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# ACUPUNCTURE and NATURAL MEDICINE



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## Editorial

Dear friends of acupuncture and natural medicine.

This year we introduce you the second issue of our magazine, which has already

found a wide range of readers.

The upcoming spring is a symbol of new life, nature is awakening and offering a bright variety of colours. This waking up and beginning of another cycle concerns not only nature around us, but every living creature including human being. These biorhythms are very sensitive and disregarding them leads to disturbances in the organism. A part of healthy living is the unconditional respect for laws of Mother Nature. This leads me to a short reflection on change of so called winter time- the biological time to summer time. This is extraordinarily insensitive and has an unjustifiable intervention to biorhythms of many millions of people with all its consequences. On March 29<sup>th</sup> 2015 we've turned the clock's handle an hour forward. In the nature we notice inherent changes of rhythms of day and night, summer and winter, everything has its beginning and its end, too.

Human is a microcosm within the macrocosm, he is a part of a whole thus he is a subject to changes of cosmic cycles. Physiological and biological actions in our body are supervised by natural biorhythms. Only if we will live in accordance with periodical rhythms of nature and the cosmos, we establish harmony and health in our organism. Human being and animals have their own inner clock including circadian rhythm as its part. Shift in time means a failure of spontaneous rhythm and a disruption of natural balance of organism. For sensitive people this may mean sleep disturbances, nervousness, depressive mood, stomach ache, weakening of concentration and working efficiency. An increase of accident frequency, job accidents

and myocardial infarctions are registered in first three days after the shift in time. It is a tax too high for unsubstantiated economic arguments concerning spared electrical energy.

Dear readers, in our magazine we aim for interdisciplinary insight on human being and nature. Let me introduce you this new issue full of interesting and inspiring articles.

Already standard on high professional and scientific level is the article by G. Solár, M.D., PhD., Z. Solárová, M.P., PhD., Dr. O. Zelmanová with title "Pyramid model in acupuncture and its application in practice". In the presented pilot study authors confirm the existence of pyramidal model in acupuncture. Authors pointed out statistically significant differences between sets of meridians of yang and yin concatenation in the horizontal level in a common file of men and women. With this work authors give a proposal for further research in acupuncture, which is already demanding an interdisciplinary cooperation.

T. Mochnáč, M.D., PhD, in his article "Acupuncture in rheumatoid polyarthritis" informs us about the modern acupunctural approach in diagnostics and therapy of this disease, which significantly decreases the patient's life comfort. Author presents a new method of diagnostics that takes principles of eastern medicine and mathematical processing into account.

Mgr. R. Klobucký, PhD., Dr. M. Kozánek, CSc., Associate Prof. M. Čambal, M.D., PhD., Dr. P. Takáč, CSc. familiarized us already in last issue with a new bio-therapeutic method – the larval therapy. In the second part they do very clearly analyse social and economic aspects of chronic wounds. In conclusion authors introduce examples of successful treatment with larval therapy.



In interdisciplinary insights we introduce an article of collective of authors Dr. A. Mojzeš, PhD., Associate Prof. Dr. V. Gajdoš, CSc., Mgr. B. Porubčanová with the title “Radon and naturally occurring radionuclides as both necessity and risk – geological aspects of a threat in the nature”. You will read about ionising emission in this article. Ionising emissions are part of our life on earth and have its social benefits, but health risks, too. Protection against radiation is a complex problem not only in Slovakia. Authors refer to necessity of determination of real radon risk of a building plot from geological floor.

Nowadays full of hectic and rapid development an expression “Your food – your cure” by Hippocrates is still valid. I am really glad to introduce an article by international collective of authors Associate Prof. Ing. J. Brindza, CSc., Ing. E. Ivanišová, PhD, Mgr.O. Grygorieva, PhD, and Ing.V. Abrahámová. In their study authors analyse results of antioxidant activity of parts of herbs, traditional remedies and extracts of different vegetable species that are less or more

known. We can read about antioxidant activity of honey made of dandelion, elderberry, sorts of teas and wild garlic.

In an Insight Into the Acupuncture Thinking we present “Reflections of an older acupuncturist”. Author of the article is T. Rosinský, M.D., CSc., who is considered a Nestor of acupuncture and natural medicine in Slovakia, and who is very much requested and well-known also abroad. I was always very much looking forward to his lectures. In this article he is describes his first contacts with acupuncture in a lively manner, an application of his first needle, learning about acupuncture, study of Chinese language and his trips to China.

I wish you plenty of inspiring moments and contentment by reading this issue and I am looking forward to our next meetings.

Sincerelly yours,

**Soňa Sázelová, M. D.**

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## Pyramid model in acupuncture and its application in practice

G. Solár, M.D., PhD., Z. Solárová, M.P., PhD., Dr. O. Zelmanová



### Summary

The authors present a pilot study, statistically assessing and comparing relationships in the pyramid model in acupuncture. Analysis of

relationships between yang and yin concatenation with meridians of the central vertical axis of the pyramid was conducted on the basis of a random selection of 100 patients, who were examined in the period from 2013 to 2015 at the First Clinic of Acupuncture and Natural Medicine of G. Solár. The study results confirm the basic theses of the pyramid model of acupuncture, as well as the expected differences between the group of men and women in electroakugraphic findings. This information is of diagnostic significance and opens up new possibilities of acupuncture, but also a comprehensive diagnosis in the future.

Rated current clinical findings were patients of the First Clinic of Acupuncture and Natural Medicine of G. Solar Ltd. (hereinafter Clinic). The study included 100 patients without a special selection within a three year span. This information is of diagnostic and therapeutic importance and opens up new possibilities for comprehensive acupuncture care for the future.

### Key words

Electroakugraphy, pyramid model of acupuncture, yang and yin concatenation, central vertical axis

### Method and materials

#### Group characteristics

The group consists of 100 patients, including 50 men and 50 women. They are routine patients at the clinic without specific selection, examined between 2013 and 2015. The average age was 44.4 years with a range from 9 to 77 years. The average age for men is 42.9 years (range 9–72 years), the age of women was 45.9 years (range 15–77 years). Diagnostic range constitutes of an entire spectrum of disorders, including polymorbidity, sufficiently representative with patients of the clinic. In terms of traditional medicine those years were the years of water Snake (2013), wooden Horse (2014) and wooden Sheep (2015). The time span eliminates (at least partially) possible characteristic influences of differences in individual years of the Chinese zodiac. When analyzing groups of patients by different years in the past, we noticed significant differences in the so-called average patient in different years according to the Chinese horoscope.

#### Methodology

Ex post evaluation of routine electroakugraphic (EAG) examination, which is an implicit part of each entry examination, was conducted on all patients. We examined manually the biorhythm points at both branches of each of the twelve organ meridians (Picard 1996, Wang 2007). These points were measured using oscilloscope PPS 10, that reads via a probe and adapter XS510 PP the frequency and course of bio-currents in

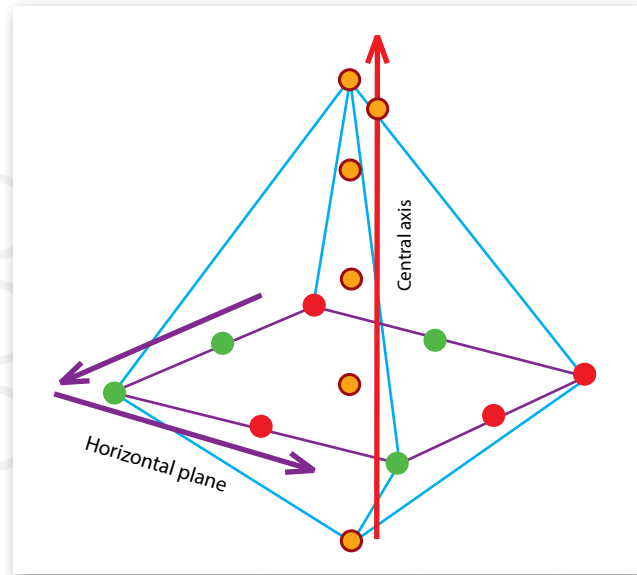




acupuncture points. We evaluated the curves that were constructed according to the sequence of circadian rhythm, i.e. through a routine procedure of electroakugraphic examinations. Based on these results, we calculated the so called “Statistical average patient” for the entire group and separately for the group of men and the group of women. This is how we came up with statistically calculated EAG curves, which were analyzed further. Statistical analysis was done using the statistical program SPSS. We used descriptive statistics - mean, standard error of the mean, determinative deviation, as the values contained in the group of 100 patients are normally distributed. Comparing the values of the pairs of variables, we used the t-test (independent and paired t-test), for detecting the relationship between number variables of Pearson correlation coefficient.

### Objective

The study aims to examine statistically correct relationships and within the pyramid model of acupuncture.

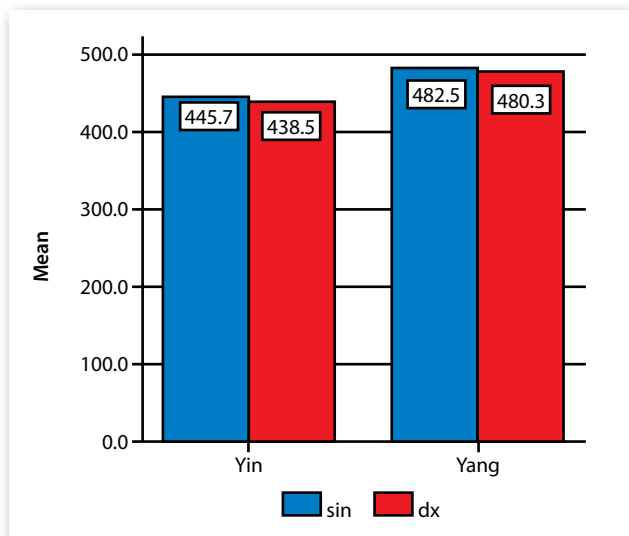


**Fig. 1** Central vertical axis and horizontal plane  
● yin concatenation (CONC) – meridians of horizontal plane (LP, PU, TC, PE),  
● yang concatenation (CONC) – meridians of horizontal plane (VF, RE, IT, VU),  
● central vertical axis meridians (from top to bottom CO–VU–HE–VE–IC)

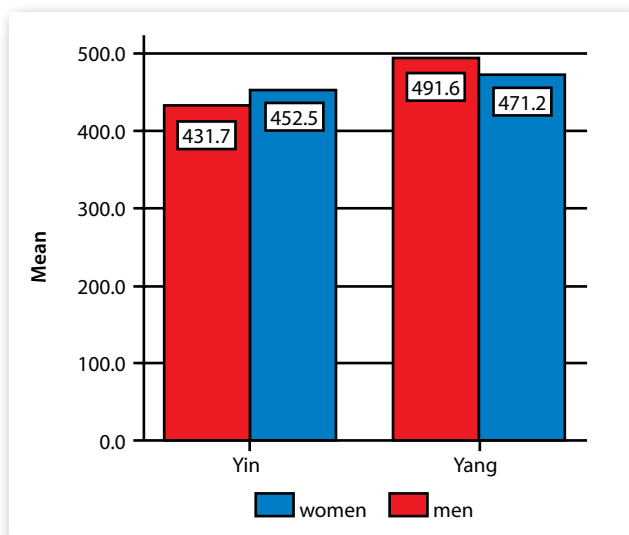
### Results

A) There is not a statistically significant difference in either men or women between left (sin) and right (dx) branch of yin and yang concatenations (Figures 2, 3).



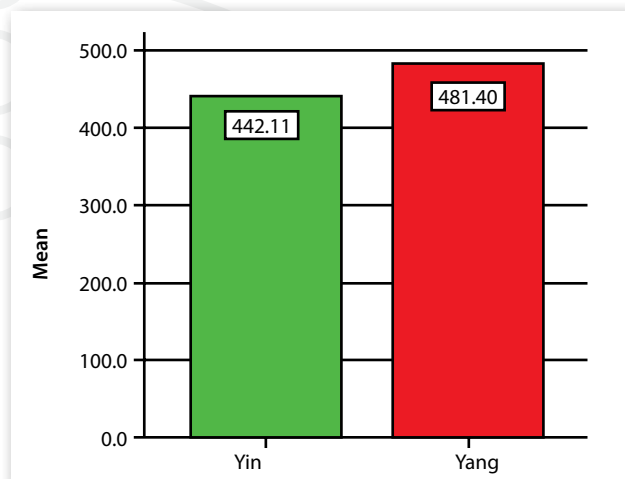


**Fig. 2** Yin and yang concatenations (CONC), right (dx), left (sin) branch



**Fig. 3** Yin and yang concatenations (CONC) – men, women

B) Between yin and yang concatenation as a whole (men and women combined) is a statistically significant difference demonstrated by paired t-test, while yang concatenation has statistically significantly stronger (higher values). (Figure 4, Table 1)



**Fig. 4** Yin and yang concatenations (CONC)

**Tab. 1** Descriptive statistics of yin and yang concatenation

Pair 1	Mean	N	Standard Deviation	Standard Error Mean
Yin	442.11	196	141.61	10.11
Yang	481.40	196	159.74	11.41

C) There is not a statistically significant difference between men and women in yin and yang concatenations (CONC). (Table 2, Figure 2)

**Tab. 2** Descriptive statistics of yin and yang concatenations (CONC) – men, women

	N		Mean		Standard Error Mean	
	sex		sex		sex	
	women	men	women	men	women	men
Yin	98	98	452.53	431.69	14.38	14.22
Yang	98	98	471.22	491.57	14.92	17.28





D) There are statistically vast differences between meridians of yin and yang concatenations and the meridians of the central vertical axis (CVA). While the yang meridians have the strongest power, the central vertical axis are rather average, and the weakest meridians are those of the Yin concatenations. (Figure 5, Tables 3, 4, 5)

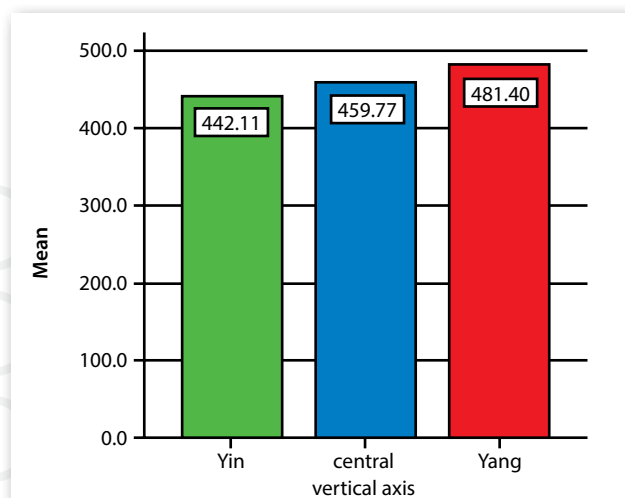


Fig. 5 Yin and yang concatenations (CONC)

Legend:

yin CON meridians LP, PU, TC, PE,

yang CON meridians VF, RE, IT, VU,

central vertical axis meridians CO, VU, HE, VE, IC.

