SKIN CONTACT SPECTROPHOTOMETRY IN THE STUDY OF IMBALANCES OF OLIGOMINERALS AND CHRONIC TISSUE POISONING WITH HEAVY METALS IN SKIN DISEASES

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Summary

In order to evaluate the nosological, pathogenic and therapeutic implications of changes in tissues of concentrations of oligominerals and especially the concentration of heavy metals and their role in the start of immune and autoimmune phenomena in skin pathology, we explored by skin contact spectrophotometry a number of 77 patients (17 patients with plaque psoriasis), 18 patients with autoimmune dermatological disorders (vitiligo, alopecia areata) and 44 patients with skin allergies (chronic rash, chronic eczema , dermographism). We noticed the decrease in the concentration of magnesium in the lot with psoriasis (average concentration of 28.5) and in the lot with autoimmune disorders, (average concentration M of 25.8); we found low values for Silicium : 13.12 average value in the lot with psoriasis : 11.08 average value in the lot with autoimmune disorders and 12.76 average value in the lot with allergic disorders. Chrome was lower in the lot with psoriasis (average value of 0.70) and in the lot with allergies (average value 0.74). The dosage of heavy metals in tissues showed the increase of concentrations in all the 3 lots for Aluminium, Silver, Barium, Bismuth ,Cadmium, Mercury and Lead with the highest concentrations for Aluminium in patients with allergies, for Silver in patients with psoriasis, for Barium for patients with allergies, for Bismuth in psoriasis and for Cadmium and Mercury in patients with psoriasis and for Lead in patients with allergies. We found increases of tissular concentrations of Arsenic in patients with allergies and autoimmune disorders and increase of Beryllium in patients with psoriasis and allergies. The results plead for the important involvement of these changes in the pathogeny of skin disorders with immune and autoimmune mechanisms studied and require therapeutic consequences (alkalinisation and chelation therapy for heavy metals)

Key words: *spectrophotometry, oligominerals, heavy metals, autoimmunity, psoriasis, autoimmune disorders, allergies).*

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Introduction

The chronic tissue poisoning by heavy metals generates by toxic direct mechanisms auto-immunity, production of free radicals, chronic tissue inflammation. The chronic tissular inflammation will affect structurally and functionally all the cells and tissues.

The pathology induced by the chronic tissue poisoning with heavy metals could not be documented directly because the instrument which allowed the repeated, non-traumatic and safe tissular dosage of concentrations of heavy metals in tissues was missing, while we estimate that the average level of tissue poisoning is about 500 times higher in tissues compared to the blood level from the same person.[1,2]

The invention of devices which work based on skin contact spectrophotometry allowed for the resolution of this problem.

Purpose of work

The evaluation of the role and nosological, pathogenic and therapeutic uses of imbalances of oligominerals and chronic heavy metal poison-

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ing, revealed by investigation technique by skin contact spectrophotometry, in dermatological pathology included in lot.

Material

We explored by skin contact spectrophotometry a number of 77 patients with various skin disorders, in the pathogenicity of which chronic tissular inflammation phenomena are involved. Depending on the clinical diagnosis we formed 3 lots as follows:

- lot 1: plaque psoriasis vulgar: 17 patients (12 women and 3 men aged between 25 and 48 years old and average age of 37.3 years old),
- lot 2: autoimmune dermatological disorders (vitiligo, alopecia areata) 18 patients (12 women and 6 men, aged between 31 and 58 years old and average age of 42.2 years old) and
- lot 3: allergies (chronic rash, chronic eczema, dermographism) 44 patients (29 women and 15 men) aged between 21 and 65 years old and average age of 43.9 years old).

Method

We measured the concentrations in tissues for **20 oligominerals** (Calcium, Magnesium, Phosphorus, Silicium, Potassium, Sodium, Copper, Zinc, Iron, Manganese, Chrome, Vanadium, Boron, Cobalt, Molybdenum, Iodine, Lithium, Germanium, Selenium and Sulphur), **14 toxic heavy metals** (Mercury, Aluminium, Lead, Arsenic, Cadmium, Silver, Barium, Beryllium, Bismuth, Antimonium, Nickel, Platin, Talium, Torium), using the skin contact spectrophotometer Oligoscan, according to the recommendations of manufacturer from the Operation and Maintenance Manual and user manual [36].

