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DORMANTINOL, A POSSIBLE PRECURSOR IN SOLANIDINE BIOSYNTHESIS, FROM BUDDING *VERATRUM GRANDIFLORUM*

KO KANEKO, MIKAKO W. TANAKA, and HIROSHI MITSUHASHI
Faculty of Pharmaceutical Sciences, Hokkaido University, Sapporo 060, Japan

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Key Word Index—*Veratrum grandiflorum*; Liliaceae; solanidine biosynthesis; new steroidal sapogenin; 22,26-dihydroxycholesterol.

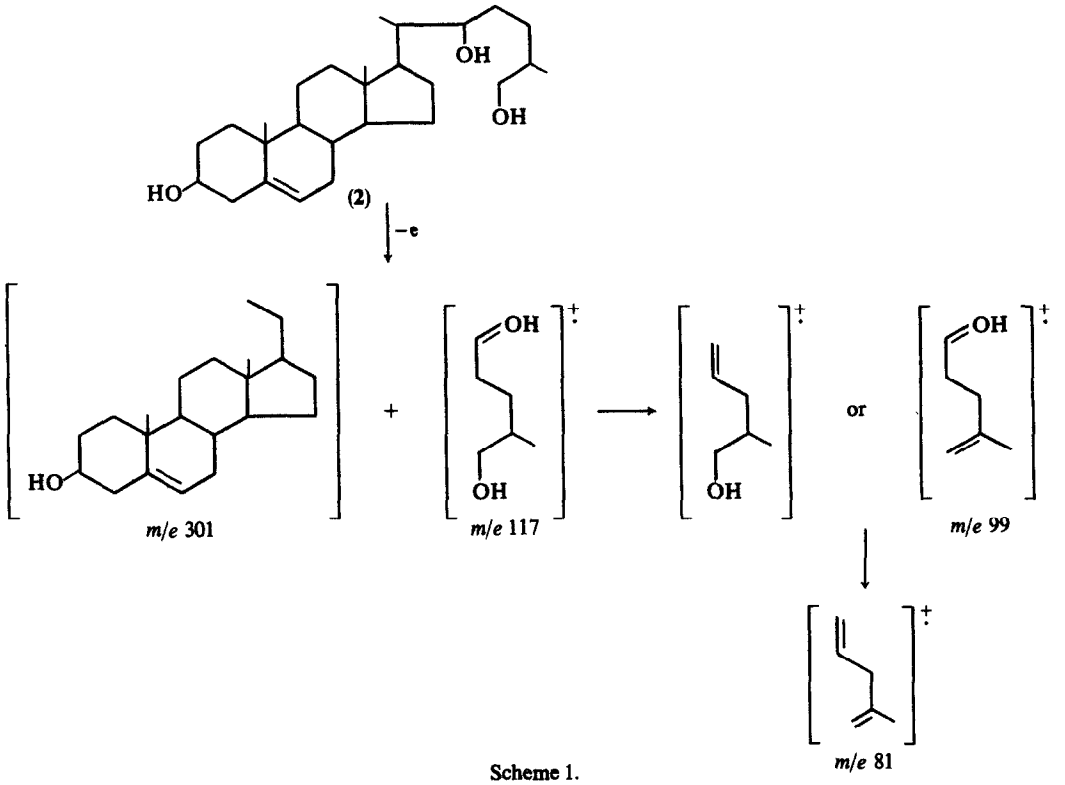
Abstract—A new sapogenin, dormantinol, was isolated from budding *Veratrum*, and identified as (25*S*)-cholest-5-ene-3β,22α,26-triol by spectral analysis and its synthesis from dormantinone. Cholesterol was also identified in the budding *Veratrum*.

INTRODUCTION

In a previous paper [1] we reported the biosynthesis of solanidine in *Veratrum grandiflorum* which actively biosynthesises this compound in the budding stage. Solanidine and etioline were isolated from the budding plant as the main alkaloids. Previously, we isolated a new steroidal sapogenin, dormantinone, which was identified as (25*S*)-3β,26-dihydroxycholest-5-en-22-one, from its physical properties and its chemical synthesis [2].

However, Tschesche [3] stated that in the biosynthesis of spirostan, cholesterol is first oxygenated at C-20, and cyclizes to furostane derivatives after oxygenation at C-16. The resulting furostane is converted to furostanol after oxygenation at C-26, and then cyclizes to spirostan. Moreover, he emphasized that cholesterol oxygenated at C22 cannot participate as a precursor in spirostan biosynthesis but is the intermediate produced in the degradation of the side chain to yield pregnenolone.

