Aust. J. Chem., 1976, **29**, 2753–5

New Routes to 7-Alkyl-10-methylnaphtho-[1,2-*g*]pteridine-9,11(7*H*,10*H*)-diones and 12-Alkyl-9-methylnaphtho[2,1-*g*]pteridine-8,10(9*H*,12*H*)-diones from Naphthols

Stewart J. Gumbley and Lyndsay Main

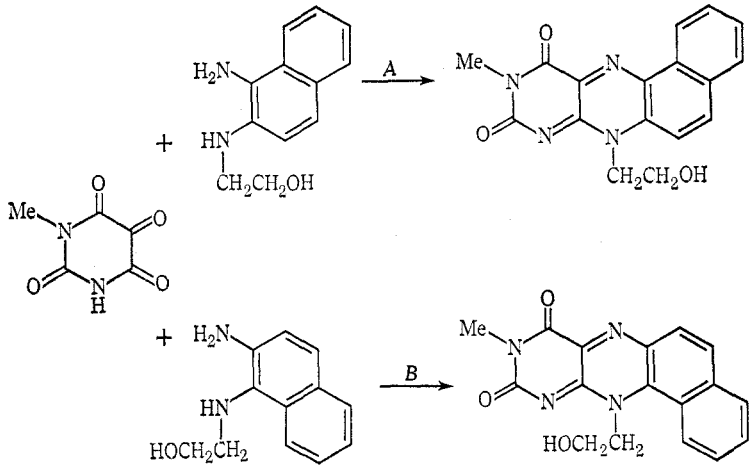
School of Science, University of Waikato,
Hamilton, New Zealand.

Abstract

2-(1-Nitronaphthalen-2-ylamino)ethanol, prepared from 2-methoxy-1-nitronaphthalene and 2-aminoethanol, can be reduced to 2-(1-aminonaphthalen-2-ylamino)ethanol which condenses with 1-methylalloxan to give 7-(2-hydroxyethyl)-10-methylnaphtho[1,2-*g*]pteridine-9,11(7*H*,10*H*)-dione.

12-(2-Hydroxyethyl)-9-methylnaphtho[2,1-*g*]pteridine-8,10(9*H*,12*H*)-dione can be prepared by a similar reaction sequence from 1-methoxy-2-nitronaphthalene.

The reaction of 2-methoxy-1-nitronaphthalene with 2-aminoethanol provides a convenient synthesis of 2-(1-nitronaphthalen-2-ylamino)ethanol. Reduction of the latter to 2-(1-aminonaphthalen-2-ylamino)ethanol followed by a condensation with 1-methylalloxan gives 7-(2-hydroxyethyl)-10-methylnaphtho[1,2-*g*]pteridine-9,11-(7*H*,10*H*)-dione (Scheme 1, route *A*).



Scheme 1

By a similar route, 1-methoxy-2-nitronaphthalene can be used to synthesize 12-(2-hydroxyethyl)-9-methylnaphtho[2,1-*g*]pteridine-8,10(9*H*,12*H*)-dione (Scheme 1, route *B*).

These reactions represent parts of new general routes to *N*-alkylnaphthalene-1,2-diamines and to the title compounds starting from 1- and 2-naphthols; the more toxic 1- and 2-naphthylamines have previously been used as starting materials in the synthesis of both 7-alkylnaphtho[1,2-*g*]pteridine-9,11(7*H*,10*H*)-diones[1–4] and 12-alkylnaphtho[2,1-*g*]pteridine-8,10(9*H*,12*H*)-diones.[3,5]

Experimental

Ultraviolet–visible spectra were recorded on a Cary 17 spectrophotometer, and mass spectra on a Varian MAT CH5 spectrometer.

Microanalyses were performed by Dr A. D. Campbell and his associates at the University of Otago.

2-(1-Nitronaphthalen-2-ylamino)ethanol

2-Methoxy-1-nitronaphthalene (1·4 g, 0·007 mol) and 2-aminoethanol (1·2 g, 0·02 mol) were dissolved in chloroform (5 ml) and heated under reflux for 2 h. The solution was cooled, diluted with chloroform (20 ml), and repeatedly extracted with water to remove excess amine. After drying (magnesium sulphate), the chloroform was evaporated under reduced pressure. The solid was recrystallized twice from chloroform and gave bright orange crystals of 2-(1-nitronaphthalen-2-ylamino)ethanol, m.p. 127–128°; yield 1·25 g (74%) (Found: C, 62·1; H, 5·3; N, 11·9. Calc. for $C_{12}H_{12}N_2O_3$: C, 62·1; H, 5·2; N, 12·1%).

