salmon calcitonin is unlikely to produce symptomatic relief of the RSDS but might prevent bone mineral loss.

¹ Genant, H K, *et al*, *Radiology*, 1975, **117**, 21.

² Woodhouse, N J Y, *Journal of Hospital Medicine*, 1974, **2**, 677.

³ Hannington-Kiff, J G, *Lancet*, 1974, **1**, 1019.

⁴ Schiano, A, Eisinger, J, and Aquaviva, P C, *Les Algodystrophies*, p 103. Paris, Laboratoire Armour-Montagu, 1976.

⁵ Robinson, C J, *et al*, *Journal of Endocrinology*, 1967, **39**, 71.

(Accepted 8 March 1977)

Princess Elizabeth Orthopaedic Hospital, Exeter EX2 4UE

N N S MCKAY, FRCS, consultant orthopaedic surgeon

King's College Hospital, London SE5

N J Y WOODHOUSE, MRCP, senior lecturer, department of medicine (present appointment: consultant physician, Nôtre Dame de Fatima Hospital, Joussef Abad Mohamad Reza Shah, Kouchech 21, Tehran, Iran)
A K CLARKE, MRCP, senior registrar, department of rheumatology and rehabilitation (present address: Royal National Hospital for Rheumatic Diseases, Bath, Avon)

Gamma-glutamyltransferase levels in ascitic fluid and liver tissue from patients with primary hepatoma

The diagnosis of primary hepatoma, particularly in patients with underlying liver disease, may be difficult and delayed. The most sensitive test—measuring serum α -fetoprotein—may yield both false-negative and false-positive results, depending on the method of estimation and the age or ethnic group of the patients.¹

We report here observations that show that the estimation of γ -glutamyltransferase levels in ascitic fluid may be a useful adjunct in the diagnosis of primary hepatoma.

Patients and results

Ascitic fluids from 31 patients were studied. Five patients had hepatoma; nine had cirrhosis; five had chronic liver disease (three chronic active hepatitis, one alcoholic hepatitis, one Budd-Chiari syndrome); five had secondary carcinoma (two stomach, one pancreas, one bronchus, one carcinoid); three had chronic serositis due to systemic lupus erythematosus; and four had miscellaneous diagnoses (one acute pancreatitis; one intestinal lymphangiectasia; one congestive cardiac failure; one nephrotic syndrome). Ascitic fluid was collected during routine diagnostic peritoneal tap and a portion was frozen at -20°C until assay. γ -Glutamyltransferase activity was estimated fluorimetrically² and protein was assayed by the Lowry procedure.³

The table shows the levels of γ -glutamyltransferase in ascitic fluid from the 31 patients. The five patients with hepatoma had highly significantly raised levels of enzyme activity compared with all the other groups and there was no overlap of the range of values. These patients all had circulating α -fetoprotein detectable by immunodiffusion and the liver biopsies showed hepatoma with cirrhosis. The patients with cirrhosis could be subdivided, clinically and histologically, into two subgroups: those with inactive cirrhosis and those with cirrhosis associated with considerable macronodular regeneration and nuclear dysplasia. Patients in the latter group had significantly higher levels of the enzyme in the ascitic fluid than those with inactive

γ -Glutamyltransferase levels in ascitic fluid in seven groups of patients

Diagnosis	No of patients	Enzyme activity (mU/ml)	
		Mean $\pm$ SE	Range
Primary hepatoma	5	33.5 $\pm$ 5.0	17 – 56
Inactive cirrhosis	5	0.86 $\pm$ 0.40	0.46 – 1.4
Cirrhosis and dysplasia	4	6.29 $\pm$ 2.4	3.5 – 8.5
Secondary carcinoma	5	2.44 $\pm$ 2.1	1.2 – 3.5
Serositis (SLE)	3	1.04 $\pm$ 1.1	0.66 – 1.48
Chronic hepatitis	5	3.2 $\pm$ 2.1	0.21 – 3.5
Miscellaneous	4	2.72 $\pm$ 1.1	0.57 – 4.8

cirrhosis (table I). The levels of γ -glutamyltransferase activity (mean ($\pm$ SE) mU/mg protein) in liver tissue from nine controls (2.93 ± 1.1), 16 patients with cirrhosis (15.2 ± 2.1), and five patients with cirrhosis in whom part of the biopsy specimen was infiltrated with hepatoma (35.5 ± 5.1) indicated a correlation between liver and ascitic fluid enzyme levels.

Comment

Our findings indicate that assay of γ -glutamyltransferase in ascitic fluid may be a useful investigation in diagnosing hepatoma. The enzyme is probably released into the ascitic fluid from hepatic tissue. Patients with cirrhotic livers in which there was evidence of active cellular regeneration had raised enzyme activities in both ascites and liver tissue, which suggests that the increased enzyme activity is related to cellular proliferation.

Studies in experimental animals have shown raised levels of γ -glutamyltransferase in a wide variety of liver tumours.⁴ Study of γ -glutamyltransferase, as well as having diagnostic implications, may therefore throw light on the fundamental processes occurring in cellular proliferation and the development of malignancy.⁵

We are grateful to many colleagues for supplying specimens of ascitic fluid, to Ms Janet Heath for carrying out some of the estimations, and to Ms Jean de Luca for typing the manuscript. This work is supported by the Cancer Research Campaign and by a grant from The Wellcome Trust.

¹ Alpert, L, *Clinics in Gastroenterology*, 1976, **5**, 639.

² Seymour, C A, and Peters, T J, *Clinical Science and Molecular Medicine*, 1977, **52**, 229.

³ Lowry, O H, *et al*, *Journal of Biological Chemistry*, 1951, **193**, 265.

⁴ Fiala, S, Fiala, A E, and Dixon, B, *Journal of the National Cancer Institute*, 1972, **48**, 1393.

⁵ Novogrodsky, A, Tate, S S, and Meister, A, *Proceedings of the National Academy of Sciences of the USA*, 1976, **73**, 2414.

(Accepted 15 March 1977)

Department of Medicine, Royal Postgraduate Medical School, London W12 0HS

T J PETERS, FRCP, senior lecturer in medicine
CAROL A SEYMOUR, MRCP, research fellow
GILL WELLS, LIBIOL, technical officer

Department of Medicine, Ahmadu Bello University, Zaria, Nigeria

F FAKUNLE, MRCP, lecturer in medicine
G NEALE, FRCP, visiting lecturer sponsored by Inter-Universities Council