AMNIOTIC FLUID PROLACTIN AND FETAL LUNG MATURITY

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SUMMARY

Prolactin concentration and palmitic acid/stearic acid ratio were measured in 92 samples of amniotic fluid at various gestational ages. There was no correlation between prolactin concentration and palmitic acid/stearic acid ratio, when this ratio was greater than 5, that is when there was an obvious indication that fetal pulmonary maturation was complete. On the contrary there was a statistically significant negative correlation between prolactin levels and palmitic acid/stearic acid ratio when this ratio was lower than 5 (incomplete fetal pulmonary maturation).

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Respiratory distress syndromes of the newborn are one of the main causes of neonatal mortality and morbidity, particularly in preterm infants.

In most cases these syndromes are due to lack of surfactant synthesis in the immature alveoli of the baby.

It has been known for some time that the concentration of lecithin (phosphatidylcholine) in amniotic fluid is closely correlated with the respiratory adequacy of the neonate's pulmonary alveoli ([1]), although lecithin / sphingomyelin ratio (L/S) ([2]) and disaturated phosphatidylcholine (SPC) ([3]) are perhaps better indicators.

Among the various method for evaluating the concentrations of lecithin in amniotic fluid, gas-chromatographic analysis of the amniotic fluid fatty acids has been widely used ([4, 5]).

Warren *et al.* ([4]) recommend quantitative measurement of palmitic acid. Gautray and Vielh ([6]) suggest for reasons of simplicity to determine the ratio of palmitic acid to stearic acid (P/S) using stearic acid as internal standard.

In this study we have used the P/S ratio, adopting Gautray and Vielh's value of 5 as the lower limit for maturity.

Sharp *et al.* ([7]) report varying degrees of positive correlation between amniotic fluid cortisol level and L/S ratio, as a suggestive evidence of the influence of fetal adrenal corticoids on synthesis of pulmonary surfactant.

Many authors ([8, 9, 10]) studied the relationship of the concentrations of prolactin and cortisol in cord plasma to the incidence of RDS. On the basis of their results it is suggested that fetal lung maturation and augmented surfactant formation are functions of the fetal prolactin concentration.

As a matter of fact, experimental demonstration of the triggering action exerted by prolactin on lung surfactant synthesis in the rabbit fetus had already been given by Hamosh and Hamosh ([11]).

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For a more extensive review on the ontogenesis of prolactin in the human fetus we refer to the detailed review of Aubert *et al.* ([12]).

In 1978 Mukherjee *et al.* ([13]) studied the relationship of amniotic fluid prolactin level to L/S ratio and found a trend to a negative correlation.

In the present study we intended to investigate the correlations of prolactin levels to P/S ratio in samples of amniotic fluid obtained in the last part of pregnancy (28-42 weeks).

We stress that any new acquisition concerning fetal pulmonary maturity is important because RDS still is one of the major causes of neonatal loss.

The current data regarding early neonatal deaths (first week of life) and late neonatal deaths (first month of life) in Italy from 1972 to 1976 are as follows for 100,000 living newborns:

	1972	1973	1974	1975	1976
early neonatal deaths	2.0	3.2	11.1	7.2	10.4
late neonatal deaths	2.0	3.4	11.8	7.9	11.4

MATERIAL AND METHODS

Ninety-two samples of amniotic fluid were obtained from 87 patients (transcervical puncture of the amniotic sac with a Drew-Smythe catheter at the beginning of labor in 28 cases and transparietal puncture of the uterus in 57 cases of elective caesarean section). In only 7 cases amniotic fluid was obtained by amniocentesis. 66 were normal cases; in the other cases the following complications were present: diabetes (7 cases), gestosis (8 cases), Rh isoimmunization (4 cases), acute polihydramnion (2 cases).

In order to avoid interferences by contaminants (cells, meconium, hairs, vernix) all samples were centrifuged according to a standard procedure (3500×g for 60 minutes at room temperature) without delay and then stored at −20 °C until the time of analysis ([14]).

Lipids extraction from amniotic fluid and gas-chromatographic analysis are described in our earlier publications ([14, 15, 16]).

Amniotic fluid prolactin assay was performed with radioimmunoassay procedure.

RESULTS AND DISCUSSION

In figure 1 the concentrations of prolactin (PRL) of 92 samples of amniotic fluid from our 87 cases are plotted against the values of P/S ratio of the same samples.

In only two cases the newborns developed a moderate respiratory distress syndrome: one was a baby born at 36 week gestational age from a pregnancy complicated by severe hypertensive gestosis (PRL: 672 ng/ml; P/S: 3.4) and the other was a baby born at the 37th week with obvious signs of intrauterine growth delay but from an apparently uncomplicated pregnancy (PRL: 759 ng/ml; P/S: 3.8).

Analysis of the data was performed separately on the group of samples (69 samples) with a P/S ratio higher than 5 (completed pulmonary maturation) and on the group of samples with a P/S ratio lower than 5 (23 samples). Mean P/S value in the first group was 10.7 ± 3.9 (S.D.) and in the second group was 3.5 ± 1.2 (S.D.) the difference being highly significative ($t = 8.582$; $p < 0.01$).

