# DETERMINATION OF PLASMATIC COPPER AND ZINC IN UNCOMPLICATED PREGNANCIES

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SUMMARY

The copper and zinc plasmatic concentrations were determined in a group of 50 pregnant women and in a control group. We found higher copper and lower zinc plasmatic levels in pregnancy than in control group. No correlation was found between the copper and zinc plasmatic levels and the weeks of pregnancy.

## INTRODUCTION

Copper and zinc, as constituting parts of several enzymes and cofactors, are essential elements, important for a normal growth and development. A possible nutritional deficiency of these elements in pregnancy may cause negative effects to the condition of fetus and new-born child ([12]).

Copper, which is daily introduced along with food at the amount of 0.7-2.2 mg ([13]), plays a significant role in the development and maintenance of mielyna ([8]). The plasmatic amount is related to ceruloplasmina for about 90% and to albumin and aminoacids for 10% ([4]). Its plasmatic concentrations are higher in women than in men ([4]), in pregnant than in non-pregnant women, in mothers than in new-born children ([1, 5, 6, 8, 12, 17]).

Zinc is present in the proteinic synthesis and its possible deficiency has been related to severe teratogenic effects on the central nervous system of laboratory animals ([12]) and to congenital skin defects in man ([9]). It is daily introduced along with food at the amount of 10-15 mg ([18]), it is related to albumin for 60-70% and to alphaglobuline for 30-40% ([16]). Lower values for plasmatic zinc in women than in men ([7]) and in pregnant than in non-pregnant women ([1, 2, 11]) have been found in literature. Neither the material nor the foetal metabolism of these metals is clear yet; the relationship between maternal and foetal serum concentrations suggests the presence of a transplacentar passage by passive transfer.

The aim of this paper was to determine the plasmatic concentrations of copper and zinc in a group of pregnant women

Table 1. — *Anthropometric features of the two groups studied.*

| | Age | Height (cm) | Weight (kg) |
|---|---|---|---|
| Pregnant women | 27.7±5.4 | 162.5±4.8 | 57.8±9.4 |
| Control group | 26.4±4.2 | 161.3±4.0 | 54.3±7.2 |



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Table 2. — *Mean values ± S.D. of plasmatic copper and zinc in pregnant women and in control group.*

| μg/100 ml | Control group (N = 50) | Pregnant women (N = 50) |
|---|---|---|
| Cu | 122 ±22.5 | 167 ±24.2 |
| Zn | 94.5±16 | 57.2±10 |

in the local population (these women were apparently healthy and in good alimentary condition) and to compare the data with the ones in literature referring to mainly Anglosaxon populations with different alimentary habits.

## MATERIAL AND METHODS

The copper and zinc plasmatic concentrations were determined by means of an atomic absorption spectrometer. The subjects we considered were the following: 50 pregnant women that were followed during their pregnancy with determinations at the 18th, 26th, 31th, 34th and 38th week and 50 non-pregnant women (control group).

The anthropometric features of the two groups are reported in table 1. None of the women carried such pathological conditions, as to change the plasmatic levels of the two metals, for instance anaemia, liver disease, acute or chronic infectious disease, cancer, kidney alterations bad, intestinal absorption.

The venous sampling (10 ml) was performed between 8 and 9 o'clock p.m., on empty stomachs, and the samples were immediately put in borosilicate glass test-tubes containing eparine (5000 UI/ml).

