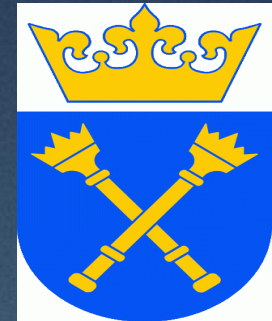


Physiological metals in the serum, hair and nails of patients with head and neck cancer



Woźniak A., Kulza M., Seńczuk – Przybyłowska M.,
Kujawa A., Golusiński W., Szyfter K., Piekoszewski W.,
Szyfter W., Florek E.

EPIDEMIOLOGY OF SMOKING



- About 1,25 billion people smoke all around the world, every year about 30 million people become new daily cigarette smokers;
- Around 35% of men and 22% of women currently smoke in developed countries; in developing countries – 50% of men and 9% of women;
- In Poland, 32% of the population smoke tobacco, of which adult males account for 38% and women 25,6%;
- People poorly educated and in lower socio – economics groups, much more likely smoke cigarettes, as compared to better educated and wealthier people.

WHAT IS NEXT..?



If the current trend continues, the use of tobacco products will cause deaths of more than 8 million people per year by 2030; 80% of these premature deaths will occur in poor or middle-income countries.

In this way, by the end of the twenty-first century, tobacco may be the cause of death of about one billion people!

ALCOHOL - STATISTICS



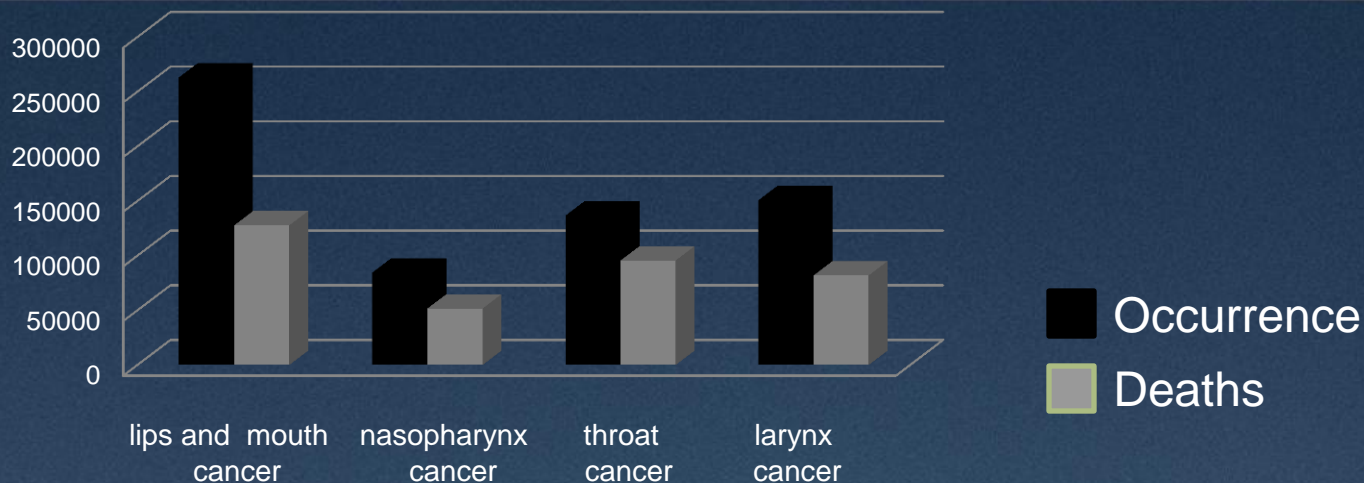
- ❖ according to the CBOS data in Warsaw, 2008, men drink on average 4,5 times more alcohol than women
- ❖ among young people, about 3-5% of girls and 10-15% of boys had their first contact with alcohol
- ❖ it is estimated that in the European Union $\frac{1}{4}$ of people regularly drink alcohol
- ❖ in the United States alcohol is consumed for about half of the adult population, and about 15-20 million people are alcoholics

HEAD AND NECK CANCER

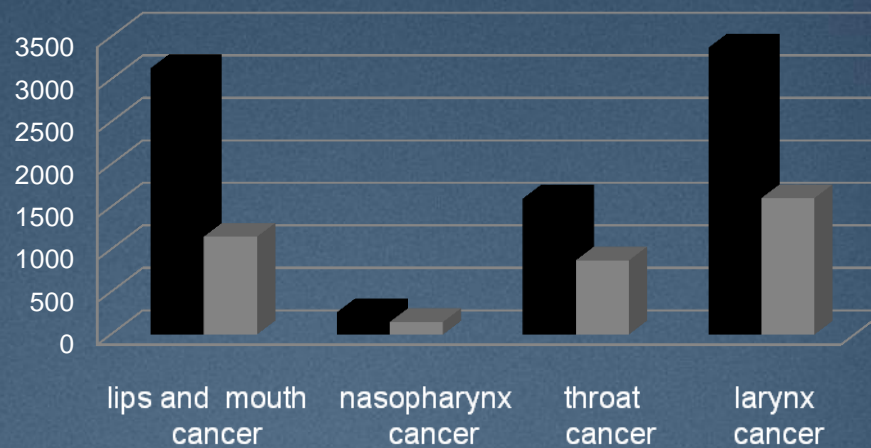
- head and neck cancer are more than two times common in undeveloped countries (67,8%) than in well-developed areas (32,2%)
- mortality because of these diseases is up to 3 times higher (76,3%) in countries with a low level of development then in well-developed countries (23,7%)
- almost 60% of all head and neck cancers in the world takes place in Asia; it is also estimated, that the highest number of deaths comes from this region



