

4) R.B. Woodward, *Angew. Chem.*, **69**, 50 (1957).
5) S. Ōmura, M. Katagiri, and T. Hara, *J. Antibiotics*, **21**, 272 (1968).



II : R=H

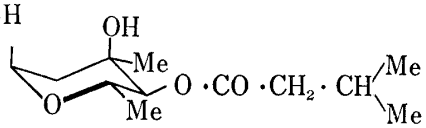
IV : R= 

Chart 2

of proton at C-9, as stated above, and the lowering of pK_a' to 5.70 from 6.70 of I. Catalytic reduction of the mono acetate (V) gave a tetrahydro compound (VI), $C_{44}H_{75}O_{16}N$, $[\phi]_D^{25}$ −818° (c=5, methanol), which was derived to 3,5-dinitrobenzoate (VII), $C_{51}H_{77}O_{21}N_3$, $[\phi]_D^{25}$ −934° (c=5, methanol). It was found from the application of the "benzoate rule"[6] that VI and VII belong to the R system by the comparison of their molecular rotation ($\Delta[\phi]_D^{25}$ −116°).

Therefore, from the present results and the previously reported results on the two glycosidic linkages, configuration of the diene system, and the X-ray crystal structure analysis, the absolute configuration of leucomycin A_3 has been revealed as represented by formula (I).

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6) J.H. Brewster, *Tetrahedron*, **1961**, 106.

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Synthesis of Rubrosterone

As part of our research program directed to the investigation of compounds having insect moulting hormone activities, the synthesis of androstane compounds the nuclear structures of which are closely related to that of ecdysone have been progressed. Quite recently, Takemoto, *et al.*[1] isolated a new insect moulting hormone-like substance, "rubrosterone" from *Achyranthes rubrofusca* Wight and proposed its chemical structure as 2β,3β,14α-trihydroxy-5β-androst-7-ene-6,17-dione (I) on the basis of spectroscopic evidences. The synthesis of rubrosterone by the similar methods used in the synthesis of ecdysone[2] will be described in this communication.

3β,17β-Dihydroxy-5α-androstan-6-one (II)[3] easily obtainable from dehydroepiandrosterone in 5 steps was served as a starting material. The introduction of 2β-hydroxyl grouping

1) T. Takemoto, Y. Hikino, H. Hikino, S. Ogawa, and N. Nishimoto, *Tetrahedron Letters*, **1968**, 3053.
2) H. Mori, K. Shibata, K. Tsuneda, and M. Sawai, *Chem. Pharm. Bull.* (Tokyo), **16**, 563 (1968).
3) H.B. MacPhillany, and C.R. Scholz, *J. Am. Chem. Soc.*, **74**, 5512 (1952).