The budding *Veratrum* contains sitosterol, yamogenin, and dormantinone (1) as the main sapogenin in the hydrolysed neutral fraction. Δ^{16}-Pregnenolone was isolated from the same fraction as a minor component [4], but not pregnenolone. It may be surmized that dormantinone is a precursor in the biosynthesis of 22,26-epiminocholestenes such as verazine, etioline and solanidine from



Scheme 1.

a consideration of their structural and chemical relationships [5].

This paper deals with the structural elucidation of a newly isolated sapogenin (2) from the dormant budding stages of *Veratrum* and also the presence of chloesterol in the same plant.

RESULTS AND DISCUSSION

The neutral fraction from the hydrolysate of the glycosidic material of the terrestrial part of budding *Veratrum* was separated by column chromatography over alumina to give two new sapogenins (2 and 3) in addition to sitosterol, yamogenin, and dormantinone (1).

The empirical formula of sapogenin (2), $C_{27}H_{46}O_3$, MW 418, was determined by elemental analysis, and the IR absorption band at 3400 to 3200 cm^{-1} showed the presence of a hydroxyl group. In the MS, 2 revealed ions at *m/e* 400 (M^+-H_2O), 117, 99 (base peak), and 81. The strong peak at *m/e* 117 could have been formed as a result of the C-20—C-22 bond fission [6], shown in Scheme 1. Such fragmentation of 2 suggests the presence of hydroxyl groups at C-22 and C-26.

The NMR spectrum of 2 displayed two signals (3H each) at δ 0.70 and 1.08 indicative of C-18 and C-19 angular methyl groups of a Δ^5 steroid, two doublets (3H each, J = 6 Hz) at δ 1.19 and 1.23 corresponded to two secondary methyl groups at C-21 and C-27 and a signal at δ 5.43 for a C-6 vinyl proton.

Compound 2 formed a triacetate mp 111–112°, by the usual method of acetylation, which showed NMR signals at δ 2.01 and 2.02 (OAc) and an IR absorption band at 1735 cm^{-1} (OAc). In the NMR spectrum of 2, four protons at δ 3.87 [this signal shifts downfield to δ 3.81 (H, *dd*, J = 10.6 Hz), 3.95 (H, *dd*, J = 10.5 Hz), 4.60 (H, *m*), and 4.82 (H, *m*), respectively, by acetylation] were associated with the hydrogen adjacent to three hydroxyl groups. From the spectral data, 2 was assumed to possess a cholestane skeleton with the Δ^5-3β-ol moiety, secondary hydroxyl groups at C-3 and C-22 and a primary hydroxyl group at C-26. Two protons associated with the hydrogen adjacent to the hydroxyl group at C-26 appeared as a mixed singlet with two other protons at δ 3.87 and the signal of these protons was shifted downfield to δ 3.81 and 3.95 by acetylation. One of the two remaining protons was assigned to the 3α-H position, and this signal was shifted downfield to δ 4.60 by acetylation. The other proton was assigned as the 22-H, and its signal shifted downfield to δ 4.82 after acetylation.

On the basis of these data, 2 was identified as cholest-5-ene-3β,22,26-triol and named dormantinol from the structural relationship to dormantinone.

To elucidate the absolute configuration of dormantinol (2), dormantinone (1) was reduced with $NaBH_4$ and the mixture of two C-22 isomers was obtained. Compound 4 (lower R_f on TLC) and its isomer 5 (higher R_f on TLC) were obtained in a 1:3 ratio and purified by TLC.

In connection with the configuration at C-22 Nagai [7] reported that nitrobenzene derivatives having a secondary alcohol as the asymmetric centre in the vicinity of a nitro group in the steroidal skeleton show a Cotton effect in the 330 nm region of the ORD curve. ORD curves of the *o*-nitrobenzoates of 4 and 5 showed a similar positive Cotton effect. With 22-hydroxycholesterol Nickolson [8] found that a positive Cotton effect in the 226 to 233 nm region followed by a negative Cotton effect at 218 nm in the CD curve of the benzoate was indicative of the (22*S*)-configuration (22α-hydroxyl) whereas the mirror image Cotton curves were exhibited by the benzoate of opposite (22*R*) chirality. The CD curve showed a greater magnitude for the negative Cotton effect at 230 nm in both 4 and 5, as shown in Fig. 1.

It remained to compare directly the differences in rotation between compounds 4 and 5 and their derivatives. Barton *et al.* [9] found that the (22*S*)-isomer (22α-hydroxyl) consistently possessed a more highly positive rotation than their 22*R*-counterparts (22β-hydroxyl). The molecular rotation of compound 4 and its derivatives was larger than those of the epimer 5 and its derivatives, as shown in Table 1. From these results, the epimers 4 and 5 were determined as the (22*S*) and (22*R*) isomers, respectively.