Tab. 3 Comparison table of yin concatenation, central vertical axis and yang concatenation

		Mean	N	Standard Deviation	Standard Error Mean
Pair 1	Yin	442.1122	196	141.60595	10.11471
	Yang	481.3980	196	159.73961	11.40997
Pair 2	Yin	442.1122	196	141.60595	10.11471
	Vertical	459.7704	196	148.00202	10.57157
Pair 3	Yang	481.3980	196	159.73961	11.40997
	Vertical axis	459.7704	196	148.00202	10.57157

Tab. 4 Paired t-test of the central vertical axis and yin/yang concatenation

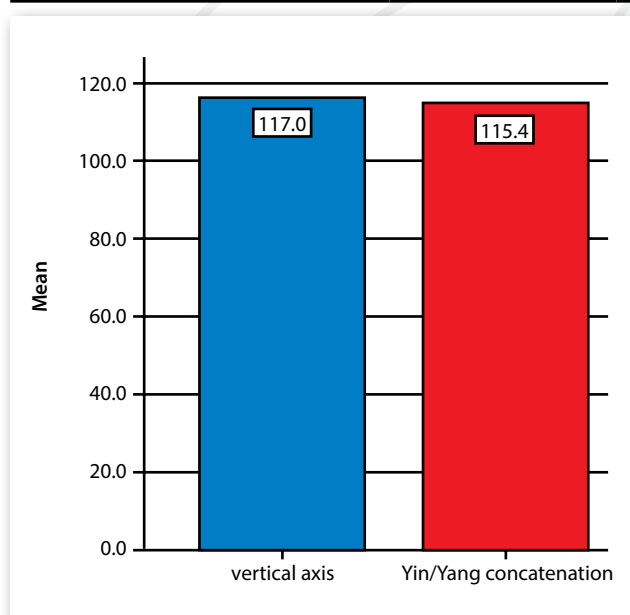
		Mean	Standard Deviation	Standard Error Mean	t	df	Significant difference (2-tailed)
Pair 1	Yin – Yang	-39.28571	80.81140	5.77224	-6.806	195	0.000
Pair 2	Yin – vertical axis	-17.65816	68.42387	4.88742	-3.613	195	0.000
Pair 3	Yang – vertical axis	21.62755	72.19070	5.15648	4.194	195	0.000



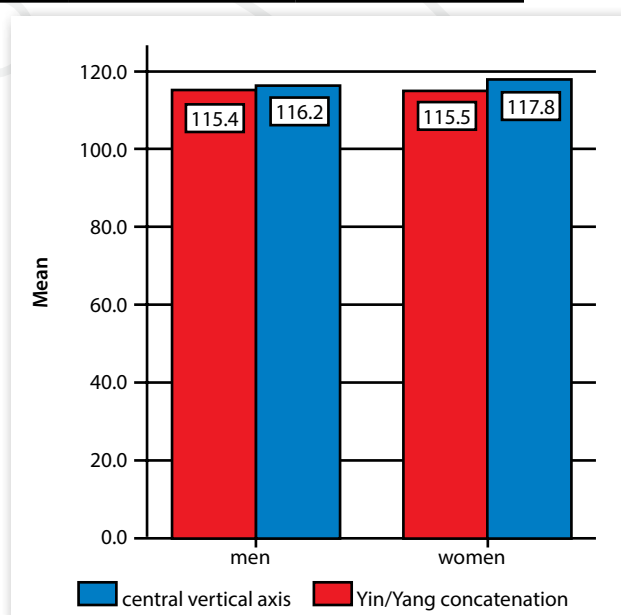
E) Comparison of the central vertical axis and the yin and yang concatenation. Paired t-test showed that there are significant differences between yin and yang concatenation and central vertical axis. There is no statistically significant difference between men and women.

**Tab. 5** Paired t-test of the central vertical axis and yin and yang concatenation

		Mean	N	Standard Deviation	Standard Error Mean
Pair 1	Yin/Yang concatenation	115.4388	196	36.35921	2.59709
	Vertical axis	117.0306	196	36.04533	2.57467



**Fig. 6** Yin and yang concatenation (CONC) and the central vertical axis



**Fig. 7** Yin and yang concatenation (CONC) and central vertical axis – men women

**Tab. 6** Descriptive statistics of the yin and yang concatenation (CON) and the central vertical axis – men women

	Sex	N	Mean	Standard Deviation	Standard Error Mean
Vertical axis	men	98	116.2449	36.97970	3.73551
	women	98	117.8163	35.25877	3.56167
Yin/Yang concatenation	men	98	115.4082	37.64619	3.80284
	women	98	115.4694	35.21897	3.55765

## Men

F) With men, the EAG examination are outside the norm in the right and left branches of the meridians RE (kidney), TC (triple heater), HE (liver) and right branch of the meridian VE (stomach). (Figure 8)

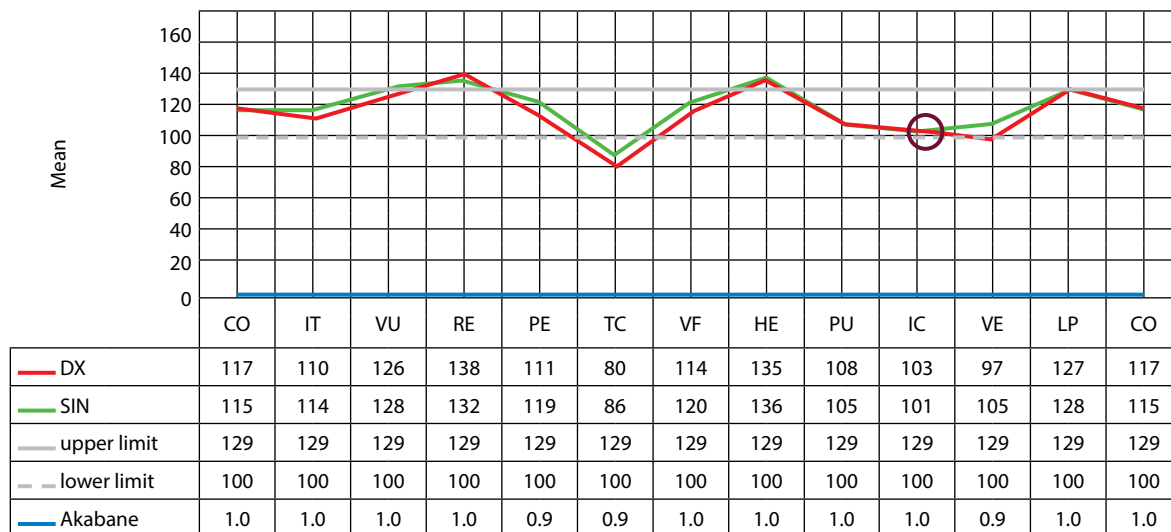


Fig. 8 EAG module of an average patient – men

Legend:

- upper and — lower limit of the norm,
- right branch of meridians
- left branch of meridians
- crossing-of only monotonously increasing and monotonously decreasing curve

Women

G) Meridians RE, TC, VF, HE a VE on the right side are statistically outside the norm in EAG examination

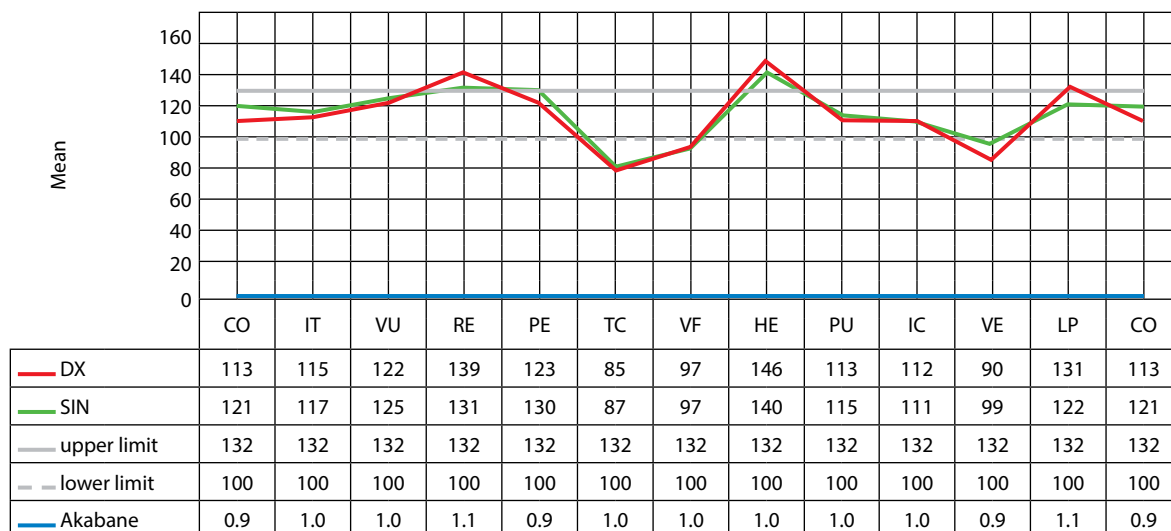


Fig. 9 EAG module of an average patient – women

Legend:

- upper and — lower limit of the norm,
- right branch of meridians
- left branch of meridians



## Interpretations

The EAG examination of the statistical patient – man, meridians kidney (RE), triple heater (TC), liver (HE) and right branch meridian stomach (VE) are outside the statistical norm. This means that two meridians of the central vertical axis (HE, VE) and two meridians of the horizontal axis (RE, TC) are outside the statistical norm. There is a kidney meridian failure (RE) in the horizontal axis, which is represented in the yang concatenation as the only yin meridian. Similarly, there is a failure of meridian of the triple heater (TC), which is represented in the yin concatenation as the only yang meridian. There is an imbalance of opposite polarity in both concatenations. There is an imbalance of yin in the yang concatenation just as there is an imbalance of the yang in the yin concatenation. The meridian kidney (RE) is paired with meridian colon (IC) in the central vertical axis. The meridian triple heater (TC), which is paired with the meridian spleen (LP) has no direct bond to the central vertical axis. If we consider only the central vertical axis, it can be concluded that the statistical patient - man has no imbalance at the top of this axis not even when linked to the horizontal axis, meaning the link between the heart meridian and the meridian gallbladder (VF). In addition, there is an imbalance in the lowest meridian IC of this axis, which alone has the character of qualitative disorders (crossing of right and left branches). This means that the “statistical man” is unable to effectively eliminate stress, which is implemented predominantly through the meridian colon (IC). While meridian CO is a carrier of emotions, meridian IC is an indicator of the ability to eliminate stress, which may occur not only in the emotional sphere but also in the somatic sphere. In men, we don't find a projection in the emotional sphere, which does not exclude somatization. This fact has to be a subject to further study.

The EAG examination of the statistical patient – woman, meridians kidney (RE), triple heater (TC), liver (HE), gallbladder (VF) and the right branch of the meridian stomach (VE) are quantitatively outside the statistical norm. Except the imbalance of meridian gallbladder (VF) (which does not occur in the group “statistical man”) and qualitative disorders of the meridian colon (IC) (found only in “statistical men”) the findings in the group “statistical woman” are similar to the findings of “statistical man”. The EAG examinations show a fundamental difference between the “statistical man” and “statistical woman” in meridians gallbladder (VF) and meridian colon (IC). One possible interpretation of this finding is that the “statistical man” cannot adequately eliminate stress, while the “statistical woman” has difficulty penetrating into problems and therefore tends to be more emotional when processing problems.

## Discussion

In this study, we continue to analyze the relationships and contexts in pyramid model of acupuncture. We analyze the relationship between the horizontal and the vertical axis of this model, based on the statistical evaluation of a group of 100 patients. Statistical analysis showed significant differences between meridian sets of yin and yang concatenation in the horizontal axis in the common group of men and women. If we take into account that the existence of yin and yang concatenation can be regarded as ascertained also in the sum pa-kua by Fu-Shi, Wen, S1 and S2 (Solár, Solárová 2014), then the statistical evidence of differences in the presented study is another argument, testifying to their real existence. Until now, we have been using particular findings based on Tactile Solar's Test (TST). The presented study however, uses the data obtained through the electroakugraphy method (EAG) developed and used for 17 years at our clinic. While TST data are derived on the basis





of tactile sensitivity, EAG values are measured in millivolt at points of biorhythm (Mochnáč 2013, 2015). The evaluated set of 100 patients can thus be considered statistically relevant for such a pilot study. The different groups, men and women, reflect more the differences between the sexes. In this evaluation, the differences between the concatenations are not statistically significant. This finding, for the time being, is considered premature to be seriously interpreted and requires further examination of larger groups.

We have also statistically shown, in a common group of men and women, the diversity of meridians in the central vertical axis from the other examined groups (meridians of the yin and yang concatenation). The greatest strength, however, lies in the yang concatenation, while the slightest is in the yin concatenation and the middle strength is represented by the meridians of the central vertical axis. However, this only applies when the central vertical axis only includes four meridians (cor CO, liver HE, stomach VE and colon IC), which together with the meridian concatenation represent the 12 organ meridians. Such a strength ratio is predictive based on the nature of each meridian group. Meridian bladder (VU) is considered as part of both the vertical as well as the horizontal axis. Its inclusion among the meridians of the central vertical axis is supplemented on this axis by the missing meridian of WATER element, as here we assume the representation of all elements. Specific and stabilizing position of the meridian bladder (VU) (which shall be discussed in more detail in the future) is confirmed by the fact that, after its inclusion in the central vertical axis, statistically significant differences disappear among all three groups of meridians. The strength of yang meridian concatenation, yin concatenation and the central vertical axis mutually offset each other (Table 3, 4, 5 and Figure 6) and the system is stabilized.

When comparing the EAG curve of the “statistical man” and “statistical woman” there is a fundamental difference in the meridians gallbladder (VF) in the group “statistical woman” and IC colon (IC) in the group “statistical man”. This difference emphasizes even more the fact that meridian colon (IC) in males shows a qualitative disorder that we consider to be more clinically severe than the quantitative meridian gallbladder (VF) disorder in the group of women. Other imbalances between men and women are analogous. The interpretation of this difference is also stated in the results part, where we note that the “statistical man” cannot adequately eliminate stress, while “statistical woman” has difficulty penetrating into problems and therefore tends to be more emotional when processing problems. Supporting evidence for these conclusions is a higher incidence of colorectal cancer in men (Blahová 2013, Vavrečka 2010) and on the other hand, a higher incidence of gallbladder pathology in women (Statistics, 2014).

There are EAG imbalances in the meridians RE kidney (RE), triple heater (TC), liver (HE) and the right branch meridian stomach (VE) in both groups of men and women. Interpretation of these imbalances may vary. These are common disorders, regardless of gender or diagnostic composition of groups. It requires deeper analysis, which is not the primary problem of this study. However, quite remarkable are the imbalances in the horizontal axis, where both meridians (kidney – RE and triple heater – TC) are meridians lying in the opposite concatenation as their characteristics. Thus Yang triple heater meridian (TC) is part of the yin concatenation and the Yin kidney meridian (RE) is part of the yang concatenation. This can be provisionally interpreted as a manifestation of a certain instability and increased vulnerability in these oppositely polarized concatenations of meridians at the clinic. They are related to the essence of Qi







and to the dynamics of processes in the body, where we could theoretically expect such vulnerability. But for now, it can be evaluated only as a certain trend that needs to be examined further. As far as the central vertical axis is concerned, the liver meridian (HE) is metabolically most loaded at the somatic level and at the psycho-regulative level serves as an indicator of harmony in the organism. Its vulnerability is generally predictive just as it is in all medicine fields. The same is essentially true for stomach meridian (VE), whose imbalance is related to poor eating habits of the population but also with disturbance of balance of the psycho-regulative level. Unilateral imbalance on the right requires further study of this issue. These results suggest the directions for future needed research in acupuncture and probably in the entire medicine as well.

### Conclusion

The presented pilot study is a further proof of eligibility of the pyramid model of acupuncture. At the same time, it has confirmed the distinction between “statistical patient – man and woman” at the statistical level of significance. The results show, first, the urgent need for such studies, but at the same time indicate the possible direction for further research in acupuncture. We will continue to analyze this issue and look for penetration for further interdisciplinary collaboration in research of acupuncture.

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## Acupuncture in rheumatoid polyarthritis

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### Summary

*Polyarthritis rheumatica* is one of the serious diseases that greatly limits patients in their life comfort. The eastern traditional approaches provide some solutions. These procedures are usually borrowed, hardly reproducible and incomprehensible to the wide non-acupuncture public.

In the work, the author reports about the modern approach of acupuncture treatment towards the rheumatic polyarthritis, based on a new diagnostic methodology, which takes into account the principles of Eastern medicine diagnostic and mathematical processing. It uses procedures of the already proclaimed diagnostics on the basis of Teo Mo hexagram time sequence (time acupuncture) using the IDS-M (Impedance data system-M) diagnostics and TST DS-M (tactile Solar's test data system-M) presented in the last Journal of Acupuncture and Natural Medicine 2015, 1.<sup>(5)</sup> The author presents the success of such treatments in two cases.

### Key words

IDS-M (Impedance data system-M), TST DS-M (tactile Solar's test data system-M), polyarthritis rheumatica, acupuncture treatment.

People have always formed an image of the world surrounding them; they have compared the present with the past.

This relates to cosmological imaginings and imaginings in acupuncture, too. The current superficial knowledge have led us to a deeper study and it draws us into the history, luring us to know what was before and if former ideas are true even today.

Old masters have expressed this understanding in the YiJing (the book of changes), the oldest literary work dating to the 12 century BC.

It describes cosmological and philosophical ideas of phenomena in the universe.

It is based on the assumption that the basic principle of all phenomena is TAO (the way).

In the beginning was the TAO. Yang and Yin are the essence of events.

Before that was the Intention. In the Bible, it is written. *In the beginning was the Word.* (John 1 : 1). *It was a dark. And God saw the light, that it was good: and God divided the light from the darkness.* (Gen 1:3-4)<sup>(13)</sup> The creation of space, time and the world.

