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Calcium in Acute Pancreatic Necrosis.*

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In acute pancreatic necrosis neutral fat is split into fatty acid and glycerol by the action of lipase. The glycerol is absorbed and the fatty acids combine with calcium to form soaps.[1]

Recently one of us (H.A.E.) performed an autopsy on a patient who died with symptoms of shock and tetany. Extensive fat necrosis in and around the pancreas and fat embolism were observed. The carbon-dioxide combining power was 47 volumes %, so alkalosis could not have caused the tetany. Serum calcium was not determined antemortem. It occurred to us that possibly due to excessive formation of fatty acids and subsequently calcium soaps, enough calcium had been removed from the blood to cause tetany. On analysis a 2 g sample of pancreas and peripancreatic tissue contained 10.5 mg calcium or 525 mg per hundred g tissue. As there were at least 300 g of tissue so affected some 1500 mg of calcium may be assumed to have been present. This figure is slightly in excess of the total normal amount of calcium in the blood serum and the extracellular fluid combined. The total serum calcium may be estimated at 600 mg. There is about 3 times as much extracellular fluid as blood plasma.[2] Studies of transudates reveal an average calcium content of 7.5 mg[3] or an estimated total of 750 mg in the extracellular fluid.

No published accounts could be found of the total calcium in the lesions of acute pancreatic necrosis or of the serum calcium level in this diease.

We have since studied 2 additional cases which came to necropsy, in one (G.C.) the disease followed surgery and was of less than 24 hours' duration. In this case the entire pancreas and involved peripancreatic tissue was used for analysis. In the second (C.L.) all the tissue (2250 g) was ground 3 times and 3 separate samples were taken which contained almost identical amounts of calcium.

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1 Langerhans, R., *Virchows Arch. f. path. Anat.*, 1890, **122**, 252.

2 Gamble, James L., *Bull. Johns Hopkins Hosp.*, 1937, **61**, 151.

3 Green, C. H., Bollman, J. L., Keith, M. M., and Wakefield, E. G., *J. Biol. Chem.*, 1931, **91**, 203.

TABLE I.
Calcium Content of Lesions in Acute Pancreatic Necrosis Compared with Normal Human Controls.

	Pancreas. Ca mg per 100 g wet tissue	Peripancreatic fatty tissue. Ca mg per 100 g wet tissue	Total Ca mg in pancreas plus 2 kg of adjacent fatty tissue
C.R. (control)	5.6	2.6	Estimated maximum 58.0
E.Q. ''	5.3	2.3	'' '' 52.0
H.P. ''	6.0	3.6	'' '' 78.0
F.H.	525.0		'' 1500.0
G.C.	—	—	200.0*
C.L.	178.0	152.0	1732.0

*Disease of less than 24 hr duration.

TABLE II.
Serum Calcium in Eleven Cases of Acute Pancreatic Necrosis (Clinical).

	Serum calcium per hundred cc of blood. Results tabulated on days which represent time elapsed since onset of illness													
Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14
B.W			7											
O.B.						8			9.4			9.4		
T.R.	9.6													
V.C.			8.3					9.7						
J.E.			8.7			8.4								
W.D.	10.3													
J.B.							7.9	7.7		7.4	7.6			13.4
								7.7			8.1		10.1	
L.K.	9.5		9.1		9.4									
			8.5	8.5										
M.E.			9.7	9.7										
				9.4										
A.D.				9.7										
J.M.		9		8.9	8.8									

Three normal controls were also studied. The results are given in Table I. To give comparable figures for the controls an estimate was made of the amount of calcium in the pancreas (estimated weight 100 g) plus that in 2 kg of adjacent fatty tissue.

We have also studied the serum calcium (Table II) in 11 individuals who clinically were suffering from acute pancreatitis. In all of these the urinary diastase and/or blood amylase were greatly increased.

Conclusions. As much as 1732 mg of calcium may be present in the lesions of acute pancreatic necrosis. A moderate fall in serum calcium levels in acute pancreatic necrosis may occur between the 3rd and 11th days of illness.