The molecular rotation of dormantinol (2) agreed well with that of epimer 4. The mp of dormantinol (2) was not depressed by admixture with 4. From these results, dormantinol (2) was identified as (25*S*)-cholest-5-ene-3β,22α,

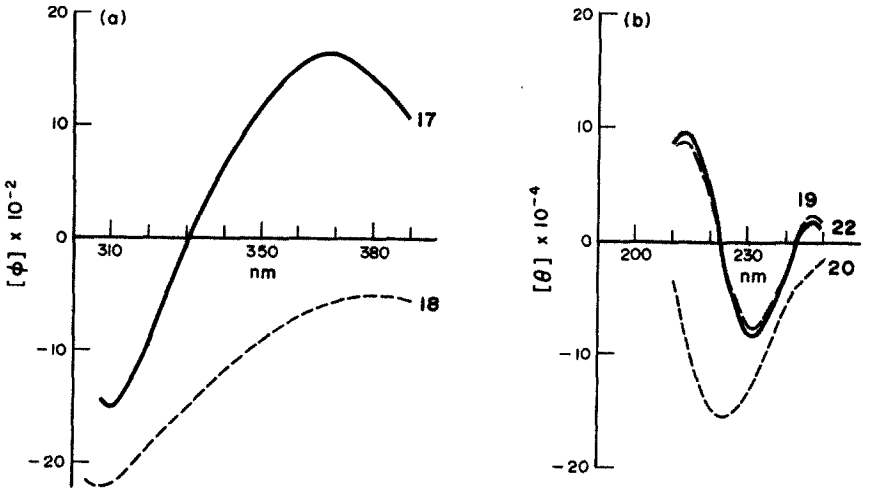


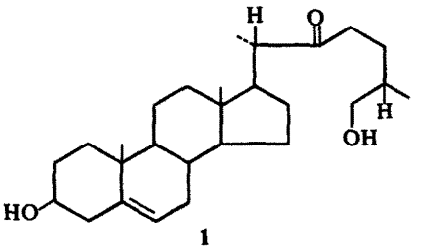
Fig. 1 (a). OCR-curves of (22*R*)-3,26-dimethoxy-22-*o*-nitrobenzoyldormantinol (17) and its (22*S*)-epimer (18). (b). CD-curves of (22*R*)-benzoyl-3,26-dimethoxydormantinol (19 and 22) and its (22*s*)-epimer (20).

Table 1. Molecular rotation differences between (22*R*)- and (22*S*)-alcohols

	$[M]_D$		$[M]_D$		Δ
Dormantinol					
	2	−41°	5	−118°	+77°
	4	39	5	−118	+79
Derivatives of 4 and 5					
3,26-Diacetate	9	−91	10	−209	+118
3,22,26-Triacetate		−107		−258	+151
3,26-Dimethylether	12	−133	13	−213	+80

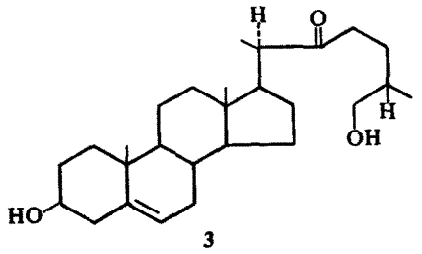
26-triol. 22-Hydroxycholestane derivatives previously isolated from the plant kingdom are 22-hydroxycholesterol [10], carpesterol [11], inotodiol [6], ecdysone [12], and antheridiol [13] which all possess a 22α-hydroxyl group.

Sapogenin (3) was isolated from the same neutral fraction. It showed properties quite similar to dormantinone (1), except for the mp and its behaviour on TLC in several solvent systems, and it was assumed to be an epimer of dormantinone (1) at either C-20 or C-25. Refluxing dormantinone (1) with 1M HCl in MeOH gave a mixture of dormantinone (1) and compound 3. On the other hand, hydrolysis of *Veratrum* glycoside by commercial emulsin gave dormantinone (1) without compound 3. From this evidence, 3 was confirmed as an artifact produced from dormantinone (1) by HCl hydrolysis. In general, the C-21 methyl group in a 22-keto steroidal sidechain epimerizes to the 21β-methyl (20*R*) configuration under acidic or alkaline conditions. When refluxed with methanolic KOH, dormantinone (1) was converted completely into



1

the 21β-methyl isomer which was identical to compound 3 by GLC and other physical properties. Therefore, 3 was identified as (20*R*, 25*S*)3β,26-dihydroxycholest-5-en-22-one which was an artifact produced from dormantinone (1) by HCl hydrolysis.



