cc. of assay medium elicits a half-maximal response with *Leuconostoc citrovorum* 8081. Simultaneously a number of inactive principles are formed in the reaction mixture. Application of the above procedure to folic acid without prior formylation produces material which possesses some activity. Similarly, omission of ascorbic acid greatly reduces the activity of the reaction mixture.

Ascorbic acid, though not specific, appears to enhance the ability of several organisms to convert folic acid to a substance possessing folinic acid-like activity.

Application of the above procedure to N-pteroyl-α-glutamylglutamic acid produces a reaction mixture which gives two active bands on paper chromatograms developed with butanol–water containing acetic acid. One of these bands corresponds to the single band obtained with the reaction mixture derived from folic acid. If N-pteroyldi-γ-glutamylglutamic acid is employed in the above procedure, three bands of active principles are obtained on paper chromatograms developed in the same solvent. Thus, the diglutamate gives rise presumably to the mono-glutamate and an α-glutamylglutamate, and the triglutamate is converted presumably to the monoglutamate, a γ-glutamylglutamate and a di-γ-glutamylglutamate containing a modified pteroyl substituent. Pteroic acid, itself, subjected to the above procedure forms material possessing slight activity.

The activity of the synthetic material derived from folic acid is destroyed by very dilute acid, peroxides, dilute chlorine solutions, and by dilute nitrous acid. Destruction in very dilute acid occurs with the formation of material which is still effective in promoting the growth of *Streptococcus faecalis* R and *Lactobacillus casei*.

Further investigations concerning the relationship of these synthetic members and the naturally occurring members of the folinic acid group are in progress.

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RECEIVED APRIL 20, 1950

ON NEUTRON DEFICIENT ISOTOPES OF BARIUM[1]

Sir:

While investigating the spallation reactions occurring when cesium is bombarded with 250 Mev. protons in the Rochester 130-inch cyclotron, two previously unreported positron emitting isotopes of barium were encountered.

Spectroscopically pure cesium chloride in a thin platinum tube was irradiated for periods of 30 and 90 minutes. The latter was used in an attempt to produce enough barium activity to make parent–daughter separations feasible. The decay of the barium fraction was followed in the usual manner and also by deflecting the positrons into a counter tube by means of the 4800 gauss field of a permanent magnet. The decay curves of the barium fraction were resolved into half-life periods of 1.8 ± 0.2 hours, 2.4 ± 0.1 days and 11.5 ± 0.2 days. The latter is undoubtedly that assigned to Ba^{131} by Katcoff[2] and Yu, Gideon and Kurbatov.[3]

A 31-hour cesium activity was isolated from the barium fraction. This is clearly the activity assigned to Cs^{129} by Fink, Reynolds and Templeton.[4] Parent–daughter separations performed more than 24 hours after the bombardment failed to show any Cs^{129} activity whereas earlier milkings did show the activity. This led to the conclusion that the 1.8-hour barium is Ba^{129}. The 2.4-day barium activity had no observable daughter activity.

Energy studies have been made. The 2.4-day barium emits a positron of 3.1 Mev. energy as shown by the end-point in aluminum. Energies have not been obtained for Ba^{129}. Measurements made when both Ba^{129} (1.8-hour) and the 2.4-day barium were present showed a β^+ energy of 3.9 Mev., the aluminum absorption curve of which could not be resolved. It is felt that this energy is a combination of the energies of both isotopes, indicating that β^+ from Ba^{129} is hard. On this assumption, the relative yields at the end of bombardment are approximately $Ba^{129}:Ba^{<129} = 19:1$.

The results on these two isotopes[5] can be summarized.

Isotope	Half-life	Mode of decay and energy	Method of mass asign.
Ba^{129}	1.8 ± 0.2 hr.	β^+ (hard) exact energy unknown	Isolation of daughter Cs^{129} (31-hr.)
$Ba^{<129}$	2.4 ± 0.1 days	β^+ 3.1 ± 0.3 Mev.	

The coöperation of Professor Sidney S. Barnes and the staff of the 130-inch cyclotron in making these irradiations possible is gratefully acknowledged.

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[1] This work was performed under atomic Energy Commission contract AT(30-1)-655.

[2] S. Katcoff, *Phys. Rev.*, **72**, 1160 (1947).

[3] Fu-chun Yu, D. Gideon and J. D. Kurbatov, *ibid.*, **71**, 382 (1947).

[4] R. W. Fink, F. L. Reynolds and D. H. Templeton, *ibid.*, **77**, 614 (1950).

[5] Ba^{129} and Ba^{128} have been listed on the General Electric 1950 revised Chart of the Nuclides just received but as yet have not been reported in the literature. A subsequent private communication from Professor Templeton of the University of California Radiation Laboratory indicates that the results of Fink and Templeton are in agreement with those presented here.

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RECEIVED APRIL 13, 1950

RADIOACTIVE ISOTOPES OF BARIUM[1]

Sir:

In this communication we report the results of some preliminary experiments concerning neutron deficient isotopes of barium.

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[1] This work was supported by the Atomic Energy Commission.