Zell-Check in daily practice – a spectrophotometrical mineraland metal analyzing technology

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During evolution, most living systems have developed a **biological oxidation cascade** for better energetically balance. Oxidative degradation of nutritive substances result in activated oxygen species, also known as Free Radicals, which play an important pathophysiological role. Elevated concentrations of Free Radicals are described as **"Oxidative Stress".** Oxidative stress is a normal phenomenon coming along in nearly all metabolic pathways like generating and providing energy or restructuring cell structures. But nature has provided efficient systems for protecting the own structures against oxidative damages. **The price that has to payed for high energy output is the small balance between bad and good.** By paying attention to nutrition, lifestyle and supplementation of antioxidants the risk of oxidative damages can be minimized and promotes well-being, health and vitality up to senior ages.

Oxidative aggression - Oxidative protection: Minerals, trace minerals, toxic metals

As a consequence of oxidative aggression symptoms like reduced performance, energetically deficits, fatigue, susceptibilities to infections, sleeping disorders, immune deficiencies, obesity, high blood pressure, cardiovascular diseases and much more occur. In Germany, a shift from acute to chronical diseases has been observed during the last decades.

Permanently increasing workload requires more energy work from the metabolism. The magnesium and other trace mineral depots are rapidly depleted trying to compensate burn out and fatigue. Magnesium correlates directly to cellular productivity. A deficiency in potassium, if not analyzed, slows down the recharging of the cellular batteries. Heavy metals play an important role in generating diseases that becomes manifest and turn into a chronical status.

Oxidative stress will long term provoke a deficit in micronutrients. To identify a disbalance, deficit or a blockade of micronutrients or any heavy metal overload, a reliable and easy-to-handle technology would be helpful.

Subsequently analytical methods in blood, urine or hair will be compared to the Zell-Check technology. The spectrophotometrical "Zell-Check" device will be presented with its potential in daily practice.

Blood testing

Blood testings for analytical purposes are the main standard in medical daily world, in academic medicine as well as naturopathic offices. But interpretation is a challenge because reference values may be controversial and the differences in concentration of parameters inside and outside the cells are known. Interaction and metabolisation between minerals and enzymatic systems or between minerals and toxic metals makes it even more complicate. Normal blood values do not always reflect the cellular situation where a lack or abundance might be the reality. So depending only on blood values bear the risk of not identifying hidden problems. Under the still normal determined value a potential pathological situation may be under the surface. Summarized it has to be noted that blood values do not necessarily reflect the current physical or micronutrient situation.

Two examples of the poor significance of blood values are the deficits of magnesium and calcium.

Example 1: Magnesium

According to Prof Holtmeier (1995) in 50% of all blood tests a deficit in magnesium was not analyzed. On his opinion, the blood serum value is inadequate. The explanation is the blood homoestasis. Homoestatis is defined by the physiological balance between concentrations inside and outside. This can be in blood, tissue or cells. Normal measured magnesium values do not necessarily mean a normal status in every physical region.

Example 2: Calcium

M. Muhm (2016) describes it very clear: *If there is any* substance, where a normal blood value is not a guarantee of physiological health, then we speak about calcium. This mineral shows very clearly that blood values only show how many of the material circulates in blood not the concentration of calcium in cells or tissue. On the website Lab. Tests online of the American Association for Clinical Chemistry (AACC) it can be read: Calcium blood values do not reflect the amount of calium in bones, only how many calcium is circulating in blood. We may have normal calium blood values but suffer from a serious osteoporosis.

Blood testing is the common analytical method but has weaknesses specially in analysis of minerals and toxic metals.

Urine and hair analysis

Other analytical methods like urine or hair analysis have weaknesses as well. Urine measurements only illustrates the current situation. Urine measurements for heavy metals will indicate the short-term intake. This point is well accepted by experts but very often ignored by practitioners and naturopaths (De Groodt, J. 2016)

Hairmineral analysis indicates enclosures over the last 2 – 3 months. In addition, unknown external factors make it difficult to identify chronical diseases.

The Zell-Check technology

With the new Zell-Check technology a method is now available for the first time that overcomes the difficulties described before. While developing the Zell-Check device a well known physical measurement was modulated that way that it became applicable for body measurements.



