

# The Harmful Effects of Smoking during Pregnancy and Correlating Lead and Selenium Levels in Mothers and Premature Fetuses

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*Cigarette smoke contains about 2,500 chemicals, and when the mother is an active or passive smoker, part of the oxygen in her blood is replaced by carbon monoxide. The absorption is inversely proportional to the cell dimension, which makes breathing dust with lead have the greatest impact. It is also transplacentally transferred, due to its involvement in congenital intoxication, with the following possible consequences: spontaneous abortion, prematurity or low birth weight. Our study included smoking mothers who gave birth to premature children and also preterm babies born to non-smoking mothers, in the Bega Department of Obstetrics and Gynaecology of the Emergency County Hospital, Pius Brânzeu, from Timi'oara, between Jan 1<sup>st</sup>, 2015 and Dec 31, 2015. We dosed maternal and fetal blood lead and selenium by the methods below. Theoretically, the effects of selenium deficiency or excess are known, in terms of human health, but the Romanian statistical databases cannot provide experiments and concrete proof of the effects of selenium.*

*Keywords: infertility, premature children, seric Pb, seric Se*

Numerous statistics show that the vast majority of future mothers do not give up the vice of smoking when they become pregnant, arguing that cigarettes do not affect the baby. That is a false statement, given that smoking while pregnant is intentionally and immeasurably harming the fetus, and then later on, after the nine months of pregnancy, the child, as it may be affected for life because of maternal unconsciousness and selfishness. Cigarette smoke contains about 2,500 chemicals, and when the mother is an active or passive smoker, part of the oxygen in her blood is replaced by carbon monoxide [1-4]. The risk of premature birth to a smoking mother is about 30%, and the baby may have different problems due to incompletely developed organ functions: breathing difficulties, more predisposed to infections and sequelae, such as higher risk of blindness, cerebral palsy, mental retardation, learning difficulties, behavioral disorders, psychomotor development, a higher risk of developing diabetes etc.

Dysfunctions on the number, motility and morphology of sperm are associated with lead poisoning in men. In women, lead can have consequences like imminent abortion, premature birth and low birth weight. It had been noticed that pregnant women with a blood lead concentration of 0.014 mg/dL, are four times more exposed to premature birth than those with a 0.008 mg/dl concentration [5-9].

Lead is absorbed into the organism both through the respiratory tract, and the gastrointestinal one. The absorption is inversely proportional to the cell dimension, which makes breathing dust with lead have the greatest impact. It is also transplacentally transferred, due to its involvement in congenital intoxication, with the following possible consequences: spontaneous abortion, prematurity or low birth weight [10-12].

Recommendations for determining lead:

- lead in blood: reveals exposure to lead;
- lead in urine: reveals chronic lead poisoning.

Regarding selenium, almost no attention is given to this dietary mineral, although it is proven to be extremely important to the fetus's health status. In the past 50 years, scientists have come to some conclusions. Therefore, some have proven that adding small doses of selenium in the diet of farm animals led to a sharp decrease in the number of cases of disease. Selenium is very important during the pregnancy, while when there is a deficit, it disturbs the bone growth. In addition, selenium prepartes are adjuvant treatment in preventing postpartum thyroid. It can be found in tuna, octopus and boiled liver [13].

Selenium acts as a strong antioxidant and free radical scavenger. Some British researchers measured the selenium in the toenails of 53 patients with preeclampsia and 53 women in the John Radcliffe Hospital, Oxford, UK. They found that the average levels of selenium taken from the toenails of the patients with preeclampsia were

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Parameter	Element	
	Selenium	Lead
Wavelength, nm	196.0	283.3
Slit, nm	1.0	0.5
Lamp current, mA	10	
Calibration mode	Absorbance, peak height	
Background correction	Zeeman	
Atomization temperature, °C	2700	2100

**Table 1**  
OPERATING PARAMETERS FOR  
SELENIUM AND LEAD  
DETERMINATION IN BIOLOGICAL  
SPECIMENS BY ZEEMAN AA 240

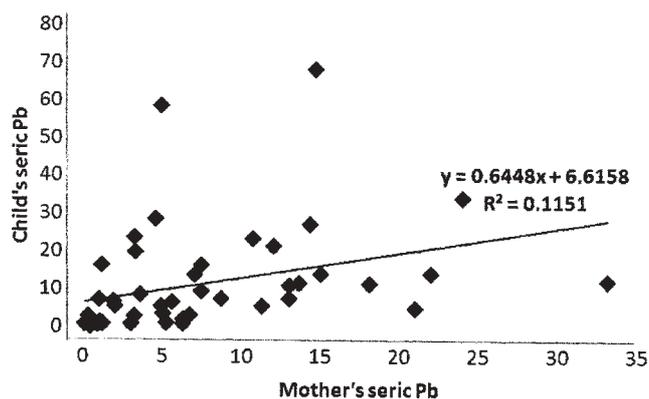


Fig. 1. Correlation between serum Pb levels to mother and child

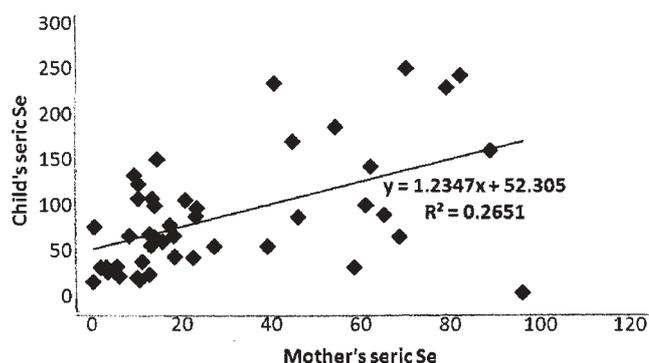


Fig. 2. Correlation between serum Se levels to mother and child

significantly lower than those of the future mothers in hospital. The low levels of selenium found in toenails was associated with a 4.4% incidence of severe expression of affection (birth before 32 weeks). Scientists reported that preeclampsia affects around 5-8% of all pregnancies. The question is whether filling the level of selenium may reduce the risk. In our country, selenium is not available in supplement form [14-16].

