of the second alkyl chain. This is unusual, since an increased total hydrophobicity of the side chains involved in domain formation is expected to lead to enhanced catalytic activity. Thus, our results appear to suggest that flexibility of the copolymer chain is a factor that governs microdomain formation.[30] The presence of a (second) *n*-butyl and *n*-pentyl chain in Copol C 4-12 (97/3) and C 5-12 (98/2) allows less efficient compact coil formation as compared with that for Copol C 1-12 (87/13). However, the differences in the molar percentage of the *n*-dodecyl chain in the three copolymers will also affect microdomain formation. Finally, steric effects varying with the length of the second alkyl chain may also modulate the catalytic effect of the polysoap. Interestingly, for the three catalytically most effective copolymers, the K_m values vary only little, which also suggests that most likely several factors are involved in determining the catalytic efficiency. Apart from Copol C 1-8 (61/39), the other copolymers of the Copol C 1-8 and Copol C 1-7 type induce modest or small rate enhancements of the decarboxylation, again in accord with the previous conclusion that these macromolecules do not form extensive microdomains. Therefore, the Menger–Portnoy analysis was not applied for these systems (Table II).

(30) The importance of geometrical constraints in determining the formation of hydrophobic microdomains has been noted before, see: Jager, J. Ph.D. Thesis, Groningen, 1987. For example, poly(methacrylic acid) readily forms compact coils, whereas poly(crotonic acid) does not: Muroga, Y.; Nagasawa, M. *Polym. J.* **1986**, *18*, 15.

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Conclusion

Hydrophobically modified homo- and copolymers of the poly(alkylmethyldiallylammonium bromide) type form hydrophobic microdomains in aqueous solution depending on the length(s) of the alkyl chain(s) and, most likely, the flexibility of the polymer main chain. The polysoaps allow interesting comparisons between intra- and intermolecular micellization processes.

Acknowledgment. Financial support from the Netherlands Technology Foundation (STW) is gratefully acknowledged. We thank T. A. A. Fonteijn for performing highly useful preliminary experiments. We are also much indebted to Mr. Anno Wagenaar for his help in the analysis of the NMR spectra.

Registry No. 1, 14764-64-8; 2, 69419-83-6; 3, 133833-04-2; 4, 133833-05-3; 5, 69419-86-9; 6, 41454-28-8; Pol C-1 (homopolymer), 30870-73-6; Pol C-5 (homopolymer), 133833-10-0; Copol C1-12 (copolymer), 133833-11-1; Copol C5-12 (copolymer), 133833-13-3; Copol C1-7, 133833-15-5; Methyl orange, 547-58-0; 6-nitrobenzisoxazole-3-carboxylate, 42540-91-0.

Supplementary Material Available: ^{1}H NMR spectra of the novel monomers and (co)polymers (16 pages). Ordering information is given on any current masthead page.

Nortopsentins A, B, and C. Cytotoxic and Antifungal Imidazolediylbis[indoles] from the Sponge *Spongosorites ruetzleri*

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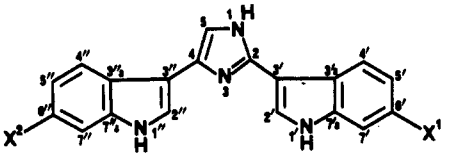
Received October 31, 1990

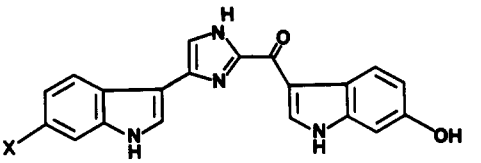
Three novel cytotoxic and antifungal alkaloids, nortopsentins A (1), B (2), and C (3), along with two known compounds, topsentin (4) and bromotopsentin (5), were isolated from the Caribbean deep-sea sponge *Spongosorites ruetzleri*. The structures of the nortopsentins were established mainly on the basis of NMR spectroscopic data. The unique imidazolediylbis[indole] skeleton of the nortopsentins demonstrates a new condensation process in tryptophan metabolism. The nortopsentins exhibited in vitro cytotoxicity against P388 cells and antifungal activity against *Candida albicans*.

