1.32, 1.42 (2 s, acetonide Me), 1.54 (s, C8 Me), 1.65 (dd of AB, J_{AB} = 7.5 Hz, $\Delta\nu$ = 13 Hz, J_{Avic} = 6.8, 2.6 Hz, J_{Bvic} = 11.4, 3.1 Hz, H2), 1.72 (s, C12 Me), 1.91 (m, H1), 1.98 (m, H9), 2.15 (m, H10), 2.25 (m, H10), 2.54 (d of AB, J_{AB} = 15.8 Hz, $\Delta\nu$ = 22 Hz, J_{Avic} = 6.1 Hz, J_{Bvic} = 11.0 Hz, H13), 2.58 (m, CH_2CO_2R), 3.00 (s, $MeSO_2O$), 3.69 (s, MeO), 3.75 (dd, J = 11.4, 2.6 Hz, H3), 5.13 (br t, J = 8.2 Hz, H7, H11), 5.22 (ddd, J = 11.0, 6.1, 2.2 Hz, H14); MS calcd for $C_{24}H_{40}O_7S$ m/e 472.25, found ($M^+ - C_3H_6O$) 414, ($M^+ - CH_3$) 457, (M^+) 472, ($M^+ + 1$) 473, ($M^+ + 2$) 474.

***rel*-(1*R*,3*S*,4*R*,14*S*)-(7*E*,11*E*)-3,4-(Isopropylidenedioxy)-4,8,12-trimethyl-15-oxabicyclo[12.3.0]heptadeca-7,11-dien-16-one (37).** A solution of 15.6 mg (0.0329 mmol) of mesylate **36** in 0.6 mL of DME was stirred under nitrogen as 0.29 mL (0.99 mmol) of 3.44 N aqueous NaOH was added. The mixture was heated at 55 °C for 19 h, chilled to 0 °C, and treated with 1 mL of 2.08 N HCl. The mixture was diluted with water and extracted with CH_2Cl_2. Drying of the organic solutions over $MgSO_4$ and solvent removal in vacuo gave the crude lactone. Chromatography on silica gel (elution with 5% EtOAc–hexane followed by 10% EtOAc–hexane) gave 8.1 mg (67%) of lactone **37** as an oil: IR (film) ν 2960, 2900, 1780, 1380, 1210, 1105 cm^{-1}; ^1H NMR (300 MHz, $CDCl_3$) δ 1.23 (s, C4 Me), 1.26 (m, H5), 1.30, 1.43 (2 s, acetonide Me), 1.52 (s, C8 Me), 1.60 M, H2), 1.66 (s, C12 Me), 1.95 (m, H6, H10), 2.15 (m, H6, H10, H9), 2.22 (d of AB, J_{AB} = 12.3 Hz, $\Delta\nu$ = 20 Hz, J_{Avic} = 2.9 Hz, J_{Bvic} = 10.8 Hz, H13), 2.44 (m, H1), 2.70 (m, H17), 3.63 (dd, J = 11.3, 2.6 Hz, H3), 4.14 (ddd, J = 10.8, 8.6, 2.9 Hz, H14), 5.08 (br t, J = 6.2 Hz, H7), 5.17 (br t, J = 6.9 Hz, H11); MS calcd for $C_{22}H_{34}O_4$ m/e 362.25, found ($M^+ - C_3H_6O$) 304, ($M^+ - CH_3$) 347, (M^+) 362.

***rel*-(1*R*,3*R*,4*R*,14*S*)-(7*E*,11*E*)-3,4-Epoxy-4,8,12-trimethyl-15-oxabicyclo[12.3.0]heptadeca-7,11-dien-16-one (44).** A solution of 26.1 mg (0.0720 mmol) of acetonide lactone **37** was stirred in 1.4 mL of dry MeOH under nitrogen as 26 mg of Amberlite IR-120 ion-exchange resin (H^+ form) was added. The mixture was heated at 60 °C for 4 h and then cooled to room temperature. The mixture was filtered through silica gel (CH_2Cl_2 elution), and the filtrate was concentrated under reduced pressure with drying by azeotropic distillation of benzene. The crude diol **42** thus obtained was stirred in 0.20 mL of dry pyridine at −20 °C as 60 μL (0.78 mmol) of methanesulfonyl chloride was added. After 14 h at −20 °C the mixture was warmed to 0 °C, quenched with 0.3 mL of 2.5 N aqueous NH_4OH, stirred for 30 s, and then treated with 1 mL of saturated NH_4Cl. The mixture was diluted with water, extracted with CH_2Cl_2, dried over $MgSO_4$, and concentrated under reduced pressure to afford the crude mesylate **43**.

