Effect of Calcitonin on Acetylcholinesterase Activity in the Gastrointestinal Tract and Pancreas

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With 1 Figure

Received November 21, 1979

Summary

The intramuscular injection of calcitonin (20 MRC units/kg) produced 30 % increase in the activity of acetylcholinesterase in the pancreas with a concomitant 30 % and 25 % decrease in the activity of the enzyme in the jejunum and ileum respectively, 30 min after the injection. The hormone treatment did not significantly change the enzyme activity in the stomach and colon.

Introduction

Calcitonin (CT) has been found to cause various effects on the physiological function of the gastrointestinal tract and pancreas. It inhibits gastrin and gastric acid secretion (Hesch et al., 1971; Becker et al., 1973; Ito et al., 1977) and stimulates jejunal secretion of water, sodium, potassium and chloride (Gray et al., 1973). When added to a solution bathing the serosal surface of rat ileum, CT decreased sodium absorption, changed chloride transport from net absorption to net secretion and elevated short circuit current (Walling et al., 1977). An inhibition in pancreatic enzyme secretion was observed following the administration of CT (Hotz et al., 1977). The mechanism by which CT exerts these effects is not fully understood, particularly in that plasma calcium levels did not alter. Recently, it has been proposed that the release of 5-hydroxytryptamine from the gut tissues could mediate CT effects (Nakhla and Latif, 1978). On the other hand, cholinergic
systems are well known to play a significant role in the control of the physiological function of the gastrointestinal tract and pancreas (Wright et al., 1940; Vizi et al., 1973; Kondo and Magee, 1976; Tiscornia, 1977). The present study was undertaken to see whether CT treatment would affect the cholinergic neurotransmission of the gastrointestinal tract and pancreas, by measuring the activity of the enzyme responsible for the degradation of acetylcholine, acetylcholinesterase (AChE; EC 3.1.1.7) in these tissues.

**Materials and Methods**

Two groups of adult, male Wistar rats weighing 200—250 g were maintained on a commercial laboratory diet and water ad libitum. At the time of the experiments, the rats of the first group were injected intramuscularly with a porcine CT dose of 20 MRC units/kg body weight (10.25 MRC units/mg; Armour Pharmaceutical Co., Eastbourne, Sussex, U.K.) dissolved in gelatin diluent. The second group served as control and received the equivalent volume of the vehicle alone. Thirty minutes after injection the rats were killed by decapitation. The pancreas, fundus of stomach (oxyntic gland area), jejunum, ileum and colon were quickly excised out, rinsed thoroughly in cold saline solution and frozen in liquid nitrogen. The tissues were then kept at −20 °C until measurement of the enzyme activity. The activity of AChE was measured by the method of Ellman et al. (1961) using acetylthiocholine iodide as a substrate. The activity of the enzyme is expressed as the number of micromoles of substrate hydrolyzed per min per g tissue. Plasma calcium concentration was measured by atomic absorption spectrophotometry. For the statistical evaluation of the data, Student’s t-test was applied with p < 0.05 as the significance level.

**Results and Discussion**

The results of the present investigation demonstrate that a single injection of CT (20 MRC units/kg) produce 30% increase in the activity of AChE in the pancreas with a concomitant 30% and 25% decrease in enzyme activity in the jejunum and ileum respectively, 30 min after injection. The hormone treatment did not significantly change the enzyme activity in the stomach and colon (Fig. 1). The dose of CT applied in this study was chosen from previous work, where it produced a maximal response for AChE activity in the brain (Nakhla and Majumdar, 1978). Thirty minutes after injection CT causes its maximal effect on pancreatic and intestinal 5-hydroxytryptamine (Nakhla and Latif, 1978).