The topsentins, discovered recently as antitumor and antiviral agents from marine sponges,[1-3] represent an emerging class of marine bis[indole] alkaloids.[1-8] During our search for bioative marine natural products, we isolated three novel cytotoxic and antifungal compounds belonging to this class, designated as nortopsentins A (1), B (2), and C (3), together with two known compounds, topsentin (4) and bromotopsentin (5), from the deep-sea sponge *Spongosorites ruetzleri* Van Soest and Stentoft, 1988 (order Halichondrida, family Halichondriidae).[9] The unique imidazolediylbis[indole]skeleton of the nortopsentins demonstrates a new condensation process in tryptophan metabolism.[1-8]

S. ruetzleri, one of the four *Spongosorites* sponges reported to produce the topsentins by Tsujii et al.,[2,10] was recollected by Johnson-Sea-Link submersible at a depth of 460 m off Nassau, Bahamas, in March 1987. The



1: X^1 = X^2 = Br
2: X^1 = Br, X^2 = H
3: X^1 = H, X^2 = Br



4: X = H
5: X = Br

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0022-3263/91/1956-4304$02.50/0

Table I. ^{13}C (90 MHz) and ^{1}H (360 MHz) NMR Assignments of Nortopsentins A (1), B (2), and C (3)

	1		2		3	
atom	δ ^{13}C[a]	δ ^{1}H[a] (m, J, Hz)	δ ^{13}C[b]	δ ^{1}H[a] (m, J, Hz)	δ ^{13}C[c]	δ ^{1}H[a] (m, J, Hz)
2	143.8		143.8		145.0	
4	133.3		132.9[d]		132.7[d]	
5	116.1	7.53 (s)	118.0	7.43 (s)	117.3	7.43 (s)
1′-NH		11.06 (br s)		10.71 (br s)		10.60 (br s)
2′	125.0	7.90 (d, 2.1)	125.5	7.92 (d, 2.7)	125.0	7.89 (d, 2.1)
3′	108.7		108.9		108.1	
3′a	125.1		125.3		126.2	
4′	123.3	8.47 (d, 8.5)	123.2	8.54 (d, 8.5)	121.1	8.55 (br d, 8.7)
5′	123.8	7.32 (dd, 8.5, 1.8)	124.1	7.29 (dd, 8.5, 1.8)	123.3	7.18 (m)
6′	116.1		116.4		121.2	7.16 (m)
7′	115.2	7.62 (d, 1.8)	115.5	7.65 (d, 1.8)	112.5	7.45 (dd, 8.5, 2.5)
7′a	138.3		138.6		137.9	
1″-NH		10.85 (br s)		10.38 (br s)		10.60 (br s)
2″	123.5	7.80 (d, 2.3)	122.9	7.74 (d, 2.3)	123.6	7.76 (d, 2.1)
3″	110.7		109.8		110.2	
3″a	125.1		126.4		125.4	
4″	122.3	8.00 (d, 8.5)	120.8	8.03 (br d, 7.4)	122.0	8.04 (d, 8.5)
5″	123.2	7.20 (dd, 8.5, 1.8)	120.6	7.11 (m)	123.6	7.24 (dd, 8.5, 1.7)
6″	115.5		122.8	7.15 (m)	116.2	
7″	115.2	7.61 (d, 1.8)	112.6	7.44 (dd, 8.7, 1.3)	115.3	7.62 (d, 1.7)
7″a	138.5		138.0		138.9	

[a] Recorded in $(CD_3)_2CO$. [b] Recorded in $(CD_3)_2CO$–CD_3OD (1:1). [c] Recorded in CD_3OD. [d] Not observed in $(CD_3)_2CO$.

methanolic extract from this sponge was active in the antitumor (P388), antiviral (HSV-1), and antifungal (*Candida albicans*) assays. As expected, topsentin (4) and bromotopsentin (5), which inhibited P388 cells and HSV-1 virus, were obtained in copious amounts from the extract. Enrichment of the antifungal activity in the extract was achieved by repeated solvent partitioning. Silica gel TLC of the active partition showed the presence of a distinct fluorescent spot (R_f 0.5, $CHCl_3$–MeOH, 4:1) detectable under UV at 365 nm. The color of the spot gradually turned from colorless to reddish brown after exposure to light. Purification of this material was thus carried out in a dimly lit room by using repeated centrifugal countercurrent chromatography, HPLC, preparative TLC, and recrystallization to afford nortopsentins A (1), B (2), and C (3).

