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STRUCTURAL INVESTIGATION OF THE ANTIBIOTIC SPORAVIRIDIN XII[1)]
ISOLATION OF THE PSEUDOAGLYCONES FROM N-ACETYLSPORAVIRIDINS UNDER BASIC CONDITIONS

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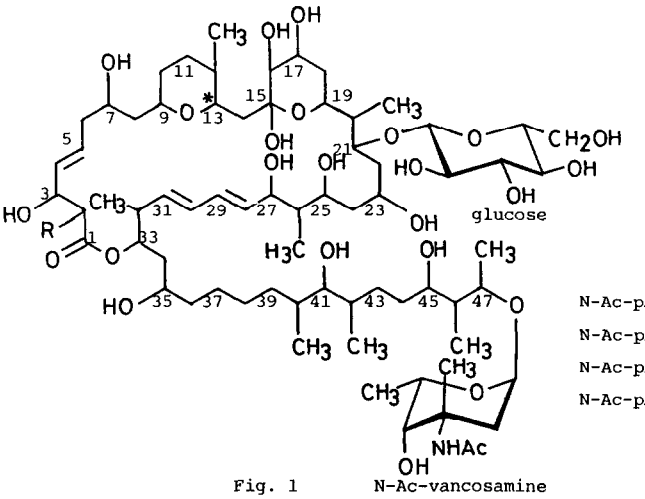
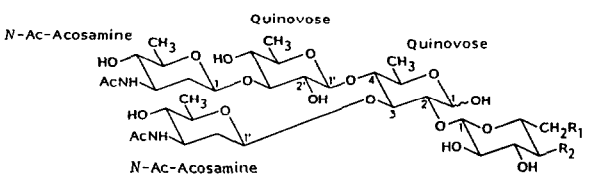
Summary: N-acetylsporaviridins (N-Ac-SVD) are composed of six components whose molecular weights are all about 2200. Treatment of each component of N-Ac-SVD with 1.8-diazabicyclo [5,4,0] undesen-7 (DBU) gave two pseudoaglycones and one of three viridopentaoses A, B and C.

Sporaviridins (SVD) are basic glycoside antibiotics produced by Streptosporangium viridogriseum. They exhibit strong inhibitory activity against Gram-positive bacteria, acid fast bacteria and trichophyton [2)]. Recently, we succeeded in the isolation of major components of N-Ac-SVD, which are composed of six components (N-Ac-SVD-A_1,-A_2,-B_1,-B_2,-C_1 and -C_2)[3)]. Treatment of each component of N-Ac-SVD with DBU gave two pseudoaglycones (N-Ac-pAG-U and -L, Fig.1) and one of three viridopentaoses A, B and C (Fig.2)[4)]. This paper describes the specific glycosidic bond cleavage of N-Ac-SVD and the structures of the resulting pseudoaglycones.



N-Ac-pAG-Ua: R=C_2H_5
N-Ac-pAG-Ub: R=CH_3
N-Ac-pAG-La: R=C_2H_5
N-Ac-pAG-Lb: R=CH_3