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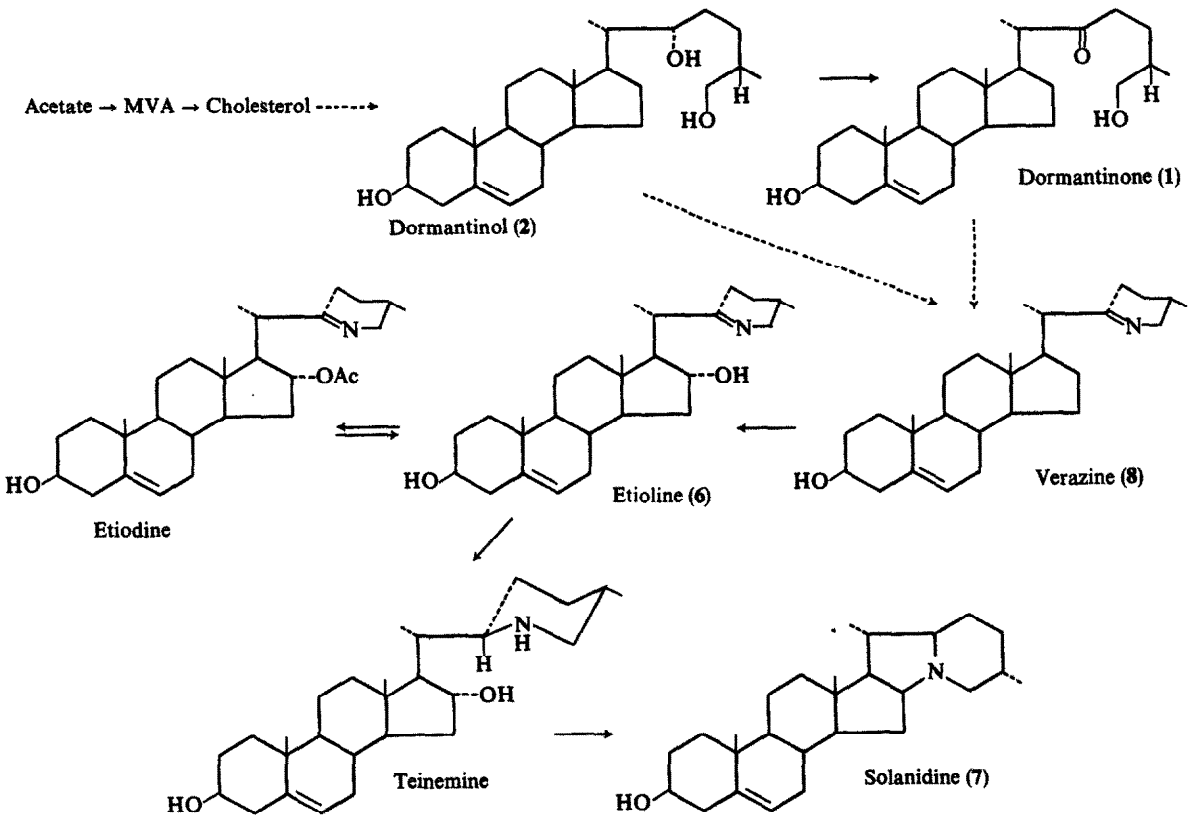
The occurrence of cholesterol in *Veratrum* has not been reported previously. The MS of the crude sitosterol showed at least two different series of fragmentation ions and they corresponded to those of sitosterol and cholesterol. GLC of this fraction, with cholestane as an internal



Scheme 2. Hypothetical biogenetic pathway of solanidine.

standard, showed peaks for sitosterol, cholesterol, campesterol, and stigmasterol. GC–MS analysis of this fraction confirmed the presence of cholesterol.

The budding *Veratrum* accumulates etioline (22,26-epiminocholestene) (**6**) and solanidine (**7**) as the main alkaloids and dormantione (**1**) and dormantinol (**2**) as the main sapogenins. A few minor sapogenins were isolated from the same neutral fraction from the budding *Veratrum*, but they were polyoxygenated steroids. Derivatives of furostane or furostanol were not isolated from this fraction. A new pathway for solanidine biosynthesis is suggested from these results in which cholesterol is hydroxylated at C-22 prior to hydroxylation at C-16 and verazine (**8**) is produced from either **1** or **2**. Verazine (**8**) was first isolated from *Veratrum album* var. *loberianum* by Schreiber and Tomko [14], and this alkaloid was also isolated from the dormant, budding, and etiolated *Veratrum grandiflorum* in our experiments [15]. The resulting verazine (**8**) would be converted to solanidine after hydroxylation at C-16, as shown in Scheme 2 [16].