WORLD



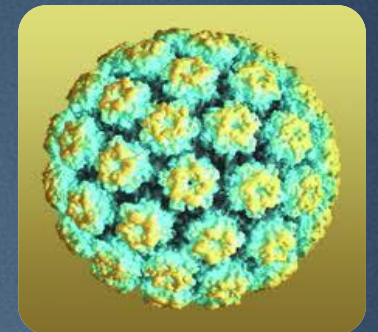
POLAND



RISK FACTORS



- tobacco smoking (or other tobacco products)
- spirits consumption
- lack of micronutrients; too little fruit and vegetables supply
- poor oral hygiene, bad teeth condition
- low BMI level while smoking and alcohol drinking
- HPV infection (3%)



METALS AND CANCER

- Calcium – observed hypercalcemia in patients with advanced malignancies
- Magnesium – level of magnesium ions is decreased in patients with solid tumors and it is related to the level of cancer development and malignancy
- Copper – elevated copper level is observed in patients with head and neck cancer
- Iron – the prevalence of iron deficiency is a known factor in determining the occurrence of tumors in the head and neck

METALS AND CANCER

- Zinc – mechanisms of chemoprevention- deficiency can lead to cancer
- Selenium - antimutagenic i anticarcinogenic factor. Epidemiological and demographic data preclude any action stimulating a tumor
- Nickel – large genotoxicity- DNA damage and changes in the genome, breaks in DNA, IARC classifies as a human carcinogen
- Chromium – stimulates the production of free radicals, elevated levels of chromium in the accelerated growth of tumor cells

AIM OF THE STUDY



- ❖ The aim of the study was physiological metal levels evaluation, such as calcium, magnesium, copper, iron, zinc and manganese in different kinds of biological material in patients with tumors of larynx, salivary glands and oral cavity and tongue.
- ❖ Hair and nail samples were used as examples of alternative material, beside the serum samples, which is a standard material and often used, to assess the exposure to diverse sources of endogenous metals.

MATERIALS AND METHODS

- Patients of Otolaryngology and Laryngological Oncology Clinic of Poznan University of Medical Sciences and Head and Neck Clinic and Oncological Laryngology of the Poznan University of Medical Sciences, Poznan, Poland
- 41 men and 18 women
- Tumors of larynx, salivary glands and oral cavity and tongue
- Control group- 9 men and 11 women with non-neoplastic changes of the head and neck

MATERIALS AND METHODS

- Questionnaire method developed in the Laboratory of Environmental Sciences, Department of Toxicology, University of Medical Sciences, Poznan, Poland was used in the study.
- Biological material used in the study was serum, hair and nails of patients
- Serum, hair and nails samples were collected, underwent washing and drying procedure and then were stored in exsiccator

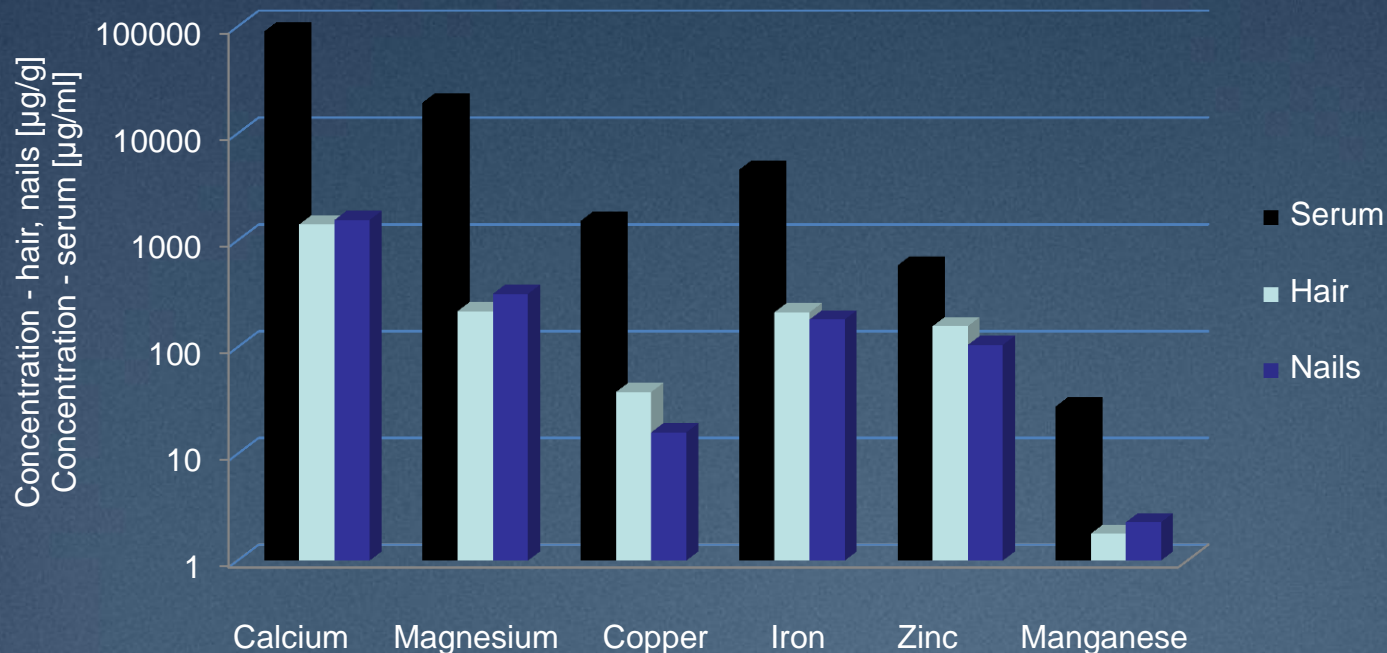


MATERIALS AND METHODS

- In the first stage of the study biological material has underwent the process of digestion.
- In the second stage quantitative analysis was performed using Inductively Coupled Plasma Mass Spectrometry (ICP-MS).

