Application of OligoCheck spectrophotometric analysis to discover new questions for in-depth research

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The following study is of a pilot nature, whose purpose is to determine the suitability of the Oligo Check spectrophotometric method to search for yet unknown or underestimated and significant interdependencies within the human body. The pilot serves as an inspiration for further in-depth research.

In our research program we have selected the issue of broadly understood skin diseases. We have chosen the skin for a pilot study because it is the easiest organ to confirm or exclude the pathological process. On the other hand, after many years of running a medical practice, we note a constantly growing number of skin diseases, especially in the population of infants and young children.

Through the study we want to answer the question of whether there are any factors related to the level of micronutrients and their proportions that increases the skin's susceptibility to diseases. These types of disorders can cause metabolic dysfunctions due to excess or deficiency of ingredients, paving the way to initiate the disease process. Notably we were expecting to find irregularities in levels of zinc and lowered levels of silicon in skin tissue of subjects suffering from skin conditions as compared to ones not affected by them.

The most likely candidate for differentiation between groups were Zinc levels. Main reason for this is that zinc is necessary for functioning of a great number of enzymes, as well as is required for DNA synthesis, protein synthesis and cell division. Zn deficiency has been shown to affect immunity and can cause cutaneous changes(1, 2).

Silicon is noted to be linked to healthy formation of bones and connective tissue(3), it may play a role in formation of collagen, though exact mechanisms are yet unknown. It has also been suggested that silicon mitigates in part aluminum toxicity(4).

27 people with clinically diagnosed skin disease and 27 random people without skin disease entered the study. To avoid differences due to the impact of the season, the study was conducted over the same period.

Description of testing process

Quantitative analysis by spectrophotometry is based on the measurement of absorbance within the examined tissue at a specific wavelength and using the Lambert-Beer law. If the tested system meets the principle of straightforwardness, according to the Lambert-Beer law, the quantitative parameters of the tested ingredients can also be determined.

Fig. 1. OligoCheck spectrophotometric sensor unit on its stand. Top: button to used to initiate scanning; bottom (not visible, hidden in stand): sensor's head.

OligoCheck analysis is performed by using sensor unit (fig. 1) connected to computer with internet access and manufacturer's software installed. Before testing can take place software must be provided with basic patient's data such as sex, age, weight, height and blood type. Test consist of taking 4 separate consecutive spectrum readings of subject's palm. Readings are passed via internet connection to servers for processing and within few seconds result raport is available.

The application of the OligoCheck spectrophotometric method requires use of a laser beam which has the advantages of being non-invasive, fast and affordable. These features have made it easy to obtain the consent of patients to participate in the study. Sensor unit is compact and doesn't need lengthy setup, making it very portable.

Results and discussion

In the course of research, we obtained a result in which the effect of deviations from the norm of chromium content in the tissues of people suffering from skin diseases turned out to be statistically significant ($p = 0.032$) with difference of on average -39.75pp (percentage points) from studied group (fig. 4).

Chromium(III) plays an important role in metabolism of carbohydrates, fats and proteins(5). Low levels in both studied group and control can be explained as poor nutrition habits(diet high in simple sugars) as well as measure of stress. Heightened levels of chromium (as compared to control) may be linked to workplace or environmental exposition to chromium.

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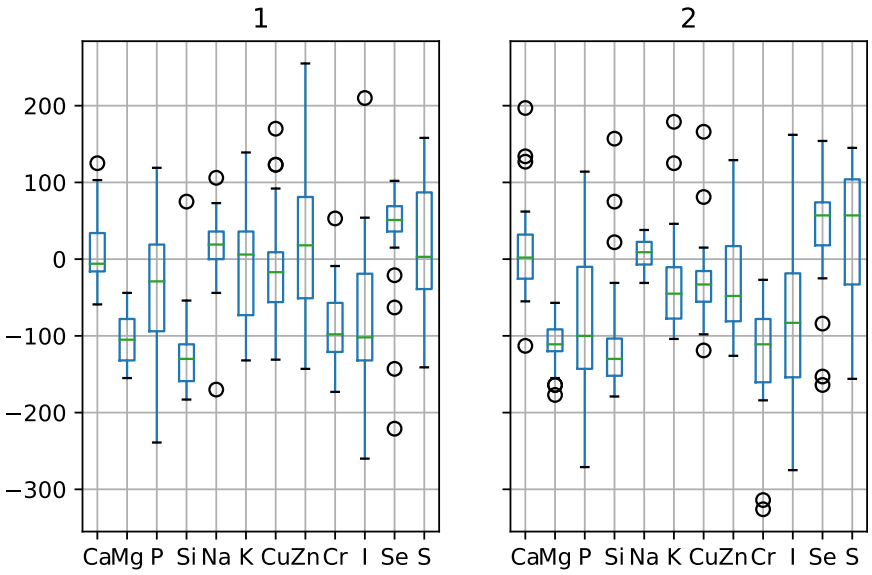

Fig. 2. Box diagram of analysis results for both groups.