The mesylate was dissolved in 0.7 mL of dry THF and chilled to −50 °C under nitrogen as 40 μL (0.075 mmol) of 1.88 M methanolic benzyltrimethylammonium hydroxide was added dropwise. After 10 min, another 40-μL aliquot of base was added and the mixture was warmed to −20 °C over 10 min. Filtration of the mixture through silica gel (CH_2Cl_2 elution) and concentration of the filtrate under reduced pressure gave the crude epoxide. Chromatography on silica gel (elution with 2% EtOAc–C_6H_6 followed by 5% EtOAc–C_6H_6) gave 8.9 mg (41%) of the epoxide **44** as an oil: IR (film) ν 2900, 1770, 1430, 1370, 1260, 1080 cm^{-1}; ^1H NMR (300 MHz, $CDCl_3$) δ 1.20 (s, C4 Me), 1.27 (m, H5), 1.59 (s, C8 Me), 1.62 (dd of AB, J_{AB} = 15.1 Hz, $\Delta\nu$ = 70 Hz, J_{Avic} = 6.5, 5.0 Hz, J_{Bvic} = 10.3, 6.9 Hz, H2), 1.68 (s, C12 Me), 2.10 (m, H7, H8), 2.25 (m, H4, H11), 2.41 (m, H1), 2.63 (d of AB, J_{AB} = 18.5 Hz, $\Delta\nu$ = 131 Hz, J_{Avic} = 8.8 Hz, J_{Bvic} = 6.1 Hz, H17), 2.64 (dd, J = 6.9, 5.0 Hz, H3), 4.21 (ddd, J = 10.2, 8.2, 4.8 Hz, H14), 4.98 (br t, J = 6.2 Hz, H7), 5.10 (t, J = 6.9 Hz, H11); MS calcd for $C_{19}H_{28}O_3$ m/e 304.20, found ($M^+ - CH_3$) 289, (M^+) 304.

***rel*-(1*R*,3*R*,4*R*,14*S*)-(7*E*,11*E*)-3,4-Epoxy-17-methylene-4,8,12-trimethyl-15-oxabicyclo[12.3.0]heptadeca-7,11-dien-16-one (46, Isolobophytolide).** A solution of 3.9 mg (0.0128 mmol) of epoxide **44** in 0.24 mL of THF was chilled to −78 °C under nitrogen as 72 μL (0.026 mmol) of 0.36 M lithium diisopropylamide in THF was added. The mixture was stirred, warming to −30 °C, over 25 min, and it was kept at −30 °C as a stream of gaseous formaldehyde in nitrogen (generated by thermolysis of 20 mg (0.60 mmol) of paraformaldehyde at 180 °C) was passed over the surface of the stirring reaction mixture. After 1 min the mixture was treated with 1 mL of saturated NH_4Cl, diluted with water, and extracted with CH_2Cl_2. Drying of the organic phases over $MgSO_4$ and concentration under reduced pressure gave the crude hydroxymethyl lactone **45**, which was dissolved in 0.8 mL of acetonitrile and treated at room temperature with 1 mg of $CuCl_2$ and 12 mg (0.028 mmol) of Morpho CDI. The mixture was stirred and heated at 50 °C under nitrogen for 3 h, then cooled to room temperature, and filtered through silica gel (ether elution). Concentration of the filtrate in vacuo and chromatography on silica gel (elution with 10% EtOAc–hexane) gave 1.6 mg (40%) of oily racemic isolobophytolide (**46**). Combination of the above sample with material from another run and chromatography on 5 g of silica gel (elution with 5% EtOAc–C_6H_6) gave racemic isolobophytolide (**46**) of purity comparable to a sample of natural (−)-isolobophytolide. Mass, ^1H NMR, and IR spectra and the TLC mobilities of synthetic and natural **46** were identical: IR (film) ν 2900, 1760, 1440, 1365, 1150 cm^{-1}; ^1H NMR (300 MHz, $CDCl_3$) δ 1.22 (s, C4 Me), 1.30 (m, H5), 1.58 (s, C8 Me), 1.65 (dd of AB, J_{AB} = 15.8 Hz, $\Delta\nu$ = 77 Hz, J_{Avic} = 4.0, 3.7 Hz, J_{Bvic} = 6.5, 8.9 Hz, H2), 1.69 (s, C12 Me), 2.10 (m, H9, H10), 2.25 (m, H6), 2.48 (d of AB, J_{AB} = 13.2 Hz, $\Delta\nu$ = 80 Hz, J_{Avic} = 3.0 Hz, J_{Bvic} = 9.5 Hz, H13), 2.77 (dd, J = 6.5, 4.0 Hz, H3), 2.86 (m, H1), 4.12 (ddd, J = 9.5, 8.1, 3.0 Hz, H14), 5.00 (br t, J = 6.5 Hz, H7), 5.15 (br t, J = 7.0 Hz, H11), 5.92 (d, J = 2.8 Hz, C17 CH_2), 6.25 (d, J = 3.1 Hz, C17 CH_2); MS calcd for $C_{20}H_{28}O_3$ m/e 316.44, found ($M^+ - CH_3$) 301, (M^+) 316.