EXPERIMENTAL

Plant material. The rhizomes of *Veratrum grandiflorum* (Max.) Loesen fil. were harvested at Teine, Hokkaido, in the early summer, and the washed rhizomes were stored in a cold room for 5 months, as described previously [1]. The bud of budding *Veratrum* was dried at 60° and the powdered plant material extracted with ammoniacal $CHCl_3$–MeOH.

Separation of sapogenins. The glycoside was hydrolysed with N HCl in MeOH for 6 hr, 50 g of the resulting neutral fraction was purified by chromatography on a column of 1.5 kg Si gel eluted consecutively with C_6H_6, Et_2O–C_6H_6 (1:9), $CHCl_3$, MeOH–$CHCl_3$ (1:19) and MeOH–$CHCl_3$ (1:9). These eluates contained sitosterol, dormantinone (**1**), sapogenin (**3**), and sapogenin (**2**) as evidenced by TLC. 10 g of this combined fraction was purified on a column of 300 g Al_2O_3, eluted with C_6H_6, Et_2O–C_6H_6(1:9) Et_2O–C_6H_6 (3:17), and $CHCl_3$ to give fractions containing sitosterol; yamogenin and dormantinone **1**, (238.2 mg); sapogenin **3**, (316.9 mg) and finally sapogenin **2**, (92.4 mg) respectively.

Dormantinol (**2**). The $CHCl_3$ fraction crystallized from MeOH, yielded needles of **2**, mp 228.5–231.5°; $[\alpha]_D^{18}$ −9.75° (*c* 0.49, MeOH); MS *m/e*: 400 (M^+–H_2O), 385, 382, 367, 313, 302, 284, 269, 213, 150, 120, 117, 105, 99 (base peak), 81; IR ν_{max}^{Nujol} cm^{-1}: 3400–3200, 1075, 1050, 1030; NMR (C_5D_5N): δ 0.70 (3H, *s*), 1.08 (3H, *s*), 1.19 (3H, *d*, *J* = 6 Hz), 1.23 (3H, *d*, *J* = 6 Hz), 3.87 (4H, *m*), 5.43 (1H, *m*). Calcd for $C_{27}H_{46}O_3$: C, 77.46; H, 11.08. Found: C, 77.69; H, 11.05%.

Dormantinol triacetate. Acetylation of 19 mg dormantinol (**2**) by the usual method of acetylation gave an acetate, crystallized from MeOH, to 13.8 mg of needle crystals mp 111–112°; $[\alpha]_D^{17}$ −19.6° (*c* 0.64, $CHCl_3$); MS *m/e*: 484, 424, 364, 303, 253, 213, 99, 81 (base peak); IR ν_{max}^{Nujol} cm^{-1}: 1735, 1260, 1240; NMR (C_5D_5). δ 0.67 (3H, *s*), 1.00 (3H, *s*), 0.91 (3H, *d*, *J* = 6 Hz, 0.93 (3H, *d*, *J* = 6 Hz), 2.01 (6H, *s*), 2.02 (3H, *s*), 3.81 (1H, *dd*, *J* = 10,6 Hz), 3.95 (1H, *dd*, *J* = 10,5 Hz), 4.60 (1H, *m*), 4.82 (1H, *m*), 5.34 (1H, *m*).

Reduction of dormantinone (**1**) *by* $NaBH_4$. A mixture of 97 mg dormantinone (**1**) dissolved in 6 ml EtOH with 91.1 mg $NaBH_4$ was allowed to stand at room temp. for 18 hr. The $CHCl_3$ extract from the reaction mixture was purified by chromatography on Al_2O_3 and afforded a mixture of isomers **4** and **5**. Compound **4** (5.4 mg), mp 229.5–231.5°; $[\alpha]_D^{17}$ −9.3° (*c* 0.45, MeOH); IR ν_{max}^{Nujol} cm^{-1}: 3450–3100, 1065, 1040, 1025; MS *m/e*: 400, 302, 284, 255, 213, 117, 105, 99 (base peak); NMR (C_5D_5N): δ 0.70 (3H, *s*), 1.08 (3H, *s*), 1.21 (3H, *d*, *J* = 6 Hz), 1.24 (3H, *d*, *J* = 6 Hz), 3.84 (4H, *m*), 5.44 (1H, *m*). Compound **5** (15.5 mg), mp 200.5–203.5°; $[\alpha]_D^{17}$ −28.2° (*c*, 0.5, MeOH); IR ν_{max}^{Nujol} cm^{-1}: 3400–3100, 1090, 1060, 1050, 1040, 1020; MS *m/e*: 400, 302, 284, 255, 213, 117, 105, 99 (base peak); NMR (C_5D_5N): δ 0.76 (3H, *s*), 1.10 (3H, *s*), 1.10 (3H, *s*), 1.15 (3H, *d*, *J* = 7 Hz), 1.23 (3H, *d*, *J* = 7 Hz), 3.79 (2H, *dd*, *J* = 6.3 Hz), 3.80 (2H, *m*), 5.42 (1H, *m*).