### Experimental part

Our study included smoking mothers who gave birth to premature children and also preterm babies born to non-smoking mothers, in the Bega Department of Obstetrics and Gynaecology of the Emergency County Hospital, Pius Brânzeu, from Timisoara, between Jan 1<sup>st</sup>, 2015 and Dec 31, 2015. We dosed maternal and fetal blood lead and selenium by the methods below. The patients have given their written consent to participate in this study.

A Varian AA 240Z equipped with graphite tube atomizer with Zeeman effect background correction, and a programmable sample dispenser, PSD 120 was the employed analytical method in order to evaluate blood and

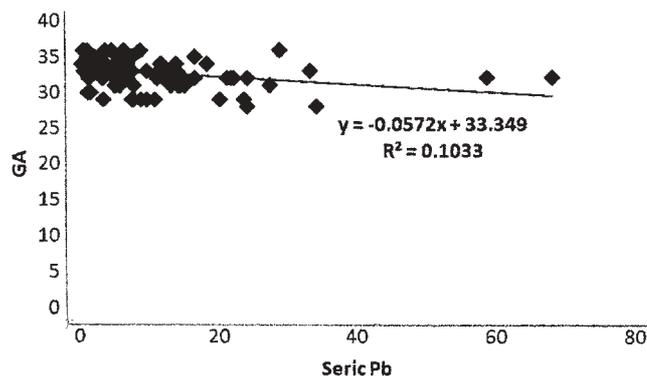


Fig. 3. Correlation between serum Pb level and GA

urine levels of the two elements. High purity argon (99.999%) was used as protective gas and nitrogen (99.999%) was used as charring gas.

After digestion of whole blood respectively urine with nitric acid and antifoam B for 20 min at room temperature, samples were introduced into the graphite furnace. Atomization was performed in pyrolytically coated tubes and a specific hollow cathode lamp was used for each element determination [17, 18].

### Results and discussions

There is a significant, direct and weak correlation between serum Pb from mothers and serum Pb from children (Pearson correlation coefficient,  $r=0.332$ ,  $p=0.024$ ). Serum Pb in children is significantly influenced by serum Pb in mothers.

In Romania, the importance of selenium for the human organism, and especially for pregnant women is still little known. Theoretically, the effects of selenium deficiency or excess are known, in terms of human health, but the Romanian statistical databases cannot provide experiments and concrete proof of the effects of selenium. However, one thing is certain: selenium is essential for life. The intake of selenium in the body is through food. In Romania, food concentrates are currently produced, and they provide the selenium intake.

There is a very significant, direct and average correlation between serum Se in mothers and serum Se in children (Pearson correlation coefficient:  $r=0.515$ ,  $p=0.003$ ). The fetal serum Se is significantly influenced by the maternal serum Se.

The correlation between serum Pb and VG is significant, inverse and average (Pearson correlation coefficient:  $r=0.493$ ,  $p=0.012$ ). Therefore, the higher the Pb concentration is, the lower the VG.

Pb and Se levels in blood are significantly elevated for the study group, while the ones in urine are slightly lower

**Table 2**  
COMPARING THE LOTS

Variable	Sample	N	Mean	Std. Deviation	95% Confidence Interval		p <sup>sign</sup>
					Lower limit	Upper limit	
					serum Pb	Control	
	Study	46	14.24	9.91	11.02	17.46	
Se seric	Control	40	51.41	10.97	38.46	64.37	<0.001 <sup>s</sup>
	Study	55	64.90	15.91	47.20	82.61	
Pb urine	Control	23	3.52	2.56	1.62	5.42	0.142 <sup>ins</sup>
	Study	15	4.70	2.03	2.88	6.52	
Se urine	Control	29	68.39	25.97	51.32	85.46	0.477 <sup>ins</sup>
	Study	19	75.22	34.77	40.91	109.53	
GA	Control	40	33.40	2.09	32.74	34.06	0.013 <sup>s</sup>
	Study	56	32.39	1.82	31.91	32.87	

<sup>s</sup> – significant difference; <sup>ins</sup> – insignificance difference

for the control group; VG is significantly lower for the study group compared with the control one (Mann-Whitney test, p values are shown in the table above).

Regarding placental pathology, it is known that smoking during pregnancy almost doubles the risk of developing pregnancy complications – the most feared complication seems to be placenta previa. In our group, there were five cases diagnosed with placenta previa, and in three cases of C-section, this was preceded by total hysterectomy. In all cases the mothers were smokers, but, according to them, they had reduced the numbers of cigarettes/day to half.

### Conclusions

Our study brought new proof of the negative effects that smoking during pregnancy has on the product of conception. The smoking future mother is by about 30% more likely to give birth prematurely, while the newborn could have various problems: from shortness of breath to infections or muscular and neurological sequelae. Thus, a pregnant smoker is more likely to have an abortion, a premature baby, or the baby to have a lower weight at birth or even suddenly die. Also, the smoking future mother is more predisposed to have complications during pregnancy, complications such as the premature peeling of the placenta, or placenta previa, and some women even risk infertility.

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