God – the ruler of all times. The ruler of all multi-dimensional time-spaces.

These cosmological ideas, as well as in our case, are taken into account in the YiJing context, where the basic abstract is actually a binary expression of connections with different phenomena displayed in hexagram relationships. The top pair (bigram) in the hexagram presents the “Heaven”, the lower pair the “Earth” and the middle pair the “Man”. It has a variety of interpretations. Another interpretation is a biblical interpretation: *Thus says the Lord: The Heaven is my throne, and the Earth is my a footstool: where is the house you build to me and where is the place of my rest?* (Is 66, 1)<sup>(14)</sup> According to this, the top bigram represents the Heaven, the middle and bottom bigram represent the time-space; and the medium bigram represents the time seasonal context. Where “young Yang” is the spring, “old Yang” is the summer, “young Yin” is the autumn and “old Yin” is the winter. This way the connections of time





arise in the centre or middle of the hexagram. On the other hand, the context of gradients is expressed by the relation of the upper and lower trigram of hexagrams, based on the context of the Ba Gua. This compilation can be applied in the acupuncture diagnosis, in case of TST DS-M and IDS-M, if we use the time characteristics of circadian biorhythm of “Antique points”. This is the essence of Teo Mo hexagram sequences. This was a brief illustration of the model (algorithm) we have used during the diagnosis and the treatment.

Traditional therapeutic procedure in acupuncture is in contrast to the therapy used by Western medicine and it is based firstly, on the creation of therapeutic model, which is then verified in practice. This means, in our case, that the model has a philosophical basis in the interpretation of phenomena according to Yijing in accordance with current cosmology and quantum physics knowledge. The aim of this work is to create such a model of these phenomena. Since this model has approved during the years of experience in therapy, we try to map and monitor these characteristics in case of particular diseases, for the purpose of presentation for a wide non-acupuncture medical public. Case reports of patients with rheumatoid polyarthritis and treatment results are an example that borrowed traditional Chinese medicine practices are not the only ways we can therapeutically affect such conditions.

The aetiology of rheumatism – bizheng from the traditional Chinese medicine point of view is explained as a result of three external influences Weiqi: wind (Feng), cold (Han) and wet (Shi), which attack the body. The flow of qi is blocked and causes rheumatism, which in this case, arises from the excess of wet (Shi). According to the mutual ratio of noxious qi (weixieqi), we distinguish three categories of

rheumatism. If wind qi prevails (weixieqifeng), it penetrates into the meridians, affects blood (xie) and circulates throughout the body. We can talk about the developed migrating rheumatism. If wet qi prevails (weixieqishi), it remains in the body and blocks the meridians. Then nutritious qi (yingqi) and the defence qi (weiqi) in the body are weak. We can talk about the fixed rheumatism. If there is excess of the cold qi (weixieqihan), it stops meridian's qi, freezes vessels and causes pain. This is called the painful rheumatism.

Depending on which parts of the body are affected, we divide the rheumatism into seven categories: rheumatism of the skin, muscles, tendons, bones, meridians, rheumatism of five zang, intestines and placenta.

In principle, the rheumatism caused by noxious wind qi is treated by acupuncture, the rheumatism of excess cold qi is treated by moxibustion and the excess wet qi rheumatism with hot needles.<sup>(7)</sup>

In terms of Western medicine, the cause of the rheumatoid arthritis is not yet known. It is assumed that the disease in genetically predisposed patients it is triggered by a particular microorganism. It is a polygenic dependent disease. The substantial part of the genetic predisposition is the HLA complex. Rheumatoid arthritis is associated with HLA-DR-4 antigen, which divides into 5 subtypes. The main biological role of HLA-molecules rests in the production of peptides, coming from protein antigens of the endogenous or exogenous origin. These antigens are subsequently recognized by T-lymphocytes that interact with other cells of the immune system and develop an immune response. As in the case of traditional Chinese medicine, also in Western medicine some criteria were established for the rheumatoid arthritis diagnosis.<sup>(12)</sup> They were suggested by Arnett et al. for the needs of the American Rheumatism Association:<sup>(1, 2)</sup>

1. Morning rigidity
2. Arthritis of three or more joint groups





3. Arthritis of hands joints
4. Symmetric arthritis
5. Rheumatoid nodes
6. Serum rheumatoid factor
7. X-ray changes

Rheumatoid arthritis is defined by 4 or more criteria in the clinical picture.

The following criteria shall be taken into account when assessing the improvement of the status of our patients; who underwent the acupuncture therapy.

### The aim:

1. To highlight the development of the rheumatic pathophysiology in the energy-interactional level during the treatment.
2. To confirm the accuracy of the acupuncture therapy.
3. To confirm the justification of the therapy effectiveness based on the Teo Mo hexagram sequence.

## Case Histories

### 1. Case report

38 years old patient

**History:** From the birth being deaf-mute, 10 years suffering from polyarthritis rheumatica.

**Subjective:** joint pain, difficulties while walking, especially in the morning, joint stiffness.

**Objective:** The X-ray confirmed degenerative changes in the joints of hands and legs. Swelling of both knees and ankles.

The serum-positive rheumatism was confirmed. Rheumatoid factor was 16.2 IU/ml (21.11.2014) and 9.7 IU/ml (9.2.2015). The patient was treated with prednisone and methotrexate with no improvement.

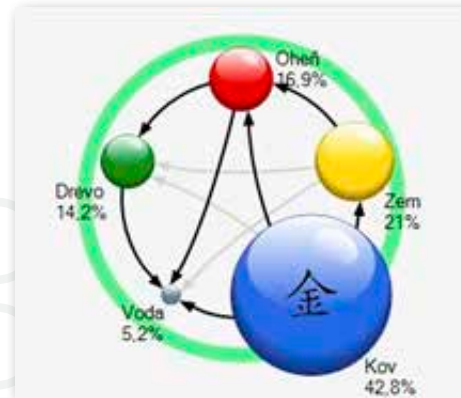


Fig. 1 13.1.2015 – VU 65 sin.  
The Fire characteristic  
The control relationship

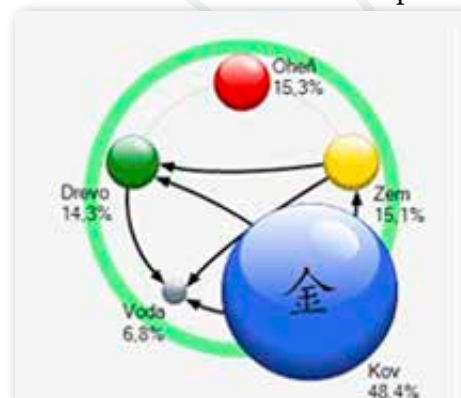


Fig. 2 20.1.2015 – IDS-M CO 4 sin.  
The Fire characteristic  
The control relationship

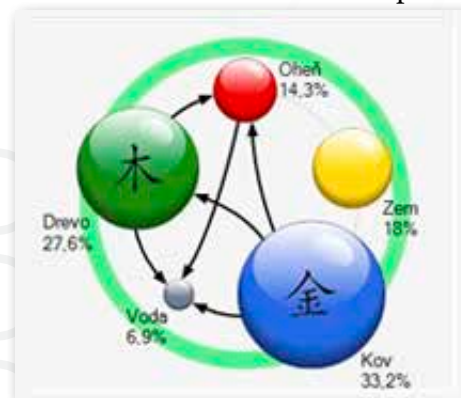


Fig. 3 29.1.2015 – IDS-M RE 1dx.  
The Fire characteristic  
The control relationship





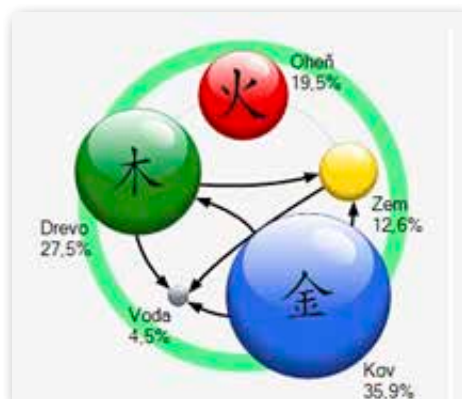


Fig. 4 9.2.2015 – IT 3 sin. IDS-M  
The time Metal characteristic  
The control and creation

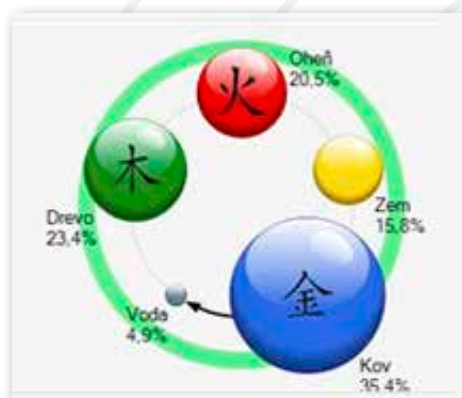


Fig. 5 16.2.2015 – VU 62 sin.  
The time Metal characteristic  
The creation relationship

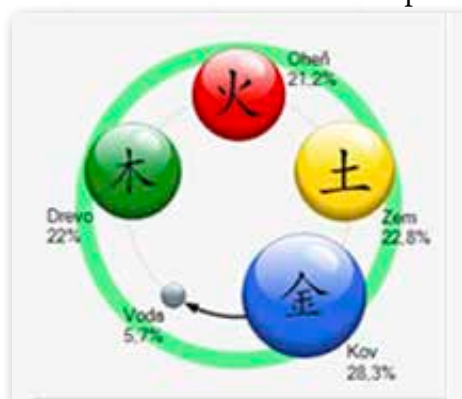


Fig. 6 23.2.2015 – VU 65 dx., VU 62 sin.  
The time Metal characteristic  
The creation relationship

**Acupuncture diagnosis:** The highest gradient METAL-WATER with the initial HCT (hypercompositional turbulent) algorithm.

*After the treatment:*

1. Modification of the HCT algorithm into a quantitative relationship (hypercompositional turbulent).
2. Disappearance of the morning stiffness of small and big joints.
3. Retreat in swelling of large joints.
4. Adjustment of the rheumatoid factor back to standards.

## 2. Case report

46 year-old patient

**History:** Rheumatoid arthritis monitored by a rheumatologist since 1999 – serum negative form, therapy by methylprednisolone (Medrol), light degree of anaemia, latent hypothyroidism, hyperbilirubinaemia.

**Subjective:** joint pain, aggravated by walking, especially in the morning, joint stiffness.

**Objective:** Deformation of interphalangeal and metacarpophalangeal joints of the hands as well as interphalangeal and metatarsophalangeal joints on the feet, the X-ray confirmed degenerative changes of hands, feet and knees joints.



Fig. 7 20.1.2015 – IDS-M IT 1  
The Fire characteristic  
The control mechanism



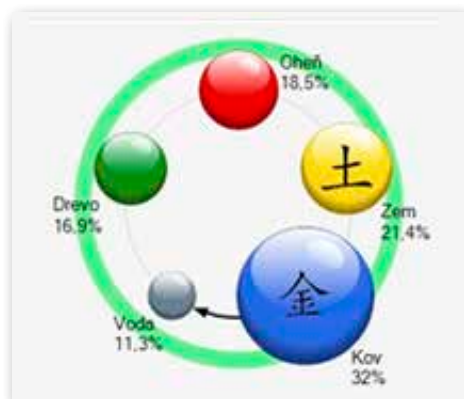


Fig. 8 27.1.2015 – RE 3 dx.  
The time Metal characteristic  
The control mechanism

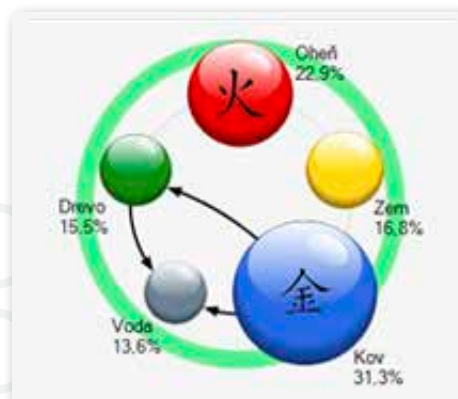


Fig. 11 24.2.2015 – LP 5 sin.  
The time Metal characteristic  
The anticontrol mechanism



Fig. 9 5.2.2015 – VE 43 dx.  
The time Fire characteristic  
The control mechanism

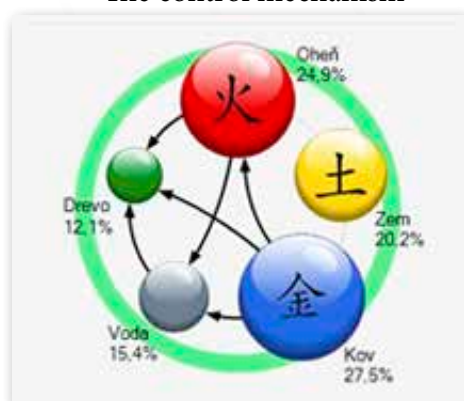


Fig. 10 12.2.2015 – HE I dx.  
The Water characteristic  
The control mechanism

**Acupuncture diagnosis:** The highest gradient METAL-WATER with the initial HCT (hypercompositional turbulent) and DCT (decompositional turbulent) algorithm.

*After the treatment:*

1. Modification of the HCT and DCT (decompositional turbulent) algorithm to the HCT algorithm.
2. Disappearance of the morning stiffness of small and big joints.
3. Retreat in swelling of large joints.

## Discussion

Up to now used acupuncture is based on the ZiWuLiuZhu and LingGuiBaFa time sequences link with biorhythm functions of human body, which is characterised by the linear perception of time. It is based on a resonance of appropriate time period for the patient and the use of so called “opened acupuncture point”. On the basis of current knowledge from physics, we do not perceive time separately from the space, but as a spacetime, which is curved.<sup>(3, 6, 8)</sup> From this perspective, the time can be curved. The idea is incorporated into the centre of the model, which we are trying to confirm.

Therefore, so called time acupuncture by Teo Mo hexagram takes into account the curvature of spacetime.



The verification methodology of the correct acupuncture therapy, was previously based only on the subjective improvement or on the improvement of laboratory results. At the present time, this objectification is investigated by e.g., IDS-M, TST, TST DS-M, MKBD-S diagnostics. The IDS-M and TST DS-M are methodologies enabling us to follow the evolution and adaptation of the pathological condition of the organism during each session in the dynamics. We can monitor also the accuracy of the acupuncture therapy.<sup>(4, 5, 9, 10, 11)</sup>

Our two case reports present the progress of patients with rheumatoid arthritis, with improvements not only in the clinical condition of the organism, but also on the energy-interactional state level. At the same time, we monitor the accuracy of acupuncture therapy.

In both cases we present conditions dominated by the disturbing effects of the cold qi (weixieqihan). This can be seen in figures 1–11, where the IDS-M examination shows us prevailing characteristics of weakened water function. However, the current acupuncture therapy is not focused on single element, it focuses on all elements (energy-interactional states) at the same time.

In the first case, the internal interaction features have changed from the original HCT (hypercompositional turbulent algorithm) up to the level of the quantitative changes in the elements of METAL and WATER. Clinical changes are clear, early morning muscle and joint stiffness disappears, and the rheumatic factor adjusts back to standards. (Figure 1–6)

In the second case, there is adjustment of the HCT (hypercompositional turbulent algorithm) and DCT (decompositional turbulent algorithm) algorithm back to the HCT (hypercompositional turbulent algorithm) and improvement of the quantitative status of WATER element. Clinical changes are clear, the early morning muscle and

joint stiffness disappears and mobility improves. The treatment was carried out always with only one needle.

## Conclusion

1. We assume that the treatment on the basis of IDS-M, TST DS-M diagnostics according to Teo Mo hexagram sequence has justification in the acupuncture therapy.<sup>(4, 5)</sup>
2. The importance of IDS-M is in the monitoring of the accuracy of the acupuncture treatment and also in the monitoring of the pathophysiology development of organism's energy-interactional state.

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## The socioeconomic impact of diseases that can be treated using maggot debridement therapy

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*Review article, part II*

### Analysis of the quality of life of patients affected by a chronic wound

Socio-economic aspects of chronic wounds are assessed in terms of quality of life and economic costs. Ruckley (1997) noted that reliable socio-economic data in this area are possessive. Chronic wounds of the lower extremities also are not sufficiently underpinned in the health system. Patients often conceal them, not only with clothing, but also deliberately in front of doctors because they do not trust the doctor, they fear social stigma, they have fear or embarrassment of the illness or fear the costs associated with treatment.