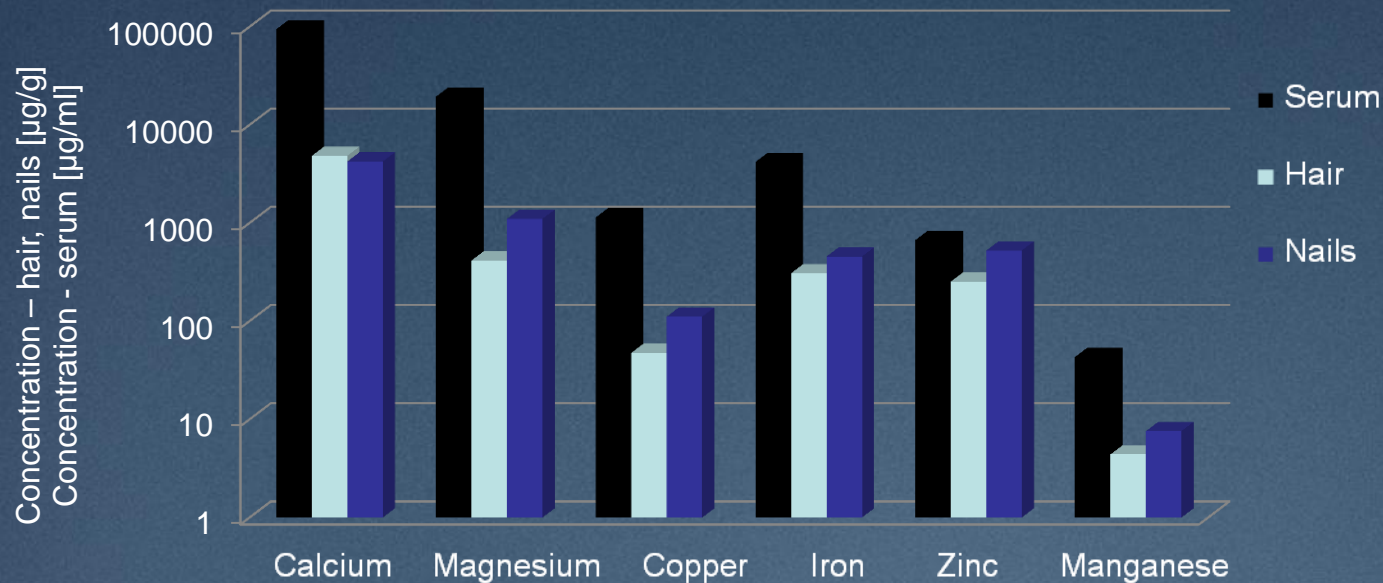
RESULTS – LARYNX CANCER

Average concentrations of calcium, magnesium, copper, iron, zinc and manganese in serum, hair and nails of patients with cancer of the larynx on a logarithmic scale