Reduction of dormantinone acetate with $NaBH_4$. A mixture of 54.0 mg dormantinone acetate and 144.2 mg $NaBH_4$ in 3 ml EtOH was allowed to stand for 4.5 hr at room temp The extract from the reaction mixture was purified by repeated TLC and gave isomers **9** and **10**. Compound **9** (9.0 mg), mp 100–101°; $[\alpha]_D^{16}$ −18.2° (*c* 0.28, $CHCl_3$); IR $\nu_{max}^{CHCl_3}$ cm^{-1}: 3630, 3500–3300, 1735, 1725, 1250, 1040; MS *m/e*: 442 (M^+-60), 424, 409, 380, 353, 213, 159, 158, 145, 133, 105, 99 (base peak), 81; NMR ($CDCl_3$): δ 0.70 (3H, *s*), 1.03 (3H, *s*), 0.92 (3H, *d*, *J* = 6 Hz), 0.96 (3H, *d*, *J* = 6 Hz), 2.03 (3H, *s*), 2.06 (3H, *s*), 3.56 (1H, *m*), 3.92 (2H, *m*), 4.60 (1H, *m*), 5.36 (1H, *m*). Compound **10** (20.0 mg), mp 165.5–167.5°; $[\alpha]_D^{16}$ −41.7° (*c* 1.26, $CHCl_3$); IR $\nu_{max}^{CHCl_3}$ cm^{-1}: 3630, 3500–3400, 1735, 1725, 1250, 1040; MS *m/e*: 442 (M^+-60), 424, 409, 380, 253, 213, 159, 158, 145, 133, 105, 99 (base peak), 81; NMR ($CDCl_3$): δ0.71 (3H, *s*), 1.05 (3H, *s*), 0.96 (6H, *d*, *J* = 6 Hz), 2.05 (3H, *s*), 2.08 (3H, *s*), 3.60 (1H, *m*), 3.93 (2H, *m*), 4.60 (1H, *m*), 5.40 (1H, *m*).

Acetylation of compound **10**. Compound **10** was acetylated by the usual method, mp 119–122°; $[\alpha]_D^{16}$ −47.4° (*c* 0.74, $CHCl_3$): IR $\nu_{max}^{CHCl_3}$ cm^{-1}: 1735, 1725, 1250, 1030; MS *m/e*. 484 (M^+-60), 424, 409, 364, 349, 303, 253, 213, 158, 145, 107, 105, 99, 81 (base peak); NMR ($CDCl_3$): δ 0.68 (3H, *s*), 1.02 (3H, *s*), 0.93 (3H, *d*, *J* = 6 Hz), 0.97 (3H, *d*, *J* = 6 Hz), 2.05 (9H, *s*), 3.91 (2H, *d*, *J* = 6 Hz), 4.56 (1H, *m*), 4.96 (1H, *m*), 5.38 (1H, *m*).

Methylation of dormantinone (**1**). Dormantinone (**1**) (59.2 mg) in CH_2Cl_2 was stirred with activated Ag_2O and MeI by the Purdie method and gave 64.7 mg of the 3,26-dimethyl ether (**11**) as an oil. IR ν_{max}^{Nujol} cm^{-1}: 1715, 1270, 1200, 1110; NMR ($CDCl_3$): δ 0.68 (3H, *s*), 0.98 (3H, *s*), 0.89 (3H, *d*, *J* = 6 Hz), 1.07 (3H, *d*, *J* = 6 Hz), 3.00 (1H, *m*), 3.19 (2H, *d*, *J* = 6 Hz), 3.30 (3H, *s*), 3.32 (3H, *s*), 5.38 (1H, *m*).