The plasmatic portion, which was separated by means of 1500 turns/min centrifugation for 10 min, was stored at −20 °C for 6 hours before the analysis. The measurements were performed by means of a Perkin-Elmer mod. 603 Atomic Absorption Spectrophotometer, supplied with a hollow cathode lamp, a 056 Hitachi P.E. recorder, and equipped for atomizations in acetylene

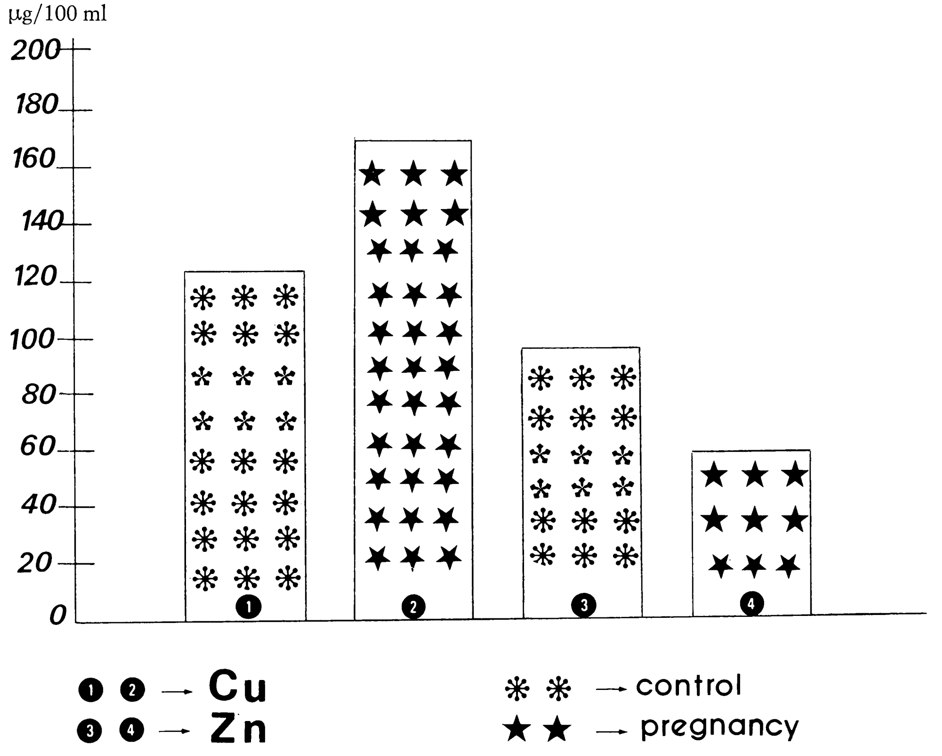


Fig. 1.

Table 3. — *The mean values ± S.D. of plasmatic copper and zinc at the 18, 26, 31, 34 and 38 weeks of pregnancy.*

| μg/100 ml | 18 weeks | 26 weeks | 31 weeks | 34 weeks | 38 weeks |
|---|---|---|---|---|---|
| Cu | 172±44 | 163±50 | 193±31 | 184±46 | 167±24 |
| Zn | 56±15 | 59±12 | 52±5 | 57±16 | 57±10 |

air flame. We adopted the Meret and Coll's method ([14]) which was partly changed according to the equipment we used. The exactness, sensitivity, accuracy and specificity parameters were reported in a previous paper ([15]).

## RESULTS

The mean values ± S.D. of plasmatic copper and zinc in the two groups we studied are reported in tab 2. The copper plasmatic levels are higher in pregnancy (167 ± 24.2 μg/100 ml) than in control group (122 ± 22.5 μg/100 ml). The difference between the two sets of values is statistically significant student's test for non paired data: $P<0.001$. On the contrary, the zinc plasmatic levels are lower in pregnancy (57.2 ± 10 μg/100 ml vs. 94.5 ± 16 μg/100 ml) ($P<0.001$) (fig. 1).

The mean values ± S.D. of plasmatic copper and zinc determined respectively at the 18th, 26th, 31th, 34th and 38th week are reported in tab. 3. No correlation was found between the plasmatic copper and zinc levels and the weeks of pregnancy ($r = -0.0463$) (fig. 2).