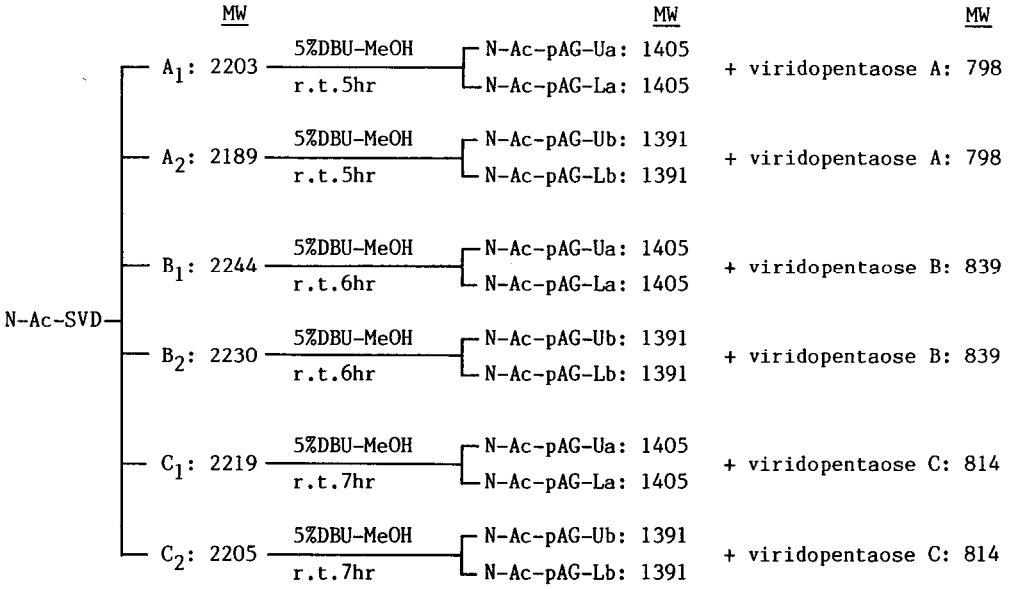
Fig. 1



viridopentaose A: R_1=H, R_2=OH
viridopentaose B: R_1=H, R_2=NHAc
viridopentaose C: R_1=OH, R_2=OH

Fig. 2

Previously, we have obtained aglycone moieties and viridopentaoses A, B and C on hydrolysis of N-Ac-SVD with 7% NH_4OH. However, under the conditions the resulting aglycone moieties could not be obtained in satisfactory yield and by-products were also produced. Therefore, various bacic reagents were examined to obtain satisfactorily the aglycone moieties. Among them, DBU gave a reproducible and good result. Treatment of each component of N-Ac-SVD with 5% DBU-MeOH at room temperature gave viridopentaoses A, B or C in good yield as summarized in Scheme 1. Viridopentaoses A, B and C were eliminated from N-Ac-SVD-A_1 and -A_2, -B_1 and -B_2, and -C_1 and -C_2, respectively. Whereas N-Ac-SVD-A_1, -B_1 and -C_1 afforded N-Ac-pAG-Ua and -La, N-Ac-pAG-Ub and -Lb were given from N-Ac-SVD-A_2, -B_2 and -C_2 as aglycone moieties. The physico-chemical properties of the four aglycones obtained are summarized in Table 1.