Personal results

The dosage of oligominerals, showed a decrease in the concentration of magnesium in the psoriasis lot (average concentration of lot is 28.5 compared to the normal values between 30.5 and 75.7 with an average value of 68.35) but also in the lot with autoimmune disorders, where the average value of Mg concentration is 25.8 compared to the normal average value of 68.35. In all the 3 lots we found low values for Silicium as follows: 13.12 average value in the lot with psoriasis compared to the normal average value of 30.5 (with normal limits between 15 and 31); 11.08 average value in the lot with autoimmune disorders compared to the normal average value of 30.5 (with normal limits between 15 and 31) and 12.76 average value in the lot with allergies compared to the normal average value of 30.5 (with normal limits between 15 and 31). We found low values for Chrome in the lot with psoriasis ; average value of 0.70 compared to the normal average value of 1,445 (with normal variation interval between 0.92 and 1,250) and in the lot with allergies: 0.74 average value compared to the normal average value of 1,445 (with normal variation interval between 0.92 and 1,250) (Table I. Average values of oligominerals in the pathological lots studied)

The dosage of heavy metals in tissues shows the increase in the concentrations of heavy metals in all the 3 lots for Aluminium, Silver, Barium, Bismuth, Cadmium, Mercury and Lead with the highest increases for Aluminium in patients with allergies, for Silver in patients with psoriasis, for Barium in patients with allergies, for Bismuth in psoriasis and for Cadmium and Mercury in patients with psoriasis and for Lead in patients with allergies. We found increases in tissular concentrations of Arsenic in patients with allergies and autoimmune disorders and increase of Beryllium in patients with psoriasis and allergies (Table II. Average values of heavy metals in tissues).

Discussions

The skin contact spectrophotometer device Oligoscan is a mobile spectrophotometer easy to use, non-traumatic, which allows for the repetition of exploration, whenever it is necessary and which offers precise results based on complex algorithms of interpretation, regarding the tissular concentrations for 20 oligominerals, 14 heavy metals, the oxidative aggression level and antioxidative protection level, the tissular acidosis level and the level of affectation of 10 major biological functions by toxic metals. The

Table I. Average values of tissular concentrations for 20 oligominerals in tissues at Oligoscan test

Pathologies	Tissular minerals (average values)									
	Ca	Mg	P	Si	Na	K	Cu	Zn	Fe	Mn
Psoriasis	484.68	28.5	145.3	13.12	56.46	17.18	20.06	150.84	8.34	0.45
Autoimmune	456.23	25.8	150.9	11.08	58.96	22.5	17.68	128.7	10.6	0.35
Alergies	471.3	30.5	144.5	12.76	58.35	16.55	16.03	131.01	8.55	0.42

Pathologies	Tissular minerals (average values)									
	Cr	Va	B	Co	Mo	I	Li	Ge	Se	S
Psoriasis	0.70	0.019	2.46	0.030	0.037	0.25	0.088	0.023	1.38	50.04
Autoimmune	1.08	0.026	2.08	0.034	0.045	0.32	0.061	0.018	1.54	49.91
Allergies	0.74	0.025	2.30	0.031	0.038	0.34	0.079	0.021	1.54	49.23

Table II. Average values of tissular concentrations for 14 heavy metals in tissues in Oligoscan test

Pathologies	Results of tissular heavy metals (average values)						
	Al	Sb	Ag	Ar	Ba	Be	Bi
Psoriasis	0.01172	0.00499	0.01105	0.00489	0.00752	0.00535	0.00875
Allergies	0.01270	0.00210	0.01063	0.00534	0.00541	0.00486	0.00685
Autoimmune	0.01168	0.00322	0.00984	0.00550	0.00874	0.00639	0.00816

Pathologies	Results of tissular heavy metals (average values)						
	Cd	Hg	Ni	Pt	Pb	TI	Th
Psoriasis	0,01239	0.01222	0.00357	0.00211	0.00706	0.00182	0.00112
Allergies	0.00997	0.00688	0.00463	0.00241	0.00821	0.00126	0.00078
Autoimmune	0.01110	0.00974	0.00403	0.00213	0.00710	0.00204	0.00122

device Oligoscan fulfils the EC requirements – directive 93/42/CEE for medical devices [36].

