The ethereal filtrate from the trituration was concentrated and 18.5 g. (46%) of a thick yellow water-soluble oil was obtained. A sample was taken up in ether, decolorized with charcoal and taken to dryness under high vacuum.

Anal. Calcd. for $C_{24}H_{45}N_9O_3$ (II): C, 56.77; H, 8.93; N, 24.81. Found: C, 56.67; H, 8.96; N, 24.83.

2,4,6-Tri-(γ-morpholinopropyl) Cyanurate Trihydrochloride (III).—The procedure of Spielman, Close and Wilk[3] for non-basic cyanurates was modified for this preparation. Sodium hydride (2.52 g., 0.105 mole) was added to γ-morpholinopropanol (21.75 g., 0.15 mole) in 25 cc. of dry benzene and the mixture was refluxed overnight. To this stirred mixture, after cooling in ice, was added dropwise cyanuric chloride (6.072 g., 0.033 mole) dissolved in a minimum amount of dry benzene. The mixture was then refluxed for one hour, filtered and concentrated. The residual oil was submitted to distillation and the low-boiling material was removed at 64° (0.4 mm.). The distillation was stopped and the undistilled oil was dissolved in ether and filtered. The trihydrochloride was made by treatment with excess ethereal HCl. It was recrystallized by dissolving in dry methanol and adding an equal volume of dry isopropyl alcohol and cooling. There was obtained 15 g. (73%) of a white powder, m.p. 272–275° dec.

Anal. Calcd. for $C_{24}H_{42}N_6O_6 \cdot 3HCl$ (III): C, 46.48; H, 7.31; N, 13.55. Found: C, 45.98; H, 7.58; N, 13.01.

Tri-(β-dimethylaminoethyl) Cyanurate Trimethiodide (IV).—This compound was prepared in a manner similar to that employed in the preparation of III. In this case 4.8 g. (0.20 mole) of sodium hydride, 18.7 g. (0.21 mole) of β-dimethylaminoethanol and 12.14 g. (0.066 mole) of cyanuric chloride was used. The mixture was refluxed 1.5 hours instead of overnight. After removal of the solvent the dark brown semi-solid residue was stirred well with ether. After filtering, the ether solution was concentrated. The resulting thick oil was taken up in absolute alcohol and excess methyl iodide was added. Precipitation of the quaternary salt began almost immediately. After standing overnight and filtering, a crude yellow solid was obtained. After repeated recrystallization by suspending the solid in boiling ethanol or methanol and adding water dropwise until solution occurred, a 10% yield (based on cyanuric chloride) of colorless leaflets, m.p. 214–215° dec., was obtained.

Anal. Calcd. for $C_{18}H_{30}N_6O_3 \cdot 3CH_3I$ (IV): C, 28.16; H, 5.11; N, 10.93. Found: C, 27.92; H, 5.20; N, 10.73.

Acknowledgment.—The analyses were carried out by E. F. Shelberg, Chief Microanalyst, and his staff.

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N-{*p*-[(2,4-Diamino-6-pteridylmethyl)-tosylamino]-benzoyl}-L-glutamic Acid, a Pteroylglutamic Acid Analog

BY BARNEY J. MAGERLEIN AND DAVID I. WEISBLAT

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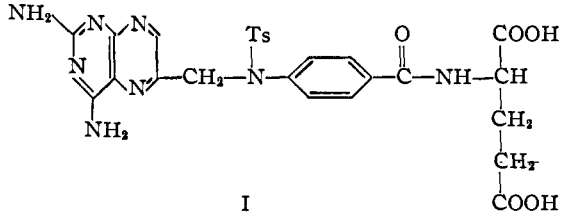
The condensation of 2,4,5,6-tetraminopyrimidine hydrochloride[1] with diethyl N-[N'-tosyl-N'-(3,3-diethoxy-2-ketopropyl)-*p*-aminobenzoyl]-L-glutamate[2] followed by saponification gave the pteridine, N-{*p*-[(2,4-diamino-6-pteridylmethyl)-tosylamino]-benzoyl}-L-glutamic acid (I).

This compound possessed neither folic acid activity nor antifolic acid activity when assayed with the test organism *S. faecalis R.*



I

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Experimental

N-{*p*-[(2,4-Diamino-6-pteridylmethyl)-tosylamino]-benzoyl}-L-glutamic Acid (I).—A solution of 4.77 g. of diethyl N-[N'-tosyl-N'-(3,3-diethoxy-2-ketopropyl)-*p*-aminobenzoyl]-L-glutamate,[2] 2.49 g. of 2,4,5,6-tetraminopyrimidine hydrochloride,[1] 1.5 ml. of concentrated hydrochloric acid and 5.0 ml. of 95% ethanol was heated under reflux for 2 hours. The ethanol was distilled under vacuum, the residue diluted with 25 ml. of water, and extracted with ethyl acetate. The *p*H of the aqueous solution was adjusted to 5.0, and, after cooling, the precipitate collected by centrifugation. It weighed 2.1 g. (45.7% yield).

A slurry of 0.50 g. of the crude pteridine and 0.15 g. of calcium hydroxide in 8 ml. of 0.5 *N* sodium hydroxide and 100 ml. of water was stirred at 25° for one hour and filtered. The filtrate was heated to 95° and again filtered. The *p*H of the hot filtrate was adjusted to 4.0. After 18 hours at 4° the yellow precipitate was separated by centrifugation. Following lyophilization this material was dried at 100° for 6 hours at 0.1 mm. pressure. It weighed 0.23 g.; $\lambda_{max.}^{0.1\ N\ NaOH}$ 229 mμ, $E_{1\ cm.}^{1\%}$ 470; 259 mμ, $E_{1\ cm.}^{1\%}$ 580; 270 mμ, $E_{1\ cm.}^{1\%}$ 130.

Anal. Calcd. for $C_{26}H_{26}N_8O_7S$: C, 52.52; H, 4.4; N, 18.85; S, 5.4. Found: C, 51.71; H, 4.47; N, 19.24; S, 5.15; ash, 1.23. Found (corrected for ash): C, 52.4; H, 4.5; N, 19.5; S, 5.2.

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Crystalline Δ⁴-Androsten-17β-ol-3,16-dione[1]

BY ANDRE S. MEYER AND MARJORIE C. LINDBERG

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Δ⁴-Androsten-17β-ol-3,16-dione (III) (16-ketotestosterone) was required for purposes of comparison. This substance was obtained as an oil in 1942 by Stodola and Kendall[2] through the nitrosation of the Δ⁴-androstene-3,17-dione 3-enol ethyl ether (I) to the 16-isonitroso derivative (II) and subsequent zinc–acetic acid reduction. Compound III yielded the crystalline monoacetate (IV) with a m.p. 194–195° from petroleum ether–acetone. An $[\alpha]^{25}_{4561}$ −56° in 95% ethanol was determined for IV synthesized by a second route.[3] Through their investigations on various 16,17-ketol steroids prepared by the nitrosation method[2] Huffman and Lott[4] were able to ascertain the steric arrangement of the hydroxyl group at position 17 as being β-oriented. Recently, in this Laboratory with the use of paper chromatography the resolution of compound III from the reduction mixture was accomplished. It

(1) This investigation was supported by a grant from G. D. Searle and Company, Chicago, Illinois.

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