REVISTA ESPAÑOLA DE FISIOLOGIA, 29, 103-106. 1973

Changes of Individual Proteins in Mother and Newborn*

T. Quesada, J. Peña, F. Mora and C. Osorio

Department of Physiology and Biochemistry
Medical School
Granada (Spain)

(Received on December 2, 1972)

T. QUESADA, J. PEÑA, F. MORA and C. OSORIO. *Changes of Individual Proteins in Mother and Newborn.* Rev. esp. Fisiol., 29, 103-106. 1973.

Seven proteins [Tryptophan-rich prealbumin, albumin, antitrypsin (α_1), acid-glycoprotein (α_1), macroglobulin (α_2), transferrin, ceruloplasmin] were measured and studied by immunological methods in the serum of thirty normal women, fifty pregnant women and their infants at birth.

Pregnant women showed important dysproteinemia with hypoalbuninemia and increases in the other proteins. All the studied proteins are present in the newborn at birth. Many of these proteins are decreased respect to normal group and to their mothers, only albumin and α_2-macroglobulin are increased.

There are not correlation between the levels of the diferent proteins in the mother and in the newborn.

The serum proteins in pregnancy and in the newborn have been studied by many workers and different techniques (1, 2, 8, 15). Their reports have shown that in both cases there are quantitative variations in albumin and globulins.

In this paper and using an immunological method, the quantitative estimation of seven serum proteins in a group of 50 women at delivery time, in the blood of umbilical cord of theirs newborn, and 30 normal women in fertile age has been made.

* This study was supported by a grant of «Formación del Personal investigador del Ministerio de Educación y Ciencia». Spain.

Materials and Methods

Blood samples. — The «normal» group were 30 non-pregnant normal women of child-bearing age no taking any kind of medication.

The samples of a group of 50 pregnant women were taken at the moment of delivery. Blood from their respective newborns was taken at birth, from the umbilical cord.

The serum was obtained and kept frozen at —20° C.

Immunological methods. — The values of individual proteins was determined by the method of «radial diffusion» of MAN-

Table I. *Concentration (Means ± S.D.) of serum proteins (mg/100 ml serum) and total proteins (g/100 ml) in normal reference women, women at delivery and newborns.* The diferences between the means of the three groups are compared by «student's test»: in every cases $P < 0.01$ except when the concentration of macroglobulin (α_2) is compared in mother and newborn, $P < 0.05$.

Individual Proteins	Normal women	Pregnant women	Cord
Tryptophan-rich prealbumin	46.36 ± 13.34	36.48 ± 13.11	25.15 ± 8.24
Albumin	4,072.72 ± 505.50	3,424.48 ± 591.50	4,279.41 ± 747.60
Antitrypsin (α_1)	523.63 ± 141.80	956.80 ± 199.70	518.11 ± 118.40
Acid-glycoprotein (α_1)	71.30 ± 27.42	90.90 ± 27.89	26.50 ± 13.00
Macroglobulin (α_2)	255.50 ± 53.40	322.80 ± 77.40	352.11 ± 68.40
Transferrin	211.13 ± 36.40	324.42 ± 74.80	166.74 ± 32.90
Ceruloplasmin	52.05 ± 10.40	109.52 ± 21.60	27.16 ± 17.30
Total protein	7.06 ± 0.65	6.30 ± 0.74	5.75 ± 0.76

CINI *et al.* (9). The squares diameter of precipitation of samples was compared with those obtained from the dilutions of a standard serum*. Each sample was measured in triplicate twice.

OUCHTERLONY precipitation (14) was used to verify that the three samples (normal, mother and newborn) gave an immunological identity reaction in front of the antisera used.

The following proteins were measured: tryptophan-rich prealbumin, albumin, antitrypsin (α_1), acid-glycoprotein (α_1), macroglobulin (α_2), transferrin, ceruloplasmin.

Results

Table I shows the mean values with standard desviations of total proteins and the seven determined proteins in the three groups.

In the Figure 1 the results found in the mother are compared with those of the newborn. The value of the 100 % was taken as the mean for normal group.

There was not found correlation between levels of differents proteins in mother and newborn. Similarly, there is not correlation between protein levels in newborns and their weight and between such protein levels and the placenta weight.

Discussion

The results seem to confirm that in the pregnant women there are an important dysproteinemia with hypoproteinemia.

The low levels in albumin concentration agree with recent work (11, 18), and probably it is due to the hemodilution which occurs in pregnancy. The decrease in serum prealbumin may have the same explanation.

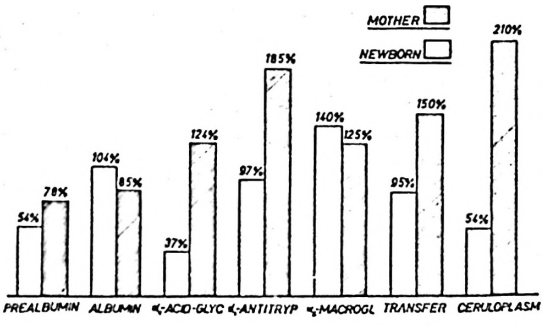

Fig. 1. *Variations of protein levels in pregnant women and newborn serum from normal values (100 %).*

* Antisera and standard serum values was obtained from the Behringwerke, A. G. (Germany).