Reduction of **11** *with* $NaBH_4$: *(22R)- and (22S)-3,26-dimethoxydormantinol* (**12** *and* **13**). To a stirred suspension of **11** (64.7 mg) in EtOH (3 ml), 160.9 mg $NaBH_4$ was added in small portions. The mixture was allowed to stand for 9 hr at room temp., then H_2O was added, and the product was extracted with Et_2O. Partial separation of the alcohols was achieved on Si gel TLC (**12**: 11.8 mg, low R_f value; **13**: 24.9 mg, high R_f value). **12**: mp 128–129.5°; $[\alpha]_D^{18}$ −29.8° (*c* 0.26, $CHCl_3$); IR ν_{max}^{Nujol} cm^{-1}. 3420, 1320, 1250, 1190, 1115, 1090; MS *m/e*: 428 (M^+-18), 396, 131 (base peak); NMR ($CDCl_3$): δ 0.68 (3H, *s*), 0.98 (3H, *s*), 0.90 (6H, *d*, *J* = 6 Hz), 3.00 (1H, *m*), 3.20 (2H, *m*), 3.28 (3H, *s*), 3.30 (3H, *s*), 3.56 (1H, *m*), 5.34 (1H, *m*). **13**: oil; $[\alpha]_D^{16}$ −47.7° (*c* 0.67, $CHCl_3$). IR ν_{max}^{Nujol} cm^{-1}: 3600–3100, 1195, 1120, 1110, 1090, 1060, NMR ($CDCl_3$): δ 0.68 (3H, *s*), 0.98 (3H, *s*), 0.90 (6H, *d*, *J* = 6 Hz), 3.00 (1H, *m*), 3.20 (2H, *d*, *J* = 6 Hz), 3.30 (3H, *s*), 3.32 (3H, *s*), 3.60 (1H, *m*), 5.36 (1H, *m*). To detect isomerization at C-20 during reduction with $NaBH_4$, a small amount of both isomers (**12** and **13**) were each oxidized with CrO_3 to yield **14** and **15**, respectively. On the other hand, the 21β-methyl derivative (**16**) of **11** was prepared by refluxing with 5% KOH in MeOH. Retention times of these compounds on GLC (1.5% SE-30, column temp. 250°) were **14**: 30.8 min, **15**: 30.8 min, **11**: 30.8 min, **16**: 26.2 min. These results show that **12** and **13** have the natural configuration at C-20 and they possess a 22α or 22β-hydroxyl group respectively.

*(22R)-3,26-Dimethoxy-22-*o*-nitrobenzoyldormantinol* (**17**). A mixture of 25 mg of **12** and 5 mg *o*-nitrobenzoylchloride in 1 ml dry C_5H_5N was reacted at room temp. for 44 hr. The mixture was poured into ice H_2O and extracted with Et_2O. The extract was washed with dil. HCl and 5% $NaHCO_3$, and gave 19.3 mg of **17** as plate crystals, mp 118–119°; IR ν_{max}^{Nujol} cm^{-1}; 1730, 1610, 1580, 1540, 1350, 1290, 1255, 1200, 1100, 1070.

(22R)-22-Benzoyl-3,26-dimethoxydormantinol (**19**). A mixture of 9 mg compound **12** and 0.5 ml benzoylchloride in 0.5 ml dry C_5H_5N was reacted at 37° for 18 hr. After the mixture was poured into ice H_2O, the ppt. was filtered, purified on TLC with $CHCl_3$, and gave 7.6 mg of crystals of **19** from MeOH, mp 142–144°. IR ν_{max}^{Nujol} cm^{-1}: 1720, 1610, 1590, 1320, 1290, 1200, 1190, 1125, 1110.

*(22S)-3,26-Dimethoxy-22-*o*-nitrobenzoyldormantinol* (**18**). The

same procedure as for **17** with 63.1 mg of **13** gave 45 mg of **18**, mp 114.5–116.5°; IR ν_{max}^{Nujol} cm^{-1}: 1730, 1580, 1540, 1300, 1130, 1110, 1080.

(22S)-22-Benzoyl-3,26-dimethoxydormantinol (**20**). The same procedure as for **19** with 25.9 mg of **13** gave 17 mg of **20**, mp 86–89°; IR ν_{max}^{Nujol} cm^{-1}: 1720, 1600, 1540, 1320, 1270, 1180, 1160, 1110, 1070.

