BRAIN AND LIVER PHOSPHOINOSITIDES OF RATS POISONED WITH ETHANOL

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A significant fall in the monophosphoinositide level was found in the brain of rats poisoned with alcohol but there was virtually no change in the content of di- and triphosphoinositides; the content of all three fractions of phosphoinositides in the liver was reduced. A tendency for the normal level of di- and triphosphoinositides in the brain to be preserved in alcohol poisoning can be regarded as an important factor maintaining the physiological state of brain metabolism.

KEY WORDS: alcohol intoxication; phosphoinositides of rat brain and liver.

Information on the content of the various phosphoinostide (PI)* fractions in brain tissue is extremely contradictory [5, 6]. PI in the brain of normal animals are distributed in the following order: MPI > TPI > DPI [1-4, 9].

In the present investigation the dynamics of changes in the content of individual PI fractions of the brain and liver was studied in albino rats with fatty degeneration of the liver induced by ethanol.

EXPERIMENTAL METHOD

Experiments were carried out on albino rats of both sexes weighing 180-200 g. The animals were killed by rapid immersion in liquid nitrogen. Isolation and purification of PI from brain and liver tissue were carried out by the method of Rossiter and Palmer [10]. MPI, DPI, and TPI fractions were separated by ascending chromatography on Whatman No. 2 paper treated with formaldehyde [8]. Mineralized lipid phosphorus was determined by the method of Fiske and Subbarow [7]. Ethanol poisoning was produced by alternate combined intravenous and intraperitoneal injections of 1 ml of a 33% solution and 2 ml of a 16.5%

TABLE 1. MPI, DPI, and TPI (in μg lipid phosphorus/g wet weight of tissue) in Brain and Liver of Normal Rats and Rats Poisoned with Alcohol (M±m)

	Brain				Liver			
	control	poisoned	difference	P	control	poisoned	difference	P
MPI	93,3±1,4	66,3±0,9	31,0	<0,001	106,8±2,1	91,1±1,9	15,7	<0,001
DPI	9,3±0,2	10,2±0,2	0,9	=0,025	1,8±0,1	1,5±0,1	0,3	<0,001
TPI	30,0±0,3	31,6±0,5	1,6	>0,5	2,4±0,1	2,0±0,1	0,4	<0,001
Total PL	1831,3	1934,8	103,1	>0,5	1062,2	950,5	111,7	=0,01

*MPI, DPI, TPI, and PPI denote mono-, di-, tri-, and polyphosphoinositides respectively.

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solution of ethanol respectively over a period of 38-40 days and by giving a 10% solution of ethanol instead of water to drink.

EXPERIMENTAL RESULTS AND DISCUSSION

The qualitative identity of PI in the brain and liver was established. The PI content in these two organs, however, differed significantly (Table 1). The MPI content in the liver was almost twice as high as in the brain tissues. Conversely, the DPI and TPI content in the brain was greater than in the liver, evidence of their important functional role in metabolic reactions, especially in processes supplying energy to nerve tissues [2-4]. In rats with chronic alcohol poisoning, general adiposity was observed. Histochemically a considerable accumulation of neutral fats, unsaturated lipids, and fatty acids was observed in the liver and the total phospholipid content (PL) was reduced. Alcohol poisoning had no marked effect on the total PL content in the brain, although corresponding deviations were found in the content of individual PL fractions, notably MPI. On the other hand, the DPI level rose, and the TPI content showed a hardly perceptible tendency to increase. Unlike in brain tissue, a considerable decrease was observed in the lipid phosphorus level and the content of all PI fractions in the liver tissue, evidence of inhibition of function of this organ in alcohol poisoning.

There was a considerable difference both in the direction of the changes described and in the intensity of their development in the tissues studied during alcohol poisoning. For example, in the brain, in which the MPI level was significantly reduced, the DPI and TPI levels were actually a little higher; in the liver, on the other hand, the content of all three PI fractions fell. It is interesting to note that changes in the content of these various PI fractions in the liver took place in the same direction and at the same time, whereas in the brain the changes affected MPI before the others. The absence of significant changes in the DPI and TPI content in the brain points to relative stability of these compounds in the brain tissue. The PPI are represented in the brain as a specific system among the total PL content and, in all probability, they play an essential role in the maintenance of the high energy potential of nervous tissue even under pathological conditions.

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