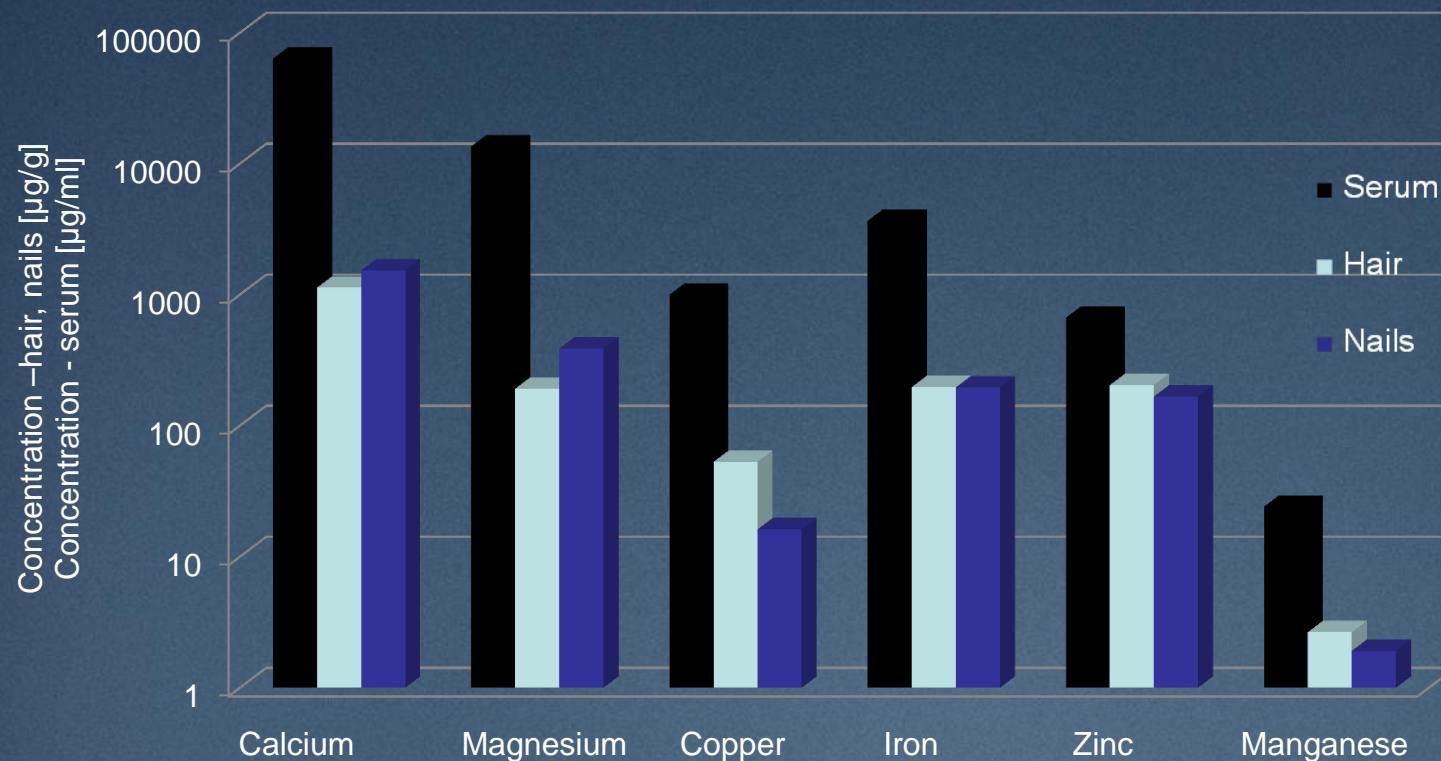
RESULTS – SALIVARY GLAND CANCER

Average concentrations of calcium, magnesium, copper, iron, zinc and manganese in serum, hair and nails of patients with salivary gland cancer on a logarithmic scale



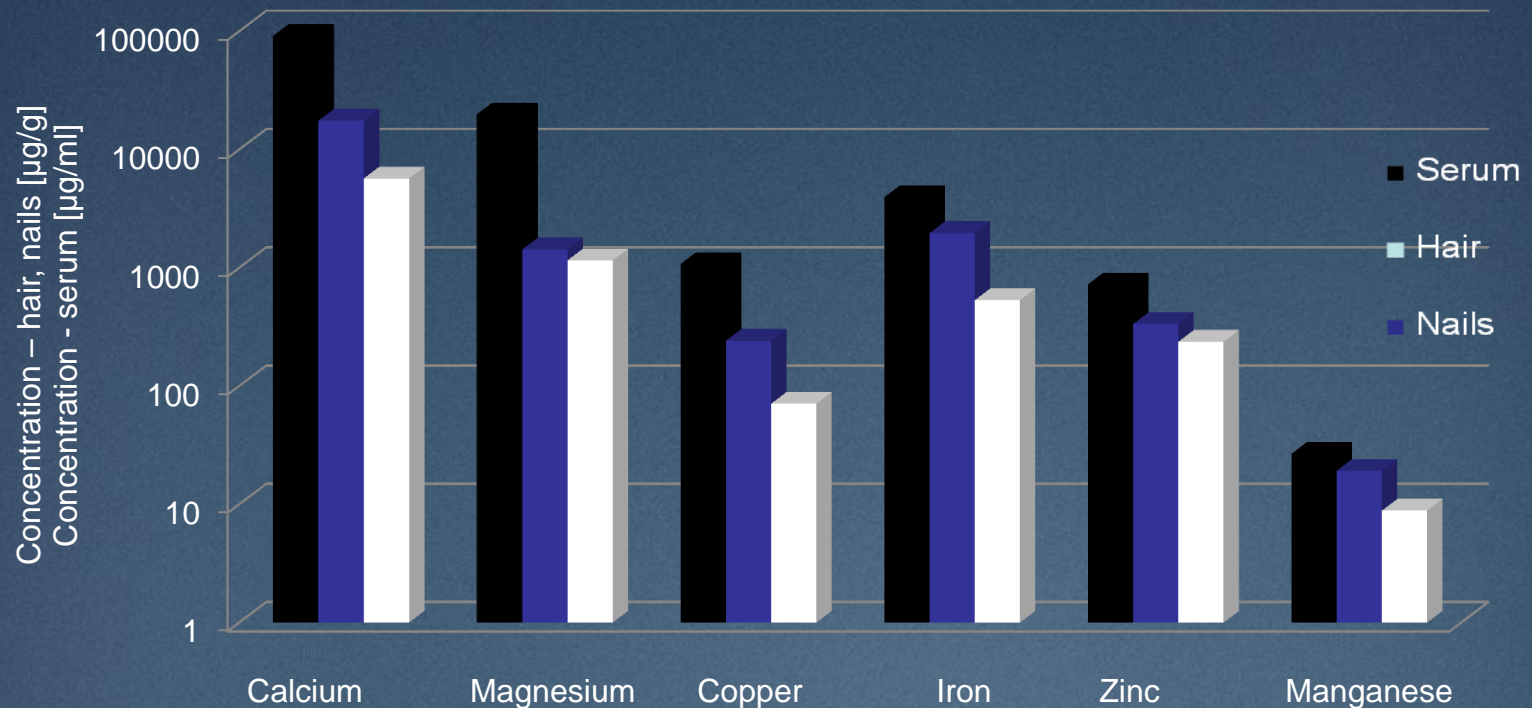
RESULTS – ORAL CAVITY AND TONGUE CANCER

Average concentrations of calcium, magnesium, copper, iron, zinc and manganese in serum, hair and nails of patients with oral cavity and tongue cancer on a logarithmic scale