Fig 1: The Zell-Check

So far, the spectrophotometric measurements were used to investigate molecular properties. Different molecules can be identified and quantified. Basis of the measurements is the Lambert-Beer law describing the light absorption properties of molecules. The reflected or absorbed light and ultraviolet electromagnetic waves are measured.



Fig 2: Chemical compounds absorb light at a different wavelength. Minerals, trace minerals or toxic metals absorb between 180 and 1000 nm.

The results of the Zell-Check device based on spectrophotometric values, sex, age, weight, blood type, height of the tested person is evaluated by a mathematical algorithm. With the Zell-Check device the intracellular concentration of more than 20 minerals, trace minerals, metalloids or toxic metals can be me measured by direct skin contact. The contact points are four points in the hand palm of the counterhand. Calibration, measurement and online evaluation only takes a few minutes. The hand should the thorougly cleaned and dried.



Fig 3: Zell-Check contact points in hand palm

Differences between blood-, urine-, hair- and Zell-Check measurements

For micronutrients or toxic metals blood measurements indicates the circulation of these materials. Quantity or concentration in cells is extrapolated or estimated. Urine or hair analysis show the quantity excreted. Die Zell-Check technology allows an evaluation of current intracellular and tissue situation. According to Ljuba (2013) the advantages of the Zell-Check technology can be summarized as follows: the level of trace minerals and minerals in epithelial cells demonstrates the substances

responsible for a working tissue metabolism. **Deficiencies** or lacks can be seen first in epithel cells, months or years before the blood values turn pathologic.

But the comparability between blood-, urine-, hair- and Zell-Check measurements is limited because of the very different methodological and physiological approaches which result in different information or conclusions or different direct or indirect relations. This means a "1-to-1" comparison is hardly possible; a correlation will be poor. Looking at the advantages or disadvantages of the single methods will help implementing the most appropriate method or method mix to get the best diagnosis and therapy.

A substantial expertise 2012/2013 about Zell-Check technology was provided by Dr. Marion Ljuba, internist and cardiologist. 650 tests were performed following different questions:

- 1. Is the method suitable for medical purposes or health checks?
- 2. Is the non-invasive approach of spectrophotometry for micronutrient or heavy metal analysis in connective tissue cells possible?
- 3. Is reliability or reproducibility sufficient?
- 4. Comparative measurements of micronutrients and heavy metals in connective tissue and blood
- 5. Usability and possibilities following new findings
- 6. Other perceptions and advantages compared to other methods or technologies.

Dr. M. Ljuba summarizes the results and resume as follows: All test series or -groups have indicated, that the Zell-Check system matches the stated requirements and can complete the medical diagnostic systems. The qualitative assessment of the current physiological situation or "first-Look" information of concentrations of micronutrients or cellular disorders can be performed acceptably sensitive by the Zell-Check device. It has to be taken into account that the test persons had a different micronutrient situation in blood and tissue therefore the comparison to the blood test correlates weaker but the tendency was comparable.

It can be summarized, based on the experiences up to now and the review of the obtained results, that all data reflects the real situation to 80-85 percent in 2012 and climbing to 95-97 percent in 2013.

The deviations are small and are due to the applications. If all criteria given were followed consequently all results will be reliable. Regarding the determinations of minerals, trace minerals or metals the use of the Zell-Check device offers several advantages:

- Stable and reproducible results in cells and tissue
- Immediate output of results; no delays by lab analysis
- No influence of day-time or current mode of nutrition
- Discovers current and chronic stressloads
- Discovers deficiencies, overloads or intoxications
- Gives evidence of oxidative stress situation
- Monitoring of applied minerals or trace minerals
- Offers immerdiate ways of treatment
- Cost efficient
- Moderate technical invest



Fig 4: Zell-Check Technology

Zell-Check application in the field

The complete measurement is split into four sessions:

- 1. Balancing of minerals
- 2. Ratio of minerals
- 3. Balancing of toxic metals
- 4. Interdependencies of Zell-Check results

Balancing minerals and toxic metals

Minerals are essential co factors in metabolic pathways and have to be delivered by daily nutrition. To highlight the outstanding meaning of minerals on our health some metabolic pathways and the main minerals involved are shown in Tbl. 1.:

