ADENOSINETRIPHOSPHATASE ACTIVITIES OF HUMAN PLACENTAE IN INDIAN SUBJECTS

by

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Adenosinetriphosphatase was detected in microsomal fraction in the human placenta by Cerletti and Zichella (1960). Later Lister (1966) found the localization of this enzyme in both microvilli and syncytial pinocytotic vesicles. It is noted that ATP is intimately related to the transport of metabolites from the membranes into the different compartment of the cell for metabolism of substrates. As such, a definite concentration of ATP is a prerequisite for active transport of the metabolites. ATPase is an enzyme which acts on ATP yielding adenosinemonophosphate (AMP) and pyrophosphate. The present investigation offers the measurements of ATPase in placentae under different conditions to have an idea on ATP turnover in placental tissues.

Methods and Material

The placentae from the different groups mainly, (1) term, (2) post term, (3) pre-eclamptic toxaemic subjects were collected immediately after delivery and put into ice. Placenta was sliced and minced and homogenized in 0.05 M sodium borate-boric acid buffer, pH 8.0 in a Potter Elvehjem homogenizer for equal number of strokes for 3-4 mins. All these operations were carried out at O°C. The homogenate was used for enzyme assay. Enzyme was assayed after liberating the phosphate from ATP with enzyme from the reaction mixture according to the method of Fiske and Subbarow (1925) by treating the protein free filtrate with acid molybdate reagent which reacts with inorganic phosphate to form phosphomolybdic acid. The hexavalent molybdenum of the phosphomolybdic acid is reduced by means of 1, 2, 4-amino naphtholsulfonic acid to give a blue compound which is estimated at 680 mμ.

Results

Assay of ATPase:

The reaction mixture contained in a total volume of 3.0 ml, 0.1 ml of 0.16 M $MgCl_2$, 0.5 ml of sodium—ATP containing 0.3 mg phosphorus per ml, enzyme, 150 μg reduced glutathione. The reaction was made up in the cold, substrate being added last and was allowed to incubate at 42°C for 5 minutes and the reaction was stopped by the addition of TCA to a final concentration, 8 per cent.

Results given are the average of five cases for each group.

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Groups	No. of cases	Gestational period	Specific activity lug Pi released per mg. protein)
Term	5	40 weeks	0.0468
Post term	5	Above 40 weeks	0.036
P.E.T.	5	-	0.0872

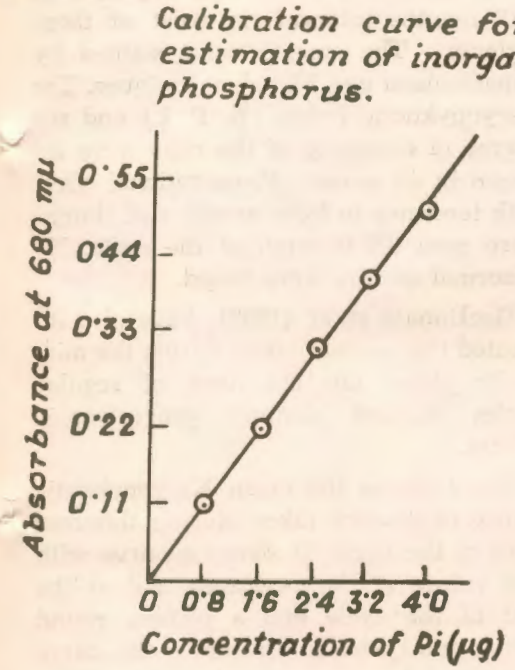

Fig. 1

Discussion

Analysis of the results showed that the activity of adenosinetriphosphatase in placenta of post term cases was found to be lower than that of term one, but in pre-eclamptic toxaemia the activity was found to be twice the values obtained with that of term placenta. It is normally found in placental metabolism that the activities of many other enzymes showed to be diminished with the advancing period of gestation. This might be due to the diminished placental function. With the maturity of the placenta, the diminished activity of ATPase in post term placenta in this light was quite reasonable. But the enhanced activity of ATPase in pre-eclamptic toxaemia presented a new picture. This might be due to the enhanced rate of synthesis of ATP, as a result a high turn over of ATP was essential or there might be possibilities of some abnormalities of the metabolism of toxaemic placenta where ATP required for the energy requiring reaction in the cell was not utilised as such, but they were degraded to AMP by adenosinetriphosphatase. This might be possible from the standpoint of the foetal malnutrition in toxamia.

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