Aeroplysinin-I, a New Bromo-compound from *Aplysina aerophoba*

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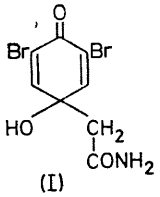
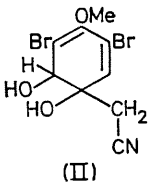
Summary Structure (II) has been assigned to aeroplysinin-I, a new antibacterial bromo-compound from the sponge *Aplysina aerophoba.*

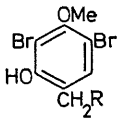
EXTRACTION of the sponge *Aplysina aerophoba* has afforded, together with 2-(3′,5′-dibromo-1′-hydroxy-4′-oxocyclohexa-2′,5′-dien-1′-yl)acetamide (I) previously isolated from the sponge *Verongia cauliformis*,[1] a number of new bromo-compounds.



(I)



(II)



(III) R = CN
(IV) R = CO_2Me

One of these, with antibacterial activity, aeroplysinin-I, m.p. 120°, $[\alpha]_D$ + 186° (*c* 0·5 in MeOH), has now been shown to have the structure (II).

The elemental analysis and the mass spectrum have established the molecular formula as $C_9H_9NO_3Br_2$; the i.r. spectrum (Nujol) shows the presence of OH (3380 cm^{-1}) and CN (2265 cm^{-1}) groups; the n.m.r. spectrum(CD_3CN) exhibits singlet bands at δ2·28 (1H, exchangeable with D_2O, t-*HO*); 2·74 (2H, CH_2); 3·70 (3H, CH_3O) and δ 6·34 (1H, C=C*H*) and an ill-defined multiplet centred at δ 4·16 (2H, C*H*OH): after exchange with D_2O the methyne proton resonates as a singlet at δ 4·10.

The presence of tertiary and secondary hydroxy-groups is confirmed by the n.m.r. spectrum ($CDCl_3$) of the diacetate, m.p. 114°; singlets at δ 2·10 and 2·23 (each 3H, CH_3CO_2), 3·10 (2H, CH_2), 3·78 (3H, CH_3O), 6·25 [1H, C*H*-OAc proton ("acylation shift" 2·09 p.p.m.)] and at δ 6·58 (1H, C = C*H*).

Both aeroplysinin-I and its diacetate, on treatment with dilute alkali, afford a phenolic compound $C_9H_7NO_2Br_2$ (elemental analysis and mass spectrum), m.p. 158° dec., formulated as (III) from its spectral characteristics [λ_{max} (MeOH) 252 (ε 4980), 292 (ε 2300), and 312 (ε 1790) nm; λ_{max} (MeOH–NaOH) 252 (ε 8460) and 312 (ε 3610) nm; i.r. (Nujol) 3365 (OH) and 2260 cm^{-1} (CN); n.m.r. ($CDCl_3$), singlets at δ 3·70 (2H, CH_2), 3·88 (3H, CHO_3), 5·87 (1H, exchangeable with D_2O, *H*O) and at δ 7·53 (1H, Ar*H*)] and from chemical evidence. In fact, treatment of (II) with

conc. H_2SO_4 (5 min. at 100°) gives an amide $C_9H_9NO_3Br_2$, m.p. 166° [ν_{max} (Nujol) 1675 cm^{-1}], which, on hydrolysis with boiling 6N-HCl (1 hr), yields 3,5-dibromo-2-hydroxy-4-methoxyphenylacetic acid, identified as the methyl ester (IV), m.p. 71°, by comparison with an authentic sample synthesised from methyl 2-hydroxy-4-methoxyphenylacetate[2] by standard bromination procedure.

The results summarized above lead to the structure (II) for aeroplysinin-I; the u.v. spectrum of the antibiotic, λ_{max} (MeOH) 284 nm (ϵ 4910), agrees with the suggested structure.

The occurrence of this glycol, which seems fairly obviously to be biosynthesised *via* a benzene epoxide, is relevant to the problem of the role of the arene oxides in the metabolism of aromatic substrates.[3]

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[1] G. M. Sharma and P. R. Burkholder, *Tetrahedron Letters*, 1967, 4147.
[2] J. Gripenberg and B. Juselius, *Acta Chem. Scand.*, 1954, **8**, 734.
[3] D. Jerina, J. Daly, B. Witkop, P. Zaltzman-Nirenberg, and S. Udenfriend, *Arch. Biochem. Biophys.*, 1968, **128**, 176.