A quality of life and socioeconomic analysis has become part of clinical research only recently. Chronic wounds are often perceived as a disease of older people, since their peak prevalence is between sixty and eighty years of age; however, it is clear that the beginning of their illness can occur during their working lives.

Among the first to notice the extent of the impact of chronic wounds not only on the patient's health but also his working life was Widmer et al. (1978).

If we think about the quality of life of patients with a chronic wound, we cannot have doubts about their discomfort, social difficulties, and problems with mobility, odour, the cost of treatment and other factors. If we assess the impact of therapeutic interventions for chronic wounds, we should evaluate not only the process of treatment and healing, but also the quality of life itself.

Phillips et al. (1994) collected data through standardised interviews from 73 patients with a chronic lower extremity wound. A significant number of these patients had moderate to severe symptoms (mainly pain) that caused the disease. Up to 81 % reported reduced mobility. Chronic wounds of the lower limb significantly correlated with the length of sick leave and loss of jobs and had a negative impact on the patient's financial situation. The study showed a strong correlation between the length of the period of treatment of chronic wounds and feelings of fear and resentment. The authors of this study conclude that chronic wounds represent a significant threat to the various dimensions of the patients' quality of life.

The consequences of chronic wounds can also be explored by using quality of life scores. Franks et al. (1994) used the "Symptom Rating Test" for 185 patients. Before treatment, patients showed signs of anxiety, depression, hostility, and cognitive deficits. After twelve weeks of







therapy, even though only 52 % of the wounds had healed, those characters were significantly reduced. The study also documented other aspects improving the quality of life. Pain, which was reported by 78 % of patients at baseline after twelve weeks of treatment, was reduced to only 22 % of patients. Concerns and fear of disease decreased from 15 % to 1 % and problems of leisure and social activities declined from 42 % to 30 %. In this study, the authors demonstrated demonstrable progress in many dimensions of quality of life as a result of community-based treatment in a specialised clinic.

At our disposal, however, we also have the latest report of studies dealing with the assessment of the impact of chronic wounds of the lower extremities to the quality of life related to health (health-related quality of life – HRQoL). The current concept of HRQoL is based on the fact that the subject assesses his current situation with regard to personal expectations. This may change over time and react to external influences, such as length and severity of illness, family support, etc. HRQoL is currently being assessed by patient questionnaires. These are often multidimensional and include physical, social, emotional, cognitive, and working or spiritual aspects. A wide range of disease symptoms, side effects of therapy and also the financial impact on health is assessed.

Surveillance studies on the impact of chronic wounds of the lower extremities on health-related quality of life (HRQoL) were developed by Green (2009) and Jester (2010), and analysed 21 studies (14 quantitative and qualitative 8).

## The physical consequences of chronic wounds

### Pain

Pain is the most commonly reported symptom of chronic wounds of the lower extremities and is mentioned in all of the studies analysed, regardless of the research design. In contrast to earlier studies, it appears that the pain is present even with venous ulceration. Pain is often worse during the re-bandaging and from studies we can conclude that it is sometimes also incorrectly managed (Holinworth and Collier, 2000; Douglas, 2001).

Qualitative studies give patients the freedom to talk about the symptoms of disease and those observations clarify the severity of pain as a result of chronic wounds. Walsh (1995) conducted semi-structured interviews with thirteen patients suffering from venous ulceration and found that the pain was an overwhelming part of their lives. Respondents described the pain as a permanent part of their disease. The pain is continuous and gave them a feeling of loss of control. Problems with pain control contribute to the belief that analgesics are inefficient in managing pain caused by a chronic wound. Given the scope and short term that this study accounts for, the validity of the results may be questionable.

Chase et al. (1997) conducted a relatively large qualitative study of 37 patients suffering from venous ulceration. The research followed a 12-month period using participant observation of their re-bandaging held every week. The study described the specific nature of chronic pain caused by venous ulceration, and, as Walsh (1995) pointed out, such a pain is a continual reminder of the process of the disease for the patient.







Ebbeskog and Ekman (2001) conducted a hermeneutical and phenomenological study of 15 elderly patients in Sweden who suffered from venous ulceration. Although the short duration of the study may limit the validity of the results, the study nevertheless showed that pain is the focal point in the lives of patients, controls their existence, and makes them unhappy, angry, or even in their despair can make them cry.

A comprehensive study (Hamer and Roe, 1994) focused on elderly patients ( $n = 158$ ), of whom 88 had a chronic wound of the tibia and 70 were in good health. More than a third of the respondents testified that the pain was the worst part of the disease, which, according to them, is very often overlooked.

Chase et al. (2000), in their relatively small study ( $n = 20$ ) of outpatients with venous ulceration of the legs in the U.S., reported slightly different results in comparison with the previous study, where only 10 % of patients mentioned severe pain, 19 % moderate pain, 38 % mild to moderate severity pain and 33 % reported not feeling any pain. This study demonstrated a positive correlation between wound healing and relief from pain.

Similar results have been obtained by a further study (Charles, 2004) with a larger sample ( $n = 65$ ), which demonstrated major deficits in HRQoL in patients with chronic wounds of the lower limbs which was directly caused by pain. Charles (2004) stated that after twelve weeks of treatment, all respondents reported an improvement in pain. The most significant improvement occurred in patients whose chronic wound healed. These findings support other studies (Franks et al., 2001, 2003; Walters et al., 1999).

A relatively large study ( $n = 758$ ) (Franks et al., 1998) focused on gender differences in pain perception in chronic wounds. The study showed that men reported greater deficits in quality of life due to soreness of chronic wounds.

Results drawing attention to pain as a significant factor in reducing HRQoL due to chronic lower extremity wounds have resulted in further studies. Iglesias et al. (2005), in their study, demonstrated that, among all the symptoms of venous ulceration of the lower limb, pain has the greatest impact on the reduction of HRQoL, while as many as 12–21 % of patients confirmed severe pain. Similar results were reported by another study (Hareendran et al., 2005), which indicated that pain associated with the disease is the most significant limitation in social life for 38% of the respondents.

### Mobility and daily life

Walsh (1995) stated that the main limitation of mobility of the respondents is pain resulting from chronic wounds. Thus, limited mobility is often complicated by leakage from the dressing and the associated odour. In this study, most patients were virtually confined to bed which was either directly due to chronic wounds or indirectly and voluntarily due to fear of recurrence of the healed wound.

Douglas (2001) used a “grounded theory” in his study on eight patients. Research participants completed a semi-structured interview in which they talked about their limitations in maintaining personal hygiene, which affected their well-being and contributed to their social isolation. Such difficulties associated with maintaining personal hygiene have been described in many studies where patients reflected on when they washed their feet last and when they took baths and





spoke out about the problems and difficulties with adherence to maintaining personal hygiene (Ebbeskog and Ekman 2001).

It is also often a problem to find appropriate and comfortable clothes and shoes that are able to hide the bandages (Rich and McLachlan 2003). Hyde et al. (1999), in an Australian study of women with chronic leg wounds, described respondents who had to change their clothes in order to hide their wounds. This study also describes additional lifestyle restrictions that led to the erosion of their femininity. Such single-gender studies, although uncommon, provided rich informative and enlightening insight.

Chase et al. (2000) indicated that respondents had significant deficits in comparison to the general population, which limited their daily physical activities such as bathing, dressing, walking, climbing the stairs or lifting. Some studies have also examined the gender-specifics of these restrictions, but have not reported any homogenous findings (Charles, 2004; Franks and Moffat 1998).

Two studies (Walters et al., 1999; Hamer and Roe, 1994) reported that 50 % and 30.7 %, respectively, of the respondents suffered from significant problems with mobility due to chronic wounds of the lower limbs. Franks et al. (2006) performed a longitudinal study and indicated that mobility problems are dominant and growing deficits, especially with patients who fail to achieve healing of chronic wounds.

Limitations of physical activity in relation to chronic wounds of the lower extremities are often noted in other studies, and these restrictions are mainly attributed to the wound pain. Hyland et al. (1994) reported that 29 of the 50 participants of their research were bedridden, while 16 respondents attributed this restriction

to the chronic wound. Iglesias et al. (2005) found that all respondents (n = 387) spoke of poor physical health compared with the general population, while their assessment of physical health had improved if the chronic wound healed. Price and Harding (2004) wrote about similar problems with mobility and daily activities and personal hygiene. Palfreyman (2008) provided specific symptoms of chronic wounds of the lower extremities: 75 % of respondents indicated problems associated with exudates, 56 % described problems associated with odour and 65 % reported insomnia as a result of wound pain. As in other studies, it has been shown that these symptoms disappear after healing of the wounds. Hareendran et al. (2005) reported similar results: 80 % of patients experienced pain, 66 % itching of the wound and 57 % insomnia.

Many studies therefore suggest that mobility limitations and problems in carrying out daily activities pose significant difficulties for many patients suffering from chronic wounds of the lower extremities.

### **Vitality**

Different degrees of reduction of vitality are cited in several studies in patients with chronic wounds of the lower extremities. Franks and Moffatt (2001) point to improved vitality in the context of wound healing. Similar results were also reported by a further study (Franks et al., 2006).

Chase et al. (2000) found a large energy deficit in patients suffering from a chronic lower extremity wound in comparison with two types of diabetes and cardiovascular disease.

Another study (Franks and Moffatt, 1998) noted the overall impaired quality of health status of respondents compared with the whole population. Similar results have also been reported by another study (Walters et al., 1999).





### Sleep

Walsh (1995) reported that sleep disorders are a normal part of life for patients with a chronic lower extremity wound. These sleep disorders are primarily caused by soreness of the wounds. Patients often reported that overnight sleep is a rare event for them. Douglas (2001) made a connection with this finding and the fact that sleep plays an important role in the success of tissue regeneration. Ebbeskog and Ekman (2001) also wrote about problems with insomnia caused by soreness of wounds. This insomnia causes daytime fatigue as well as a lack of strength and energy.

### Exudate and odour

Exudate and odour are mentioned as important symptoms of chronic wounds of the lower extremities, but are often overlooked. Rich and McLachlan (2003) in their range of small (n = 8) phenomenological studies based on in-depth semi-structured interviews, wrote that patients consider the exudates to be rich and intolerable, and that of the accompanying odour is hard to manage. The study contains statements about wet shoes, wet litter and concerns about what other people may think. The problem was also considered more serious if the affected individual worked (Douglas, 2001; Hyde et al., 1999).

Patients reported that methods that should have managed the exudates secretion were often inadequate and the odour was described as “the worst thing” associated with the wound. The odour led to a reduction of social networking to increase shyness and to a feeling that their privacy has become public (Walsh, 1995). Chase et al. (1997) made a similar testimony, which suggests that the odour from the wound limits the patient’s ability to have social contact. He also argues that “objectification” of the leg of the patient, which behaves as if his wound and sometimes even the whole leg did not belong.

Jones et al. (2008) indicated a link between depression, exudates and chronic venous ulceration of the foot. The study showed a direct correlation between problematic exudate and the related odour with depression and anxiety in patients.

### Social consequences of chronic wounds

Hopkins (2004) demonstrated that chronic leg wounds, mainly as a result of exudates and odour, have a significant impact on the social lives of patients. Patients said that they hardly check these distressing symptoms and feared the reactions of their immediate surroundings. The result of these concerns and embarrassment was voluntary social exclusion of patients and resignation to socialise (Rich and McLachlan, 2003). Ebbeskog and Ekman (2001) also wrote about the limited social contacts of patients. Walsh (1995) reported similar problems and stated that patients look forward to curing the wounds, because for them it means a new start for social interaction. Patients identified the period of the disease as “lost days”.

Chase et al. (1997) describe situations where the wound exudates and odour restricted the patient’s ability to work. The chronic wound may limit the patient’s freedom but also his livelihood. Such restrictions are often ignored in the literature, since it is assumed that chronic wounds are a matter of particular patients in post productive working age (Franks and Moffatt, 2007).

Charles (2004) found significant deficits in social functioning, but also wrote about improvements in this area after 12 weeks of treatment. Franks et al. (2006) found that patients were socially isolated as a result of their illness. Franks and Moffatt (1998) state that social isolation is an important part of chronic wounds of the lower





extremities and in terms of gender analysis showed that the major limitations in social functioning were suffered by younger men.

Hyland et al. (1994) reported that patients often reduced their social activities, mainly due to a fear of further injury to the lower extremity and to prevent recurrence of the disease. In this study, 38 % of respondents indicated that they avoid crowded places such as shopping malls.

Hareendran et al. (2005) reported that 97 % of respondents felt some restrictions due to their physical functioning. They also say on how the disease affected their family life and their dependence on their partner's care. Social life is usually limited due to pain, odour, the inability to dress appropriately and visibility of the dressing.

### **Psychological consequences of chronic wounds**

Hopkins (1994) revealed the concept of "biographical disruption", where patients clearly differentiated between life before disease of the chronic wound and after, which manifested a significant impact on their physical and social life. Despite such a sense of loss, patients often felt hope for the future. Hyde et al. (1999) highlighted the inner strength of patients, their dedication, steadiness, stoicism, resilience and hope for the future, because they believe that their chronic wounds would heal.

Many patients suffer from an unhealthy obsession with their wound, which is a constant part of their thoughts. Some patients, in order to live a normal life, intentionally try to normalise the wound, thus ignoring it in order to live a normal life (Hopkins, 2004). Walsh (1995) wrote about the problems of patients with their own identity and their feelings of discouragement and pessimism. Chase et al. (1997) described the lengthy healing

process as "eternal healing". The chronic nature of the disease has consequences in everyday suffering and the desire to hide their sick body.

Douglas (2001) drew attention to the experience of many patients who were the head of the family before the disease, with responsibility for others, but became dependent on other family members after the outbreak of the disease.

Negative psychological consequences of non-healing wounds caused by pain and insomnia can also have a negative impact on patients' well-being, which leads to "learned helplessness". Such feelings can also result in increased frustration, which in turn can affect the process of wound healing (Charles, 1995).

Franks et al. (2003) performed a twenty-week study, which clearly demonstrated that lower limb ulceration has a significant impact on the mental health of the patient; the healing process has a positive impact on the mental state. Charles (2004) showed improved mental health of participants, but also found a change in their ability to handle everyday problems and limitations associated with the disease.

Hyland (1994) described feelings of regret, anxiety, loss of power, powerlessness and lack of cleanliness. Of 50 respondents, 32 % felt that the wound dominates their body, 24 % reported episodes of crying as a result of chronic wounds and some stated that patients were thinking about their wound for up to two hours a day. The results of Hyland's study were later confirmed in another study (Iglesias et al., 2005).

Palfreyman (2008) reported that 65 % (n = 266) of respondents reported feelings of depression, most often due to pain associated with ulceration. This study was consistent with the findings of







other research, which pointed to improved mental health as a result of the associated successful wound healing.

For individuals, mental and physical health is inseparably linked, but very often treatment is focused only on the physical aspects of the disease. Everyday debilitating symptoms caused by a chronic wound of the lower extremity have a negative impact on the mental health of the patient, which in turn may influence the process of wound healing. The European Wound Management Association (EWMA) found a link between psychological well-being of the patient and fundamental physiological processes of wound healing (Moffat et al., 2008). Poor mental condition worsens wound healing, which may result in a vicious circle with significant negative health consequences for the patient.

### Economic aspects of chronic wounds of the lower extremities

Although it is not established that membership of a social class is related to a predisposition to chronic wounds of the lower extremities, some studies claim that disease duration and the number of episodes are longer in the lower social strata (Callie Harper and Dale, 1988). This research also claimed that 50 % of the study population (600 patients) were of working age and 21 % of them reported significant limitations associated with the disease or even complete absence from work.

Based on the reported prevalence of the disease and the fact that the literature argues that the peak prevalence of chronic wounds of the lower extremities is primarily within the age range from 65 to 80 years, in our analysis we use a conservative estimate that about 20 % of Slovak patients suffering from chronic wounds of the lower extremities are of working age, that is below

the age of 65. Of the total estimated number of 45,692 people affected by chronic wounds of the lower extremities, we consider about 9,138 to be of working age. Of these, Nelzena (2008) estimated that only about half are in contact with physicians, accounting for 4,569 patients of working age.

If we agree with the cited study (Callam, Harper and Dale, 1988), that about 20 % of patients have sick leave, then about 914 people of working age in Slovakia are incapacitated due to chronic lower extremity wounds.