Epinigericin, a New Polyether Carboxylic Antibiotic. Structural Determination by 2D NMR Methods

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A new polyether carboxylic antibiotic, epinigericin (1), was isolated from *Streptomyces hygroscopicus* NRRL B-1865. Its structure and stereochemistry in comparison with nigericin are investigated by 1D and 2D ^1H and ^{13}C NMR spectrometry.

The majority of polyether carboxylic antibiotics[1] possess the ability to transport monovalent cations through biological membranes by forming lipophilic complexes. They are of considerable commercial importance as feed additives acting as anticoccidial agents and growth promoters in ruminants.

High-field NMR spectrometry and new pulse Fourier transform techniques allow the structure and conformation of ionophore–cation complexes in solution to be determined.

NMR conformational studies can help to understand the

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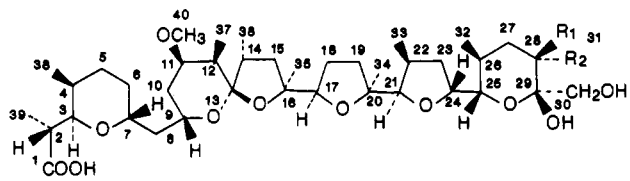
biological properties of a new naturally occurring substance. Total assignments of ^1H and ^{13}C NMR spectra are first required.

In the course of our study of the biosynthesis of nigericin (2), the second member of the ionophore family to be isolated, we have been able to increase the titers of polyether antibiotics over 7-fold after 7 days by adding methyl oleate (1%) to the original fermentation culture of nigericin-producing *Streptomyces hygroscopicus* NRRL B-1865.[2] Addition of oils or fatty acids to the fermentation medium has positively affected the production of some other polyether antibiotics[3,4] and neomycin.[5] In addition, this increased yield (85 and 600 mg/L without and with methyl oleate, respectively) allowed us to isolate two new antibiotics closely related to nigericin, which had already shown up as traces in mycelium of cultures grown without addition of methyl oleate. Abierixin[2] was the first of these to be described.

We describe here the complete assignments of ^1H and ^{13}C NMR spectra and report structural determination of the second antibiotic, epinigericin (1).



2, R_1=CH_3, R_2=H, nigericin
1, R_1=H, R_2=CH_3, epinigericin

Results and Discussion

Epinigericin, $C_{40}H_{68}O_{11}$, $[\alpha]^J_{25}$ 3.1° (*c* 0.03, CH_3OH), was obtained as a colorless powder, soluble in organic solvents but not in water. From culture, epinigericin-Na, $C_{40}H_{67}O_{11}Na$, mp 188.5 °C $[\alpha]^J_{25}$ 8° (*c* 0.03, CH_3OH), was obtained.

The minimal inhibitory concentration (MIC) of nigericin and epinigercin against *Bacillus cereus* was determined by a serial 2-fold dilution using Mueller–Hinton broth, 01 $\times 10^{-3}$ and 0.2×10^{-3} mg/L, respectively.