Table 1. comparison of mean values of zn, si and cr, and their standard deviation

element	group	mean	standard deviation
Zn	1	15.08	108.15
	2	-28.26	71.18
Si	1	-123.96	51.92
	2	-105.33	78.24
Cr	1	-85.32	56.06
	2	-125.07	72.05

Cross-group Cr difference established with $P < 0.05$

While trivalent chromium, in very high concentration can elicit dermatitis in chromium-sensitive patients, we propose that hexavalent chrome, a water-soluble form is more likely cause. It has been found in trace amounts as unintended byproduct of oxidation of Cr(III) used in manufacturing process in tanned leather products(6).

This result (as shown in table (1)) is somewhat divergent with our expectations regarding the influence of trace elements. As mentioned before, we expected to see a statistically significant difference in silicon over that of any other elements. Our study did not find silicon to be differentiation factor between studied group and the control (fig. 3).

We have however shown that there seems to greater divergence in levels of zinc in studied group then in control one (fig. 5). We find this to be consistent with our experience in course of our practice testing using OligoCheck.

Conclusions

The goal of this study was application of OligoCheck technology in order to forward new exploratory research looking into correlations between particular disorders and micronutrient imbalances. If such regularity can be established, it is an introduction for further studies on whether these observations can be successfully reproduced on bigger samples, thereby ex-

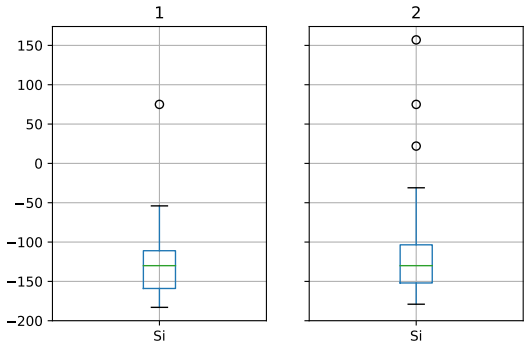

Fig. 3. Levels of Silicon in groups 1 and 2

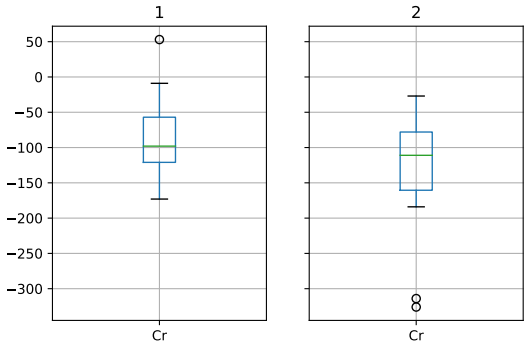

Fig. 4. Levels of Chromium in groups 1 and 2

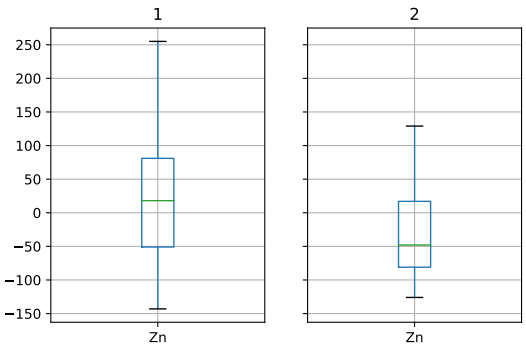

Fig. 5. Levels of Zinc in groups 1 and 2

panding our knowledge about possible causes for development of morbidity.

Forgoing study is of pilot nature, before engaging in broader research of this subject. We have tested a local patient group suffering from dermatosis, contrasting it with a control group of patients exhibiting other conditions. Tested patients were selected from the same region, tests were performed during the same season.

Analysing results we have noted higher level of chromium and higher variability of zinc in patients with dermatosis compared to levels measured in control group. This calls for further study into the subject, especially given that chromium is one of the metals frequently causing contact dermatitis. Further clarifications requires possible connection between dermatosis elicited and not only by chromium itself, but also with aberration of zinc levels, which in turn may increase chromium-sensitivity in tissues.

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