According to Eurostat data, the average labour productivity in Slovakia in 2010 was about € 30,500. The annual shortfall in labour productivity due to the illness of a chronic lower extremity wound in Slovakia can therefore be as high as € 27,877,000.

### Conclusion

The main social impact of diseases that can be treated with MDT

- The most common disease which MDT can be used for is a chronic leg wound.
- In line with the international literature, we estimate that the Slovak prevalence of the disease is 1 %, which means that there are 45,692 people living with chronic wounds of the lower extremities (Minimum estimate 31,984, maximum estimate 59,400), with about half of them (22,846) being treated for this disease.
- If we consider restrictions on the use of MDT to only those patients whose chronic wounds are not healed after two years of therapy, then the number is estimated at 2,284–4,569.
- We estimate that approximately 914 people of working age in Slovakia are incapacitated due to chronic lower extremity wounds, and therefore the annual shortfall in labour







productivity due to illness of chronic lower extremity wounds in Slovakia can be up to € 27,877,000.

- Of the physical consequences of chronic wounds, perhaps the most important is pain, which often negatively affects not only the mental state of the patient, but also limits their social life.
- With pain, there are often associated limited mobility and sleep disorders.
- Difficulties in carrying out daily activities pose significant difficulties for many patients suffering from chronic wounds of the lower extremities.
- There has also been a significant loss of energy and lack of vitality detected.
- The wound exudates and odour cause patients to feel socially excluded.
- Social isolation is an important accompaniment of the disease.
- According to clinical trials, worsening of mental health, depression and anxiety are commonly found in patients with a chronic wound. Bad mental state prevents the wound from healing, which may result in a vicious circle with significant negative health consequences for the patient.

### An example of successful treatment using larval therapy

A 53-year-old hypertensive patient was admitted to the clinic with 3 month-old diabetic gangrene of the left Achilles tendon in order for MDT. The patient had diabetes mellitus, had been on PAD for about 10 years, and was taking medication irregularly; in a local hospital, amputation had been recommended.



Fig. 1 Necrectomy and excision of the left Achilles tendon



Fig. 2 MDT with direct application to defect



Fig. 3 Spontaneously granulated and epithelialized defect



Fig. 4 Completely healed defect

Under spinal anaesthesia, necrectomy and excision of the left Achilles tendon was performed (Fig. 1), followed by 4 cycles of MDT with direct application to defect (Fig. 2); the patient complained during the larval therapy of moderate pain. This treatment led to healing





of the defect, which spontaneously granulated and epithelialized (Fig. 3); after healing (Fig. 4), the patient observed plantar flexion limitations.

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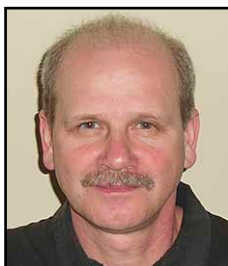
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## Radon and naturally occurring radionuclides as both a necessity and a risk: Geological aspects of a threat hiding in the nature

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### Summary

Ionizing radiation is a phenomenon that makes part of the life on Earth and brings considerable social benefits (applications in industry, in agriculture and food industry, in health service, in environment protection, in archeology and in antiquities' protection and study, in geology and hydroeconomics) as well as possible harmful effects on the human health. The protection against this type of radiation represents a complex issue that is focused mainly on the observation and the assessment of the radiation load coming from various sources, and also on different ways of reducing this radiation to the lowest level possible. The whole biosphere, human beings included, is situated from the very beginning of its existence in a sphere of a natural radioactive radiation that is, however, distributed rather unequally. Many studies prove the dominant influence of the natural sources of radiation: the inhalation of the decay products of radon accounts for almost a half of the global average of the radiation load of population. The main source of radon and other radioactive elements that can be found in the nature is the geological environment of rocks and soils.

### Key words

radon, radioactive elements in the nature, radon and radiation risk, geological basement, building sites

### Introduction

**Natural radioactivity** is produced by extra-terrestrial sources (the first type) and by radioactive elements dispersed in the Earth's crust (we talk about **terrestrial radiation** – the second and the third type). The naturally occurring radionuclides that are present in our environment can be divided into three categories according to their origin:

1. **Cosmogenic radionuclides** are continually produced by nuclear reactions during the interaction of the cosmic radiation with stable elements primarily in the outer atmosphere. Man is exposed to this sort of radiation externally (e.g.  $^{14}\text{C}$ ,  $^3\text{H}$ ,  $^7\text{Be}$ ,  $^{22}\text{Na}$ ) and the degree of radiation is conditioned by the elevation and the position on the Earth.
2. **Primordial radionuclides** came into existence approximately 4.5 billion years ago during the initial synthesis of the chemical elements that constitute the planets of the Solar System. Up to the present time, only those with sufficiently long half-life were preserved ( $> 10^8$  years, e.g.  $^{238}\text{U}$ ,  $^{235}\text{U}$ ,  $^{232}\text{Th}$ ,  $^{40}\text{K}$ ,  $^{87}\text{Rb}$ ). A large part of these radionuclides is already gone or no longer detectable due to their shorter half-life.
3. **Secondary radionuclides** come from primordial radionuclides that establish decay chains. Originally, they were present in four decay chains (uranium-radium chain that



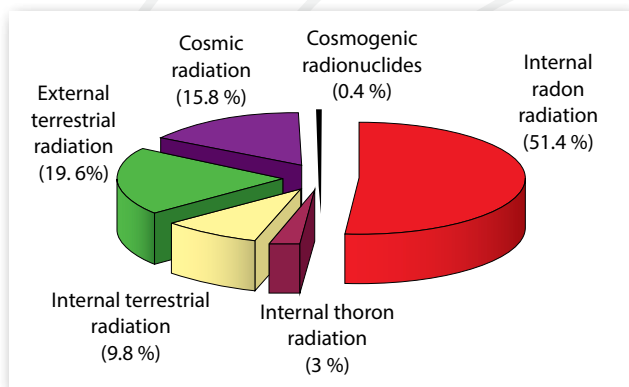




begins with  $^{238}\text{U}$ , thorium chain starting with  $^{232}\text{Th}$ , uranium-actinium chain starting with  $^{235}\text{U}$  and neptunium chain starting with  $^{237}\text{Np}$ ). Only the first three can be detected in the nature.

### Structure and origin of the radiation load of population

The Picture 1 presents the contribution of individual natural sources of ionizing radiation to the overall radiation load of population (Cabáneková and Nikodemová, 2013).



**Fig. 1** The contribution of individual natural sources of ionizing radiation to the overall radiation load of population (Cabáneková and Nikodemová, 2013).

The presence of uranium, thorium and potassium in rocks and soils (generally in a layer of a few dozens of centimeters in thickness) results in an **external** radiation by gamma radionuclides. Adding up all the constituents of the external terrestrial radiation, we obtain a final percentage of **19.6 %** that originates in geological (and soil) environment. **Internal** radiation, i.e. internal exposition that is due to **inhalation** of aerosol particles and **ingestion** of radionuclides in alimentation, is dominated by the following radionuclides: radon ( $^{222}\text{Rn}$ ), thoron ( $^{220}\text{Rn}$ ), the products of their decay (isotopes of polonium, lead and bismuth), and the isotope of potassium ( $^{40}\text{K}$ ). Adding up the individual percentages for

each of the components of internal terrestrial radiation, we obtain the figure of **64.2 %** (51.4 % + 3.0 % + 9.8 %), that is nearly 2/3 of the whole amount that has its origin in the geological and soil environment.

In total, the overall proportion of the terrestrial radiation coming from the geological environment represents as much as **83.8 %** (19.6 % + 64.2 %), which holds the specialists in the fields of geophysics, geochemistry and geology responsible for providing a detailed and a very precise description of the distribution of radioactivity in rocks and soils.

The average dose rate of the terrestrial radiation in the world is approximately  $0.057 \mu\text{Gy}\cdot\text{h}^{-1}$ . Slovakia belongs among the countries with an increased radon risk and its average dose rate of photon radiation in the natural environment, cosmic radiation included, amounts to  $0.1 \mu\text{Sv}\cdot\text{h}^{-1}$ , that is  $0.1 \mu\text{Gy}\cdot\text{h}^{-1}$  ( $0.1\cdot 10^{-6} \text{Gy}\cdot\text{h}^{-1}$ ). There are certain regions in the world, however, with extreme dose rates, such as **Brazil** ( $50 \mu\text{Gy}\cdot\text{h}^{-1}$ ), **India** ( $2 \mu\text{Gy}\cdot\text{h}^{-1}$ ) and **Iran** ( $1\text{--}10 \mu\text{Gy}\cdot\text{h}^{-1}$ ) (UNSCEAR, 2010).

### The quantity of radon in the environment

With regard to its effects on the human health and to the extent of human exposition to it, **radon** is the radioactive element that deserves our closest attention.

**Radon** is a naturally occurring gas without odour, taste or colour that is spread all over the Earth's surface. Its proton number is 86 and it is commonly observed in the nature in form of three radionuclides (isotopes). Table 1 indicates the decay chain they belong to (the first column), their half-life (the third column) and the historical designation used for them (the fourth column).







Tab. 1 Isotopes of radon

Decay chain	Radionuclide	Half-life	Name
Uranium $^{238}\text{U}$	$^{222}\text{Rn}$	3.82 days	Radon, Rn
Uran-actinium $^{235}\text{U}$	$^{219}\text{Rn}$	3.92 sec	Actinon, An
Thorium $^{232}\text{Th}$	$^{220}\text{Rn}$	55.3 sec	Thoron, Tn

The concentration (volume activity measured in becquerel per cubic meter –  $\text{Bq}\cdot\text{m}^{-3}$ ) of radon in the soil air depends on the concentration of uranium and thorium in rocks and on the physical specifications of the latter. The **volume activity of radon** in a rock environment is proportional to the **activity concentration** in such environment, to its density and to the **coefficient of the emanation** of radon; by contrast, it is inversely proportional to the porosity of this environment.

According to a report published by UNSCEAR in 1988, the average concentration of **radon in the soil air** is in the **range between 8,000 and 16,000  $\text{Bq}\cdot\text{m}^{-3}$**  (Matolín, 1994).

From a regional point of view, the volume activity of radon in regular concentrations of radium in a rock complex is influenced by changes in density and porosity of the environment. Therefore, soil, air or water function as intermediaries of the transfer of radon from the rocks into the atmosphere.

In an open environment, radon contained in the atmosphere is highly diluted by atmospheric gases, and hence, its volume activity is relatively low. Based on measurements of the volume activity of radon in ambient air, the global estimate of the concentration of  $^{222}\text{Rn}$  in air reaches approximately **4  $\text{Bq}\cdot\text{m}^{-3}$**  (UNSCEAR, 2010).

According to data provided by UNSCEAR, the average concentration of **Rn in the living space in the countries of the European Union is 60  $\text{Bq}\cdot\text{m}^{-3}$**  (UNSCEAR, 2010).

### Concentration of radon on building sites

Radon can penetrate a building in various ways: firstly, through cracks in the building itself (particularly through cracks in its foundations); secondly, owing to a direct contact of the building with soil; thirdly, through gaps in water pipes and cabling and other structural defects (Picture 2). A certain amount of radon is contained also in water sources, in the surroundings of the building, even in the building materials.



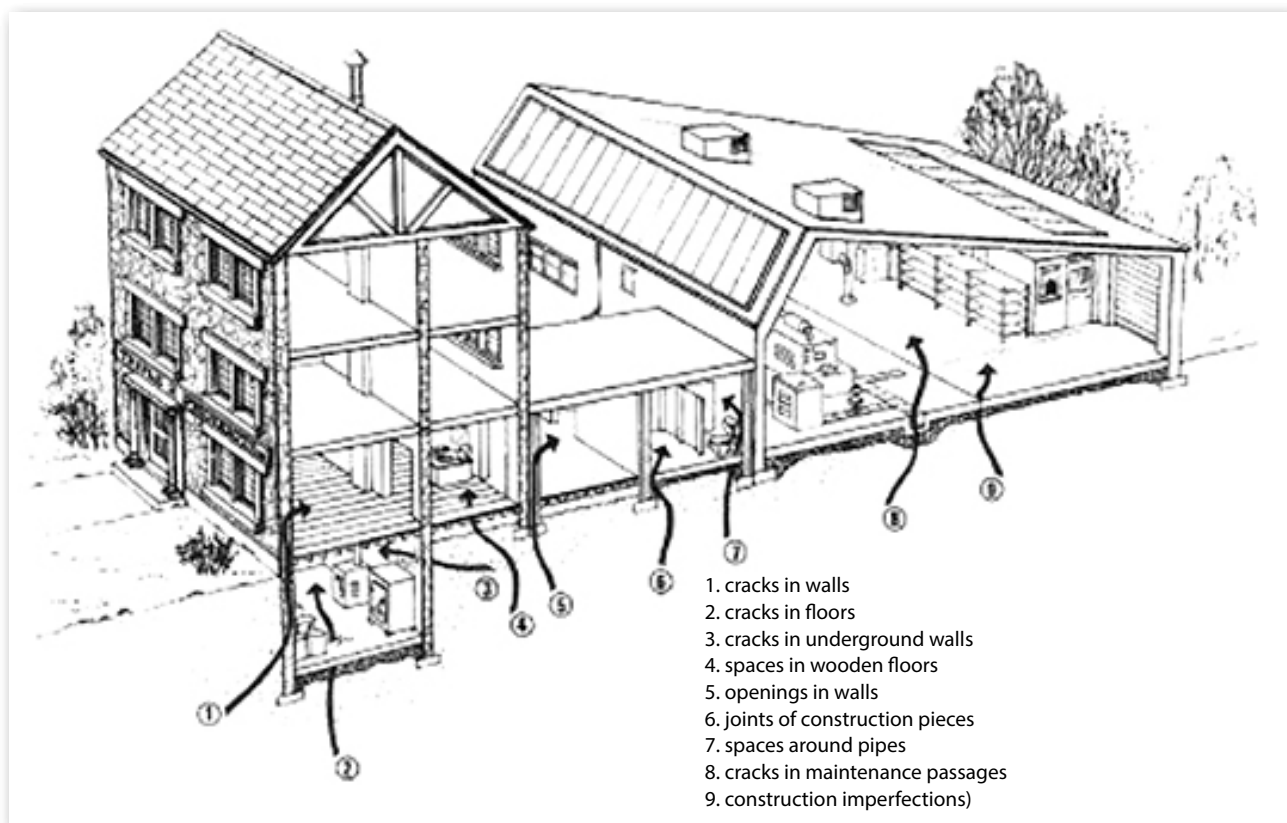


Fig. 2 The ways radon penetrates houses (Jiránek, 2000)

As shown on Picture 3 below, the main source of radon in houses is the geological bedrock. The concentration of radon inside a specific house is closely linked to the radon concentration in the bedrock, to its gas permeability and the degree of insulation of the housing object. The largest part of the radon supply into the rooms of a house is represented by the active intake of radon by the building (a phenomenon known as “the chimney effect”). This intake increases with a growing difference between the room temperature and the outside temperature, which leads to a negative pressure in the building. All this, in case anti-radon measures are not followed, can result in a high accumulation of radon and its decay products in the house.

However, it is relatively simple to eliminate the excessive radon concentration by adopting various corrective measures.

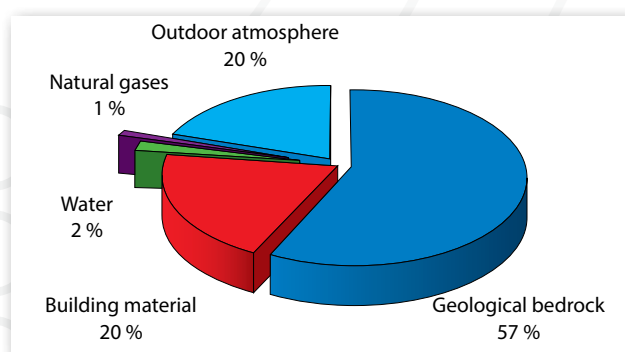


Fig. 3 The proportion of individual sources of radon in its concentration in a house (Cabáneková and Nikodemová, 2013)



### The current state of geophysical assessment of radioactivity in geological environment

The results of all airborne, carborne, ground, well-logging and mine surveys, as well as radiometric and gamma spectrometric research carried out in laboratory conditions and soil gas radon emanometry made since 1947 are processed in databases maintained by the State Geological Institute of Dionýz Štúr under the administration of the Ministry of Environment of the Slovak Republic.

Geophysical measurements of radioactivity in rocks were realized:

- until the 1990s exclusively for the purpose of detecting deposits of raw radioactive material destined for exploitation
- since the 1990s for environmental purposes in order to assess geological factors of the environment.