A molecular formula $C_{19}H_{12}N_4Br_2$ was established for nortopsentin A (1) by high-resolution EIMS. The ^{13}C NMR spectrum showed the molecule contained 19 unsaturated carbons. The presence of two independent 6-bromoindol-3-yl moieties was evident from analysis of ^{1}H and ^{13}C NMR spectral data (Table I) including DEPT, COSY, HETCOR, COLOC, and HETCOSY,[11] and from comparison of chemical shift values with those of known bromoindoles.[1-3,6] The remaining subunit $C_3H_2N_2$ as required by the molecular formula has to be a 2,4-disubstituted imidazole ring by ^{13}C and ^{1}H NMR chemical shift arguments. The chemical shifts for C-2, C-4, and C-5 at δ 143.8, 133.3, and 116.1, respectively, and for H-5 at δ 7.53, are in agreement with those reported for the imidazoles including the topsentins.[1-3,12,13] The protonated C-5 with a $^{1}J_{C-H}$ value of 189 Hz was typical of imidazoles.[2,12] H-5 was found to be long-range coupled to C-2 and C-4 in the HETCOSY spectrum. Furthermore, long-range correlations were also observed from C-2 to H-2′ (δ 7.90), from C-4 to H-2″ (δ 7.80), and from C-3″ (δ 110.7) to H-5, thereby connecting the imidazole ring with two 6-bromoindol-3-yl moieties at C-2 and C-4 to yield the structure of nortopsentin A as 1.

The high-resolution EI mass measurement and the ^{13}C NMR spectrum established the formula $C_{19}H_{13}N_4Br$ for nortopsentins B (2). 2 appeared to have the same imidazolediylbis[indole] system as in 1 on the basis of NMR spectral comparison (Table I). The existence of a indol-3-yl and a 6-bromoindol-3-yl moiety in 2 was indicated by its ^{1}H NMR spectrum and COSY experiment (Experimental Section), and further confirmed by HETCOSY. However, the ^{1}H–^{13}C correlations from the two indole moieties to the imidazole ring were not observed in the HETCOSY spectrum. A series of difference NOE experiments were thus performed on the trimethylated derivative 6. Irradiation of the imidazole 1-NCH_3 resonance at δ 3.97 resulted in enhancement of the imidazole H-5 signal (10.1%) at δ 7.94, of the H-4′ signal (3.1%) at δ 7.67, and of the H-2′ signal (2.9%) at δ 8.28, while irradiation of H-5 resonance induced enhancement of the H-4″ signal at δ 7.73 (4.0%), strongly suggesting the 6-bromoindol-3-yl moiety was linked to C-2 and the indol-3-yl to C-4 in 2. Similar NOE results were also obtained from the NOESY spectrum of the tetramethylated nortopsentin B (7).

Nortopsentin C (3) has the same molecular formula $C_{19}H_{13}N_4Br$ as 2 by HREIMS. The structural distinction between 3 and 2 was readily recognized from their ^{1}H NMR (Table I) and COSY spectral data (Experimental

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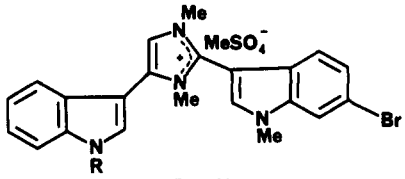

6: R = H
7: R = Me

Section). In 3 a broad doublet at δ 8.55 (H-4′) from the indol-3-yl residue occurred 0.51 ppm further downfield than a doublet at δ 8.04 (H-4″) from the 6-bromoindol-3-yl residue, while the opposite situation was observed in 2, a consequence of the deshielding effect of the imidazole N-1. This, along with the detection of the coupling between H-2′ (δ 7.89) and the imidazole C-2 (δ 145.0) by HETCOSY, enabled us to place the bromine atom at C-6″ in 3. On the basis of the above data, nortopsentins B and C were represented by structures 2 and 3, respectively. It is noteworthy that the doubling of NMR signals in neutral solutions, due to slow interconversion of imidazolylmethanone tautomers in the topsentins,[1-3] was not observed for the imidazole system of the nortopsentins, indicative of a rapid proton transform equilibrium between N-1 and N-3.

