

Pancreatic response to secretin + CCK-PZ in European and North African adults and children

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SUMMARY Pancreatic response to intravenous secretin GIH (1CU/kg) + CCK-PZ (3CHRU/kg) was investigated in European and North African normal subjects. The pancreatic responses were compared in two groups of 38 normal male adults and in two groups of nine normal nurslings (< 1 year). Body weight and age were similar in the two adult groups and in the two nursling groups. The peaks of volume, electrolytes, and enzymes were determined in samples of duodenal aspirate after hormonal stimulation. In adult subjects the flow rate and electrolytes were not statistically different in the two groups, while enzyme outputs were lower in the North African group —73% for lipase ($P < 0.001$), —54% for phospholipase ($P < 0.01$), and —35% for chymotrypsin ($P < 0.05$). On the other hand, in both groups of nursling subjects all parameters of pancreatic secretion were identical. The difference in the pattern of the pancreatic response to exogenous hormonal stimulation observed between the two groups of adult subjects could be related to genetic or acquired differences. The second hypothesis is, however, the most probable because the pancreatic secretion was similar in both groups of nursling subjects.

In an earlier paper from our service (Sarles *et al.*, 1960), it was found that the concentration of lipase in the duodenal juice of North African workers living in France was significantly lower than in the French population. Both groups consisted of patients presenting with functional disorders without apparent lesions of the digestive tract. No explanation could be given for this difference, but the pancreatic function test used at this time (maximum concentration of lipase in six 10 minute fractions of duodenal juice collected without stimulation) (Sarles *et al.*, 1963) was imprecise. We therefore decided to compare the stimulated secretion of the pancreases of apparently normal North African children and adults living in France with that of French people in the same age groups.

Methods

PATIENTS

Adult patients

Thirty-eight French adults and 38 North African adults, presenting with non-specific abdominal symptoms were studied. All were carefully questioned

about their nutrition and their symptoms. They underwent a general clinical examination, several radiological investigations (plain film of the abdomen and the chest, barium meal, radiography of the biliary tract and, if necessary, barium enema), and biochemical tests (blood count, GPTS, GOTS, glucose, cholesterol, urea, and uric acid) which reasonably ruled out organic lesions. The mean ages and the weights of these two populations were not significantly different (Table).

Children

Seventeen North African children born in France (eight males, nine females) mean age 7.88 years, SE \pm 1.13 months and 18 French children (eight males, 10 females) mean age 6.61 SE \pm 1.02 were selected. These patients had been referred to the pancreatic function laboratory by paediatric services for various reasons: slightly raised sweat test, recurrent bronchopulmonary diseases, digestive troubles. They were selected from 150 children studied by us because no organic disease had been found and their general nutritional state was good. The pancreatic function tests were always conducted with the permission and in the presence of the parents.

Table Comparison between North Africans and Europeans in two groups: adults and young children

	Weight (kg)	Volume (ml)	HCO ₃ ⁻		Ca ²⁺		Lipase U/ml	Chymotrypsin		Phospholipase		
			mmol/ml	mmol/ 15 min	mEqiv/ l	mEqiv/ 15 min		U/ml × 100	U/ml × 100	U/ml × 100	U/ml × 100	
Adults												
North Africans (38 males)												
Age (yr)												
39.28	60.86	78.13	75.94	5.39	2.51	0.191	934.60	704.63	117.65	89.92	17.23	13.01
±1.50	±1.03	±5.87	±3.13	±0.46	±0.13	±0.001	±52.47	±75.38	±7.82	+10.32	±1.52	±1.78
Europeans (38 males)												
Age (yr)												
44.07	63.44	87.84	83.65	6.66	2.43	0.207	1453.9g	1224.97	147.00	121.63	24.44	20.08
±1.74	±1.64	±5.51	±2.83	±0.52	±0.17	±0.022	±94.84	±110.58	±10.65	±12.10	±1.53	±1.66
NS	NS	NS	NS	NS	NS	NS	P < 0.004	P < 0.001	P < 0.05	P < 0.05	P < 0.005	P < 0.01
Children												
North Africans (8 males, 9 females)												
Age (months)												
7.88	7.64	11.77	36.66	0.31	2.48	0.027	840.00	88.86	93.33	10.26	16.55	1.75
±1.13	±1.20	±2.48	±5.19	±0.06	±0.22	±0.004	±71.89	±12.35	±16.74	±2.06	±2.48	±0.31
Europeans (8 males, 10 females)												
Age (months)												
6.61	6.06	11.5	39.33	0.45	2.28	0.024	1061.11	126.83	92.97	11.48	16.66	1.88
±1.02	±1.15	±1.57	±3.67	±0.07	±0.27	±0.003	±101.30	±22.55	±8.70	±2.62	±1.93	±0.31
NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

Mean ± standard deviation for each parameter: P=probability, NS=non-significant.