Metabolic Pathway	Minerals			
Antioxidative Capacity	Copper, Manganese, Molybdenum, Selenium			
Histamin Pathway	Copper, Zinc			
Intestinal Integrity	Calcium, Magnesium, Selenium, Zinc			
Immune Functions	Manganese, Molybdenum, Selenium, Zinc			
Bone Metabolism	Magnesium, Potassium, Calcium, Phosphorus, Zinc, Boron			
Neurotransmitter Metabolism	Copper, Magnesium, Zinc			
ATP Snythesis	Potassium, Copper, Magnesium, Phosphorus			
Insulin Metabolism	Calcium, Chromium, Potassasium, Manganese			
Essential Endogeneous Scavengers	Manganese, Molybdenum, Copper, Selenium, Zinc			

Tbl.1 Metabolic pathways and minerals (Kuhlmann et al., 1991; Burgerstein, 2012)

Deficiencies in minerals are observed more often than in vitamins. One critical point is nutrition: low-calorie, vegetarian, lifestyle, fast food, drug treatments, age etc. Deficiencies can be balanced by supplementation. But persisting deficits have to be investigated. The reason could be insufficient assimilation by e.g. poor nutrition, low enzyme levels in pancreatic gland, hypoacidity of stomach or any intestinal dysbiosis. Insufficient assimilation has to be investigated and has to undergo a special treatment.

The meaning of overloads is not that clear than the interpretation of deficiencies. Overloads can be the result of a metabolic blockade see also Boron Fig. 5.



John Doe

017/03/05 Male 31 years Date of Birth: 1985/12/3 Nood group: A Weight: 90 Kg Jun: 1m 25

Mineral Test Report

		Result	Nor	mal	Low-	Low	Normal	ок	Normal+	High	High+
Calcium	0	544.7	279.0	598.0				-	-		
Magnesium	0	24.3	30.5	75.7			_	-			
Phosphorus	0	91.3	144.0	199.0		-		-			
Silicon	1	20.9	15.0	31.0				-			
Sodium	()	42.0	21.0	89.0			-	-			
Potassium	8	9.1	9.0	39.0				-			
Copper	\odot	16.7	11.0	28.0				-			
Zinc	0	121.0	125.0	155.0			-	-			
Iron	0	8.3	5.0	15.0				-			
Manganese	1	0.42	0.31	0.75			-	-			
Chromium	0	0.63	0.82	1.25			-	-			
Vanadium	\odot	0.020	0.009	0.083			_	-			
Boron	0	3.43	0.84	2.87				-	_	_	
Cobalt	0	0.030	0.025	0.045			-	-			
Molybdenum	(10)	0.043	0.035	0.085			_	-			
lodine		0.23	0.32	0.59		-	_	-			
Lithium	0	0.105	0.052	0.120				-	-		
Germanium	0	0.027	0.003	0.028				-	_		
Selenium	(9)	1.42	0.95	1.77				-			
Sulphur	0	47.0	48.1	52.0		_	_	_			

Fig.5.: Balance of minerals (Zell-Check evaluation)

Supplementation of minerals indicates a look on their toxic antagonists. Heavy metals occupy the binding sites of minerals in enzymes in thereby affect their biological functionality e.g. in detoxification pathways.

Activated immune cells will be endangered when they lose their oxidative protection.

Interdependencies between mineral and metal:

Aluminum – Selenium Aluminum – Silicon Arsenic - Selenium Lead – Calcium Cadmium – Zinc Nickel – Magnesium Mercury – Selenium

Toxic metals induce oxidative stress and inflammations ("silent Inflammations"). Permanent even low dose exposure can cause inflammation of the intestinal epithelial cells which may result in the so-called leaky-gut syndrome. This fact should be considered in a detoxification treatment strategy where the intestine plays a major role.

The illustration of the interdependencies in a bar or pie chart (e.g. enzymatic status or intestinal resorption) eases the interpretation.

Cellular detoxification of heavy metals is dependent on the possibility of connecting to methyl-, acetyl- or sulfur groups (Phase II enzymes of detoxification phase II). Therefore the evaluation of "Blockage indication of missing sulfur compounds" was regarded as helpful. This point monitors also the trend of the therapeutical strategy.

