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Configuration of Glutamic Acid Isolated from Subacute Lymphatic Leukemic Tissue Proteins.

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The exact relationship of leukemia to neoplastic disease has not been determined. The following types of human neoplasm, when examined by the procedure used by Kögl and Erxleben,[1] have been reported to yield partly racemized glutamic acid:[2] carcinoma of the ovary, carcinoma of the breast, adenocarcinoma of the colon, and sarcoma of the thigh. Normal human tissues (ovaries, colon) have been reported to yield only l(+)glutamic acid.[2]

We have isolated glutamic acid from the liver and spleen of a patient who died of subacute lymphatic leukemia. Microscopic examination revealed that at least 20% of the liver, and 30% of the spleen, were composed of leukemic areas. Major portions of these organs removed at autopsy were placed in alcohol. Following transport to the laboratory, the tissues were finely minced, after which they were covered with 0.1 *N* hydrochloric acid and heated several hours on the steam bath until a majority of the material had gone into solution. Sufficient trichloracetic acid then was added to make a concentration of 10%. The precipitated proteins were filtered off, washed and extracted several times with hot alcohol in order to remove trichloracetic acid. The proteins were dried at 110° and lipids partly were extracted with boiling ether. Hydrolysis and isolation of glutamic acid were then carried out as described by Kögl, Erxleben, and Akkerman.[3] The results obtained are recorded in Table I. No racemic acid was isolated from the leukemic tissues.

TABLE I.

	Melting point uncorrected	$[\alpha]_D$* (in 9% HCl)	% of racemic glutamic acid
Leukemic liver	203-204°	+31.3°	0
" spleen	203-204°	+31.0°	0
Sarcoma (dog kidney)	201-202°	+27.8°	12

*Literature: +31.7°, calculated for free l(+) glutamic acid.

1 Kögl, F., and Erxleben, H., *Z. physiol. Chem.*, 1939, **258**, 57.

2 Kögl, F., *Z. Krebsforsch.*, 1939, **49**, 291; Arnow, L. E., and Opsahl, Jeanette C., *Science*, 1939, **90**, 257; White, J., and White, F. R., *J. Biol. Chem.*, 1939, **130**, 435.

3 Kögl, F., Erxleben, H., and Akkerman, A. M., *Z. physiol. Chem.*, 1939, **261**, 141.

As a control, glutamic acid was isolated from protein obtained from a kidney neoplasm (dog). We are indebted to Dr. E. T. Bell, Head of the Department of Pathology, University of Minnesota Medical School, who examined sections of this tumor and found it to be an undifferentiated sarcoma.

11331

Configuration of Glutamic Acid Isolated from Proteins of Pig and Chick Embryo Tissues.

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Since Kögl and Erxleben[1] announced the isolation of partly racemized glutamic acid from malignant tissue protein, numerous confirmatory and non-confirmatory articles have appeared. The only laboratories, other than Kögl's, that have investigated carcinoma protein by the Kögl-Erxleben procedure have reported the isolation of partly racemized glutamic acid.[2] Dittmar[3] obtained only 1(+)glutamic acid from Rous sarcoma and from Jensen sarcoma free of necrosis, but later[4] found racemic glutamic acid in mouse sarcomas and carcinomas containing some necrotic material. Johnson[5] reported the isolation of glutamic acid containing small percentages of racemate from acid hydrolysates of Jensen sarcoma, but claimed that similar percentages were obtained also from normal mouse liver protein hydrolysates.

Kögl, Erxleben, and Akkerman[6] found only 1(+) glutamic acid in the hydrolysate of protein obtained from two- to three-months-old calf embryos. The embryonic tissues of other animals have not been investigated from this point of view. Since the metabolism of malignant tissue is similar in many respects to that of embryonic

1 Kögl, F., and Erxleben, H., *Z. physiol. Chem.*, 1939, **258**, 57.

2 Arnow, L. E., and Opsahl, J. C., *Science*, 1939, **90**, 257; White, J., and White, F. R., *J. Biol. Chem.*, 1939, **130**, 435; Dittmar, C., *Z. Krebsforsch.*, 1939, **49**, 441.

3 Dittmar, C., *Z. Krebsforsch.*, 1939, **49**, 397.

4 Dittmar, C., *Z. Krebsforsch.*, 1939, **49**, 441.

5 Johnson, J. M., *J. Biol. Chem.*, 1940, **132**, 781.

6 Kögl, F., Erxleben, H., and Akkerman, A. M., *Z. physiol. Chem.*, 1939, **261**, 141.