RESULTS – CONTROL GROUP

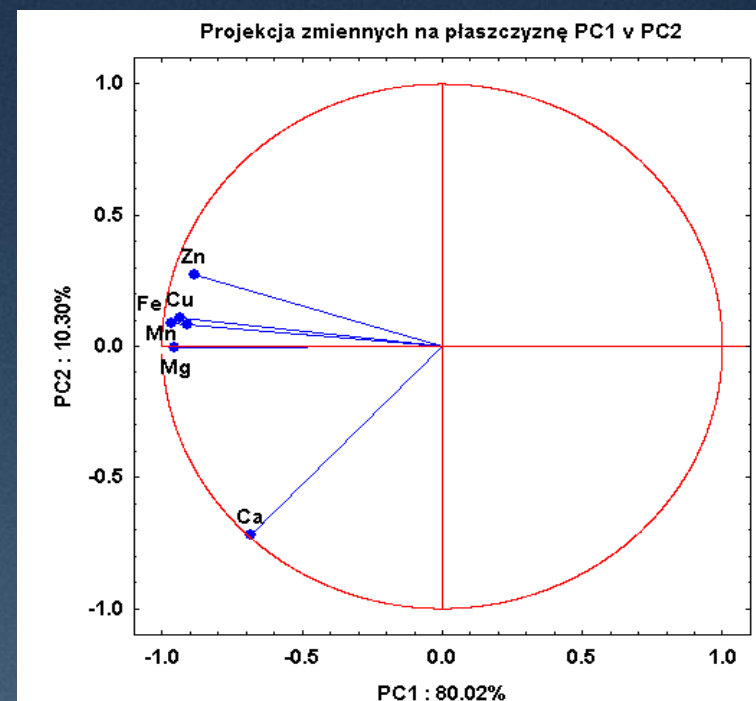
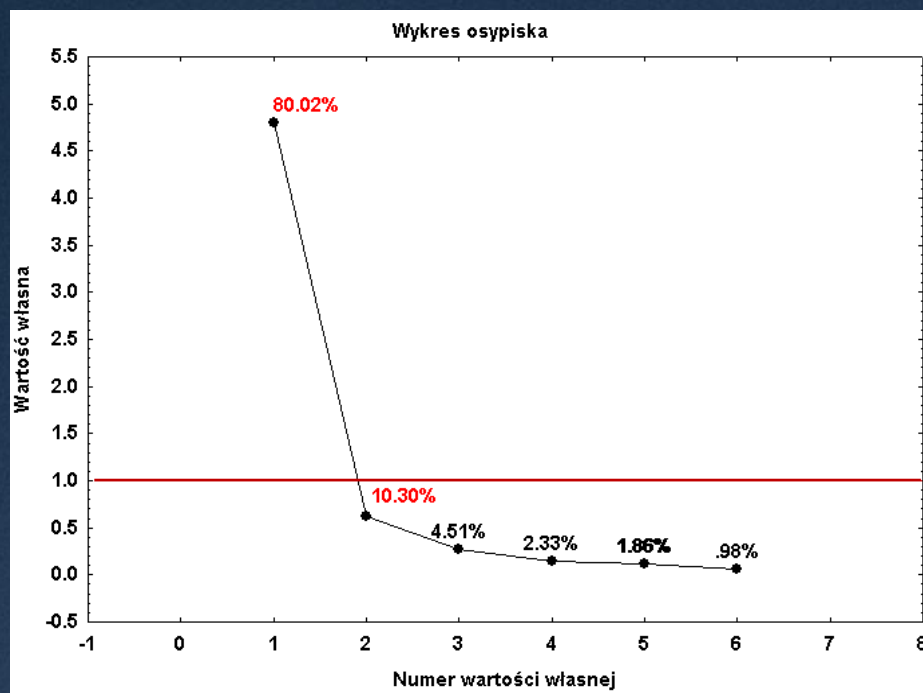
Average concentrations of calcium, magnesium, copper, iron, zinc and manganese in serum, hair and nails of patients from control group on a logarithmic scale