The data obtained by these surveys are accessible to the public on the web portal of the State Geological Institute of Dionýz Štúr (<http://www.geology.sk/new/sk/node/740>) in form of maps (Picture 4).

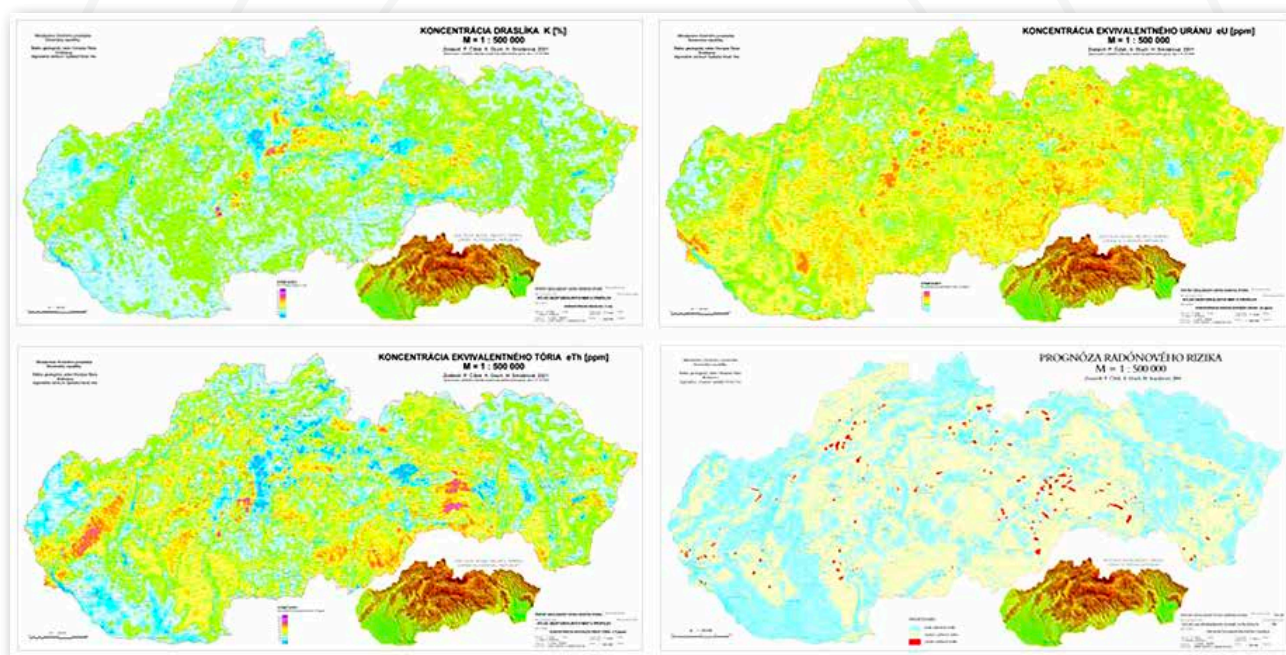


Fig. 4 Maps showing the concentration of K, U, Th and the prognosis of radon risk for the whole area of the Slovak Republic (<http://www.geology.sk/new/sk/node/740>).

### Measurement density of the densest measurements

- on the scale 1:25,000 – 1 referential sample (0.1–0.4 ha) for every 0.5 km<sup>2</sup> for measurements of natural radioactivity of rocks and
- on the scale 1:25,000 – 8 referential areas (0.1–0.4 ha) for every square kilometer in case of measurements for the Rn risk prognosis

From the point of view of the current need of a realistic assessment of the level of exposition, this density is of course far from being **sufficient**. In consequence, all of these maps have a purely **informative character**. At present, **interpolated** and **extrapolated** radon values measured in geological bedrock or in houses are no longer needed. It is necessary to obtain **specific local**



**data** (the question of the legislative, the raising of public awareness and the financial aspect of a potential research).

### Assessing the real radon risk on a building site due to its geological bedrock

The **real radon risk** (not the risk simply derived from the collected data) conditioned by the rock and soil environment is measured by the **method of assessing the radon risk owing to the geological bedrock** of a particular building site. The methodology is currently regulated by the Act of the Ministry of Environment of the Slovak Republic No. 528/2007 Z.z.

- The measurements are carried out in great detail: within an area of 10 m × 10 m or smaller.

- Minimum of 15 measurements of the volume activity of  $^{222}\text{Rn}$  in the soil gas at depth of 80 cm must be made (with the average value in form of their third quartile).
- It is necessary to provide an analysis of the soil permeability (with its characteristic maximum value) on samples taken from at least three different spots on the building site.

These measurements can be realized exclusively by an officially authorized person with a valid certification of its methodology and equipment.

The category of radon risk (low, average or high) is assessed on the basis of data presented in Table 2.

**Tab. 2** Radon risk categories (Regulation of the Ministry of Environment of the Slovak Republic No. 1/2000-3)

Radon risk category	Volume activity of radon in soil air [ $\text{kBq}\cdot\text{m}^{-3}$ ]		
	Permeability of basement		
	low	medium	high
low	< 30	< 20	< 10
medium	30–100	20–70	10–30
high	> 100	> 70	> 30

If the **values stated in the first line** of Table 2 are exceeded (Act of the Ministry of Environment of the Slovak Republic No. 528/2007 Z.z.), it suggests that measures must be taken to avoid excessive radon penetration from the bedrock. In such cases, it is necessary that the project manager or the builder in charge of construction of the house should put forward additional technic and technological adjustments to remedy this situation.

### Conclusion

Geophysical surveys that are carried out in order to learn more about the distribution of naturally occurring radioisotopes in a layer close to the surface have provided up to now data for the whole area of the Slovak Republic. However, it remains arguable whether these surveys were sufficiently detailed and thus, whether the results obtained by them are adequate enough to be used in other fields, especially in that of regional and spatial planning. A potential solution might be provided by in-depth measurements of concentration of various chemical substances in geological bedrock, radon in particular, that are already being realized using the method of







assessment of radon risk category on specific building sites. Although this method has been used in Slovakia since the 1990s, due to continuous legislative deficiencies, an insufficient public awareness campaign, as well as a general lack of financial support, it has covered so far only a very small portion of the Slovak territory. Another problem that concerns not only Slovakia but the European Union as a whole is a low percentage of housing with a determined radon index. This issue is currently addressed by, among others, The European Radon Association (ERA), [www.radoneurope.org](http://www.radoneurope.org). A cooperation between geologists, experts in natural medicine and radiation hygienists is possible for example in the field of measuring and identifying zones of geological fault zones in built-up areas (by measuring radon concentration in houses and subsequently adopting necessary corrective measures). Another issue that deserves not to be forgotten is a progressive establishment of a database of in-depth radon surveys realized both in geological bedrock and in houses.

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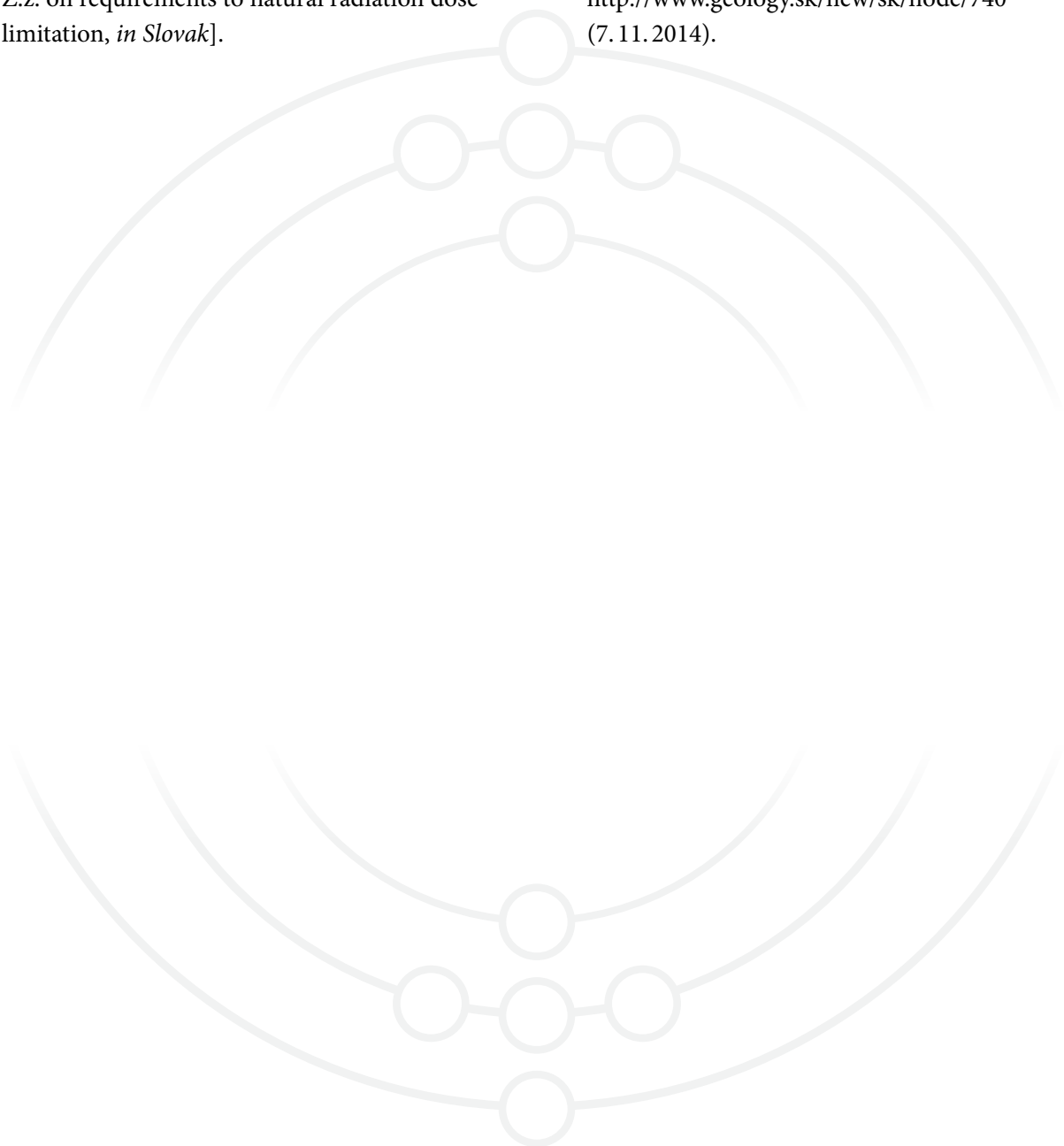
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## Antioxidants from plants in human nutrition and improving of health

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### Abstract

The aim of this study was to analyse of results and findings of the evaluation of antioxidant activity in different plant parts of six plant species and also food products from them. In aqueous extracts of dried fruits of rose (*Rosa canina* L.) without boiling, we determined the antioxidant activity by DPPH method from 65.97 to 89.01 %, while classically cooked tea ranged from 86.38 to 91.77 %. In so-called. “elderberry honey from flowers” 86.20 %, “honey” from the flowers of dandelion (*Taraxacum officinale* auct. Non Weber) 41.41 %, in ethyl alcohol extract of the flowers of elderberry (*Sambucus nigra* L.) 88.77 %, in the traditional tea from elderberry flowers 80.68 %, ramsons – wild garlic (*Allium ursinum* L.) from 1.83 to 3.03 % in aqueous extracts and from 3.83 to 5.54 % in methanol extracts, in dried fruit pulp of ziziphus jujuba (*Ziziphus jujuba* Mill.) in aqueous extracts from 8.85 to 82 %, in methanol extract from 14.24 to 85.52 %, fruit of american pokeweed (*Phytolacca americana* L.) 37.49 % of the aqueous extract and 88.81 % in the methanol extract. In a model experiment, in dry fresh fruit we determined the total carotenoid content in the range from 1.52 to 14.31  $\mu\text{g}\cdot\text{g}^{-1}$ , polyphenols from 8.76 to 21.61 mg GAE $\cdot\text{g}^{-1}$  and flavonoids from 1.49 to 11.58 mg QE $\cdot\text{g}^{-1}$ . Between antioxidant activity and carotenoid content, we identified negative dependence ( $r = -0.643$ ). Between polyphenol content and antioxidant activity, we found a very weak and statistically inconclusive dependence. The results of this study demonstrate that plants from various species exhibit antioxidant activity

at different levels. Low antioxidant activity of plant part may include a number of biologically active components, whose effects on the human body can be different, it means very positive but also very negative. The actual effects may be elevated or reduced by the consuming of other food, synthetic drugs, antibiotics, nutritional supplements, herbal teas and also fresh fruits and vegetables.

### Key words

antioxidant activity, tea, extracts, dry fruits, traditional herbal products

### Introduction

In recent years we have seen a great interest in research, pharmaceutical as well as medical and consumer community with antioxidants and antioxidant therapy. Botanists and agronomic community are seeking less known plant species as a potential and new source of food for the pharmaceutical, cosmetic and other uses of their specific biologically active substances. We replaced the important collection of medicinal plants by our grandmothers with growing in monoculture with the application of agropesticides. Biochemists reveal every day new biologically active components in different plant parts of traditional, less known and less-used plant species. Pharmacists discover in the various experiments new phytotherapeutic and antioxidant effects of hundreds of biologically active components. Manufacturing companies compete in innovation programs and are flooding the market with their nutritional supplements





and other products with guaranteed positive effects in the treatment of various diseases and improving health. Consumers community within self-medicine, quick recovery and maintaining body in good condition don't hesitate to consume many products derived from official pharmacies, but also from various online stores that offer products with guaranteed effects.

The phenomenon of antioxidants, antioxidant therapy and the use of different biologically active components became literally a fashion trend. According to bibliometrics studies realized in years 1991 to 2010 there were more than 114,000 studies published regarding antioxidants, most in the USA, Japan, China, Italy and Germany. Other countries do not delay also in this studies.

Actual antioxidants consist mainly of two major groups, polyphenols and flavonoids.

Polyphenols are characterized as secondary plant metabolites that are involved in the protection of plants from UV-radiation and other stress factors of the growing environment, while they are actively involved in the immune system, and also in development of tolerance against various diseases, pests and pathogens. These are compounds with one or more aromatic rings and one or more hydroxyl groups (Liu, 2003). In plants mainly phenolic acids are represented that are structurally classified into acid esters of hydroxybenzoic acid (such as salicylic and vanillic acid) or hydroxycinnamic acids (such as ferulic acid). In our diet are mainly ferulic acid and its derivatives dominant. Polyphenols are one of the most numerous and most abundant group of plant metabolites, while at the same time also constitute valuable micronutrients and are an integral part in the human nutrition and animal feed mixtures. In the traditionally used plants and commonly consumed fruits, vegetables and juices from them are over a

hundred polyphenolic compounds known, sometimes in higher concentrations (Süli et al., 2014). Significant antioxidant properties and also many other beneficial effects on human health were found in many of them. The active effect of polyphenols in different physiological processes is doubtless, although it is not yet satisfactorily explained.

Research teams from the whole world are studying the impact of polyphenols on human health. Polyphenols and their metabolites on human health have many positive effects. We know them as important antioxidants, which have influence on the activity of several enzymes, DNA repair, have antiviral, antimicrobial, antimutagenic, anticarcinogenic, hepatoprotective, anti-allergic, immunomodulating and anti-inflammatory effect. They lower blood pressure and cholesterol levels, have beneficial effects in the prevention of atherosclerosis and cardiovascular diseases. Epidemiological studies confirm reduced risk of free radical diseases (cancer, cardiovascular diseases, neural degenerative diseases and others) with increased consumption of fruits and vegetables, which can be due to a synergistic action of different polyphenols and other bioactive compounds present in these natural sources (Kadrabová et al., 2005).

A number of positive effects on human health of the polyphenols are primarily associated with the antioxidant activity of these components. Most studies of polyphenolic substances are oriented on the study of their antioxidant properties. This confirms an enormous increase of publications related to the study of this issue (Obied, 2013).

Flavonoids are the next important group of biologically active substances of plants. Flavonoids represent one of the groups consisting of polyphenols and 15 carbon atoms, two benzene cores linked with 3 carbon chains.