The nortopsentins are responsible for the antifungal activity associated with the extract of the sponge and partially account for the antitumor activity. Their methylated derivatives (6 and 7) showed significant improvement in P388 activity compared with that of the parent compound (2) (Experimental Section). Unlike the topsentins, the nortopsentins do not possess antiviral activity. Similar compounds, diphenylimidazoles[14] and diphenylindolylimidazoles,[15] were previously synthesized, and the latter was reported to be analgesics, antipyretic, and antiinflammatory. Whether the nortopsentins possess these activities needs to be further investigated.

Experimental Section

Isolation of the Nortopsentins. The sponge sample (830 g) was stored frozen and then extracted with MeOH (1.5 L × 4). The extract was concentrated to an aqueous suspension (400 mL) in vacuo, and extracted wiht EtOAc (300 mL × 3) to give an yellowish-brown oily extract (12.0 g). Topsentin (topsentin B-1,[1] 4, 172 mg, 0.23% of the wet weight sponge) and bromotopsentin (topsentin B-2,[1] 5, 83 mg, 0.11%) were isolated from a portion (1.08 g) of the extract by using repeated solvent partitioning, centrifugal countercurrent chromatography, and HPLC. Their spectral properties including ^1H and ^{13}C NMR, IR, UV, and mp were identical with those obtained from the authentic samples.[2] Repeated solvent partitioning (heptane–EtOAc–MeOH–H_2O, 4:7:4:3) of the extract followed by repeated centrifugal countercurrent chromatography of a upper-phase partition (2.8 g) using heptane–EtOAc–MeOH–H_2O (4:7:4:3 and 5:7:4:3, lower phase stationary) yielded a fraction containing mainly nortopsentin A (1) and a fraction containing both nortopsentins B (2) and C (3). Purification of 1 (250 mg, 0.030%) was achieved by HPLC on an NH_2 column with $CHCl_3$–MeOH (5:1). The mixture of 2 and 3 was separated on preparative silica gel plates with EtOAc to give pure 3 (200 mg, 0.024%) and semipure 2. Finally, pure 2 (250 mg, 0.030%) was recrystallized from EtOAc–$CHCl_3$.

Nortopsentin A (3,3′-imidazole-2,4-diylbis[6-bromoindole], 1): a colorless oil; HREIMS M^+ 453.9426 (calcd for $C_{19}H_{12}N_4{}^{79}Br_2$, Δ 0.3 mmu); LREIMS M^+ 458/456/454 (rel %, 32/58/29), 377/375 (9/9), 350 (2), 348 (2), 296 (5), 268 (3), 236 (5), 234 (6), 222 (5), 220 (5), 209 (7), 207 (7), 197 (7), 195 (7), 189 (7), 155 (16), 148 (7), 141 (7), 128 (26), 116 (11), 114 (10), 101 (13), 89 (7), 82 (23), 80 (24), 44 (62), 32 (53), and 28 (100); LRFABMS MH^+ 459/457/455; UV (MeOH) λ_{max} 207 (ε 50 300), 236 (42 300), 277 (26 400), and 310 nm (sh); IR (KBr) ν_{max} 3420, 1615, 1591, 1510, 1448, 1430, 1328, 1248, 1100, 1023, 919, 892, 800, 781, and 757 cm^{-1}; ^1H and ^{13}C NMR, Table I; $^1J_{C-H}$ (Hz) C-5/H-5 189, C-2′/H-2′ 185, C-4′/H-4′ 164, C-5′/H-5′ 166, C-7′/H-7′ 166, C-2″/H-2″ 184, C-4″/H-4″ 161, C-5″/H-5″ 165; COSY cross peaks H-2′/1′-NH, H-4′/H-5′, H-4′/H-7′, H-5′/H-7′, H-2″/1″-NH, H-4″/H-5″, H-4″/H-7″, and H-5″/H-7″.