CHEMOMETRIC ANALYSIS

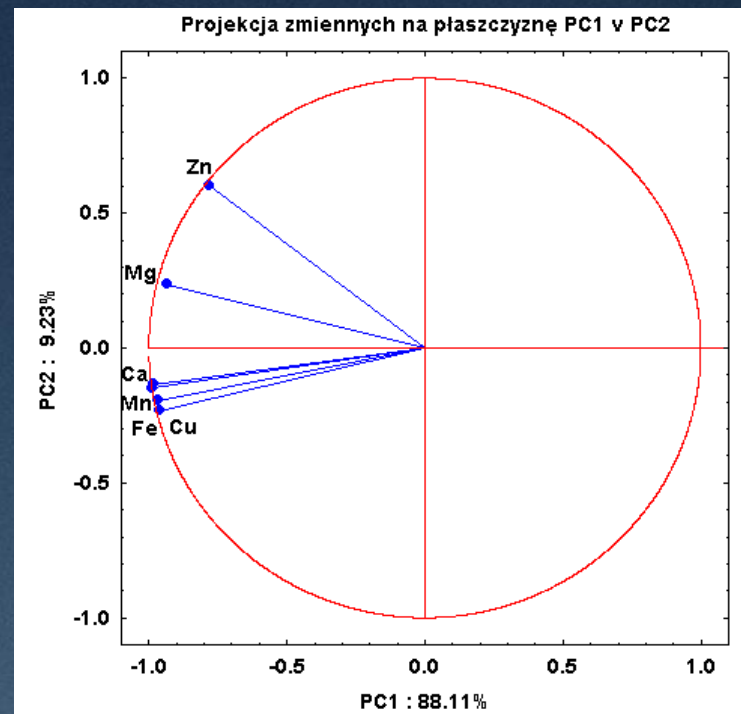
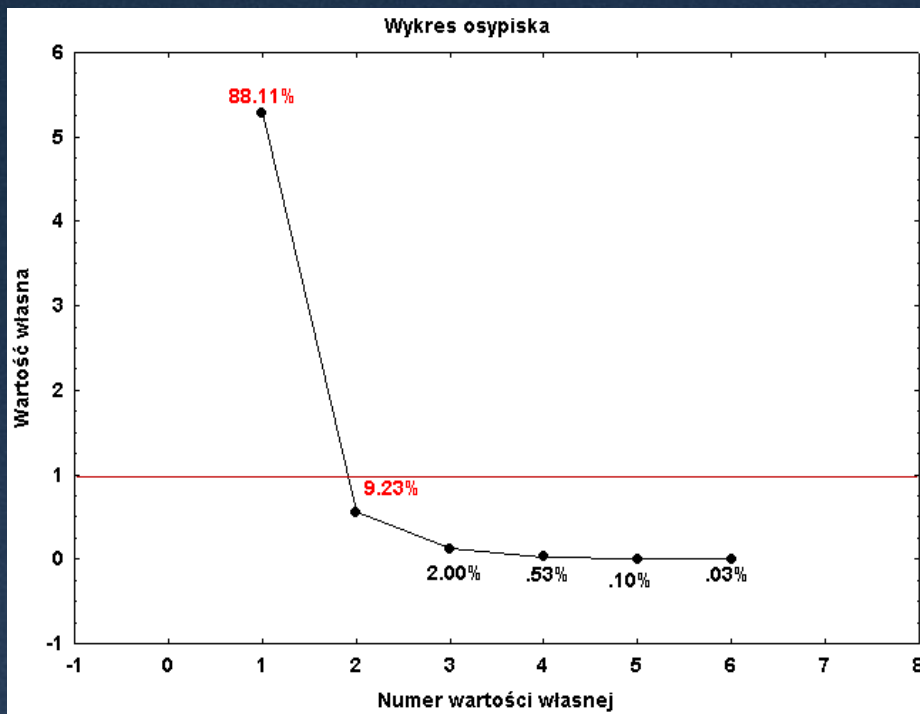
- ❖ Analysis of the relationships between variables in a multidimensional data set.
- ❖ Principal Component Analysis (PCA), enables to transform the original data into a new set containing uncorrelated variables (factors or principal components) and a graphical view of the nature of the relationship between the explanatory variables and objects (samples).

CHEMOMETRIC ANALYSIS – RESEARCH GROUP



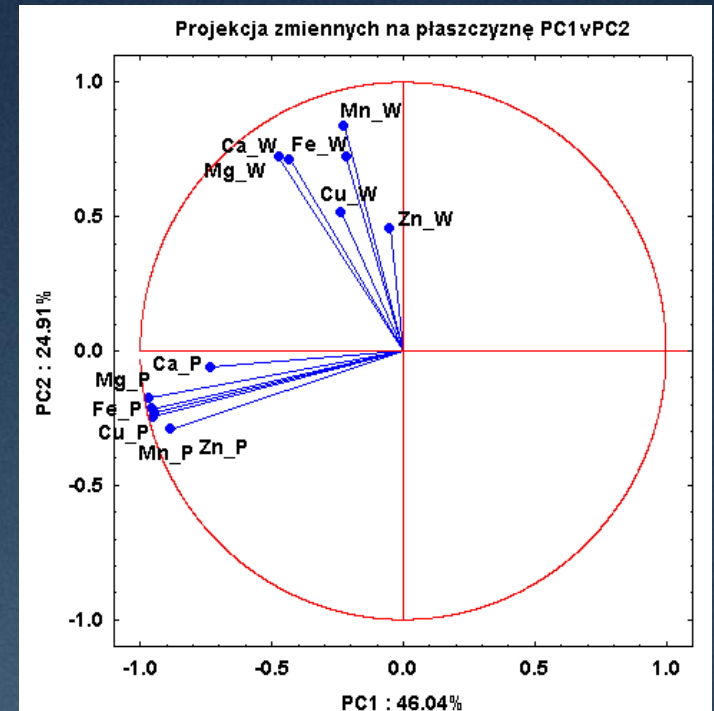
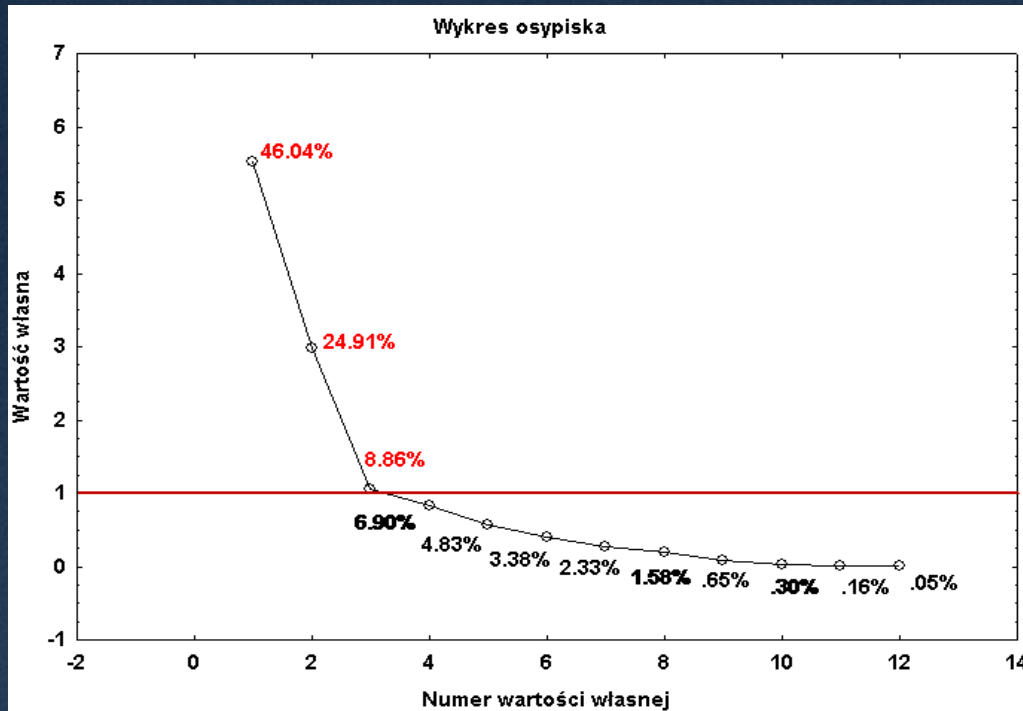
Screen test and projection of 6 variables (Ca, Cu, Mg, Fe, Zn, Mn concentration) on the plane of PC1 (80,02%) and PC2 (10,30%) obtained for cancer patients

