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Pancreatic Enzymes in Thoracic Duct Lymph after Ethanol Administration

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Summary

The effect of acute ethanol intake on pancreatic enzymes in the thoracic duct lymph and blood serum was studied in 9 male patients. Amylase and lipase lymph activities increased significantly, whereas blood enzymes did not show significant changes. After drinking, alcohol concentration in the lymph was significantly higher than in the serum. It is suggested, that the lymphatic system helps to protect the pancreas against acute damage due to alcohol.

The relation between alcohol consumption and pancreatic disease has been established; an increasing number of studies are now concerned with its pathogenetic mechanisms. The effect of acute administration of alcohol on exocrine pancreas depends on the mode of application. Given intravenously, ethanol inhibits all parameters of pancreatic secretion (11). Its intragastric administration induces a similar effect, but does not inhibit enzyme secretion if ethanol administration is combined with secretin stimulation (10). Given orally and intraduodenally, the effect of ethanol matches that of secretin and cholecystokinin (5). Intragastric and intraduodenal ethanol application results in increased resistance of the sphincter of Oddi, rise of duodenal pressure and onset of duodenopancreatic reflux (4, 6). Under these conditions a higher amount of pancreatic enzymes should leak into the periacinous and periductal spaces of the pancreas and from there on to the lymph. Sufficient lymph drainage is one of the mechanisms protecting the pancreas against the development of pancreatic oedema. We undertook this study to determine the effect of oral ethanol on pancreatic enzyme changes in the thoracic duct lymph.

Methods

The thoracic duct was cannulated in 9 male patients. Of these 5 had a malignant lymphoma and the purpose of external lymph drainage was to obtain lymph for cytologic examination and lymphography (7). In 4 patients with autoimmune diseases the external lymph drainage was part of immunosuppressive treatment (9). The patients were informed that the ethanol test served the purposes of research. We administered ethanol dosed 0.7 g/kg of body weight in the form of a 40 % solution after an overnight fast and basal blood and lymph sampling. The patients were instructed to drink the solution within 3 min. Samples of venous blood and thoracic duct lymph were collected for a period of 3 hours at 30 min intervals. The samples of blood serum and lymph were then tested for activities of amylase (Phadebas test) and lipase (Cherry-Crandall) and for alcohol concentration (Widmark).

Results

Sixty and 90 min after drinking, alcohol concentration in blood serum and lymph reached peak values 0.79 ± 0.19 ‰ and 0.98 ± 0.23 ‰ respectively. Between 90 to 180 min its concentration in the thoracic duct lymph was significantly higher than in the serum ($p < 0.01$). Amylase activity is represented in Fig. 1. Whereas amylase serum activity did not show significant changes, lymph activity reached peak values after 90 min, thus being significantly

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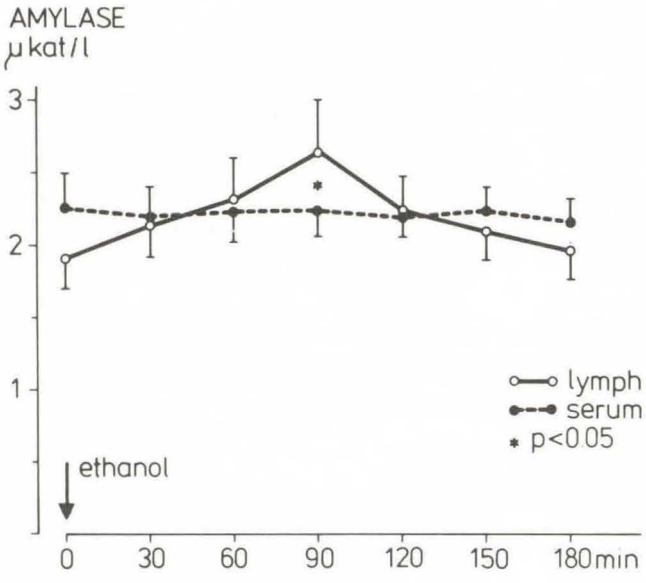

Fig. 1 Thoracic duct lymph and blood serum amylase activities after ethanol intake.

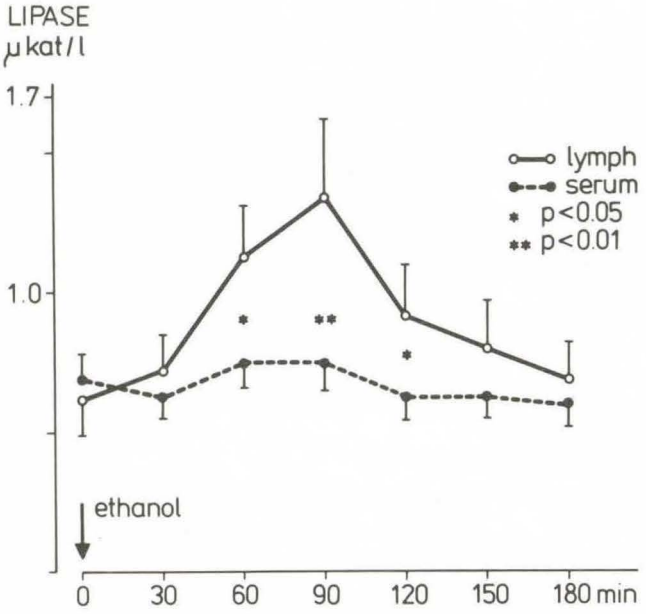

Fig. 2 Thoracic duct lymph and blood serum lipase activities after ethanol intake.

higher than in blood serum. Lipase serum activity did also not change significantly (Fig. 2); its lymph activity within 60 to 120 min after drinking was significantly higher than in the blood.

The peak increase of lymph amylase and lipase averaged 140 % and 216 %, respectively.

Discussion

The increased activity of pancreatic enzymes in thoracic duct lymph after an oral admini-

stration of ethanol resembles the increase after pancreatic stimulation with secretin and cholecystokinin (3). This, just as the time course of changes in the lymph, suggests that ethanol has an indirect effect on the lymph transport of pancreatic enzymes, i.e. via enterohormone stimulation. However the higher lymph resorption of lipase versus amylase remains speculative as there is virtually no difference between the pancreatic secretion of the two enzymes under physiological conditions. Ethanol may affect a selective increase of lymph lipase resorption from pancreatic interstices or the upper segments of the small intestine. There is experimental evidence that intraduodenal ethanol application in rats elicits increased intestinal lymph flow, together with increased protein and lipid transport (1). Analysis of the thoracic duct lymph does not make it possible to determine whether the pancreatic enzymes emanate solely from the pancreas or from the upper intestine segments as well.

The elevated thoracic duct lymph flow after oral administration of ethanol in animals (12) and man (2) and the increase of pancreatic enzymes in the lymph confirm the hypothesis that the lymphatic system helps to protect the pancreas against oedema or possibly against acute pancreatitis after alcohol intake.

We propose that higher alcohol levels in the lymph versus blood serum observed in our trial are due to its lower dilution in the lymphatics than in the blood. Similar relations were observed during a post-absorption period also after the administration of methanol (8).

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