Nortopsentin B (6-bromo-3-(4-indol-3-ylimidazol-2-yl)-indole, 2): colorless plates; decomposed at 250–270 °C; HREIMS M^+ 376.0320 (calcd for $C_{19}H_{13}N_4{}^{79}Br$, Δ 0.4 mmu); LREIMS M^+ 378/376 (rel %, 56/57), 350 (3), 348 (3), 297 (20), 270 (5), 268 (5), 242 (4), 236 (7), 234 (7), 209 (4), 207 (4), 188 (7), 155 (37), 148 (27), 142 (11), 135 (12), 128 (47), 121 (9), 114 (12), 101 (28), 82 (46), 80 (51), and 44 (100); LRFABMS MH^+ 379/377; UV (MeOH) λ_{max} 206 (ε 50 700), 232 (45 200), 278 (25 600), and 310 nm (sh); IR (KBr) ν_{max} 3400, 1620, 1603, 1587, 1562, 1448, 1422, 1364, 1328, 1249, 1238, 1104, 1092, 1024, 927, 920, 894, 811, 762, and 743 cm^{-1}; ^1H and ^{13}C NMR, Table I; COSY cross peaks H-2′/1′-NH, H-4′/H-5′, H-5′/H-7′, H-2″/1″-NH, H-4″/H-5″, H-6″/H-7″.

Nortopsentin C (6-bromo-3-(2-indol-3-ylimidazol-4-yl)-indole, 3): colorless oil; HREIMS M^+ 376.0316 (calcd for $C_{19}H_{13}N_4{}^{79}Br$, Δ 0.8 mmu); LREIMS M^+ 378/376 (rel %, 96/100), 350 (5), 348 (5), 297 (20), 270 (7), 268 (7), 242 (6), 235 (6), 233 (5), 209 (9), 207 (9), 197 (7), 195 (7), 188 (10), 155 (45), 148 (38), 142 (15), 135 (15), 128 (51), 116 (19), 101 (35), 89 (15), 82 (30), 80 (31), 58 (29), and 53 (24); LRFABMS MH^+ 379/377; UV (MeOH) λ_{max} 207 (ε 50 300), 230 (sh), 280 (sh), and 310 nm (sh); IR (KBr) ν_{max} 3410, 1620, 1598, 1450, 1431, 1411, 1332, 1245, 1128, 1100, 1023, 920, 896, 800, and 745 cm^{-1}; ^1H and ^{13}C NMR, Table I; COSY cross peaks H-2′/1′-NH, H-4′/H-5′, H-4′/H-6′, H-5′/H-6′, H-5′/H-7′, H-6′/H-7′, H-2″/1″-NH, H-4″/H-5″, and H-5″/H-7″.

Preparation of Trimethylnortopsentin B (6) and Tetramethylnortopsentin B (7) from 2. A solution of 28 mg of nortopsentin B (2) in 2 mL of distilled acetone was stirred with 1 mL of dimethyl sulfate and 30 mg of K_2CO_3 at room temperature overnight. After removal of the insolubles and the solvents, the product was separated on a silica gel TLC plate with $CHCl_3$–MeOH (5:1) to afford 8 mg of 6 and 19 mg of 7 as $MeSO_4^-$ salts.

6: colorless fine needles from $CHCl_3$–EtOAc; mp 116–118 °C; HRFABMS MH^+ 421.0833 (calcd for $C_{22}H_{20}N_4{}^{81}Br$, Δ −2.0 mmu); HREIMS $M^+ - CH_3 + H$ 404.0631 (calcd for $C_{21}H_{17}N_4{}^{79}Br$, Δ 0.6 mmu); LREIMS M^+ 420/418 (rel %, 1/1), 406 (4), 404 (4), 281 (3), 207 (25), 191 (4), 169 (3), 155 (2), 142 (5), 133 (4), 96 (27), 94 (29), 82 (14), 80 (15), 64 (49), and 44 (100); UV (MeOH) λ_{max} 217 (48 200), 272 (sh), 280 (20 700), 287 (21 100), 293 (19 300), and 314 (sh) nm; IR (KBr) ν_{max} 3400, 1625, 1615, 1580, 1561, 1525, 1495, 1450, 1420, 1363, 1340, 1322, 1296, 1245, 1228, 1185, 1157, 1137, 1105, 1053, 1013, 978, 944, 811, and 750 cm^{-1}; ^1H NMR (CD_3COCD_3) δ 11.42 (1 H, br s, 1″-NH), 8.28 (1 H, s, H-2′), 7.94 (1 H, s, H-5), 7.92 (1 H, d, J = 1.7 Hz, H-7′), 7.88 (1 H, d, J = 2.6 Hz, H-2″), 7.73 (1 H, br d, J = 7.8 Hz, H-4″), 7.67 (1 H, d, J = 8.5 Hz, H-4′), 7.63 (1 H, br d, J = 8.2 Hz, H-7″), 7.41 (1 H, dd, J = 8.5, 1.7 Hz, H-5′), 7.23 (1 H, ddd, J = 8.2, 7.0, 1.3 Hz, H-6″), 7.16 (1 H, ddd, J = 7.8, 7.0, 1.3 Hz, H-5″), 4.08 (3 H, s, 1′-NMe), 3.97 (3 H, s, 1-NMe), 3.81 (3 H, s, 3-NMe), and 3.52 (3 H, s, $MeSO_4^-$); ^{13}C NMR (CD_3COCD_3) δ 142.1 (s), 139.0 (s), 137.5 (s), 136.2 (d), 131.1 (s), 128.0 (d), 127.0 (s), 126.1 (s), 125.6 (d), 123.4 (d), 121.9 (d), 121.4 (d × 2), 119.5 (d), 117.1 (s), 115.0 (d), 113.4 (d), 101.2 (s), 96.1 (s), 53.6 (q, $MeSO_4^-$), 36.4 (q), 35.1 (q), and 34.1 (q).