CHEMOMETRIC ANALYSIS – CONTROL GROUP



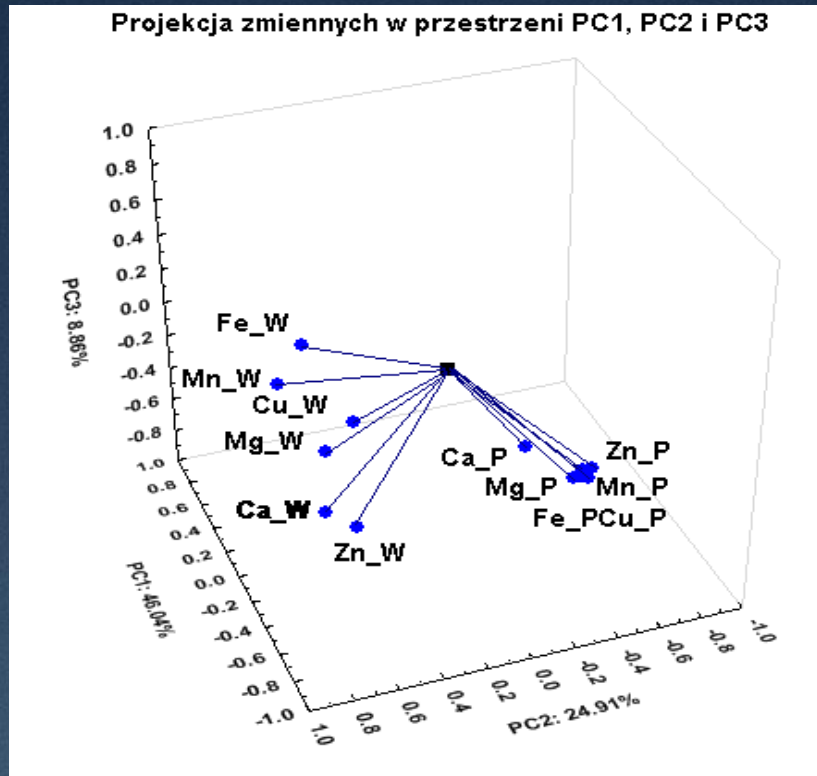
Screen test and projection of 6 variables (Ca, Cu, Mg, Fe, Zn, Mn concentration) on the plane of PC1 (88,11%) and PC2 (9,23%) obtained for control group