Mean PRL concentration in the first group was 439.7 ± 128.5 (S.D.) ng/ml, while in the second group it was 855.6 ± 185.1 (S.D.) ng/ml ($t = 15.091$; $p < 0.01$).

In the group of cases with completed pulmonary maturation (P/S ratio > 5) there was no correlation between PRL concentration and P/S ratio ($p > 0.05$).

On the contrary, in the group of cases with P/S ratio < 5 there was a significant negative correlation between PRL concentration and P/S value ($r = -0.621$; $p < 0.01$); more exactly, linear regression equation corresponds to: $y = 6.564 - 0.004\,x$, where $y = P/S$ and $x = PRL$ concentration as shown in figure 1 by the regression line.

The results of our investigation are in accordance with those of Mukherjee *et al.* (1978), who found only a questionable correlation between PRL concentration and lecithin/sphingomyelin ratio in am-

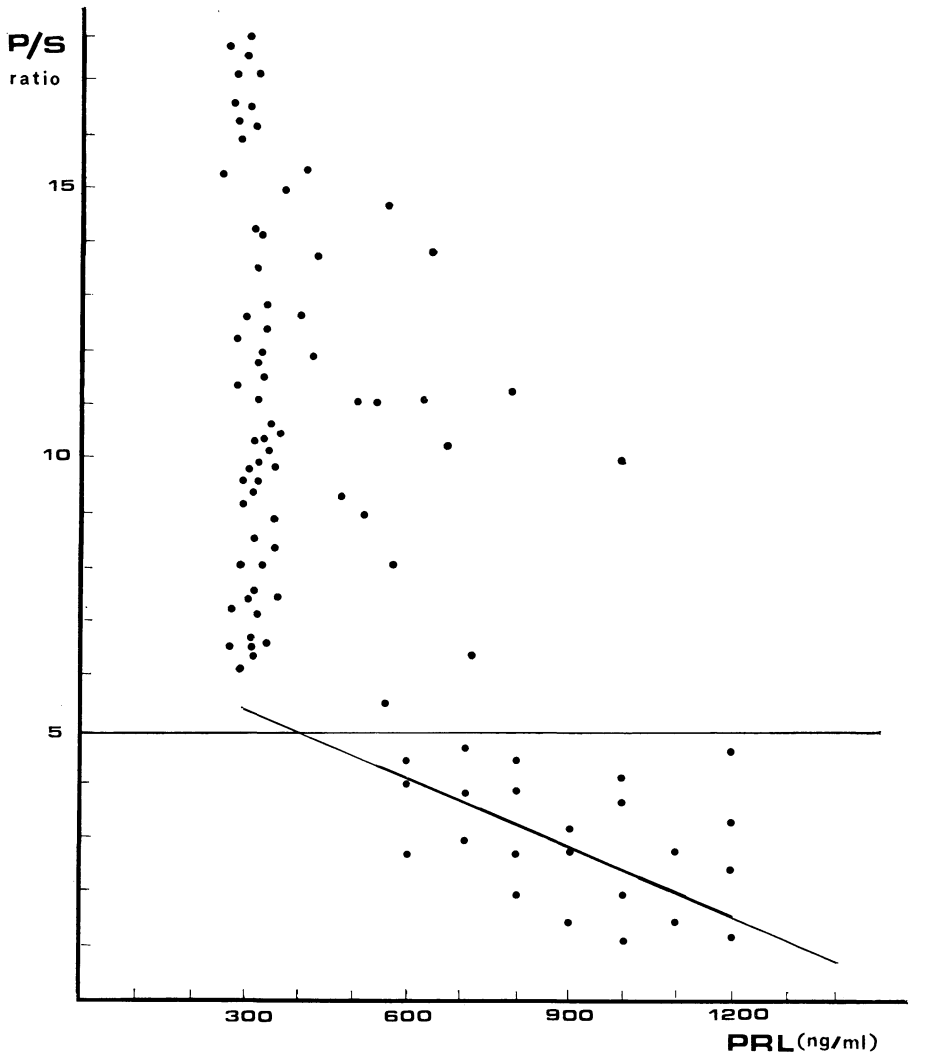

Fig. 1. — Scatter plot indicating correlation between amniotic fluid prolactin and P/S ratio in 92 samples.

niotic fluid after 36 week gestational age, that is after presumable completion of lung maturation. On the contrary, our data on samples with a P/S ratio < 5 show that in the course of the process of lung maturation there is a significant negative correlation between amniotic PRL concentration and P/S ratio.

We are not in position to explain the divergent behaviours of prolactin in fetal blood (as published by the authors already quoted) and in amniotic fluid. One reasonable hypothesis is that amniotic fluid prolactin is mainly of maternal origin ([17]) and therefore does not closely reflect prolactin production in the fetal compartment.

However, PRL is not the only hormone

involved in lung maturation as shown by ourselves ([18, 19]) and by others ([20, 21]).

We feel like Mukherjee ([13]) that evaluation of only one hormone may be inadequate to assess lung maturity.

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