Epinigericin shows IR bands ascribable to hydroxy (3700–3150 cm^{-1}), carboxylic acid (1710 cm^{-1}), and ether (1115–1020 cm^{-1}) groups.

Mass spectra give a molecular weight of 724 amu for epinigericin and nigericin. In the positive FAB/MS, diagnostic cationized molecule *m/z* 747 $[(M + Na)^+]$ was detected. In the negative mode, only the deprotonated molecule $[(M-H)^-]$ at *m/z* 723 was observed, confirming the molecular weight. Thus epinigericin and nigericin are isomers.

The ^{13}C NMR spectra of epinigericin gives further structural information. Both nigericin and epinigericin contain 40 carbons. The modulated spin-echo ^{13}C NMR spectrum gives multiplicity leading to preliminary ^{13}C assignments. All assignments (Table I) were then made by comparison with parent compounds, nigericin[6] and grisorixin.[7] The classification of the carbons suggests that 1 and 2 are isomers. Close comparison between these ^{13}C spectra revealed chemical shift changes for seven carbons (F-ring carbons 25–31).[8] The shift changes, including a marked upfield shift of the C26 signal, are compatible with a structure in which the Me31 of 1 is epimeric (α-axial conformation)[9] to that of nigericin (γ-gauche effect).

Two dimensional (2D) NMR methods[10] were useful in giving complete assignments of the ^1H spectra and in confirming the carbon 28 stereochemistry. The COSY ^1H–^1H chemical shift correlation of the two antibiotics provides a ^1H scalar coupling relationship (Figure 1, COSY NMR spectrum of epinigericin). Groups of coupled protons, separated by three quaternary carbons can be detected: Me39–H2–H3–H4–Me38–H5a,H5b–H6a,H6b–H7–H8a–H8b–H9–H10a,H10b–H11–H12–Me37 and Me36–H14–H15a,H15b, and also H17–H18a,H18b–H19a–H19b (the assignments of these three groups of protons are very similar for both antibiotics). The last group of coupled protons H21–H22–Me33–H23a,H23b–H24–H25–H26–Me32–H27a,H27b–H28–Me31 presents differences for F-ring protons compared with corresponding nigericin protons. The signals at 1.25, 1.27, 1.00, and 1.84 ppm, assigned to protons H26, H27a, H27b, and H28 in nigericin,

Table I. ^{13}C NMR Chemical Shifts of Nigericin (2) and Epinigericin (1)[a]

C	function groups	nigericin H (2)	epinigericin H (1)	Δδ
1	COOH	177.1	177.4	
2	$CHCH_3$	44.5	44.7	
3	CHO	73.4	73.3	
4	$CHCH_3$	28.4	28.5	
5	CH_2	26.4	26.5	
6	CH_3	23.9	23.7	
7	CHO	68.9	69.5	
8	CH_2	36.1	35.8	
9	CHO	60.9	60.9	
10	CH_2	32	31.7	
11[b]	$CHOCH_3$	77.5	77.7	
12[b]	$CHCH_3$	37.6	37.5	
13	O–C–O	108.7	108.7	
14	$CHCH_3$	39.5	39.3	
15	CH_2	43.0	43.0	
16[b]	C–O(CH_3)	82.0	81.8	
17	CHO	82.9	82.9	
18	CH_2	26.3	26.1	
19	CH_2	31.3	30.9	
20[b]	C–OCH_3	83.8	83.7	
21	CHO	86.3	86.1	
22[b]	$CHCH_3$	35.5	35.6	
23[b]	CH_2	32.6	32.2	
24[b]	CHO	78.3	78.2	
25	CHO	74.8	75.4	
26	$CHCH_3$	33.0	26.5	6.5 (γ gauche effect)
27	CH_2	38.3	36.4	1.9
28	$CHCH_3$	37.3	32.0	5.3 (Me31 axial position)
29	O–COH	97.7	98.3	
30	CH_2OH	69.5	67.1	
31	Me28	16.8	15.7	
32	Me26	17.2	17.4	
33	Me22	15.7	15.6	
34	Me20	22.9	22.9	
35	Me16	27.9	27.6	
36	Me14	13.3	13.2	
37[b]	Me12	13.4	13.4	
38	Me4	10.9	10.7	
39[b]	Me2	13.3	13.1	
40	OCH_3	57.6	57.5	

[a] ^{13}C FT NMR spectra were recorded in C_6D_6 (75.45 MHz) (δ in ppm). [b] Carbons assignments are given by comparison with grisorixin (Dauphin, G., unpublished results).