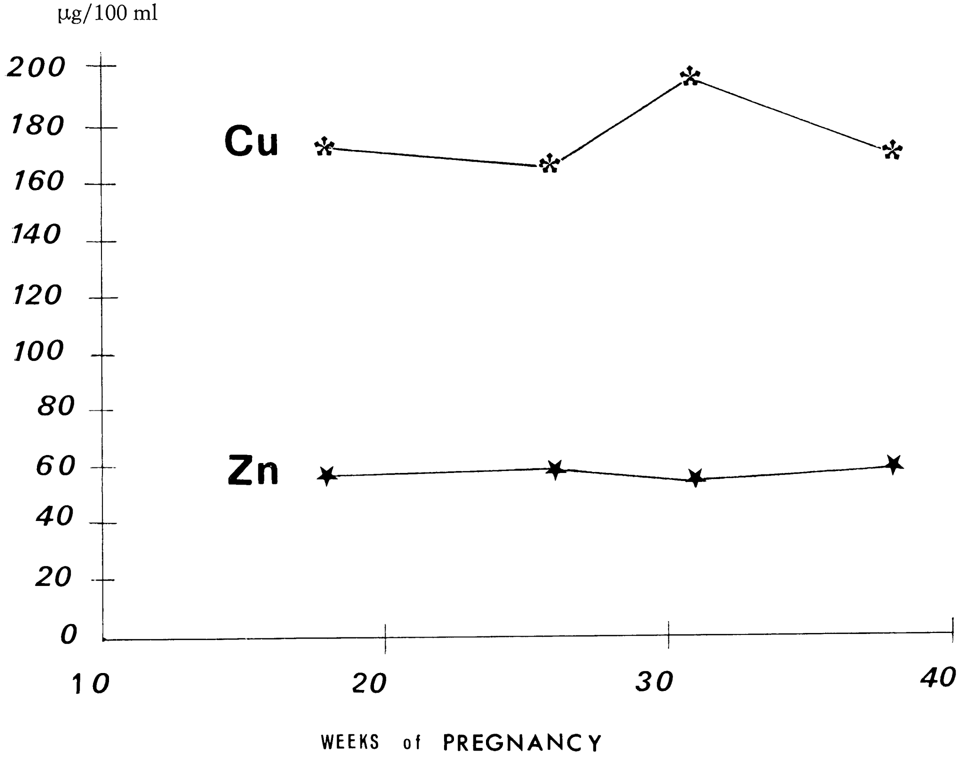


Fig. 2.

## DISCUSSION

Hypercupremia in pregnancy is due to increase of the portion related to ceruloplasmine, secondary to the plasma estrogens (8) and probably progesterone increase (12). The use of estroprogestinic as hormonal contraceptives results in a large increase of the copper plasmatic content (4).

Hyperzinchemia is probably due to the decreased quantity of linking proteins or to alterations in binding affinities (8).

A hormonal responsability can at least be supposed, as low levels of zinc are constant in those who use estrogens (12) or oral contraceptives (3).

The values we found agree with those in literature only if they are considered as mean values in the two groups.

Ipercupremia and ipozinchemia are in fact statistically more significant in the groups of pregnant women than in the control groups.

On the contrary, our data disagree as far as the longitudinal study of the single pregnant women is concerned.

According to Hambidge and Coll. (12) the copper levels increase from 162 µg/100 ml at the early stage of pregnancy to 192 µg/100 ml at the later stage, while the zinc levels decrease from 68 µg/100 ml to 56 µg/100 ml, according to Brandes and Coll. (2) from 100 µg/100 ml the zinc levels become half at the final stage of pregnancy.

No correlation between the single values and the weeks of pregnancy can be seen in the results we reported; moreover no trend can be found either.

In order to explain partly these contrasting data it is possible to make the following suppositions:

– the use of another method with different standard deviation which allows, in comparison with the past (12), a marked decrease of the margin of error;

– the different kinds of food used by the various populations;

– possible pharmacological habits (drugs containing traces of metals, use of oral contraceptives before pregnancy etc.) which are neither reported in the literature we examined nor can be controlled.

Finally, beyond the supposition on the descrepancies we found, the main purpose of this paper was to define a range of normality for the local population, so that the "risk" subject can be detected.

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