HCS, HCG, AND HCG SUBUNIT SERUM LEVELS DURING MULTIPLE PREGNANCIES

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HCS, HCG, and HCG α and β subunits were measured in the serum of women with unifetal or multiple pregnancies. Highly specific radioimmunoassay procedures were used for the determinations. Serum maternal levels of HCS are greatly increased in multiple pregnancies, sometimes more than could be expected from increased placental weight alone. Serum undissociated HCG is also elevated in multiple pregnancies. The relationship between undissociated HCG and its free circulating α and β subunits is different in multiple and unifetal pregnancies and this difference is discussed.

HUMAN CHORIONIC SOMATOMAMMOTROPIN (HCS)

The total functioning placental mass is probably the main factor that controls the placental production of HCS. Many authors, such as Saxena et al. (1969) and Spellacy et al. (1971*b*), have shown the existence of a significant relationship between the weight of the placenta (stripped of its umbilical cord and membranes) and the maternal HCS serum level. On the other hand, the relationship between the fetal weight and the HCS level is less significant, as demonstrated by Letchworth et al. (1971).

We have studied the evolution of HCS levels during the third trimester in 10 twin pregnancies and 2 quadruple pregnancies. We have used a highly specific and reproducible radioimmunosorbent technique according to Wide and Porath (1966), which has been developed to measure serum concentrations of HCS. This method has been described in detail elsewhere (Gaspard et al. 1973). According to this procedure, the evolution of the HCS serum concentration during the normal unifetal pregnancy shows an increasing pattern until the 8th month; after the 36th week of pregnancy, it gradually declines. At the peak of secretion, the mean serum HCS level is 7.81 μg/ml (Fig. 1).

In multiple pregnancies, the serum HCS concentrations are by far greater than the concentrations found in unifetal pregnancies. As illustrated in Fig. 2, the HCS levels are closely related to the placental weight. However, if the evolution of HCS levels in our cases of quadruple pregnancies is examined, it can be seen that the increase in HCS secretion is larger than what could be expected from increased placental weight alone. Perhaps metabolic factors (such as the glucose level in the maternal circulation), in addition to the total functioning placental mass, are particularly important for the regulation of the maternal levels of HCS.

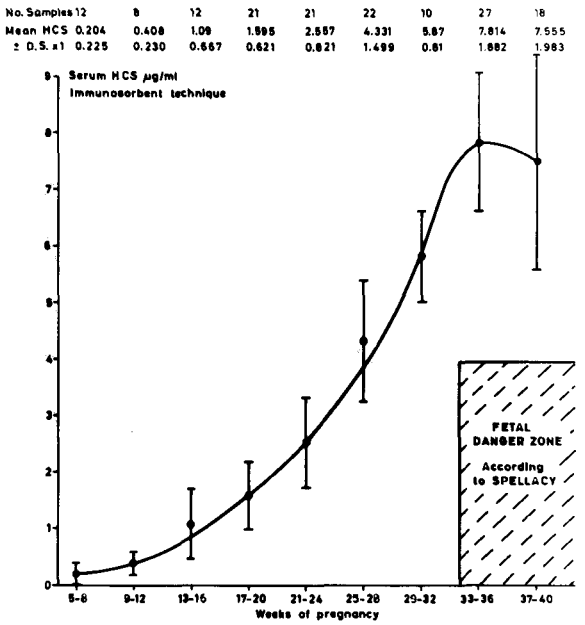

Fig. 1

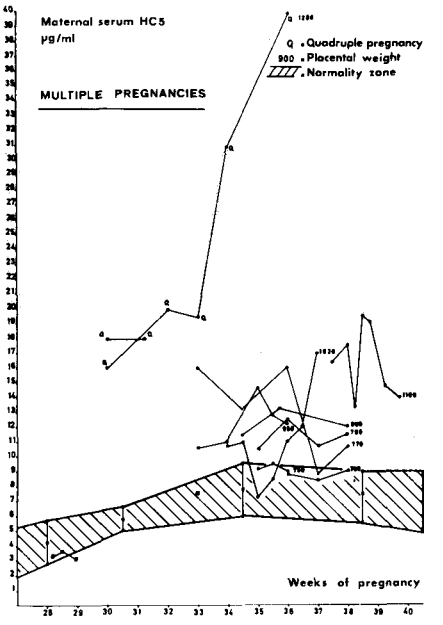

Fig. 2

HUMAN CHORIONIC GONADOTROPIN (HCG)

HCG is a glycoprotein of trophoblastic origin closely related to HLH (Human Luteinizing Hormone).

It has been established that the following glycoprotein hormones: FSH, LH, HCG, and TSH, contain two noncovalently bonded subunits designated as α and β.

The α subunits of all the above hormones appear to have similar chemical structures and are, therefore, interchangeable with one another. The specificity of the hormone is conferred by the β subunit which is the " Hormone Specific " subunit (Pierce et al. 1971). Franchimont and Reuter (1972) have recently discovered the presence of free circulating α and β subunits of HCG together with undissociated HCG in the serum and urine of pregnant women. The ability of the placenta to secrete undissociated HCG and free subunits has also been found in organ cultures of human placenta (Gaspard and Franchimont (1972).

We have measured serum concentrations of undissociated HCG and of free α and β subunits in the course of 18 normal unifetal pregnancies, 10 twin pregnancies, and 2 quadruple pregnancies, followed sequentially through the third trimester of gestation.

We have separately assayed the HCG and the α and β subunits using homogeneous assay techniques. Meaningly:

For HCG: labelled and unlabelled HCG and a specific anti-HCG serum. With this antiserum, there is slight interference from the α and β subunits.

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RESULTS

1. The mean undissociated HCG serum concentration during the third trimester of gestation is higher in multiple than in unifetal pregnancies.
2. The percentage of the α and β subunits, with respect to the total undissociated HCG, is smaller in multiple than in unifetal pregnancies.
3. The increase in the α subunit with respect to the β subunit, i.e., the α/β ratio, is greater in multiple than in unifetal pregnancies.

Table. *HCG and HCG Subunits Serum Concentrations during the Third Trimester of Pregnancy* (~20 determinations)

	HCG (ng/ml)	HCG subunits (% of undissociated HCG)		α/β ratio (calculated from absolute values of α and β HCG subunits, expressed in ng/ml)
		α	β	
Unifetal	2.224	25.00	14.00	1.72
Twin	11.500	7.05	2.75	3.48
Quadruple	25.250	8.10	1.04	5.64

For α subunit: labelled and unlabelled α subunit [1] and anti-α subunit serum [2].
For β subunit: labelled and unlabelled β subunit [1] and anti-β subunit serum [2].

CONCLUSIONS

1. The serum concentration of HCS is greatly increased in multiple pregnancies. This augmentation is sometimes greater than could be expected from increased placental weight alone. This " overproduction" of HCS could be partly caused by metabolic regulation factors.
2. The maternal undissociated HCG serum level is higher in multiple than in unifetal pregnancies. However, the circulating levels of free α and β subunits are proportionately lower in multiple pregnancies. Finally, the secretory excess of the α subunit with respect to the β subunit is greater in multiple than in unifetal pregnancies.

[1] Kindly provided by Dr. Canfield.
[2] Kindly provided by Dr. G.T. Ross.

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