sensitivity if dosage of erythropoietin is not taken into consideration.

We thank Mrs. Kathleen Hughes for assistance with the experimental work.

D. D. Porteous
S. C. Tso
K. Hirashima
L. G. Lajtha

Paterson Laboratories,
Christie Hospital and Holt Radium Institute,
Manchester, 20.

[1] Alexanian, R., Porteous, D. D., and Lajtha, L. G., *Int. J. Rad. Biol.*, **7**, 87 (1963).
[2] Gurney, C. W., Lajtha, L. G., and Oliver, R., *Brit. J. Haemat.*, **8**, 461 (1962).
[3] Bangham, D. R., in *Erythropoiesis*, edit. by Jacobson, L. O., and Doyle, M., 23 (Grune and Stratton, 1962).
[4] Cotes, P. M., and Bangham, D. R., *Nature*, **191**, 1065 (1961).
[5] Annual Report of Paterson Laboratories, p. 14 (1964).
[6] Lajtha, L. G., in *Ciba Foundation Symposium on Haemopoiesis*, 289 (Churchill, London, 1960).
[7] Stohlman, F., Brecher, G., and Moores, R. R., in *Erythropoiesis*, edit. by Jacobson, L. O., and Doyle, M., 162 (Grune and Stratton, 1962).
[8] Puck, T. T., and Marcus, P. I., *J. Exp. Med.*, **103**, 653 (1956).
[9] Hodgson, G. S., *Acta Physiol. Lat. Amer.*, **12**, 365 (1962).

Haemorrhage in Ehrlich Ascites Tumour

The presence of blood in Ehrlich's ascites tumour has been described[1–6], but only Hartveit[2] reported quantitative data regarding the effect of the blood content on the survival of tumour-bearing mice. Because no information was found in the literature concerning the progressive development of haemorrhage in this tumour, an experiment was performed to determine the effect of tumour implantation in intra-abdominal organs on the blood content of the ascites.

Twenty-one female Swiss Webster mice were injected intraperitoneally with 0·4 ml. of slightly haemorrhagic ascites obtained from a carrier mouse. The inoculum contained $2{\cdot}24 \times 10^6$ Ehrlich tumour cells, $0{\cdot}74 \times 10^6$ red blood cells and $0{\cdot}75 \times 10^6$ white blood cells. Randomly selected groups of three animals were marked before inoculation and killed 3, 4, 5, 6, 7, 8 and 10 days after injection. The ascites were withdrawn, the volume was measured and the percentage of tumour cells and of white and red blood cells, and the concentration of tumour cells, were calculated. If the blood content is expressed as the fraction of red blood cells (RBC) divided by tumour cells plus white blood cells, ascites containing 0·16 RBC or less appeared straw coloured, that containing more than 0·16 and less than 0·32 RBC appeared pink or blood-streaked, and that with 0·81 RBC or more was red. At autopsy, tissue specimens were obtained from the site of injection, from the peritoneum and mesentery, and from tumour nodules over liver, pancreas and intestine. Table 1 shows the results of the examination of the histological sections as related to the time of death and to the blood content of the ascites. Three animals had less than 0·1 c.c. of ascites or none at all, and they are not included in Table 1. The data indicate that the development of massive haemorrhage in the ascites is associated with invasion of viscera by the tumour.

Hartveit[3] found the survival of mice to be prolonged and the amount of haemorrhage to be decreased after administration of cortisone to tumour-bearing mice, and he concluded that haemorrhage in the ascites is due to a Shwartzman-like phenomenon expressing the immunological response of the host to the tumour. On the other hand, Goldie and co-workers[7] have been able to demonstrate that the number of intraperitoneal nodules and the amount of ascitic fluid of sarcoma 180 ascites tumour were decreased after administration of cortisone. They postulated that this was due to decreased capillary permeability. A similar effect of cortisone on mice bearing the Ehrlich ascites tumour may be assumed, although the inhibition of tumour cell growth by steroids is probably due to a more

Table 1. Blood Content of Ehrlich Ascites Tumour and Tumour Invasion

RBC = red blood cells; WBC = white blood cells; TC = tumour cells; + = present; 0 = absent