⁴ Dirk Kuhlmann, PhD – Zell-Check in daily practice – a spectrophotometrical mineral-and metal analyzing technology. Special Print, Publisher Bio-Medoc, 2016

Heavy Metal Test Report

		Result	Normal	High -	High +	Excess
Aluminium		0.00866				
Antimony	Sb	0.00304				
Silver	Ag	0.00741		-		
Arsenic	As	0.00609		-		
Barium	Ba	0.01088			_	
Beryllium	Be	0.00714		-		
Bismuth	BI	0.01158			_	
Cadmium	60	0.01519				
Mercury	Hg	0.00887		-		
Nickel	Ni	0.00371				
Platinum	Pt	0.00168				
Lead	Pb	0.00857				
Thallium	П	0.00264				
Thorium	Th	0.00163				

Heavy Metals Intoxication



Fig. 6. Balance of toxic metals (Zell-Check evaluation sheet)

Other useful information are the different ratios of the minerals like Calcium (Ca), Magnesium (Mg), Potassium (K), Sodium (Na), Phosphorus (P), Copper (Cu) or Zinc (Zn) between each other.

For example: An elevated Cu/Zn ratio indicates immunological problems; a low ratio Cu/Zn cardiological problems (Klevey index). Osteoporosis, paradontosis, hypertherosis or cardiocvascular symptoms are coming very often along with an elevated Ca/Mg ratio. Low Ca/Mg ratios will show up in case of low levels of magnesium or vitamin D. Low K/Na ratio indicates hypertension (or treatment with diuretic drugs) or chronical stress (hyperaldosteronism), high K/Na ratio comes along with renal or adrenal insufficiencies and low salt nutrition.

Ratios

	Ratios	Nor	mal	Low	ок	High	Deficiency	Excess
Ca/Mg	22.44	7.84	18.25				Mg	
Ca/P	5.97	1.64	4.15				•	
K/Na	0.22	0.45	0.75					
Cu/Zn	0.14	0.11	0.17		9		Zn	

Fig. 7 Mineral ratios (Zell-Check evaluation)

The Zell-Check technology provides a rapid look-insight the quantitative ratios and the physiological and pathological situation of minerals in tissue.

5 Dirk Kuhlmann, PhD – Zell-Check in daily practice – a spectrophotometrical mineral-and metal analyzing technology. Special Print, Publisher Bio-Medoc, 2016

Mineral Test Report

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Sodium	Na	42.0	21.0	89.0			-	_			
Potassium	К	9.1	9.0	39.0				_			
Copper	Cu	16.7	11.0	28.0			-	-			
Zinc	Zn	121.0	125.0	155.0		-		-			
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Manganese	Mn	0.42	0.31	0.75			_				
Chromium	Cr	0.63	0.82	1.25							
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Cobalt	0	0.030	0.025	0.045			_				
Molybdenum	Mo	0.043	0.035	0.085				-			
Iodine		0.23	0.32	0.59		-		-			
Lithium	Li	0.105	0.052	0.120				-	-		
Germanium	Ge	0.027	0.003	0.028				-			
Selenium	Se	1.42	0.95	1.77				-			
Sulphur	s	47.0	48.1	52.0		-		_			

You can get help on the items by clicking on the item line.

Mineral Balance

Deficiencies unsatisfactory: 100%							
Excess			good: 20%				

Fig. 8 Zell-Check values and some therapeutic comments

Summary

Prof. Marcel Capt, managing director of the hospitial in Lausanne, Switzerland and since 10 years expert in orthomolecular medicine, characterized on the occasion of the 12th Medicine World Congress in Monaco the Zell-Check technology as a revolution in determining oxidative stress and other medical essential parameters. In my own practice the Zell-Check technology proved in a short term as one of the most useful diagnostic methods which allows to organize the daily work more efficient. The Zell-Check technology offers a quick anamnesis and way through the subsequent diagnostic steps. The technology is a useful completing tool. The broad basis of data minimizes the risk of ignoring information for e.g. cost reasons. The preventive or acute therapy based on orthomolecular medicine therefore has become much more efficient.



About the author:

Dirk Kuhlmann, PhD, is a graduated biologist. As a naturopath, he has been leading a practice for biological medicine and naturopathy in Schleswig and Flensburg since 1983. One of his main areas of practice is orthomolecular medicine. In addition to numerous publications, he was co-author of the specialist books Orthomolecular Medicine (1991) and work book Orthomolecular Medicine (1997) as well as co-founder of the orthomolecularly oriented company Orthim-Pharma.