Due to the presence of polyhydroxy groups in the molecule they act as free radicals quenchers and together with other mechanisms also have anti-inflammatory effects (García-Lafuente et al., 2009). Based on their ability to destroy free radicals and reactive oxygen species (ROS) they have been identified as natural “antioxidants at a high level” (Cuppett and Clifford, 2000). The antioxidant capacity of many flavonoids is much higher than antioxidant capacity of vitamin C and E (Prior and Cao, 2000). Flavonoids can prevent free radical damage by following mechanisms: a) direct uptake of reactive oxygen species; b) activation of antioxidant enzymes; c) chelation of transition metals; d) reduction of  $\alpha$ -tocopherol radicals; e) inhibition of oxidases; f) relieving the oxidative stress caused by NO; g) an increase of uric acid; h) enhancement of antioxidant ability of low molecular weight antioxidants (Procházka et al., 2011). Despite the extension of findings about biologically active compounds and the antioxidant activity in the known and less-known plant parts there is an unanswered question of their use in the form of juices, extracts or other forms related to the use of synthetic drugs and antibiotics. Particularly various forms of drug interactions that create increasing problems controlling modern therapeutic treatments. This means that the interaction between drugs and food components may significantly affect the therapeutic effect of drugs, and thus make them useless or even dangerous. Although flavonoids are considered to be non-toxic components of common foods, they can significantly affect the pharmacological activity of certain drugs. One of the first examples of this complication was observed in a kidney dialysis ward, in which patients with a stable kidney transplant received drugs that improved blood circulation. Some of these patients consumed grapefruit juice with their meals, but soon after they suffered the deleterious effects of the increased potency of their medication. This phenomenon was chosen as the

topic of a medical dissertation at the University of Kiel in 1998, and the effect was confirmed in a controlled, prospective project. Several authors have confirmed that the flavonoid naringenin, which is present in significant concentration in grapefruit juice, activates phosphoglycoprotein in the epithelial cells of the intestine and suppresses the expression of the cytochrome P450 and 3A4 gene. Cytochrome in our body is very important substance, as it helps us to metabolize drugs and various other xenobiotics. The former protein enhances the uptake of many drugs from the intestine, including vinblastine, cyclosporine, digoxin, fexofenadine, and losartan, and the latter initiates the oxidative decomposition of the drugs. Since the drugs mentioned are used frequently in the therapy of cancer, hypertension, HIV, immune disorders, and other serious conditions, any interference with their bioavailability has to be taken into consideration by clinicians. Although grapefruit juice contains a number of flavonoids, naringenin is in quality and quantity considered an essential ingredient. Further studies about various flavonoids, particularly quercetin have confirmed the ability of some of these substances to affect the effectiveness of different types of drugs, in particular for the treatment of blood pressure (Havsteen, 2002). Since flavonoids are ubiquitous to food products from plants, the lesson to be learned from these observations is that nutrition and medication must be considered together in future therapy plans.

### Material and Methods

We experimentally evaluated the antioxidant activity of two groups of plant products. In the first group we tested antioxidant activity by DPPH method of plant products from the following species of plants: rosehip (*Rosa canina* L.) – fruit extracts prepared in various ways in an aqueous extract with different lengths of extractions without boiling and teas from dried fruits with





cooking, dandelion (*Taraxacum officinale* auct. non Weber) – so-called “honey from flowers”, elderberry (*Sambucus nigra* L.) – so-called “honey from flowers prepared by traditional technology and flower extract in 75% ethanol, ramsons – wild garlic (*Allium ursinum* L.) and american pokeweed (*Phytolacca americana* L.). In a separate model experiments we evaluated the dry pulp of the fruit of 15 genotypes ziziphus jujubs (*Ziziphus jujuba* Mill.) for the content of carotenoids, polyphenols, flavonoids and antioxidant activity determined using the method DPPH and phosphomolybdenum method.

### Results and discussion

The determination of polyphenols, flavonoids and other groups of biologically active components in plant parts used in relation to the antioxidant activity is not so simple and unambiguous. Some confusion we can notice in some of the results in the evaluation of this issue of some plant products.

The most frequently used traditional medicinal drink in Slovakia is tea made of dried fruits of rose. In traditional medicine it is used in treating many diseases. Egea et al. (2010) were comparing antioxidant activity of the extract of the rose to the synthetic antioxidants such as butylhydroxyanizol (BHA), butylhydroxytoluene (BHT) and propylgallate in *in vitro* system and determined that natural antioxidants are much more effective, and pointed out their importance in the diet. Similar results confirmed other research groups as well (Dai et al., 2007; Farghali et al., 2013).

These findings we have confirmed in our experiments. In the first experiment, we evaluated the antioxidant activity in the extracts of the fruit of the rose prepared by 12 various methods in an aqueous extracts of different lengths of extraction without additional cooking. Antioxidant acti-

vity determined by DPPH method ranged from 65.97 to 89.01%. Our achievements fully correspond to the findings by Fattahi et al. (2012), who determined the average antioxidant activity of the extracts from the fruit of the rose 87.78 %. This means that the wisdom of our ancestors in this case is justified. Many compounds from plant parts are also emitted in the aquatic environment without heat treatment, since water is a very good polar solution, wherein the beverage thus prepared from fresh or even dried fruits, leaves, flowers, bee pollen and other plant parts may have high antioxidant activity. So, on the one hand they can be very good and refreshing drink but on the other hand its use with synthetic drugs or antibiotics, can also cause many health unpleasantness.

In the second phase we prepared a tea from the fruit of the rose in 12 variants with classic cooking. In the variants we identified even higher antioxidant activity than in variants without cooking in range from 86.38 to 91.77 %. The results clearly confirm the effect of ascorbic acid and a number of other biologically active compounds contained in the fruit of rose on the antioxidant activity of the tea.

Inhabitants of many regions currently are using so called “honey” prepared from the flowers of dandelion, elderberry or from other plant species as a replacement for the original honey or as healing agent. At the same time there are still alcoholic extracts from black elderberry flowers and other species used in folk medicine. In the experiment, we determined the antioxidant activity from many traditional products. In “honey” of dandelion flowers we determined the antioxidant activity 44.41 % and in “honey” from elderberry flowers 86.20 %. As a control, we used pure honey from acacia, in which we determined the antioxidant activity only 17.83 %.







High antioxidant activity we determined in the extracts from elderberry flowers. In ethanol extract the activity was 88.77 %, in the traditionally cooked tea from the elderberry flowers the activity was 80.68 %. However, it is not excluded that different combination of biologically active components such as in teas can have influence on the antioxidant activity of elderberry flowers in ethanol extract.

In the experiment we included the evaluation of the antioxidant activity of ramsons – wild garlic leaves which became a literally miraculous resource of detoxification and clearing the human body. In the leaves we have determined very low antioxidant activity in the range of 1.83 to 3.03 % in aqueous extracts and 3.83 to 5.54 % in methanol extract. That does not mean that the value of this plant species as herbal medicine is very low. Not every biochemical complex in plant parts will be reflected in high level of antioxidant activity. And it does not depend on the total content of polyphenols or flavonoids either. The results indicate that the effect of the plant cannot be completely assessed on the basis of antioxidant activity. Ramsons, despite the low antioxidant activity is characterized by strong detoxifying and immunomodulatory effects, mainly due to the sulphur compounds that are typical for the family *Aliaceae*. That is, at the complex assessment, we must also take into account that some of the compounds do not have to be present at high concentrations for its effect. We must also take into account that even the high antioxidant activity is not always the most important. There is evidence that high concentrations of antioxidants can have pro-oxidation effect, meaning that they may increase the formation of undesirable compounds in our body. Therefore, in preparation of tea, not only from medicinal plants but also green tea, black tea one has to observe the optimum dose written on the packaging and not to overdo it with a

concentration, because many people mistakenly think that when they make strong liquor it enhances the effect of plants on the body.

We included pokeweed fruits in the experiment. This type grows well in our country and from time immemorial the anthocyanin colour of the fruit was used for colouring food in the household. Fruits of this species and related species of pokeweed are used for colouring wines, liqueurs and sweets. However, this plant is not suitable for the preparation of teas and strong concentrates since all parts of the plant contain toxic saponins. We determined the content of antioxidants in fruits from 37.49 % in aqueous extracts to 88.81% in methanol extract. The results showed that the poisonous plants have high antioxidant activity. However, this does not mean that we can use them on our own and justify their negative effects by high antioxidant activity. These plants contain high levels of polyphenols but like the flavonoids in grapefruit juice interfere with the metabolism of our body and block important enzymes, resulting by damaging vital organs of our body. A typical example of this is plant *Leonurus cardiaca* plant that is used in low concentrations for the treatment of heart problems, but at higher concentrations of the other hand, can cause serious disorders. Therefore it is very important to thoroughly study the effects of any plant used for treatment and to distinguish plants that can be taken in long-term without side-effects from plants that can have negative effects on our body. The plants must be taken under the supervision of a medical doctor and therefore, any spontaneous consuming of these plants with the potential negative effects on the human body is very risky.

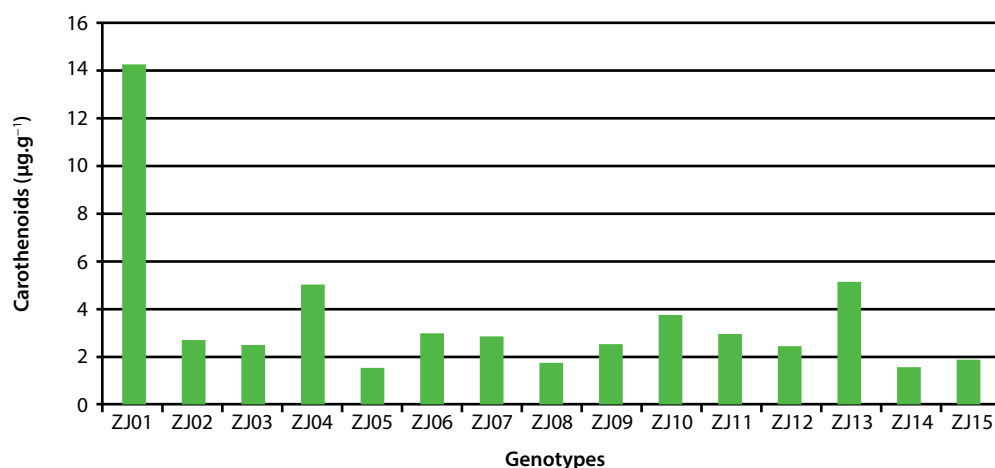
One from such species which increases the interest of producers and consumers is ziziphus jujuba (*Ziziphus jujuba* Mill.) in English known as Chinese date or red date.





In the experiment we evaluated fruits of 15 genotypes collected during their full technological ripeness. Figure 1 shows a comparison of genotypes in the total carotenoid content. From the comparison we can see that carotenoid content ranged from of 1.52 (ZJ05) to 14.31  $\mu\text{g.g}^{-1}$  (ZJ14). Guil- Guerrero et al.

(2004) determined the carotenoid content of fruit in the range of 4.12 to 5.98 mg/100 g in dry matter, San and Yildirim (2010) determined it in four genotypes ziziphus jujuba in range 7 to 35 mg/100 g in fresh fruits. Comparison of the results shows matching of the results.

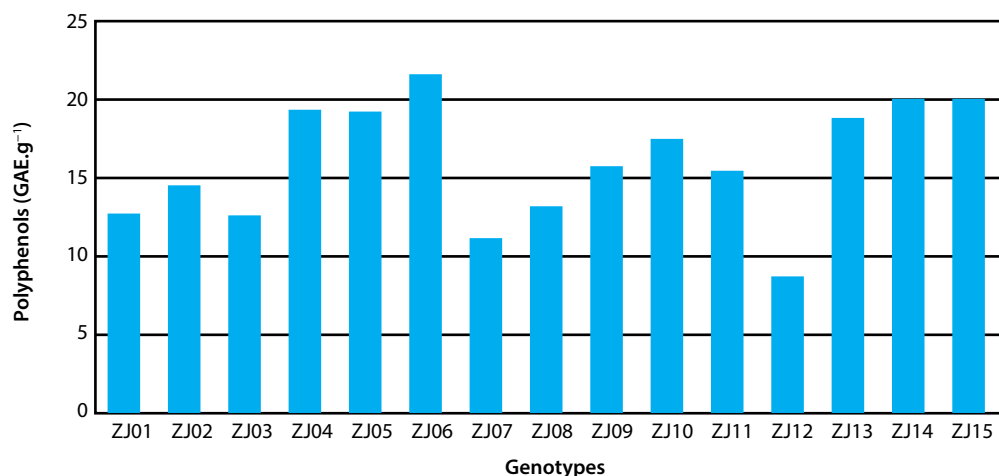


**Fig. 1** Comparison of the evaluated genotypes of ziziphus jujuba (*Ziziphus jujuba* Mill.) in carotenoid content ( $\mu\text{g.g}^{-1}$ ) of dried fruits

In the same samples we determined the polyphenol content in range from 8.76 mg GAE (gallic acid equivalent). $\text{g}^{-1}$  (ZJ12) to 21.61 mg GAE. $\text{g}^{-1}$  (ZJ06) as figure 2 shows. High variability is confirmed by the value of the coefficient of

variation ( $V = 23.60\%$ ). Shad-Ali et al. (2014) determined average phenolic content in dried fruits from 5.78 mg GAE/g in hexane extract and 21.74 mg GAE/g in methanol extract.

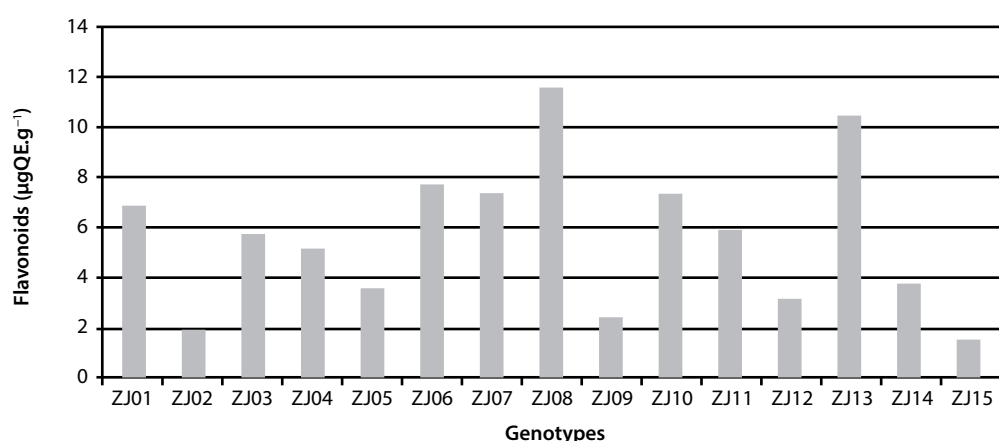




**Fig. 2** Comparison of the evaluated genotypes of ziziphus jujuba (*Ziziphus jujuba* Mill.) in total polyphenol content (mg GAE.g<sup>-1</sup>) of dried fruits

In the same samples we measured the content of flavonoids as well. In the evaluated genotypes of ziziphus jujuba we determined flavonoid content in the range from 1.49 (ZJ15) to 11.58 µg QE (quercetin equivalent).g<sup>-1</sup> (ZJ08) as shown in Figure 3. The high variability in tested collection confirmed coefficient of variation ( $V = 53.19\%$ ).

Shad-Ali et al. (2014) determined in the fruits flavonoid content from 3.25 mg QE/g in hexane extract and 15.66 mg QE/g in methanol extract. Pawlowska et al. (2000) determined the presence of ten flavonoids in their study. Some representative flavonoids are described in the study of Gong et al. (2000).



**Fig. 3** Comparison of the evaluated genotypes of ziziphus jujuba (*Ziziphus jujuba* Mill.) in total flavonoid content (µg QE.g<sup>-1</sup>) of dried fruits



We have established the antioxidant activity in the flesh of dried fruits by three methods.

By DPPH method we determined the antioxidant activity in the range from 11.18 mg TEAC (Trolox equivalent antioxidant capacity).g<sup>-1</sup> (ZJ01)

to 16.82 mg TEAC.g<sup>-1</sup> (ZJ08). Moderate variability in a test collection confirms the value of the coefficient of variation ( $V = 10.68\%$ ).