Days after inoculation	Amount of ascites (c.c.)	RBC / WBC + TC	Total No. RBC in ascites ($\times 10^6$)	Invasion of Peritoneum and injection site	Organs
3	1·0	0·16	1·6	+	0
3	0·8	0·10	1·0	+	0
4	2·0	0·04	7·4	+	0
4	1·0	0·04	< 0·1	+	0
4	0·3	0·14	8·4	+	0
5	2·0	0·04	5·0	+	0
6	3·0	0·05	1·5	+	0
6	3·0	1·56	57·4	+	+
6	3·6	1·09	306·0	+	+
7	3·4	0·05	15·3	+	0
7	6·0	2·96	1,665·0	+	+
7	2·4	0·31	93·8	+	+
8	8·0	≈5·00	≈3,000	+	+
8	4·5	≈5·00	≈1,500	+	+
8	2·5	0·82	820·0	+	+
10	7·0	1·06	520·0	+	+
10	6·0	≈5·00	≈2,000	+	+
10	4·5	0·97	438·0	+	+

complex mechanism in view of the direct cellular effect of the drugs described by Rivera and others[8]. The results of the last two mentioned experiments, and the present investigation, indicate that the decreased blood content after cortisone administration may be due, at least in part, to a decrease in number, rate of growth and invasive property of tumour nodules. This in turn may be due to a decreased amount of ascitic fluid because of reduced capillary permeability and a direct effect of the steroids on the tumour cells. A host immune reaction may form part of the mechanism of haemorrhage; its relative importance, however, remains to be determined.

This work was supported by the Michigan Cancer Foundation.

H. Gunter Seydel

Department of Radiology,
Wayne State University School of Medicine,
Detroit, Michigan.

[1] Apitz, J., *Z. Krebsforsch.*, **40**, 50 (1934).
[2] Hartveit, F., *Brit. J. Cancer*, **15**, 336 (1961).
[3] Hartveit, F., *Brit. J. Cancer*, **15**, 665 (1961).
[4] Klein, G., and Revesz, L., *J. Nat. Cancer Inst.*, **14**, 229 (1953).
[5] Kun, E., Talalay, P., and Williams Ashman, H. G., *Cancer Res.*, **11**, 855 (1951).
[6] Loewenthal, H., and Jahn, G., *Z. Krebsforsch.*, **37**, 438 (1932).
[7] Goldie, H., Walker, M., Jones, A. M., and Ross, O. E., *Proc. Soc. Exp. Biol. and Med.*, **85**, 578 (1954).
[8] Rivera, E. M., Elias, J. J., Bern, H. A., Napalkov, N. P., and Pitelka, D. R., *J. Nat. Cancer Inst.*, **31**, 671 (1963).

5-Hydroxytryptamine Content of Cerebrospinal Fluid in Leprosy

The presence of 5-hydroxytryptamine (5-HT) in cerebrospinal fluid (CSF) in varied neurological disorders has been reported[1–3]. Proved cases of leprosy admitted to the local leper hospital provided the samples of CSF for the estimation of the CSF content of 5-HT in leprosy. All cases had some peripheral neuropathy associated with the disease. The 5-HT estimation was done biologically using the oestrogen-primed rat uterus method[4]. Control values of 5-HT were obtained in CSF collected from 48 normal individuals. Results of 5-HT levels in normal and leprosy cases are given in Table 1. A significantly elevated level of 5-HT was found in all cases of leprosy.

Table 1

Type of patient	No. patients	Mean concentration of 5-HT ($\times 10^{-4}$ μg/ml.)	Significance of difference
Control	48	$10{\cdot}38 \pm 1{\cdot}9$	
Leprosy	17	$111{\cdot}2 \pm 18{\cdot}03$	$P < 0{\cdot}001$

Eight pools of 100 ml. CSF each obtained from 30 patients with leprosy were examined chromatographically for indoles by the method of Jenson[5]. In the chromatograms, tryptophan, 5-HT and 5-hydroxyindole acetic