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Table II. ^1H Chemical Shifts of Epinigericin 1 and Nigericin 2 in C_6D_6

	H-2	Me-39	H-3	H-4	Me-38	H-5A	H-5B	H-6	H-6B	H-7	H-8A	H-8B	H-9
epinigericin	2.60	1.06	4.0	1.46	0.82	1.78	1.27	2.0	1.0	4.12	2.77	1.01	4.53
nigericin	2.57	1.04	3.97	1.48	0.83	1.80	1.35	1.98	0.98	4.07	2.74	1.02	4.52
	H-10A	H-10B	H-11	H-12	Me-37	H-14	Me-36	H-15A	H-15B	Me-35	H-17	H-18A	H-18B
epinigericin	2.28	0.84	3.12	1.66	1.10	2.10	1.08	1.85	1.73	1.90	3.52	2.01	1.56
nigericin	2.26	0.85	3.13	1.67	1.10	2.12	1.08	1.86	1.77	1.86	3.54	2.0	1.59
	H-19A	H-19B	Me-34[a]	H-21	H-22	Me-33	H-23A	H-23B	H-24	H-25	H-26	Me-32	H-27A
epinigericin	2.46	1.31	1.09	4.25	2.02	0.81	2.43	1.26	4.43	4.53	1.53	0.68	2.37
nigericin	2.41	1.31	1.07	4.22	2.02	0.81	2.38	1.28	4.40	4.36	1.28	0.70	1.72
	H-27B	H-28	Me-31	H-30A	H-30B	MeO-40							
epinigericin	1.37	2.58	1.28	4.54	4.01	3.63							
nigericin	1.0	1.84	1.37	4.04	3.98	3.56							

[a] The long-range coupling H_{21}–Me_{34} leads to the assignments of Me34 protons.

Table III. Mean Apparent Vicinal Exocoupling ^3J (Hz) for (Quasi-)Axial and (Quasi-)Equatorial Methyl Groupings of Epinigericin (1) in C_6D_6

	Me-32	Me-33	Me-38	Me-39	Me-36	Me-37	Me-31
epinigericin	6.60 equatorial	7.1 pseudoaxial	6.9 axial	7.0 acyclic	6.6 pseudoequatorial	6.6 equatorial	7.3 axial
nigericin	6.60 equatorial	7.0 pseudoaxial	6.9 axial	6.9	6.4 pseudoequatorial	6.6 equatorial	6.6 equatorial
statistic[a]	6.6	7.0	7.0	7.0 acyclic	6.4	6.6	7.0 axial 6.6 equatorial

[a] ANTEUNIS (Westley, J. *Polyethers Antibiotics*; Marcel Dekker: New York, 1982; Vol. 2).