There are not reports in the literature on prealbumin and acid-glycoprotein to compare our results.

FAARVANG and LAURITSEN (4) and GANROT and BJERRE (5) showed that the trypsin inhibition capacity (TIC) increased in pregnant women. Antitrypsin and α_2-macroglobulin are the proteins responsible for this action in serum and we have found high levels for both: antitrypsin 185 % and macroglobulin 125 %. ROBERTSON (17) and HORNE *et al.* (7) show that after treatement with oestrogens and progesterone there is an increase of the levels of both proteins.

MORGAN (12) have show that the high levels of transferrin wich occur during pregnancy are not related to an iron deficiency state. Previous studies MUSA *et al.* (13) and BURTON (3), noticed that treatement with high doses of oestrogens does not affect the concentration of this protein; but recently, HORNE *et al.* (7) found statistical differences in serum transferrin between women trated with contraceptives and normals.

Ceruloplasmin shows an elevation of 210 % over normal group, this high value agrees with MENDEHALL data (240 %) (11).

It is very difficult to comment the values in the newborn because there are few reports on the subject. From the results in the cord serum it can be deduced that all proteins from this study are present in the newborn and are inmunologicaly identical to those from their mothers.

It seems worth while to point out the low concentration of acid-glycoprotein, that does not reach the 50 % of normal values. Probably the inmatury of fetal organs is responsible for the failure to synthesize the complex carbohydrate group that this protein contains (16).

The increase of α_2-macroglobulin may be related to the ability of this protein to transport certain substances related to growth (6, 10).

Resumen

Siete proteínas [prealbúmina-rica-triptófano, albúmina, antitripsina (α_1), glicoproteína-ácida (α_1), α_2-macroglobulina, transferrina, ceruloplasmina] han sido medidas y estudiadas por métodos inmunológicos en el suero de 30 mujeres normales, 50 embarazadas y sus respectivos recién nacidos.

Las mujeres embarazadas muestran una importante disproteinemia con hipoalbuminemia y aumento del resto de las proteínas objeto de este estudio.

Todas las proteínas estudiadas están presentes en el recién nacido al nacimiento: la mayoría están disminuidas con respecto al grupo normal y a sus madres, solamente albúmina y α_2-macroglobulina están aumentadas.

No existe correlación entre los niveles de las distintas proteínas en recién nacido con respecto a su madre.

ACKNOWLEDGMENT

The Prof. Salvatierra from the Gynaecology Department, Medical School, Granada, is gratefully acknowledged for providing us the blood samples and the clinical histories of pregnancies studied in this work.

References

1. BERSTRAND, C. G. and CZAR, B.: *Scand. J. Clin. Lab. Invest.*, **9**, 277, 1957.
2. BRANBELL, F. W.: *Biological Reviews*, **33**, 488, 1958.
3. BURTON, J. L.: *Lancet*, **1**, 978, 1967.
4. FAARVANG, H. J. and LAURITSEN, O. S.: *Nature*, **199**, 290, 1963.
5. GANROT, P. O. and BJERRE, B.: *Acta Obstet. Gynec. Scand.*, **46**, 126, 1967.
6. GANROT, P. O. and SCHERSTEN, B.: *Clin. Chim. Acta*, **131**, 131, 1967.
7. HORNE, C. H., HOWIE, P. W., WEIR, R. J. and GOUDIE, R. B.: *Lancet*, **1**, 49, 1970.
8. MACK, H. C.: *Clin. Obstet. Gynec.*, **3**, 336, 1960.
9. MANCINI, G., CARBONARA, A. D. and HEREMANS, J. F.: *Immunochemistry*, **2**, 235, 1965.
10. MARR, A. G., OWEN, J. A. and WILSOB, G. S.: *Biochim. Biophys. Acta*, **63**, 276, 1962.

11. MENDEHALL, H. W.: *Amer. J. Obstet. Gynec.*, **106**, 388, 1970.
12. MORGAN, E. H.: *Lancet*, **1**, 9, 1961.
13. MUSA, B. U., DOE, R. P. and SEAL, U. S.: *J. Clin. Endocr.*, **27**, 1463, 1967.
14. OUCHTERLONY, O.: *Progr. Aller.*, **5**, 1, 1958.
15. PAABY, P.: *J. Obstet. Gyneac. Brit. Emp.*, **67**, 43, 1960.
16. PARKER, W. C. and BEARN, A. G.: *Science*, **133**, 1014, 1961.
17. ROBERTSON, G. S.: *Lancet*, **1**, 232, 1967.
18. STUDD, J. W., BLAINEY, J. D. and BAILEY, D. E.: *J. Obstet. Gyneac. Brit. Comm.*, **77**, 43, 1970