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Behaviour of serum enzymes in pregnancy

by
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Studies of variations in serum enzyme activity during normal pregnancy have often given contradictory results. We have, therefore, considered this problem in connection with an extensive case material, using mass investigation methods with auto-analysers.

MATERIAL AND METHODS

The investigation was carried out on 304 pregnant women admitted to hospital, who, on clinical examination, did not present with any pathological changes. All these patients had normal pregnancies up to term.

As controls, 56 clinically normal women of the same age-group were selected.

The enzyme activities measured were as follows:

gamma-glutamyl-transpeptidase (gamma-GT)
glutamic-oxalacetic transaminase (GOT)
glutamic-pyruvic transaminase (GPT)
alkaline phosphatase (AP)
lactate dehydrogenase (LDH)

The blood samples were collected by venipuncture, while fasting.

Gamma-GT was determined by Szasz's method ([1]), based on the spectrophotometric measurement of p-nitro-aniline, liberated by transfer of the glutamyl group of γ-glutamyl-p-nitroanilide to glycyl glycine.

GOT was determined by the method of Karmen *et al.* ([2]), in which the increased oxalacetate formed by a couple indicator reaction, catalysed by malate-dehydrogenase, is measured in terms of time.

GPT was determined by a similar method, measuring the formation of pyruvate in terms of time.

Alkaline phosphatase was determined by the method of Bessey *et al.* ([3]) using p-nitrophenyl phosphate as substrate. The p-nitrophenyl liberated was measured spectrophotometrically after addition of caustic soda.

Lactate dehydrogenase was determined by the method of Wroblewski & La Due ([4]), based on the rate of diminution of NAD reduced by the pyruvate-lactate transformation.

The statistical analysis of the results was worked out with the help of an electronic calculator. The statistical tests that we used are: Student's « t » test for the differences between the means, and the coefficient of correlation in order to demonstrate the significance of the association between two variables.

RESULTS

The results of our investigation into the enzyme systems of the serum at various stage of pregnancy are summarized in the table.

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SERUM LEVELS IN PREGNANCY

Mean ± standard deviation *

months of pregnancy	Gamma GT	GOT	GPT	AP	LDH
0	11.7 ±4.6	21.9 ±7.9	18.6 ±6.2	48.5 ±12.7	148.4 ±26.5
2	13.4 ±5.2	27.2 ±7.4	23.6 ±10.9	41.0 ±11.6	141.7 ±24.7
3	10.5 ±4.4	21.9 ±5.8	18.2 ±5.5	38.6 ±8.4	134.1 ±17.4
4	10.5 ±6.1	24.7 ±10.4	23.8 ±10.2	41.1 ±9.7	130.3 ±19.7
5	13.2 ±9.5	24.3 ±8.9	22.5 ±9.5	49.6 ±13.0	127.5 ±20.2
6	15.0 ±10.5	23.9 ±8.4	18.8 ±6.4	61.3 ±15.8	142.6 ±24.1
7	16.1 ±10.4	29.9 ±11.8	24.8 ±12.9	81.1 ±26.2	148.3 ±27.2
8	22.1 ±14.6	31.9 ±12.8	27.6 ±13.4	114.2 ±32.8	159.6 ±21.3
9	24.3 ±11.5	29.5 ±11.4	25.1 ±12.6	135.2 ±41.2	162.7 ±24.2

* The mean probabilities of error are between 0.01 and 0.0005.

Taking each parameter into consideration individually, we observed some statistically significant variations:

– the levels of gamma-glutamyl transpeptidase are within the normal range up to the 5th month of pregnancy, and then increase in a highly significant manner ($p < 0.0005$) for the whole of the successive period;

– the transaminase levels show a highly significant increase during the last three months ($p < 0.0005$);

– GPT rises significantly even in the 4th and 5th months of pregnancy;

– alkaline phosphatase increases in a highly significant manner from the 6th month ($p < 0.0005$);

– lactate dehydrogenase shows a highly significant fall at the 5th month and increases significantly at the 8th and 9th months.

CONCLUSIONS

Alkaline phosphatase shows a special increase from the 5th month of pregnancy onwards, due to the presence of the thermostable quota of placental origin.

The significant increase in the other enzymes studies, during the last months of pregnancy, is difficult to explain; it cannot be excluded that these variations are related to the marked increase in steroidogenesis, oestriol especially, which involves a functional overload for the hepatocyte. Such an interpretation might be supported by the enzyme variations that are observed in hepatic toxaemia.

SUMMARY

The behaviour of some the serum enzymes (γ-GT, GOT, GPT, alkaline phosphatase, LDH) was studied during the course of physiological pregnancy. Apart from some

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variations in the alkaline phosphatase that are attributable to the placenta, the activity of the other enzymes was increased at the latter end of the pregnancy, probably in relation to the functional overload on the hepatocytes on the part of the steroids.

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Circadian rhythm of plasma progesterone in pregnant women at term

by

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The analysis, in the various maternal biological fluids, of protein hormones, steroid metabolites and enzymes of placental origin, made possible by increasingly precise and sophisticated analytical methods, is constantly gaining importance in the monitoring of the foeto-placental unit in normal and pathological pregnancy.

The controversial results obtained with other hormones (HPL, HCG, oestriol) have recently directed the interest of investigators towards progesterone and the very important part played by this hormone in the various stages of pregnancy, from the implantation of the ovum to delivery.

Clinically, the production of progesterone can be assessed by determining the amount of pregnanediol excreted in the mother's urine.

There are some factors that limit the value of this indirect method of evaluation of the metabolism of progesterone:

a) pregnanediol represents only 20% of the progesterone secreted ([1]); *b*) evident reduction of pregnanediol secretion is observed only in certain pathological situations, characterized by well defined disorders affecting the tissues that produce progesterone ([2]); *c*) its excretion remains apparently unchanged, even after the intra-uterine death of the foetus, in the presence of a retained, functioning placenta ([3]); *d*) the changes in its excretion under pathological conditions, e.g. in diabetes, are not rapid enough to allow intervention to prevent injury to the foeto-placental unit ([4]).

The inadequacy of urinary secretion of pregnanediol for the purposes of sufficiently exact evaluation of the changes in its metabolism, on the one hand, and the development of precise and rapid radio-immunological methods for the evaluation of progesterone levels in the blood, on the other, have in recent years directed the interest of investigators towards the analysis of progesterone in the plasma, on the assumption that such plasma values may be better correlated with actual production, whether in normal or in pathological pregnancy.

Since 1954, the year in which Zander succeeded in identifying and measuring

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