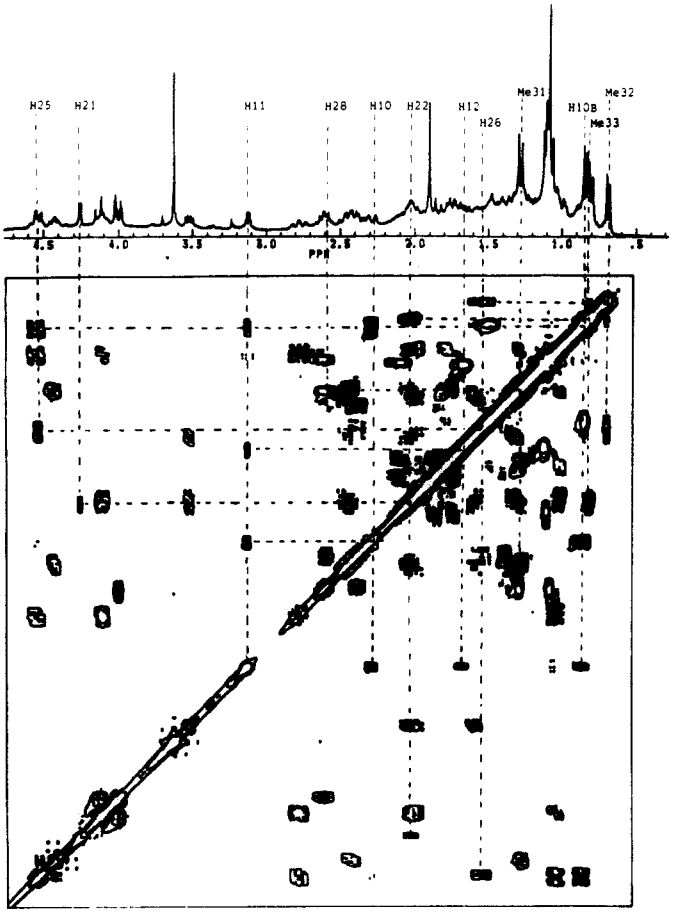

Figure 1. COSY NMR (300 MHz, C_6D_6) spectrum of epinigericin (1) presented as a contour plot (δ ^1H in two dimensions).

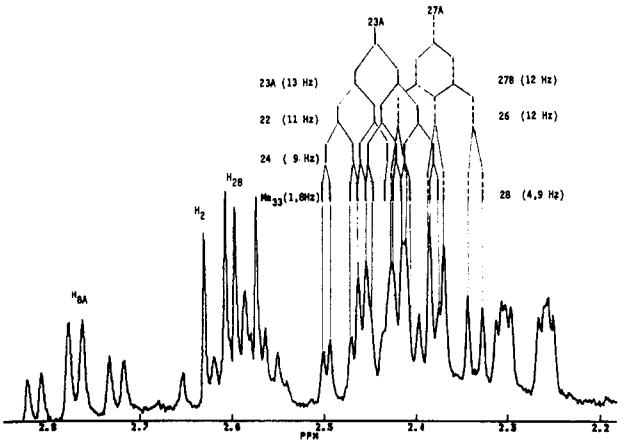

Figure 2. 1D ^1H NMR partial spectrum (2.2–2.8 ppm) of epinigericin (1) in C_6D_6.

are shifted downfield to 1.53, 2.37, 1.37, and 2.58 ppm, respectively (Table II).

Coupling constants $^3J_{H27a-H26}$ = 12 Hz and $^3J_{27a-H28}$ = 4.9 Hz for epinigericin (Figure 2) were obtained directly from the 1D spectrum. These values show that H26 and H27a are axial and H28 is equatorial. Thus the methyl 31 bound to the carbon 28 is axial (Me31 is equatorial in nigericin[11]).

Coupling constants given in Table III give further information on the C-28 stereochemistry.[12] All epinigericin and nigericin asymmetric carbons bound to a methyl have the same stereochemistry except carbon 28. Coupling constants are $^3J_{Me31-H28}$ = 7.3 Hz for epinigericin and $^3J_{Me31-H28}$ = 6.6 Hz for nigericin, confirming Me31 to be axial in epinigericin and equatorial in nigericin.

All these results are consistent with the proposed structure of epinigericin (1).

In addition, characteristic coupling constants[13] obtained directly from 1D ^1H spectrum through double resonance experiments or from 2D J–δ ^1H correlation spectrum are similar and show that nigericin (2) and epinigericin (1) have the same circular conformation.

We observed that epinigericin is less stable than nigericin. Epinigericin–Na treatment with HCl 0.1 N to obtain the acid form leads to nigericin (^{13}C spectra NMR in C_6D_6 are the same). The epimerization at C28 could be explained by the opening of the cycle F of epinigericin via the ketonic intermediate, which is converted into the

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more stable ketone, the cyclization of which gives nigericin.

Acid treatment of nigericin (same isolation procedure as for all antibiotics) give some epinigericin (≤1%). Thus it seems that nigericin was converted into epinigericin on isolation. But according to the proposed model for nigericin biosynthesis,[14] epinigericin may be a natural product.

By 2D NMR methods, we have completely assigned ^1H and ^{13}C NMR spectra and determined the structure of a new antibiotic, epinigericin, with only 0.1 mmol of material. We have shown that epinigericin and nigericin have closely related conformations. Epinigericin is half as toxic as nigericin (on the population dynamic in exponential growth of *Tetrahymena pyriformis*) and presents also half antimicrobial activity. NMR conformational studies of this new polyether carboxylic antibiotic and its complexes with various cations, in conjunction with studies of its biological properties are underway.