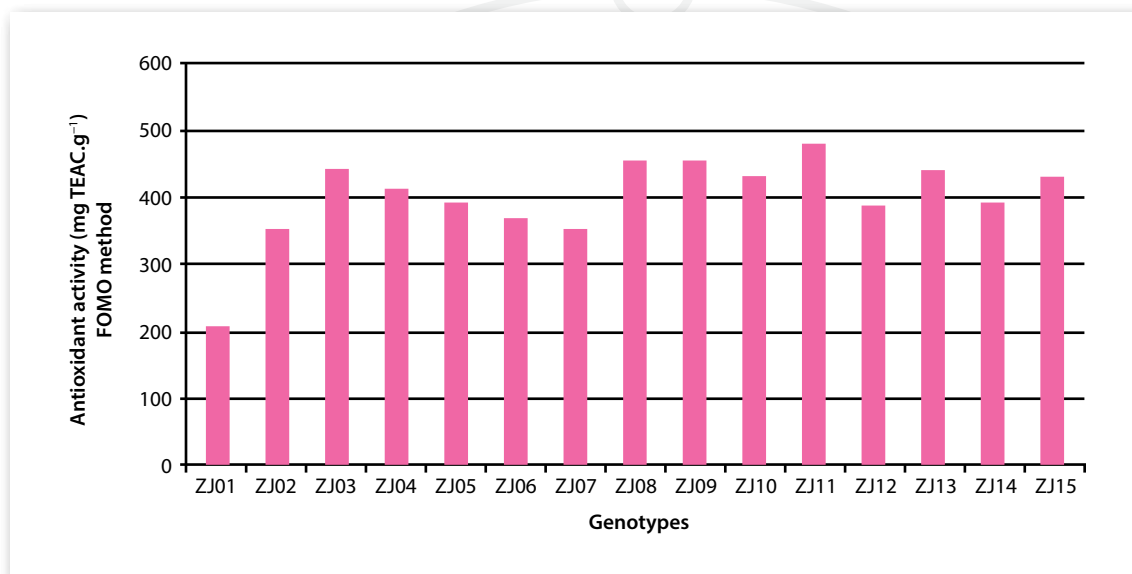


Fig. 4 Comparison of the evaluated genotypes of ziziphus jujuba (*Ziziphus jujuba* Mill.) in antioxidant activity by FOMO method (mg TEAC.g<sup>-1</sup>) of dried fruits

By phosphomolybdenum method we identified antioxidant activity in samples of dry fruits in the range from 209.64 mg TEAC.g<sup>-1</sup> (ZJ01) to 481.54 mg TEAC.g<sup>-1</sup> (ZJ11). The average degree

of variability in the test collection is confirmed by the value of the coefficient of variation ( $V = 16.36\%$ ). Genotypic comparison of antioxidant activity by this method is presented in Figure 4.



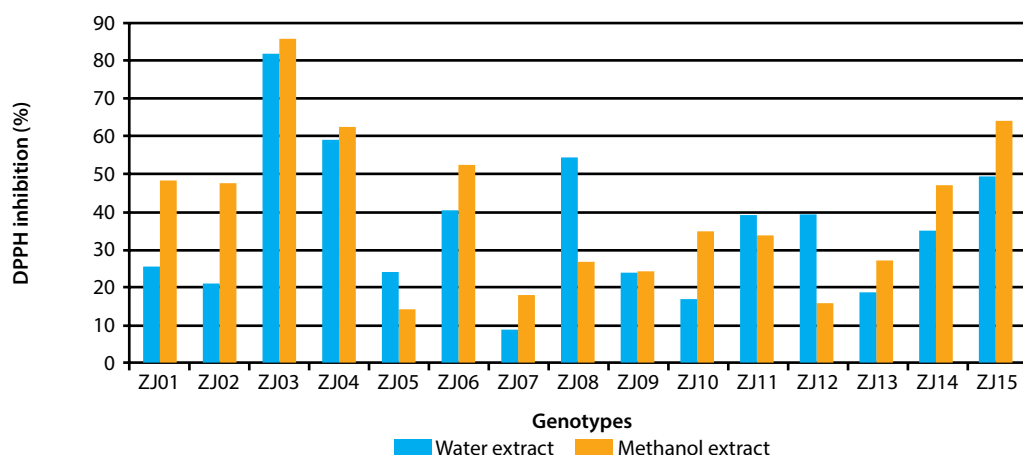


Fig. 5 Comparison of the evaluated genotypes of ziziphus jujuba (*Ziziphus jujuba* Mill.) in antioxidant activity by DPPH method in water and methanolic extracts (%) in fresh fruits

Also, we determined the antioxidant activity of fresh fruit genotypes ziziphus jujuba by DPPH method. In the water extract we determined the antioxidant activity in the range from 8.85 % (ZJ07) to 82 % (ZJ03), in methanol from 14.24 % (ZJ05) to 85.52 % (ZJ03). Genotypic comparison of antioxidant activity in the given method is presented in Figure 5. The comparison showed that there are significant differences among genotypes. Genotype ZJ01, ZJ02, ZJ15 and others we have set a higher antioxidant activity of methanol extracts as aqueous extracts. For genotype ZJ08, ZJ12 and at others we determined the opposite situation. Genotype ZJ09 and at others we have identified the same antioxidant activity in aqueous and methanol extracts.

Parkash et al. (2013) determined in the dried fruits of ziziphus jujuba average antioxidant activity in range from 69.7 to 4.3 %. Gündüz and Saracoglu (2014) determined antioxidant activity in fresh fruit ziziphus jujuba according to degree of ripeness. The results of the study, where antioxidant activity of ziziphus jujuba was also evaluated by three methods, have shown that the

antioxidant activity was the highest at the second respectively third stage of ripening. The lowest was at the first and final stage of ripening. Shad-Ali et al. (2014) determined the antioxidant activity in the alcoholic extract from 34.9 to 47.3 %. The study of Wang et al. (2013) showed that the value of antioxidant activity in the exocarp is significantly higher than in the flesh of green maturity, white and brown maturity – in all three monitored phases of ripening.

In the next part we determined the relationship between the content of the tested bioactive components and antioxidant activity determined by various methods. We have determined a statistically significant strong negative dependence between the content of carotenoids and antioxidant activity in ethanol extract of dry fruit ( $r = -0.643$ ) and antioxidant activity in dried fruits determined by phosphomolybdenum method ( $r = -0.732$ ).

We did not detect a statistically significant dependence between polyphenol content and antioxidant activity. We identified a strong







statistically significant dependence only between the values of antioxidant activity in fresh fruits of *ziziphus jujuba* in aqueous and methanol extract ( $r = 0.695$ ). We determined a medium strong dependence between the values of antioxidant activity assayed in fresh fruits of *ziziphus jujuba* in aqueous extract and antioxidant activity in ethanol extract of dry fruits ( $r = 0.403$ ) and by the phosphomolybdenum method ( $r = 0.335$ ). These results clearly confirm that the antioxidant activity and the content of carotenoids, polyphenols, flavonoids, is not in direct correlation certainly. That means that each method with the appropriate extract takes different combination of biochemical compounds into account.

The presented results of antioxidant activity of plant parts and evaluated plant products document the complexity of the issue. Not every researcher has the technical and financial capabilities to provide comprehensive content of the present compound in the assessed plant part, while also to determine their antioxidant activity by a couple of methods to learn about dependencies between biochemical and antioxidant activity. All this is insufficient, because in this cognitive process it is most important to know the therapeutic effects on human metabolism, and even more important to know the biochemical interactions and especially the specific biologically active compounds used as synthetic drugs and antibiotics by patients.

In the past, treatment of diseases was mainly realized only with the application of plant products and plant formulations. Synthetic drugs were taken in small extent. Therefore, there was no risk for adverse interactions between application of natural and synthetic drugs. At present there is an opposite problem. Patients often take a more of diverse synthetic drugs and antibiotics but using different teas or supplements of the plant extracts

that contain dozens of different polyphenols at the same time. Several authors (Veronese et al., 2003) warned about the negative interaction between pharmaceutical medicaments and polyphenols in their work. Some drugs such as benzodiazepines, and terfenadine or statins has 3 times higher efficiency with grapefruit juice, which is rich in naringenin (Veronese et al., 2003), but mainly in furanokumarins (Schmiedlin-Ren, 1997). Therefore, the beneficial effect of plant extracts may in contrary cause damage to the body. For the correct use of medicaments it is therefore more suitable not to combine it with polyphenols in food supplements. It is important that your doctor or pharmacist to highlight this fact. The big problem, however, is that supplements are not included under medical control and the medical doctor can not inform the patient about their use (Farghali et al., 2014).

Analysis of some problems proves that the solution of this issue is necessary on an interdisciplinary level, breeders, growers, processors, biochemists, pharmacists and medical doctors and other professions.

## Conclusions

In the case study, we presented results from the evaluation of the antioxidant activity of various plant parts, the traditional preparations and extracts from various kinds of known and less-known species.

We confirmed that the extracts of dry fruits of rose in water without boiling showed a high antioxidant value.

High values of antioxidant activity showed also so-called "honeys" prepared by extraction of flowers from elderberry and dandelion with a concentrating it in saccharose. The values of antioxidant activity were higher than antioxidant activity in real elderberry honey.





In the leaves of ramsons – wild garlic we have determined very low levels of antioxidant activity, although this species is considered as medicinal plant with high phytotherapeutic effects. Results don't refuse this knowledge.

The high antioxidant activity we also determined in the fruit of pokeweed which also contains toxic saponins.

In the evaluation of the fruits of red date we confirmed significant differences in the content of carotenoids, polyphenols, flavonoids and antioxidant activity among tested genotypes. The above results demonstrate that even among varieties may be some differences.

Between content of antioxidant activity and content of flavonoids and polyphenols we didn't determine direct dependency.

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### Reflections of an older acupuncturist

T. Rosinský, M.D., CSc.

My first touch with acupuncture happened during my medical student times around 1957. I found an article about acupuncture in the former journal Medical Student that was published by International Union of Democratic Students under the lead of Moscow. Through the international borrowing procedures I obtained textbooks, the French De la Fuy, the German Schmidt and a collective English one. There were of course a lot of information, but in the French textbook in combination with homeopathy, in the others there were instructions rather than interpretation, so I decided to go to the sources.

We did not have any sinologists in Slovakia in that time, therefore I was left again to study Chinese myself, to find contacts with Chinese and through them a contact on a list of Chinese books about acupuncture that were reachable there. Finally, straight after graduation in 1960 I ordered literature from China through a personal visit of Chinese Embassy in Prague. I was very pleasantly surprised to receive a package with all ordered books within two weeks. There were 8 books by mail order, it cost inclusive postage 157 crowns, which was unexpectedly cheap in that time. Except of former most used textbook by Professor Tchien Lai that I translated during my military service for my own needs there were also specialized books and two reprints of ancient books from 16<sup>th</sup> and 17<sup>th</sup> century as well. The textbook was in fact rather reduced publication that was imprinted by beginning of Cultural Revolution, but as a cookbook it was reliable. Only later after studying of those ancient texts I begun to somewhat understand that acupuncture is more than a mechanical

methodology of inserting needles into sensitive reflex points. The latter was promoted in the former official party propaganda in China and globally accepted in Europe, because it was closer to the local understanding of medicine and the human complex at all.

I inserted my first needle in December 1960. I could not buy it in that time, so I let it made by a known handy man. He did not understand fully the purpose of it and he delivered such a needle that could be used on a rhinoceros. Only his second product was fitting in size and form to the pictures in the book. I had a patient with diagnoses of neuro- circulatory asthenia treated with no effect by psychiatrists and cardiologists for years and I decided to try to help him. He was a young teacher who wanted to continue the study, but his health problems did not allow him to do that. I inserted the needle for a few minutes to seduce the heart meridian on his left. As I had only one needle I had to pretend I was a master even I felt I was less qualified than an apprentice. To patients' and even more to my surprise the patient woke up next morning after a night full of profuse sweating without problems and he stayed like that for the next 40 years due to my catamnesis. He reached all degrees of academic pedagogical education and adequate functions and he did not have to see doctors anymore. After a two year catamnesis I referred about this case on a psychiatric conference with success, despite that no participant probably knew something about acupuncture before.

After 1963 we started acupuncture as a society and later as a topic of seminars and conferences. Everything was concentrated mostly around obvious phenomena like active points, channels,







gradually something about the five elements, pathogenic factors, yang and yin. It was always more or less depending on what emerged in the Soviet Union or what soviet leaders of acupuncture events came to tell us. Of course it was not without ideology particularly in a sense of Pavlov's reflex theory. We mentioned it as a cover also between us. Time has shown that some of us longing for leading positions and obedient to the party and government started to take this cover seriously. They were convincing the rest of us that whole acupuncture is only a reflex method bound to the nervous system.

Our first Slovak textbook of acupuncture had a very prolonged birth due to those ideological uncertainties of chiefs of rehabilitation, since those were supposed to be the most competent to evaluate it. The textbook was finally published, but with several cuts. We simply did not manage to overcome the flaps on the eyes and ears of those gentlemen, they did not realize what was going on. Now a stylistic leap offers itself.

After many years during the second reading of the sources and after personal experiences collected in East Asia I have come to doubt a number of our previous full knowledge of the mechanisms and procedures of acupuncture. These doubts could be a good basis to search for reality but still something was missing that would anchor those hypothetical possibilities into a frame of natural science. That appeared in recent years. New and newly understood knowledge of physics particularly quantum physics and newer branches, different views on time, space and role of information that are not only physical as explicitly objective but also those produced by a human mind opened entirely other options of understanding acupuncture as well. That "as well" was on purpose. It turned out that even though acupuncture is a relatively well defined complex system of relations and procedures – meaning

algorithms and subprograms on an informative base, it is in many ways closely tied to other processes on the body. Even though we mostly deal with acupuncture in a partially subjective view of an involved person, we cannot take it as an isolated thing without links to everything else in the body and around the body.

To be specific, at least a few examples. An official secret research project code named "Anomalous Phenomenon Science" took place in Czechoslovakia in 1981–82. The cover should protect the subject of the research from orthodox dialectical materialists and simultaneously it should avoid that possible effects of the findings question the ideology of materialism. However, the results very clearly undermined the prevailing ideological framework. Although it seemed on the basis of our knowledge, it was later revealed that many of the results of the research actually did not exceed the bounds of natural science knowledge and there forfeit was not a transcendental ideological reversal. A deeper understanding of the phenomenon of information was known to us only as if primary school level and so some research results seemed understandable to us only by taking into account the hypothetical forces exceeding our human capabilities. There were, for example, specific research results of other reputable academic departments on effect on the reproduction of the yeast by a simple in formative stimulus, healing of experimental superficial skin injuries of mice informatively through their portrait photo sand more alike impossibilities. Our research with a cover- name "Morphoenergetic Phenomena in Active Points in Acupuncture" led to results of sub microscopic impact on processes in the active point without stimulation by a needle. These manifested clearly by interplay of five elements that is the interplay of a subsystem consisting of five modalities of functional states dynamics in a set of levels forming an active point. When





I referred about it on an acupuncture conference in Hanoi in Vietnam, I got a polite statement they welcomed these findings and they were glad we found out what they had known already for centuries. These our findings in a mathematical expression surprised the Head of the Department of bio cybernetics of University of Ostrava that was functioning there at that time. Their long term project of mathematical expression of activities in neuronal networks in the brain was identical with our results of mathematical expression of activities in the active point. It was the knowledge that showed the substantial role of something that could be called universality of processes in the body, at least in its mathematical expression.

Another contribution to the surprising, incomprehensible and gradually accepted and through the afore mentioned new knowledge acceptably explainable items on the development of comprehensive understanding of acupuncture has been my personal experience during study tours in Vietnam in 1986 and China in 1989 and additionally a bit in Soul on a World Congress of Oriental Medicine in 1996. At the Academy of Chinese Medicine in Beijing they have just then completed an extensive research project on spreading of sound in the human body, especially in different tissues with absence of major meridians and in tissues along the

pathways of meridians. The results of thousands of measurements highly statistically significantly demonstrated that the sound travels faster through the meridians than the same tissues through which any meridian does not cross according to traditional arrangement. From the other perspective, there are our corresponding recent researches on physical characteristics of active points and meridians.

In practical use I had the opportunity to see an immediate effect on the paretic hand wrist on previously mentioned workplaces. If I would not have seen it, I would not believe it. Professor Nguyen Thai – to inserted a long needle through the patients' wrist, he used the needle as a hinge, moved the hand couple of times, than removed the needle and the hand was immediately functional regardless of the length of the paresis. In that time I did not understand in neither of 50 cases that I observed from a distance of half meter how the needle could penetrate directly through the wrist bypassing all eight carpal bones and after removing there was never any drop of blood on either side of the hand.

It is good to stop on top. Hypothetical solution exists, but that is for another time.

**Teodor Rosinský, M. D., CSc.**





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