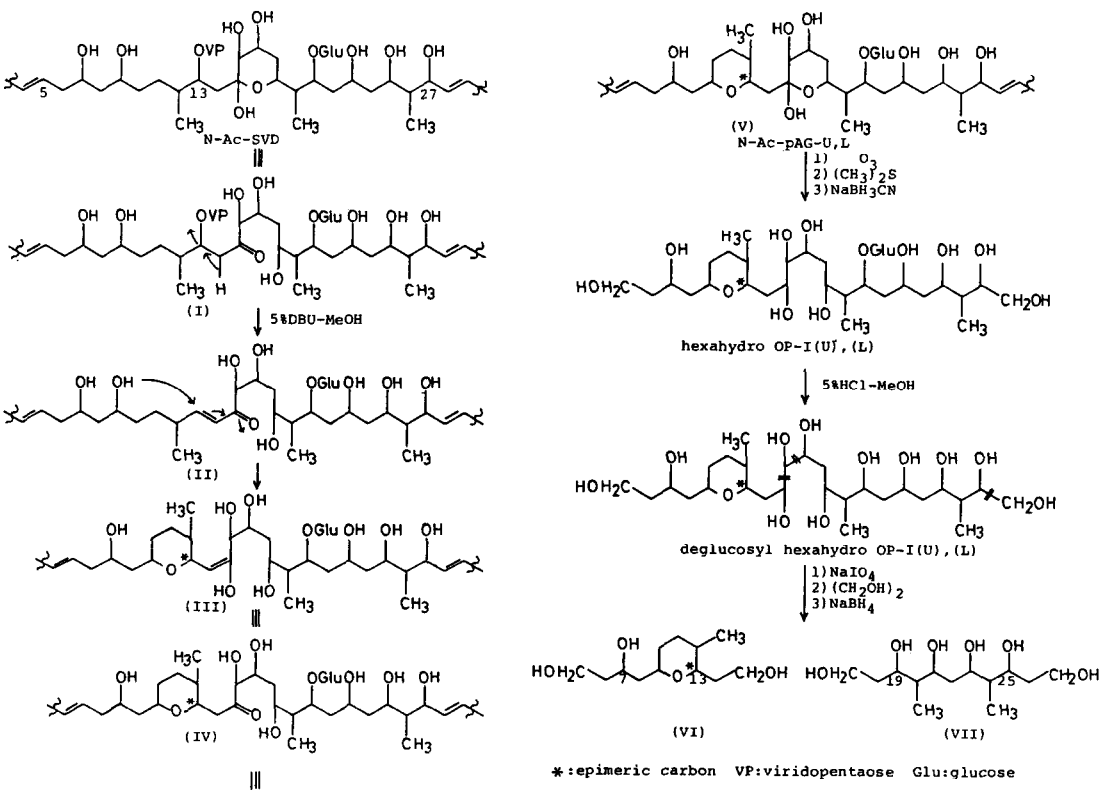


Scheme 1

Table 1

	N-Ac-pAG-Ua	N-Ac-pAG-Ub	N-Ac-pAG-La	N-Ac-pAG-Lb
Appearance	White powder	White powder	White powder	White powder
Mp (dec.)(°C)	128-131	125-128	133-136	131-135
SIMS m/z$(M+Na)^+$	1428	1414	1428	1414
MW	1405	1391	1405	1391
$[\alpha]_D$ in MeOH	-11.8°	-5.6°	-11.6°	-9.4°
	(c 0.25)	(c 1.13)	(c 1.26)	(c 0.93)
UV λ_{max}^{EtOH} nm(log ε)	232 (4.23)	232 (3.79)	232 (4.30)	232 (4.30)
IR ν_{max}^{KBr} cm^{-1}	3700-3050	3700-3000	3700-3050	3700-3050
	1710,1650	1710,1650	1710,1650	1710,1650

All components were obtained as amorphous white powder. They are closely similar one another. Secondary ion mass spectrometry (SIMS) of N-Ac-pAG-Ua and -La gave the $(M+Na)^+$ ion at m/z 1428, indicating that the molecular weights are 1405. On the other hand, N-Ac-pAG-Ub and -Lb showed the $(M+Na)^+$ ion at m/z 1414 which is smaller by 14 mass units than those of N-Ac-pAG-Ua and -La. Absorption maxima at 232 nm in their ultraviolet (UV) spectra indicate the presence of a conjugated diene. Their infrared (IR) spectra exhibit broad bands at 3700-3000 cm^{-1} due to multiple hydroxy groups, and two bands at 1710-1650 cm^{-1} due to carbonyl groups. The 25 MHz ^{13}C-NMR spectra of N-Ac-pAG-Ua and -La taken in CD_3OD showed 72 signals. They are assigned by INEPT method as follows; one ester carbonyl, one amido carbonyl, 6 olefinic carbons, 2 anomeric carbons, one hemiketal carbon, 22 oxymethine carbons, one oxymethylene carbon, one quarternary carbon, 8 methines and 17 methylenes and 12 methyls. N-Ac-pAG-Ub and -Lb have less one methylene unit than N-Ac-pAG-Ua and -La. The two carbohydrate moieties were identified as D-glucose and N-acetyl-L-vancosamine[5] and these glycosidic linkages were revealed to be β (104.5 ppm) and α (98.5ppm), respectively by their chemical shifts of the anomeric carbons in the ^{13}C-NMR spectra. Because the four pseudoaglycones have still two sugar moieties, they are abbreviated as pAG. The three double bonds were deduced to be E configulations based on the large coupling constant ($J_{4,5}$ =$J_{28,29}$ =$J_{30,31}$ =15Hz) in the ^1H-NMR spectra, of which two double bonds form a conjugated diene. Structures of the four pseudoaglycones were finally elucidated by their ozonolysis, methanolysis and periodate oxidation (Fig.1). In particular, compound VI and VII played a important role for the structure determination of N-Ac-pAG-U and -L (Scheme 2). They will be described in detail in the following paper[6].



Scheme 2

Scheme 2 shows a plausible reaction mechanism in the treatment of N-Ac-SVD with DBU. Thus, under the basic conditions, the hemiketal system changes the corresponding keto form (I), and then the retro-Michael type elimination occurs to give an α,β-unsaturated ketone (II). Subsequently, the ketone is attacked intramolecularly by a hydroxyl group *via* Michael addition (II) and tow tetrahydropyrane derivatives are formed (III). Therefore an epimeric pair with respect to C-13 is produced, which corresponds to N-Ac-pAG-U and -L series. However, after reduction of the hemiketal system with $NaBH_4$, this reaction did not proceed at all. The similar reaction has been observed in the structure determination of concanamycin A [7].

As mentioned above treatment of each N-Ac-SVD with DBU cleaved the glycosidic linkage to yield two pseudoaglycones (N-Ac-pAG-U and -L) and a viridopentaose. These degradation products were effectively used for the total structures of N-Ac-SVD. Moreover, detailed analysis of this degradation demonstrated that viridopentaose is located at the β-position of the hemiketal carbon (C-13). In the following paper, we wish to describe the further degradative reactions of the pseudoaglycones and the total structure of N-Ac-SVD.

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