In the dosage of tissular concentrations of oligominerals and heavy metals, the skin contact spectrophotometer Oligoscanis based on the principle of absorption, transmission or reflection of light by a chemical product. The more concentrated a sample is in a substance, the more it absorbs light, in the proportional limits expressed by Beer-Lambert Law. The energy absorbed by minerals and elements is analysed by Oligoscan, which produces a quantification of metal concentration in tissue [36].

The value of metal concentration obtained for the tissue is not related to the value measured in blood (homeostasis action), but is always correlated with the reflection on the physiology of a tested person. [36]

The exploration results are expressed by quantitative, percentual and coloured graphical information as follows: quantitative in absolute values, compared to the normal values from tissues, for oligominerals, only in absolute values for toxic heavy metals, and for the other parameters explored the results are expressed in percentages.

Imbalances in tissular concentrations of oligominerals, highlighted in the 3 pathology lots explored are involved in the explanation of symptoms and their pathogenic mechanisms.

Oligominerals have a key role in the correct functioning of the human body (activate enzymes, activate vitamins, adjust the pH, adjust TA, heart rate, production of cellular energy, cerebral functions, etc.). The deficiency of oligominerals is a major factor which explains

poor performances, fatigue, vulnerability to stress, decrease of intellectual capacity and the disturbance of the other metabolic functions they control, privileging the pathogeny of disorders studied in our lots.

A daily administration of micronutrients, food supplements, is essential for the correction of tissular imbalances highlighted by Oligoscan test, for a better and correct therapy of patient's sufferings.

The chronic tissular poisoning with heavy metals, highlighted by Oligoscan test in patients from the lots studied, generates mechanisms which are involved in the pathogeny of these sufferings. The chronic tissular poisonings generate: chronic inflammation with tissular acidosis, overconsumption of antioxidants and vitamins, reduction of energy, metabolic and functional performances, predispose to infections, autoimmune disorders and immunoallergic disorders and privilege the benign tissular proliferations and malignant proliferations.

Among all these mechanisms, the most important ones for the skin pathologies included in the 3 studied lots are autoimmune. Heavy metals induce the autoimmunity by direct mechanisms modulated by a genetic predisposition (see the families of atopic patients, psoriasis families) and also by epigenetic changes. [3,4, 5, 6, 7, 23]

The general scheme of action by which heavy metals induce autoimmunity is shows as follows: Protein –SH + Me => Protein-S-Me = Autoantiogen (cryptic antigen) .

Metal, (such as Mercury) will come in contact with autologous proteins. Following this contact, the heavy metal will attach to the autologous protein molecule by realization of covalent links with the external SH groups of the protein. Thus, the SH group is replaced by a S-Mercury group. The newly appeared group, S-Mercury, which changes the spatial and chemical structure of the protein molecule, which from autologous will become antigenic, signalling to the immune surveillance system that a foreign structure has appeared in the body. This foreign structure will behave as an antigen (actually an autoantigen) to which the immune system will trigger the chronic inflammatory reaction of immune destruction, which taking into account that the initial protein was self-autologous, it is an autoimmune destruction reaction.

The triggering of autoimmune reaction requires the participation of antigen-presenting cells (CPA) which will identify the antigenic determinant which by the Major Histocompatibility Complex II (CMH II) will be presented to Lymphocytes T0 (naïve lymphocytes) which will become specially-activated Lymphocytes. The specifically-activated Lymphocytes T, by synthesis of Interleukins (IL), will generate effector specifically-activated Lymphocytes Th1, Th2, Th17, Treg which will trigger the autoimmune inflammatory reaction.