7: colorless fine needles from $CHCl_3$–EtOAc; mp 158–160 °C; HREIMS $M^+ - CH_3 + H$ 418.0786 (calcd for $C_{22}H_{19}N_4{}^{79}Br$, Δ 0.8 mmu); LREIMS $M^+ - CH_3 + H$ 420/418 (rel % 100/99), 405 (40), 403 (14), 340 (12), 210 (20), 209 (21), 183 (27), 169 (24), 162 (8), 156 (10), 148 (12), 142 (19), 128 (7), 115 (14), 101 (6), 82 (14), 80 (15), 52 (23), and 50 (69); UV (MeOH) λ_{max} 220 (48 300), 268 (sh), 278 (sh), 286 (20 300), 294 (20 800), and 312 (sh) nm; IR (KBr) ν_{max} 1624, 1610, 1578, 1560, 1527, 1500, 1464, 1450, 1420, 1363, 1334, 1296, 1250, 1225, 1189, 1159, 1133, 1103, 1094, 1051, 1013, 965, 935, 810, and 746 cm^{-1}; ^1H NMR ($CDCl_3$) δ 8.73 (1 H, s, H-2′), 7.67 (1 H, s, H-2″), 7.63 (1 H, d, J = 1.7 Hz, H-7′), 7.61 (1 H, br d, J = 7.9 Hz, H-4″), 7.50 (1 H, s, H-5), 7.38 (1 H, dd, J = 8.1, 1.2 Hz, H-7″), 7.37 (1 H, dd, J = 8.5, 1.7 Hz, H-5′), 7.30 (1 H, ddd, J = 8.1, 7.0, 1.1 Hz, H-6″), 7.27 (1 H, d, J = 8.5 Hz, H-4′), 7.22

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(1 H, ddd, J = 7.9, 7.0, 1.2 Hz, H-5″), 3.95 (3 H, s, 1′-NMe), 3.86 (3 H, s, 1-NMe), 3.84 (3 H, s, 1″-NMe), 3.72 (3 H, s, 3-NMe), and 3.68 (3 H, s, $MeSO_4^-$); ^{13}C NMR ($CDCl_3$) δ 141.5 (s), 137.9 (s), 136.9 (s), 136.4 (d), 131.1 (d), 130.1 (s), 126.6 (s), 125.3 (d), 124.7 (s), 122.9 (d), 121.1 (d), 120.3 (d), 119.7 (d), 118.8 (d), 116.9 (s), 114.1 (d), 110.1 (d), 99.1 (s), 94.5 (s), 54.3 (q, $MeSO_4^-$), 36.3 (q), 34.8 (q), 33.8 (q), and 33.2 (q).

Biological Activities of 1–7. IC_{50} against P388 (μg/mL): 1, 7.6; 2, 7.8; 3, 1.7; 4, 2.0; 5, 7.0; 6, 0.90; 7, 0.34. MIC against *C. albicans* (μg/mL): 1, 3.1; 2, 6.2; 3, 12.5; 4, >50; 5, >50; 6, >50; 7, >50.