U: enzyme unit. For each given enzyme it represents the number of micromoles of substrate hydrolysed in one minute at 25°C (international unit).
SI conversion factor for Ca²⁺=1 mEqiv/l=0.5 mmol/l.

PANCREATIC FUNCTION TEST

Adults

All the patients underwent a pancreatic function test according to a method previously described (Sarles *et al.*, 1968) using double gastric and duodenal suction and the intravenous injection of 1 CU kg⁻¹ secretin + 3 CHR U CCK-PZ/kg⁻¹. Pancreatic juice was collected at 15 minute intervals, volume measured and HCO₃⁻, Ca²⁺, lipase, chymotrypsin, and phospholipase estimated in each fraction. The concentration and output of the most active sample only from each test was kept for consideration because it had been shown that it gave the maximum of information (Capitaine *et al.*, 1971).

Children

The duodenal collection was conducted according to a technique previously described (Delachaume-Salem and Sarles, 1970) using a special tube placed under fluoroscopic control. The same relative quantity of gastrointestinal hormones was injected and the same measurements were made as in the adults.

CHEMICAL DETERMINATION

Volume was measured in millilitres. Calcium was estimated by complexometry (Gullo *et al.*, 1974). Lipase (Sarles *et al.*, 1963), chymotrypsin (Figarella *et al.*, 1965), and phospholipase (Figarella and

Ribeiro, 1971) were estimated according to previously published techniques. Bicarbonate was estimated by the van Slyke method. Statistical studies were done by Student's *t* test.

Results

The different parameters of the pancreatic function tests are shown in the Table. In adults, the volume of juice, concentration, and output of bicarbonate and calcium was not significantly different in the two populations, while concentration and output of the three enzymes, lipase, chymotrypsin, and phospholipase, were significantly lower in North Africans. In children, no significant difference was observed.

Discussion

Our results show that the CCK-PZ + secretin stimulated secretion (concentration and output) of three pancreatic enzymes, lipase, chymotrypsinogen, and phospholipase, is lower in a group of North Africans working in France than in French people, both complaining only of non-specific abdominal symptoms. As organic disease had been eliminated by a careful examination, these patients are probably representative of the 'normal' population of their age and ethnic group. The secretion of water and bi-

carbonate, however, is not significantly different. As the secretion of calcium is similar in the two populations, it is probable that the diminished enzyme secretion observed in North African patients was not due to actual lesions of the pancreas. In effect, it has been shown that calcium concentration is significantly increased in patients presenting with either pancreatic cancer, chronic pancreatitis, juvenile diabetes, or within a month after an attack of acute pancreatitis (Gullo *et al.*, 1974). While, on the contrary, in young babies born in France, there is no difference between the French and North African ethnic groups. It is therefore probable that the relative pancreatic insufficiency observed in adult North Africans developed during youth when they lived in Algeria. In fact, the pancreatic secretion of enzymes (and water and bicarbonate) is stable from the age of 3 years to the age of 70 years (Delachaux-Salem and Sarles, 1970). Precocious senile insufficiency could be ruled out in the group of patients studied (mean age 39 years, 28 SEM 1,50). The assumption that adult North Africans were exposed in their youth to something which had been toxic to the pancreas without giving rise to a definite pancreatic insufficiency has to be considered. Parasites such as ascaris, hydatid cysts, and amoebae are more frequent among North Africans than among French people but none of the patients presented with parasites. Undernutrition during childhood might be responsible for chronic calcifying pancreatitis (Banwell *et al.*, 1967; Geevarghese, 1968) in India and in Africa. In adult Indians presenting with malnutrition a decrease of bicarbonate and enzyme concentration has been observed, volume being normal (Tandon *et al.*, 1969). These modifications always disappeared eight weeks after starting a well-balanced diet (Tandon *et al.*, 1970). The nutritional conditions that prevailed among young North Africans 30 to 50 years ago is not well known, but we were unable to find a case of kwashiorkor reported in the literature during the time of French colonisation; the intake of protein and calories may, however, have been lower than in Europeans. As pancreatic function generally recovers when patients are placed on a well-balanced diet, this hypothesis is not completely satisfactory. The assumption that alcoholism could explain the observed difference is ruled out, as the consumption of alcohol is minimal among North Africans because of religious prohibitions.

No completely satisfactory explanation can, at present, be given for this difference.

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