2-(2-Nitronaphthalen-1-ylamino)ethanol

This compound was prepared and purified by the methods described above for the isomer 2-(1-nitronaphthalen-2-ylamino)ethanol. The yield was 86% and the compound had m.p. 130–131° (Found: C, 61·9; H, 5·4; N, 12·1. Calc. for $C_{12}H_{12}N_2O_3$: C, 62·1; H, 5·2; N, 12·1%).

7-(2-Hydroxyethyl)-10-methylnaphtho[1,2-g]pteridine-9,11(7H,10H)-dione

A solution of stannous chloride (3·6 g, 0·016 mol) in hydrochloric acid (10 ml, sp. gr. 1·18) was added to a solution of 2-(1-nitronaphthalen-2-ylamino)ethanol (1 g, 0·004 mol) in hydrochloric acid (10 ml, sp. gr. 1·18). The solution was heated until decolorization had occurred. It was then cooled, and chilled 30% sodium hydroxide solution (20 ml) was added. The alkaline solution was extracted with ether. The ether solution was dried, filtered, and evaporated under reduced pressure to give crude 2-(1-aminonaphthalen-2-ylamino)ethanol. Owing to the instability in air of the diamine, it was not purified, but immediately dissolved in a small volume of glacial acetic acid, and added to a solution of 1-methylalloxan (0·68 g, 0·004 mol) and boric acid (2 g) in glacial acetic acid (10 ml). The solution was refluxed for 5 min. The solvent was removed under reduced pressure and the residue was suspended in water, filtered and washed. After drying, the orange solid was chromatographed on silica gel (BDH 60-120 mesh) with chloroform/formic acid (4 : 1) as eluting solvent. Mass spectral analysis suggested the purified product was the formate ester [*m/e* 350 (M^+)]. It was dissolved in hydrochloric acid (sp. gr. 1·19), reprecipitated with water, collected and washed with water. The fine orange crystals were dried under vacuum at 20° for 12 h, m.p. 287–288°; yield 0·48 g (35%). Mass spectrum: *m/e* 322 (M^+), 292, 278, 249, 221, 193, 179, 166, 152, 140. λ_{max} (5% aqueous dimethylformamide): 303 (ε 19000), 456 (16500) and 467 nm (16400) (Found: C, 62·4; H, 4·5; N, 16·6. Calc. for $C_{17}H_{14}N_4O_3,\frac{1}{2}H_2O$: C, 62·2; H, 4·5; N, 17·1%).

[1] Karrer, P., and Quibell, T. H., *Helv. Chim. Acta*, 1936, **19**, 1034.
[2] Lettré, H., and Fernholz, M. E., *Ber. Dtsch. Chem. Ges. B*, 1940, **73**, 436.
[3] Ross, W. C. J., *J. Chem. Soc.*, 1948, 219.
[4] Pushkareva, Z. V., Konyukov, V. N., and Sakovich, G. S., *Khim. Geterotsikl. Soedin.*, 1965, 604 (*Chem. Abstr.*, 1965, **64**, 2088b).
[5] Fernholz, M. E., and Fernholz, H., *Chem. Ber.*, 1951, **84**, 257.

*12-(2-Hydroxyethyl)-9-methylnaphtho[2,1-*g*]pteridine-8,10(9*H*,12*H*)-dione*

The method described above for the synthesis of the isomeric compound 7-(2-hydroxyethyl)-10-methylnaphtho[2,1-*g*]pteridine-9,11(7*H*,10*H*)-dione was followed. The crude product was sufficiently soluble in glacial acetic acid to be recrystallized; it has m.p. 278–279°; yield 0·9 g (65%). Mass spectrum: *m/e* 322 (M^+), 292, 278, 249, 221, 179, 166, 152, 139. λ_{max} (5% aqueous dimethylformamide): 303 (ε 29000), 374 (7700), 480 (11500) and 498 nm (11500) (Found: C, 63·3; H, 4·5; N, 17·3. Calc. for $C_{17}H_{14}N_4O_3$: C, 63·4; H, 4·4; N, 17·4%).

Manuscript received 31 May 1976