In reality the mechanisms are much more sophisticated, because they are modulated by the intervention of epigenetic factors. [5, 6, 7, 23]. The involvement of disturbance of epigenetic network in the pathogeny of sufferings characterized by chronic inflammation such as allergic dermatitis, systemic lupus erythematosus, rheumatoid arthritis, systemic scleroderma and psoriasis is supported by a series of very detailed studies [5,6,7,23]

The four major mechanisms studied in connection with the disturbance of epigenetic network in chronic inflammatory disorders, including in psoriasis,are: DNA methylation [8, 9, 10, 11] change of histones [12,13, 14], change of micro-RNA (miRNA) [15, 16, 17] and changes of long non-coding RNA [18, 19].

All the four factors of deactivation of epigenetic network, discussed above, can be changed by the intervention of imbalances of oligominerals and chronic tissular poisoning with heavy metals.

The study by skin contact spectroscopy of oligominerals and concentrations of heavy metals and their biological reflection can bring new understanding of chronic tissular inflammation pathogeny and also for deciphering the way in which they are involved in the imbalance of epigenetic network with clinical consequences materialized in different forms of skin pathologies included in the studied lots.

At molecular level, the intimate mechanisms by which heavy metals induce autoimmunity are much more nuanced and complex. In order to trigger autoimmunity, it is necessary to activate the antigen-presenting cell which in turn, or by the Major Histocompatibility Complex, will activate, differentiate and multiply the effector lymphocytes T.

The molecular mechanisms of producing the activation of antigen-presenting dendritic cells are complex. The triggering metal can bind to a plasmatic protein generating an antigenic cryptic peptide which in turn can penetrate directly the antigen-presenting cell or is recognized by a specific receptor to which it binds and thus penetrates the antigen-presenting cell. Some metals are recognised directly by the specific receptors from the membrane of the antigen-presenting cell. Other metals penetrate the antigen-presenting cell.

Once inside the antigen-presenting cell, the antigenic determinant will be isolated and through the histocompatibility complex type II it will be sent to lymphocytes T which it activates. It is necessary to break the functional balance between the different types of lymphocytes T involved (Th1, Th2, Th17, Treg), each of them with specific role in the development of immune mechanisms.

All these types of lymphocytes are activated by specific substances – interleukines. Thus, lymphocyte T0 is activated by IL2. By its activation it can generate:

- lymphocytes TH1 which are activated by gamma interferon and these lymphocytes are responsible for acute inflammatory immune reactions;
- lymphocyte TH17 which is activated by IL17 and is responsible for chronic or latent immune inflammatory reactions
- lymphocyte TH2 is activated by IL2 and is responsible for the synthesis of antibodies.
- lymphocyte Tregulatory activated by IL 10 is responsible for the inducement of immune tolerance.

The misbalancing of normal functional balance between these types of lymphocytes will generate the autoimmunity with chronic tissular inflammation with tissular destructions and signs and symptoms which fit in the clinical diagnoses of autoimmune disorders, but also have zero point and act long before the appearance of symptoms in the action of heavy metals.

All these events, which follow the action of heavy metals and end with triggering of autoimmunity, are carried out by exchanges of information under the action of lymphokines and cytokines and other communication factors and effector factors which are recently better known and achieve efficient immune function paths, synthesized below [23,24,26,29,31,32]:

- IL4 by systems GATA3 and STAT-6 activates the lymphocyte Th2 which will secrete Il4, Il5, IL13. By these secretions IL i twill activate the synthesis of IgE, IgG neutralisers and activators of eosinophils. This path is responsible for the appearance of allergies and anti-parasite fight.
- IL12 by systems T-bet and STAT-4 will act on the lymphocyte Th1 which will secrete gamma Interferon, TNF and LT-alpha responsible for the activation of macrophages, complement-fixing reactions IgG. This path is responsible for the fight against intracell infections, autoimmunity and transplant rejection reactions.
- TGF-beta (Tumour Growth Factor) will activate two types of lymphocytes T and also by two different groups of cytokines.