Methylation of dormantinol (**2**). The mixture of 42 mg of **2**, active Ag_2O and MeI was reacted by the Purdie method. The product was purified by TLC with cyclohexane–EtOAc (1:1), and gave 25.4 mg 3,26-dimethoxydormantinol (**21**), mp 136.5–141°; IR ν_{max}^{Nujol} cm^{-1}; 3400, 1320, 1250, 1210, 1190, 1140, 1120, 1090, 1060, 1040, 1020, 1010; MS *m/e*: 428 (M^+-18), 396, 284, 269, 213, 145, 131, 99 (base peak); NMR ($CDCl_3$): δ0.68 (3H, *s*), 0.98 (3H, *s*), 0.90 (6H, *d*, J = 6 Hz), 3.00 (1H, *m*), 3.20 (2H, *m*), 3.28 (3H, *s*), 3.30 (3H, *s*), 3.58 (1H, *m*), 5.34 (1H, *m*).

22-Benzoyl-3,26-dimethoxydormantinol (**22**). By the method described previously, 13 mg 22-benzoyl-3,26-dimethoxydormantinol (**22**) was obtained from 20.7 mg of **21**, mp 138.5–141°; IR ν_{max}^{Nujol} cm^{-1}: 1720, 1610, 1320, 1290, 1260, 1200, 1190, 1130, 1110, 1070, 1040. The mp of **22** was not depressed on admixture with (22*R*)-22-benzoyl-3,26-dimethoxydormantinol (**19**).

Detection of cholesterol in the crude sterol by GLC. The crude sterol obtained from the neutral fraction of budding *Veratrum* was analysed by GLC, 1.5% SE-30 (1.8 m × 3 mm), 250°, N_2 carrier gas at 60 ml/min, cholestane was the internal standard (R_t = 1.00). *RR*,'s were: peak A 1.78; peak B 2.30; peak C 2.48; peak D 2.85. Peak A had the same RR_t as authentic cholesterol. GC–MS, 2% OV-1 (2 m × 2 mm), 250°, He carrier gas at 30 ml/min, showed the following peaks: peak A (cholesterol) *m/e*: 386 (M^+), 371, 368, 353, 301, 275, 273, 260, 255, 247, 231, 229, 213; peak B (campesterol) *m/e*: 400 (M^+), 385, 382, 367, 315, 389, 273, 255, 231, 213; peak C (stigmasterol) *m/e*: 412 (M^+), 394, 369, 351, 300, 273, 271, 255, 253; peak D (sitosterol) *m/e*: 414 (M^+), 399, 396, 381, 329, 303, 275, 273, 255, 231, 213.

(20R,25S)-3β,26-dihydroxycholest-5-en-22-one (**3**). Mp 149.5–151.5°; $[\alpha]_D^{17}$ −61.4° (*c* 1, $CHCl_3$); IR ν_{max}^{Nujol} cm^{-1}; 3300, 1710, 1090, 1060, 1050; MS *m/e*: 416 (M^+), 398, 383, 380, 301, 213, 126 (base peak); NMR ($CDCl_3$): δ 0.67 (3H, *s*), 0.99 (3H, *s*), 0.93 (3H, *d*, J = 6 Hz), 1.03 (3H, *d*, J = 6 Hz), 3.46 (2J, *d*, J = 6 Hz), 3.52 (1H, *m*), 5.38 (1H, *m*).

Acetate of compound **3**. Obtained by the usual method of acetylation from **3**, mp 128–130°; IR ν_{max}^{Nujol} cm^{-1}; 1730, 1705, 1250, 1035; MS *m/e*: 440 (M^+-60), 380, 365, 283, 158, 146, 115 (base peak); NMR ($CDCl_3$): δ 0.67 (3H, *s*), 1.00 (3H, *s*), 0.94 (3H, *d*, J = 6 Hz), 1.03 (3H, *d*, J = 6 Hz), 2.03 (3H, *s*), 2.06 (3H, *s*), 3.88 (2H, *d*, J = 6 Hz), 4.56 (1H, *m*), 5.30 (1H, *m*).

Epimerization of dormantinone (**1**). A mixture of 21 mg of **1** and 13 ml of 5% KOH in MeOH was refluxed for 6 hr, concnd, and excess H_2O added. The $CHCl_3$ extract was purified by TLC (cyclohexane–EtOAc, 1:1) and afforded 5 mg of the 21β-epimer (**23**), mp 151–152°; IR ν_{max}^{Nujol} cm^{-1}: 3300, 1710, 1060; NMR ($CDCl_3$): δ0.67 (3H, *s*), 0.99 (3H, *s*), 0.93 (3H, *d*, J = 6 Hz), 1.02 (3H, *d*, J = 6 Hz), 3.45 (2H, *d*, J = 6 Hz), 3.50 (1H, *m*), 5.33 (1H, *m*). The mp of **23** was not depressed on admixture with **3**.

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