CHEMOMETRIC ANALYSIS



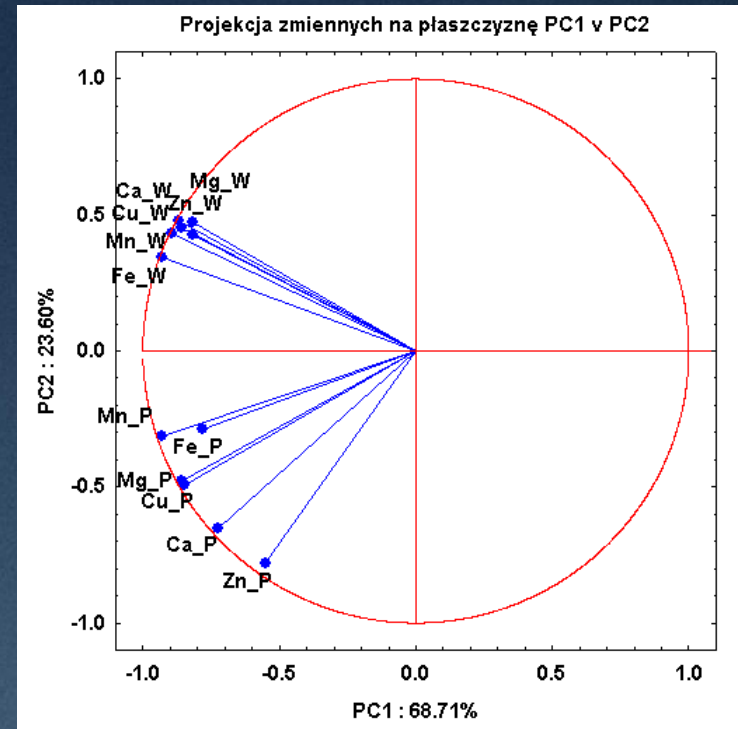
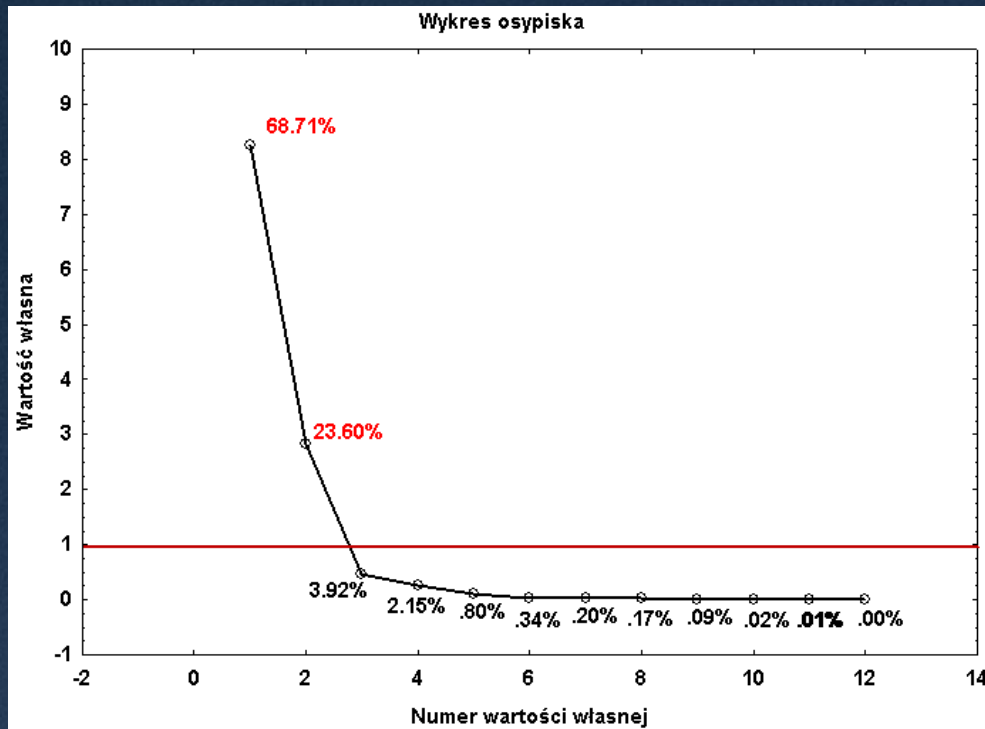
Screen test and projection of variables in two biological materials – hair and nails – on the plane PC1 (46,04%) and PC2 (24,91%) obtained for 12 variables (concentration of Ca, Cu, Mg, Fe, Zn, Mn in hair and nails) and 56 objects

CHEMOMETRIC ANALYSIS



Projection of 12 variables (concentration of Ca, Cu, Mg, Fe, Zn, Mn in two biological materials - hair and nails) on the plane PC1 (46,04%), PC2 (24,91%) and PC3 (8,86%) obtained for 56 cancer patients

CHEMOMETRIC ANALYSIS



Screen test and projection of variables obtained for 12 variables (concentration Ca, Cu, Mg, Fe, Zn, Mn in two biological materials - hair and nails) on the plane PC1 (68,71%) and PC2 (23,60%) obtained for 20 patients from control group



CONCLUSIONS

- ❖ Characteristics of patients participating in the study showed a significant strong correlation between tobacco smoking while alcohol drinking and only tobacco smoking and the cancer occurrence.
- ❖ The study showed that there is a higher frequency of larynx, salivary gland, oral cavity and tongue cancer occurrence in the case of deficiency cereal products and fiber in the diet .

CONCLUSIONS

- ❖ There was a higher concentration of metals - calcium, magnesium, iron and manganese in hair and nails of patients with salivary gland cancer.
- ❖ According to applied Chemometric Analysis of Principal Component 1 - PC1, concentration of iron, copper and manganese with magnesium and zinc in patients' nail samples showed strong correlation between measured variables .

CONCLUSIONS

- ❖ In patients' hair samples, concentration of calcium and magnesium as well as of iron and manganese were changed.
- ❖ Further research is required to indicate, which of alternative biological materials – hair or nail samples – in relation to serum, would provide a better evaluation of physiological metal levels, such as: calcium, magnesium, iron, copper, zinc and manganese in larynx, salivary gland, oral cavity and tongue cancer patients.



**THANK YOU FOR YOUR
ATTENTION.**

ご清聴ありがとうございました

**The research project funded by NCN
2011/03/N/NZ7/06266**