a) By IL 6 and IL21, by path RORgammaT and STAT-3 helped by IL23 it will act on lymphocyte Th17 which will synthesize ILT17A, IL17F, IL21 and IL23. These interleukines will activate the neutrophils, but will also have direct actions on tissues. This path is responsible for the control of extracellular infections, repair of traumatized tissues, autoimmunity and transplant rejection reactions [37,38].

b) By Foxb-3 it will act on Tregulatory lymphocyte which will secrete IL10, TGF-beta, IL35. These interleukines are responsible for the control of subsets of lymphocytes T. This path is responsible for the limitation of effect of tissue injuries, installation of peripheral tolerance and graft tolerance.

Between the 4 subtypes of lymphocytes T there are control relations but also competition, which makes more complex the autoimmunity mechanism with starting point in the action of heavy metals.

The dosage of heavy metals in tissues shows the increase in the concentrations of heavy metals in all the 3 lots for Aluminium, Silver, Barium, Bismuth,Cadmium, Mercury and Lead with the highest increases for Aluminium in patients with allergies, for Silver in patients with psoriasis, for Barium in patients with allergies, for Bismuth in psoriasis and for Cadmium and Mercury in patients with psoriasis and for Lead in patients with allergies. We found increases in tissular concentrations of Arsenic in patients with allergies and autoimmune disorders and increase of Beryllium in patients with psoriasis and allergies (Table II: Values of heavy metals in tissues in the studied lots)

The autoimmune processes induced by metals are incriminated in scleroderma, LES, Sjogren syndrome, multiple sclerosis and patients with Lymphocytes T sensitive to metals have a high incidence of Circulating Immune Complexes, Ac ANA, Ac anti neuronal structures [22,24,26].

The involvement of heavy metals in the genesis of acute allergy inflammation and chronic autoimmune reaction in many disorders is discussed in the specialised literature [20, 21,25,27,28,30].

The role of heavy metals such as Mercury, Nickel, Silver, Zinc or Titanium and Iodine in the pathogeny of autoimmune thyroiditis Hashimoto is well-stated [33,34].

There is also indirect evidence of involvement of heavy metals in autoimmune thyroiditis as shown by Sterzl and collaborators, the removal of dental stoppings with amalgam rich in Mercury led to a significant decrease in the serum level of antibodies anti-TPO [35].

Conclusions

The exploration by skin contact spectrophotometer Oligoscan represents a very valuable instrument for the safe, reliable, reproductible and non-traumatic dosage of tissular concentrations of oligominerals and heavy metals.

The dosage of oligominerals, showed a decrease in the concentration of magnesium in the lot with psoriasis and in the lot with autoimmune disorders. The chrome was low in the lot with psoriasis; In all 3 lots we found low values for Silicium.

The dosage of heavy metals in tissues shows the increase of concentrations in all the 3 lots for Aluminium, Silver, Barium, Bismuth,Cadmium, Mercury and Lead with the highest increases for aluminium in patients with allergies, for Silver in patients with psoriasis, for Barium in patients with allergies, for Bismuth in psoriasis and for cadmium and mercury in patients with psoriasis and for Lead in patients with allergies. We found increases of tissular concentrations of Arsenic in patients with allergies and autoimmune disorders and increases of Beryllium in patients with psoriasis and allergies.

The imbalances in tissular concentrations of oligominerals and heavy metals, highlighted in the 3 sublots of pathology explored, are involved in the explanation of symptoms and their pathogenic mechanisms.

A daily administration of micronutrients, as food supplements, is essential in balancing these tissular imbalances highlighted by Oligoscan test, in view of a better and correct therapy of patient's sufferings.

The chelation therapy for reduction of heavy metal poisoning level is justified for the better control of pathogenic mechanisms and for improvement of health, together with the classical therapy for each disease/disorder studied in our lots.

Our study wants to be a preliminary study. Studies on extended and homogeneous lots will contribute to a better understanding of pathogeny and to completion of classical therapy for the pathological cases studied.

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Conflict of interest
NONE DECLARED

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