TOTAL WATER CONTENT AND CHLORIDE CONCENTRATION IN EMBRYO, PLACENTA AND DECIDUA IN THE COURSE OF EARLY HUMAN PREGNANCY

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Summary

Total water content and chloride concentration were measured in embryo, placenta and decidua from 90 early human pregnancies. The total water content of the embryo and placenta is greater than that of the decidua, and decreases with increasing gestational age. The chloride content of the decidua, placenta and embryo, and by implication the extracellular fluid space, does not change between the fortieth and ninetieth days of pregnancy.

No data can be found in the literature relating to the extracellular and intracellular water compartments of the embryo, placenta and decidua at an early stage of human pregnancy, and even information about the total water content is scarce (Behrman et al., 1964; Bezold, 1857; Friis-Hansen, 1954 and 1957; Jirasek et al., 1966).

Material and Methods

The study was based on the results of 90 legal terminations of early pregnancy by dilatation and curettage. The blood was blotted off the uterine contents with a dry cloth, and the decidua, placenta, and embryo were separated and weighed. We have characterized the stage of development of the embryo with a scoring system (von Kobyletzki and Gellén, 1970), based on Streeter (1942).

From the 90 terminations of pregnancy we obtained 78 embryos: 38 of them complete, and 40 nearly complete (which means that not more than two limbs or a corresponding amount of tissue were missing). For 58 embryos, the total dry matter and the tissue chloride concentration were determined; for the remaining 20, dry matter alone. Dry substance was estimated by drying the fresh tissue at 105° C. to constant weight. Chloride concentration of the maternal serum, decidua, placenta and embryo tissue was determined by the method of Eisenman (1929), after incubation in 0·75 Normal nitric acid for 24 hours.

The statistical evaluation was made by I. Győri at the Computing Laboratory in Szeged.

Results

In Figure 1 the dry matter content of the decidua, placenta and embryonic tissue can be seen to increase with the gestational age. The average dry matter content was 13·1 g. per 100 g. of fresh tissue in decidua, 8·8 g. per 100 g.
Dry weight (as percentage of fresh weight) of decidua, placenta and embryonic tissue in early human pregnancy.

in placenta and 8·1 g. per 100 g. in embryonic tissue. While the change of water content in the products of conception with increasing gestation was statistically significant, the much smaller change in the decidua was not. These results were in good agreement with those of a similar experimental series of ours published earlier (von Kobyletzki et al., 1972).

The changes in the chloride concentration of the maternal serum, the decidua, placenta and embryonic tissue as a function of gestational age are given in Figure 2.

In the gestational period investigated the average chloride concentration was 102·0 mEq./kg. in the maternal serum, 69·0 mEq./kg. wet weight in the decidua, 76·5 mEq./kg. in the placenta and 70·0 mEq./kg. in the embryonic tissue; there was no change with gestational age.

When calculated in terms of total water content, the highest chloride concentration, 83·0 mEq./kg., was found in the placenta, the decidua contained 79·3 mEq./kg., and the embryonic tissue 76·1 mEq./kg.

**DISCUSSION**

The results demonstrate that the total water content of the placenta and embryonic tissue was about 5 per cent higher than that of the decidua, and this difference decreased with increasing gestational age.

The volume of the extracellular space of the decidua, placenta and embryo can be deduced from the chloride concentration since chloride
occurs almost exclusively outside cells (Kerpel-Fronius, 1959). According to the data of Widdowson and McCance (1956), and to our own observations, the serum chloride concentration of the five-month-old fetus is identical to that of its mother. If we assume the same relation in cases of four- to ten-week-old embryos, then the extracellular (or more correctly chloride) space of the various tissues can be calculated from the known chloride levels of the tissues and maternal sera.

The estimation of the extracellular fluid volume may be made by means of the following formula (Manery, 1954):

\[
\text{Extracellular fluid} = \frac{\text{tissue chloride \times (g./kg.)}}{\text{Serum chloride (mEq./kg.)}} \times 0.97
\]

The average extracellular compartment, so determined, averaged 65 per cent in the embryo, 70 per cent in the placenta and 67 per cent in the decidua between the fortieth and ninetieth days of human pregnancy.
REFERENCES