Propargylglycine.—The diethyl propargylformamidomalonate was hydrolyzed by refluxing 2.4 g. (0.01 mole) of the ester with 24 ml. of 8% sodium hydroxide for four hours. The mixture was diluted to 100 ml. with water and passed through a column of Duolite C-10H which removed all the base. The effluent was subsequently passed through a column of Duolite A-2 which removed the formic acid produced. The resulting solution was concentrated *in vacuo*, decolorized with Darco G-60, and on addition of acetone, the amino acid crystallized. The yield was 88.5%. An analytical sample of propargylglycine was obtained from water and acetone, m. p. 243° with decomposition.

Anal. Calcd. for $C_5H_7O_2N$: C, 53.09; H, 6.24; N, 12.39. Found: C, 53.24; H, 6.20; N, 12.47.

Norvaline.—Hydrogenation of 113 mg. (0.001 mole) of propargylglycine in the presence of Adams catalyst, at 28° and 1 atmosphere, required 0.00207 mole (104% of theoretical) of hydrogen and produced 100 mg. of norvaline, which melted with decomposition at 297° in a sealed tube; the benzoyl derivative prepared as above, m. p. 150–151°.

Microbiological Tests.—Propargylglycine was tested as an inhibitor of the growth of *Escherichia coli*, strain 9723 and *Saccharomyces cerevisiae*, strain 139.[6] To inhibit the growth of these microörganisms, to 50% of normal growth, required 4 micrograms per 7.5 ml. of medium for *S. cerevisiae* and 65 micrograms for *E. coli*. According to these data propargylglycine is more active than allylglycine for yeast but less active for the inhibition of *E. coli*.

(6) The methods employed and the test organisms were the same as those previously described.[3a]

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N[10]-NITROSOPTEROYLGLUTAMIC ACID

Sir:

The action of nitrous acid upon 2-aminopteridines has led to destruction of the ring system,[1] desamination in the 2-position,[2] and simultaneous desamination of the 2-position and nitrosation on the nitrogen atom in the 10-position of pteroic acid.[3] "Folic acid" concentrates from natural sources[4] were inactivated by nitrous acid under the conditions of the Van Slyke determination.[5] These experiments involved the use of excess nitrous acid and temperatures ranging from "room temperature" to 100° or higher.

We wish to report that pteroylglutamic acid in cold hydrochloric acid solution reacts quantitatively with one mole of nitrous acid to form N[10]-nitrosopteroylglutamic acid, which precipitates from the reaction mixture as a white solid.

N[10]-Nitrosopteroylglutamic acid gives a positive Liebermann nitroso reaction. The nitroso group can be removed by treatment with phenol and hydrochloric acid, and pteroylglutamic acid thus regenerated.

Under substantially the same conditions, the following give N[10]-nitroso compounds: pteroyl-α-glutamylglutamic acid[6]; pteroyl-γ-glutamyl-γ-glutamylglutamic acid,[7] 9-methylpteroylglutamic acid,[8] 4-aminopteroylglutamic acid,[9] 2-dimethylaminopteroylglutamic acid,[10] and 4-(1-piperidyl)-pteroylglutamic acid.[10]

Neither 2-amino-4-hydroxy-6-methylpteridine,[11] 2,4-diamino-6-methylpteridine,[9b] nor N[10]-methylpteroylglutamic acid[12] react appreciably with nitrous acid under these conditions.

In a typical experiment, 4.4 g. of pteroylglutamic acid (90% purity,[13] 0.5% *p*-aminobenzoylglutamic acid, 8% H_2O) was dissolved in 50 ml. of concentrated hydrochloric acid, and cooled to 5–10° by the addition of ice. Then 0.7 g. of sodium nitrite dissolved in a little water was added slowly. A white precipitate formed, which was filtered, washed, and dried to give 3.2 g. of N[10]-nitrosopteroylglutamic acid. One gram of this dissolved in 25 ml. of 5 *N* sodium hydroxide was clarified with activated charcoal. On standing the sodium salt crystallized. It was collected, dissolved in water and precipitated with acid, filtered, washed, and dried two hours at 100° (2 mm.). *Anal.* Calcd. for $C_{19}H_{18}N_8O_7$: C, 48.5; H, 3.83; N, 23.8. Found: C, 48.9; H, 4.77; N, 24.05 (corrected for 3.8% ash).

Through the courtesy of our colleagues, Dr. B. L. Hutchings, and Dr. J. J. Oleson, of the Lederle Laboratories Division, American Cyanamid Company, N[10]-nitrosopteroylglutamic acid has been tested in a preliminary way in the nutrition of *S. faecalis* R and the chick, and in both cases appears to be equivalent to pteroylglutamic acid.

(1) Schopf and Kottler, *Ann.*, **539**, 134 (1939).
(2) Wieland, *et al.*, *ibid.*, **507**, 245 (1933); Wittle, *et al.*, THIS JOURNAL, **69**, 1780 (1947); Taylor and Cain, *ibid.*, **71**, 2538 (1949).
(3) Wolf, *et al.*, *ibid.*, **69**, 2758 (1947).
(4) Mitchell and Williams, *ibid.*, **66**, 272 (1944).
(5) Van Slyke, *J. Biol. Chem.*, **16**, 121 (1913).
(6) Mowat, *et al.*, THIS JOURNAL, **70**, 1096 (1948).
(7) Boothe, *et al.*, *ibid.*, **70** 1099 (1948).
(8) Hultquist, *et al.*, *ibid.*, **71**, 619 (1949).
(9) (a) Seeger, Smith and Hultquist, *ibid.*, **69**, 2567 (1947) (b) Seeger, *et al.*, *ibid.*, **71**, 1753 (1949).
(10) Roth, Smith and Hultquist, in press.
(11) Mowat, *et al.*, THIS JOURNAL, **70**, 17 (1948).
(12) Cosulich and Smith, *ibid.*, **70**, 1922 (1948).
(13) Hutchings, *et al.*, *J. Biol. Chem.*, **168**, 705 (1947).

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STEROLS. VIII.[1] 17α-HYDROXYPROGESTERONE AND 17α-HYDROXY-11-DESOXYCORTICOSTERONE

Sir:

Recently we reported[1] the facile preparation of 16,17-oxidoprogesterone from 16,17-oxido-5-pregnene-3β-ol-20-one acetate (I). We now wish to record the use of I as an intermediate for a new and very simple partial synthesis of both 17α-hydroxyprogesterone and 17α-hydroxy-11-desoxycorticosterone acetate (V) (acetate of Reichstein's Compound S). The reactions as applied to the latter are schematically presented by formulas I → V. A treatment of 16,17-oxidoprogesterone

(1) For paper VII in this series see THIS JOURNAL, **71**, 756 (1949)