Acknowledgment. Partial financial support was provided by the Agricultural Research Division, American Cyanamid Co., Princeton, NJ. We wish to thank Drs. N. Burres for in vitro P-388 assays, P. McCarthy for antifungal assays, S. Pomponi for sponge taxonomy, K. L. Loening, Chemical Abstracts Service, for IUPAC nomenclature, and K. L. Rinehart, University of Illinois at Urabana—Champaign, for mass spectra. We are also indebted to Dr. S. Gunasekera for providing samples of topsentin (4) and bromotopsentin (5). This is Harbor Branch Contribution No. 840.

Supplementary Material Available: ^1H and ^{13}C NMR spectra for compounds 1–3, 6, and 7 (10 pages). Ordering information is given on any current masthead page.

Notes

A Brominated (Aminoimidazolinyl)indole from the Sponge *Discodermia polydiscus*

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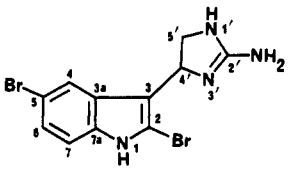
Received January 4, 1991

A wide variety of bioactive imidazole alkaloids derived from aromatic amino acids were reported from marine invertebrates.[1] Representative structures included aplysinopsins,[2] topsentins,[3] polyandrocarpamide D,[4] and naamidines.[5] During the course of our search for antitumor compounds from marine organisms, we isolated a novel brominated (aminoimidazolinyl)indole, designated as discodermindole (1), from the sponge *Discodermia polydiscus* DuBocage 1879 (family Theonellidae, order Lithistida).[6] In in vitro assays, 1 yielded IC_{50} values of 1.8 μg/mL against P388 (murine leukemia), 4.6 μg/mL against A-549 (human lung), and 12 μg/mL against HT-29 (human colon) cell lines. Its isolation and structure elucidation are reported herein.



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Samples of *Discodermia polydiscus* were collected by Johnson-Sea-Link submersible at a depth of 185 m off Chub Cay, Barry Islands, Bahamas, in August 1985. Freshly collected sponge specimens were immediately frozen and extracted later with methanol to give an extract that was active in our antitumor screening panels. The extract was partitioned between ethyl acetate and water. The aqueous fraction was lyophilized and triturated with 1:1 chloroform–methanol. Centrifugal countercurrent chromatography of the resulting oily extract, followed by Sephadex LH-20 chromatography and HPLC, yielded an active component, discodermindole (1).

Table I. ^1H (360 MHz) and ^{13}C (90 MHz) NMR Data of Discodermindole (1)[a]

atom	$\delta(^1H)$ (m, J, Hz)	$\delta(^{13}C)$ (m[b])	long-range coupled ^1H[c]
2		111.7 (s)	H4′
3		111.8 (s)	H4, H5′
3a		126.7 (s)	H4, H7
4	7.57 (d, 1.8)	119.8 (d)	H6
5		112.3 (s)	H4, H6, H7
6	7.24 (dd, 8.6, 1.8)	124.3 (d)	H4
7	7.32 (d, 8.6)	113.5 (d)	
7a		135.5 (s)	H4, H6, H7
2′		159.8 (s)	H4′, H5′
4′	5.23 (dd, 10.1, 7.1)	51.2 (d)	H5′
5′	3.99 (dd, 10.1, 10.1)	48.5 (t)	
	3.53 (dd, 10.1, 7.1)		

[a] Recorded in DMSO-d_6. [b] Multiplicity deduced from DEPT. [c] Observed from COLOC, HETCOR, and HETCOSY.

The molecular formula of 1 was determined to be $C_{11}H_{10}Br_2H_4$ by high resolution FAB mass spectrometry. EIMS failed to show the molecular ion but exhibited a 1:2:1 molecular ion cluster at m/z 273/275/277 corresponding to $C_8H_5Br_2N$, indicative of a dibromoindole moiety. The UV spectrum showed absorptions at 224 (ϵ 34 000), 282 (5700), 292 (6100) and 300 nm (5000), characteristic of an indole chromophore.[7] The coupling pattern of three aromatic ^1H NMR signals at δ 7.24 (dd, J = 8.6 and 1.8

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