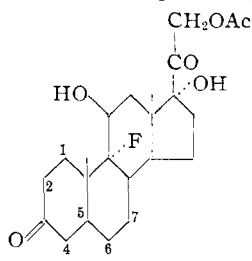


with one mole of bromine and the resulting bromo-ketone was dehydrohalogenated *via* semicarbazone formation. Reversal⁵ of the semicarbazone with pyruvic acid in aqueous acetic acid gave in addition to (I) and (II) the ketone (III) [m.p.⁶ ca. 237°; $[\alpha]_D +34.9^\circ$ (acetone) $\lambda_{\max}^{\text{MeOH}}$ 222 m μ (log *E* 4.03); $\lambda_{\max}^{\text{nujol}}$ 2.77, 2.98 μ (OH), 5.73, 5.78 μ (acetylated side chain), 6.05 μ (unsaturated ketone); Found: C, 65.66; H, 7.05]. (III) possessed about 60% of the activity⁴ of hydrocortisone acetate by the one-day oral mouse liver glycogen assay.

Bromination of (II) with two moles of bromine⁷ followed by dehydrohalogenation with collidine afforded the dienone (IV) [m.p. ca. 237°; $[\alpha]_D +100.9^\circ$ (acetone); $\lambda_{\max}^{\text{CH}_3\text{OH}}$ 239 m μ (log *E* 4.19); $\lambda_{\max}^{\text{H}_2\text{SO}_4}$ (2 hr.) 310 m μ (4.06), 262.5 m μ (4.18); $\lambda_{\max}^{\text{nujol}}$ 2.92, 3.02 μ (OH), 5.74, 5.82 μ (acetylated side chain), 6.0 μ (unsaturated ketone), 6.12, 6.21 μ (diene system); Found: C, 65.66; H, 6.74] and the isomeric dienone (V) [m.p. ca. 208°; $[\alpha]_D +106^\circ$ (acetone), $\lambda_{\max}^{\text{CH}_3\text{OH}}$ 281 m μ (log *E* 4.40), $\lambda_{\max}^{\text{nujol}}$ 2.85, 3.06 μ (OH), 5.70, 5.81 μ (acetylated side chain), 6.12, 6.18 μ (conjugated dienone system); Found: C, 65.86; H, 6.99]. 1-Dehydro-9 α -fluorohydrocortisone acetate (IV) possessed about 25 times the activity of hydrocortisone acetate in the mouse liver glycogen assay and in the rat systemic granuloma inhibition test.⁴ It is, therefore, the most potent glucocorticoid known. It is of interest to note that enhanced glucocorticoid activity was reported recently⁸ for 1-dehydrocortisone and 1-dehydrohydrocortisone acetate, which possess the same chromophoric system as (IV).



- I, Double bond between C₄-C₅.
 II, H at C₅ formulated as "α".
 III, Double bond between C₁-C₂; H at C₅ formulated as "α".
 IV, Double bonds between C₁-C₂ and C₄-C₅.
 V, Double bonds between C₄-C₅ and C₆-C₇.

(5) W. F. McGuckin and E. C. Kendall, *THIS JOURNAL*, **74**, 5811 (1952).

(6) Taken on a micro hot-stage m.p. apparatus.

(7) See for instance C. Djerassi and C. R. Scholz, *THIS JOURNAL*, **69**, 2404 (1947).

(8) H. L. Herzog, A. Nobile, S. Tolksdorf, W. Charney, E. B. Hershberg, P. L. Pearlman and M. M. Pechet, *Science*, **121**, 176 (1955).

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RECEIVED MAY 7, 1955

EFFECT OF IONIZING RADIATION ON AQUEOUS ETHYLENE OXYGEN SOLUTIONS

Sir:

In the course of our studies on the effects of ionizing radiations on hydrocarbons in aqueous solution we have noted oxidation of ethylene along with hydrolysis to ethanol. This oxidation leads to a production of acetaldehyde with *G* values as high as 60 when solutions equilibrated with 1-1 ethylene-oxygen mixtures under a pressure of 120 p.s.i.

are irradiated with γ -rays from cobalt-60 at a dose rate of 2×10^5 r./hr.¹ Ethanol and acetic acid are also produced later in the reaction with much smaller *G* values (Fig. 1).

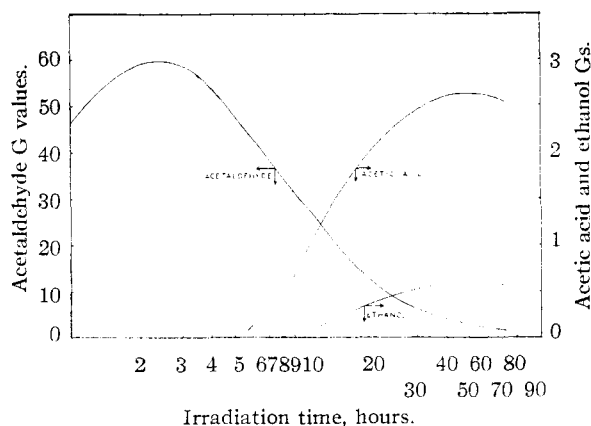


Fig. 1.—*G* values for ethanol, acetic acid and acetaldehyde production as a function of radiation dose.

Hydrogen peroxide is formed in water equilibrated with ethylene-oxygen mixtures under atmospheric pressure at an initial rate corresponding to a *G* of 20 (*Energy dissipation in the solution was calculated from the rate of oxidation of ferrous ion in the Fricke dosimeter using a *G* value of 15.5). These *G* values for hydrogen peroxide production increase with increasing gas pressure, rising to an order of magnitude comparable to the aldehyde values at 120 p.s.i.

These *G* values contrast with those obtained with most organic materials in aqueous solution, which are an order of magnitude lower (Weiss²). Detailed studies to elucidate the nature of the processes leading to this chain utilization of oxygen are in progress.

(1) E. J. Henley, *Nucleonics*, **11**, no. 10, 41-43 (1953).

(2) J. Weiss, *Chem. & Ind.*, **13**, 358-9 (1955).

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RECEIVED APRIL 27, 1955

A NEW PTERIDINE IN URINE REQUIRED FOR THE GROWTH OF THE PROTOZOON CRITHIDIA FASCICULATA

Sir:

Work carried out jointly in these Laboratories and the Haskins Laboratories¹ established that the Trypanosomid flagellate *Crithidia fasciculata* (*Herpetomonas culicidarum*) could be grown in a chemically-defined medium in the presence of a "high" amount of pteroylglutamic acid (PGA), 1 γ /assay tube. It was then found that the amount of PGA required for growth of *C. fasciculata* was markedly spared by a variety of natural materials including certain liver fractions and human urine (adult males), or by certain 2-amino-4-hydroxy-6-substituted pteridines. These relationships are illustrated in Table I.

By procedures of adsorption and solvent distribu-

(1) J. Cowperthwaite, M. M. Weber, L. Packer and S. H. Hutner, *Ann. N. Y. Acad. Sci.*, **56**, 972 (1953).