

192. Response of Glucagon, Insulin, C-peptide and Human Growth Hormone to Oral Glucose (50 gm.) in Late Pregnancy

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The forty-three women in late pregnancy were studied. Plasma glucose and glucagon (IRG), serum insulin (IRI), C-peptide (CPR) and human growth hormone (HGH) were examined in the response to oral glucose. Specimens were obtained two minutes before and 30, 60, 90, 120 and 180 minutes after the ingestion of 50 gm. glucose. Subjects were classified to normal, borderline and diabetic groups according to the criteria of Japan diabetic society.

Basal values after overnight fast; Three groups were IRG; 191-195 pg/ml, IRI; 8.6-11.1 μ U/ml, CPR; 2.0-2.6 ng/ml and HGH; 5.4-5.6 ng/ml respectively. For serum IRI and CPR, diabetic group was lower than the normal. For the other value, there was no significant difference among the groups.

Response to oral glucose: Plasma IRG displayed small but significant reductions, which were at 30 and 60 min. in the normal and 60-180 min. in the borderline. In the normal, serum IRI rose to the maximal value, 45.1 μ U/ml, at 60 min. and fell subsequently. In the borderline, the response was the greatest of all and the maximal value 50.2 μ U/ml occurred at 60 min. In the diabetic, it was slow and low with the maximal value, 36.2 μ U/ml, at 90 min. It is evident that the beta cell of pancreas secretes C-peptide simultaneously with insulin. But, we found CPR response delayed than IRI response in periphery. CPR response was the greatest in the borderline and the lowest in the diabetic. On the value at 180 min. serum IRI return to the basal value in the normal, 1.8 times higher than that in the borderline and 2.0 times in the diabetic. On the other hand, serum CPR were 1.2, 2.1 and 2.4 times respectively. In the ratio of the value at 180 min. to the basal value, serum CPR was higher than serum IRI in each group. The pattern of the response after oral glucose was similar between CPR and IRI. And the Δ CPR/ Δ BS tended to be in preposion to the Δ IRI/ Δ BS. Further the correlation was found at each time after oral

glucose. HGH response displayed small reduction, particularly which was remarkable in the borderline.

Comments: The secretability of insulin and the suppressibility of glucagon were large in the borderline, but both ability were small in the diabetic. It's considered that serum CPR to glucose indicate the function of beta cell in late pregnancy, so it is available for insulin dependent diabetics in pregnancy who is difficult to measure serum IRI.

193. The Effect of Polypeptide Hormones on the Carbohydrate and Lipid Metabolism during Pregnancy

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It is well known that maternal carbohydrate and lipid metabolism is largely affected by pregnancy. The authors investigated how polypeptide hormones such as hCS, insulin and glucagon modify the metabolism of carbohydrate and lipid in pregnant subject. Blood was drawn from vein of 80 normal pregnant women after overnight fasting at each gestation week. Serum hCS and insulin were measured by RIA of double antibody method, plasma glucagon by RIA of charcoal method utilizing antiserum 30K, blood glucose by Hoffman's method, serum FFA by Ui-Itaya's method, serum TG by enzymatic method, and serum β -lipoprotein by the turbidity method of dextran sulfate. All samples were systematically measured simultaneously. As total plasma volume is known to change during pregnancy, the obtained data were corrected by Hytten's data (1963). All data obtained by these experiments were statistically analyzed by student's t-test. As pregnancy advances, blood glucose, serum FFA, insulin and plasma glucagon increased, and also serum TG, β -lipoprotein and hCS remarkably increased. There were statistically significant correlations between hCS and glucose, FFA, TG, β -lipoprotein, insulin, glucagon ($p < 0.01$), and between insulin and glucose, TG, β -lipoprotein in blood ($p < 0.01$), but glucagon and the metabolites were not correlated. From these data, it was thought that in the maternal liver hCS may act on synthesis of apoprotein and release of glucose, insulin on synthesis of apoprotein and TG, and that

hCS may stimulate secretion of insulin and glucagon in the maternal pancreas. However the role of glucagon during pregnancy is unknown. The characteristics of carbohydrate-lipid metabolism in the pregnant subject are that the maternal body mostly utilizes FFA as its energy to save glucose, and feto-placental unit is dependent on glucose.

194. Effect of Human Chorionic Somatomammotropin on the Glucose-fatty Acid Cycle in the Maternal Liver

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hCS has an intrinsic lipolytic action and its effect are primarily on maternal metabolism producing important materials of maternal origin for fetal growth. However, the physiological actions of hCS are virtually unknown. For this reason it seemed desirable to re-examine the biological significance of hCS as a metabolism-regulating hormone during pregnancy. Direct action of hCS on the release of FFA, glucose and potassium from liver of fasted adult female or pregnant rats are investigated by use of non-recirculating liver perfusion system. FFA, glucose and potassium levels in the perfusate were increased by the administration of hCS, on the other hand the contents of liver glycogen were decreased. It is proposed that hCS plays a physiological role in the maintenance of the blood glucose level through stimulation of glycogenolysis in the liver as well as lipolysis in the peripheral adipose tissue during pregnancy. Specific binding of ^{125}I -hCS was examined in detail in liver membrane fractions prepared from fetal, adult female and pregnant rats. hCS binding was observed in the liver of adult female and pregnant rats, but the binding was very low in the fetus. Affinity binding constants and binding capacities were determined by Scatchard analysis of these displacement curves. The K_a value of membranes from adult female and 20-day pregnant rats was approximately the same, but the binding capacity was about 3 fold higher in membranes from pregnant than from adult rats. ^{125}I -hCS was displaced by hormones capable of stimulating lactation (i.e. primate growth hormones, prolac-

tines and hCS). Nonprimate growth hormones, which possess no lactogenic activity, showed minimal ability to displace ^{125}I -hCS.

195. Hyperlipemia during Pregnancy Studies of Post Heparin Lipolytic Activity

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During pregnancy, the mother undergoes metabolic changes that are numerous and intense.

In pregnancies, the plasma lipids, especially triglyceride, increased. It has so-called hyperlipemia.

Clearance rate of the exogenous triglyceride in pregnancies was decreased in comparison with non-pregnancies.

The conversion rate of exogenous triglyceride, labelled lynoleic acid to the respiratory $^{14}\text{CO}_2$ in pregnant rat was two third of that in non pregnant rat.

Then, the post heparin lipolytic activity (P.H.L.) in pregnant women was lower than that of non pregnant, which the change of the free fatty acid and free glycerol after heparin injection rapidly increased and the concentrations were about three times higher than that of control levels.

In the case of the toxemia, the P.H.L. activity was no significant changes and the free fatty acid and free glycerol level after heparin injection were lower than that of normal pregnancies.

In the case of the diabetes, the P.H.L. activity, free fatty acid and free glycerol level after heparin injection were also same level as normal pregnancies.

196. Studies on Hyperlipemia in Pregnancy —Dynamics of Postheparin Lipase Activity—

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