Experimental Section

General Methods. Infrared spectra were recorded with a Perkin-Elmer 327 spectrometer in KBr. Positive and negative FAB (fast atom bombardment) mass spectra were obtained with a ZAB 2F VG spectrometer (Manchester, G.B.). ^{13}C NMR spectra were run on a Bruker 300 MSL instrument in C_6D_6. The two-dimensional correlated ^1H NMR experiment "COSY" was also performed on the Bruker 300 MSL. The applied pulse sequence was $(\pi/2)$-(t1)-$(\pi/4)$-(FID,t2). The spectral width in F1 and F2 was 1272.265 Hz. The number of data points in F2 was 2048 and 128 increments were recorded. Before Fourier transformation, zero filling was applied in t1 (size × si_1 = 1024), and the data were multiplied with unshifted sine bell in two dimensions. Total acquisition was 10 h for nigericin and epinigericin.

Thin-layer chromatography (TLC) was carried out by using Merck precoated silica gel F-254 plates. Spots were visualized with H_2SO_4-H_2O (50/50 v/v).

Production of Epinigericin. The antibiotic epinigericin was produced and isolated from a strain of *Streptomyces hygroscopicus* NRRL B-1865.[2] The EtOAc extract was concentrated and the residue fractionally separated by chromatography column on silica gel (Merck silica gel 60, 0.063–0.200 mm). Elution with cyclohexane–ethyl acetate yielded crude epinigericin (400 mg from 15 L of culture broth). The purification of epinigericin-Na was achieved by a flash chromatography column[15] using MeOH–$CHCl_3$ with increasing amounts of MeOH as eluting solvent: TLC (MeOH–$CHCl_3$, 95:5) R_f 0.58 (0.70 for nigericin); IR (KBr) 3200, 2900, 1580, 1380, 1120, 1040, 950, 650 cm^{-1}. Anal. Calcd for $C_{40}H_{67}O_{11}Na$: C, 64.36; H, 8.98; O, 23.58. Found: C, 64.66; H, 9.43; O, 23.05.

Epinigericin was isolated from its sodium salt by running it through a flash chromatography column with the same solvents as above, acidified with 5% acetic acid: ^1H NMR (C_6D_6), see Table II; ^{13}C NMR (C_6D_6), see Table I.

Acknowledgment. Our thanks to Mrs. G. Kergomard and N. Grangemare for the antimicrobial tests.

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8a,9-Dihydro-8a-methyl-9-methyleneanthracene: A Hydrocarbon with Fused Blocked Aromatic Rings

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The title compound 1 was prepared from diketone 2 by a four-step synthesis. Photorearrangement of 1 proceeded slowly compared to that of the corresponding fused blocked aromatic ketone A to form 1,10-dimethylanthracene in variable yields. Thermolysis of 1 yielded the "double aromatization" product, 9-ethylanthracene. The thermal rearrangement was not affected by the addition of free radical chain inhibitors. An attempt to prepare 1 by reaction of hydrocarbon 3 with NBS and dibenzoyl peroxide yielded the vinyl bromide 5.

Blocked aromatic molecules, which contain unsaturated six-membered rings that can be aromatized by the migration or loss of a single substituent, exhibit a wide range of rapid and often unusual rearrangement processes.[1,2] Molecules with fused blocked aromatic rings, in which the migration of a single substituent might simultaneously convert two or more alicyclic rings to aromatic structures, should rearrange with even greater facility.

Our group recently reported the synthesis of the fused blocked aromatic ketone A[3] and provided evidence for the formation of ketone B as a short-lived intermediate.[4a] As expected, these compounds rearranged to form aromatic isomers, ketone B, at an immeasurably fast rate. However, both ketones rearranged by processes that resulted in aromatization of a single ring (eq 1 and 2), rather than by "double aromatization" processes.

Until the appearance of a preliminary communication about this work,[4b] no example of formation of a hydrocarbon with fused blocked aromatic rings had been reported. Since the isomerization of hydrocarbons to aromatic isomers is usually more exothermic than the corresponding processes with carbonyl compounds, we decided to prepare the fused blocked aromatic hydrocarbon 1 to see whether double aromatization processes or other novel reactions could be observed.

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