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OSTEOREFLEXOTHERAPY IN LATVIA

In 1997 the 40th anniversary was celebrated of the now traditional method of the reflectory treatment method – osteoreflexotherapy (ORT) which was introduced into practice and worked out by scientists of the Institute of Experimental and Clinical Medicine (IECM) at the laboratory of Experimental Physiology (LEP).

The founder of the method of osteoreflexotherapy is Prof. Georgs Jankovskis. The theoretical basis of ORT is discovery of the osseous sensory system (OSS) – the connection of osseous nerves with spinal cord, brain and other sensory systems and organs. It forms the basis for development of clinical guidelines on the appropriate prevention diagnosis and treatment of various diseases and the prognosis of treatment results. Scientists of IECM have taken part in these activities as well as many doctors in Latvia and abroad.

Osteoreflexotherapy which was elaborated by Latvian scientists can be defined as Latvia's osteoreflexotherapy: our priority has been proved by information and licence on research and techniques in the achievements in physiology of the sensory system, performed during the 60–70 ies.

Since 1987, when the Riga osteoreception school (its founder was G. Jankovskis together with colleagues), was organised more than hundred courses for doctors in Latvia and abroad were taught theory of OSS and practice of ORT.

In 1993 osteoreflexotherapeutists founded Latvia's Association of Osteoreflexotherapeutists; G. Jankovskis was elected its president, deputy president was M. Vītola and secretary A. Čūrišķis. Latvian scientists have received over 30 invention certificates; 32 of these have been maintained obtaining degrees of doctors of medicine, biology and habilitated doctors.

G. Jankovskis regards 1957, the 24th of April as the beginning date for osteoreflexotherapy; at the I Municipal tuberculosis hospital he performed the first osteoirritation on a patient with tuberculosis of the knee (as a result, the patient felt no pain in the knee joint anymore, which had been torturing him at the slightest movement).

At the same time Georgs Jankovskis claimed, that every discovery in science and technique revealed indirect indications of something similar. Thus, for example, in the book compiled by P. Šmits "Latvian Folk Beliefs" [1] there are about 20 beliefs concerning irritation of skeleton bones, which were used for the treatment of pains in the bones, head and back. In the chapter "Pains in the bones" we read: "Those who suffer from pains in the bones should go to a cemetery, pick a bone from a corpse and rub with it the aching bone." On the other hand, in the chapter "Thunder as a cure" more than 17 beliefs can be found concerning headaches, which shouldn't bother you all the year round.

"When hearing the first peel of thunder one should hit one's head against a stone for several times, or draw it along a stone wall from the bottom up to the top; one should take three times sand from the soil and press it against the forehead a summersault turned three times would take away headaches and backaches; also, one should press a silver coin against one's head".

Two inscriptions testify to the fact that there used to be a custom in Germany to turn somersaults during peels of thunder, to hit one's head with a stone in order to stop headaches and backaches. There are notes that Latvians irritated the painful spot (*locus dolens*) with a bone from a corpse, a piece of brick, silver coins and otherwise.

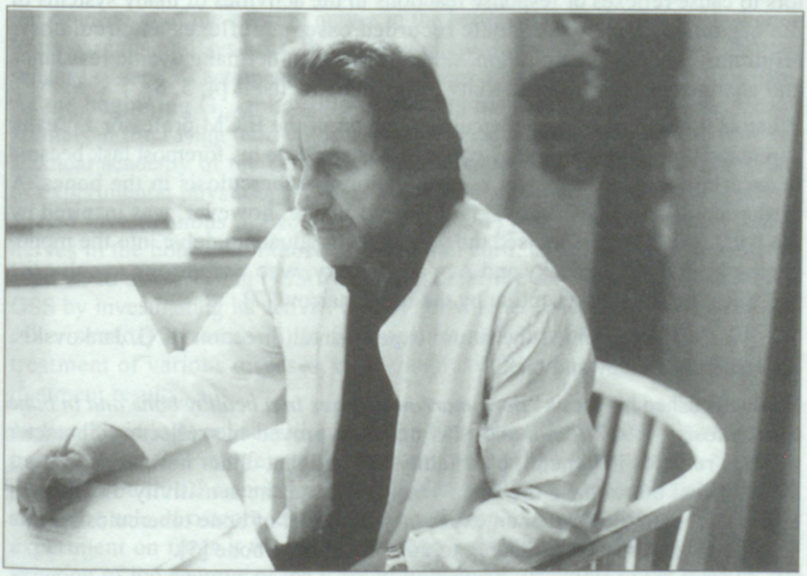
This was common in practically the whole territory of Latvia. While rubbing the painful spot with a cadaver bone, not only the skin and muscle, but also the bone got irritated and, possibly, even deeper elements of nerves and tissues where touched. Thus, this ancient Latvian procedure was the first evaluation of the role of bone in treatment.

The Riga osteoreception school of G. Jankovskis is of the opinion that the bone marrow must be first irritated, either by introducing 0,9% of NaCl solution (0,5–2 ml in 5–15 seconds), or the osteoreceptors (bone nerves ends) in the bone marrow should be irritated with electric current impulses, laser irradiation, vibration and other irritants [2, 3].

G. Jankovskis approved the contribution of M. Vītola, who gave a scientific evolution of the use of 0,5% Novocain and 0,9% NaCl solution as an irritant of osteoreceptors.

Latvian scientists, doctors, physiologists have scientifically proved that bone irritation can be used to do away with pain in the bones, head and back and many other diseases, by using the ORT method.

Thus, procedures that have been used by ancient Latvians, Germans and probably by some other people have been scientifically and clinically evaluated and have returned to Latvia as G. Jankovskis method of ORT which is more and more often used by many doctors in their everyday practice as a method of physiological treatment of various diseases.



Professor Georgs Jankovskis – founder of osteoreflexotherapy in Latvia

I From experiment to discovery — the osseous sensory system and osteoreflexotherapy

The discovery of osseous sensory system can be used for treatment, prevention, diagnostics and prognosis of treatment results. The beginnings of this discovery can be dated back to G. Jankovskis experimental research on animals in 1953. At that time postgraduate G. Jankovskis of the Latvian Academy of Sciences, IECM section of tuberculosis, investigated reflectory reactions on animals (dogs, cats, rabbits etc.), by irritating osteoreceptors with electrical current, vibrations, chemicals, by introducing saline solution into the bones, by thermic and other irritations. The result obtained by experiments proved irritation of osteoreceptors to cause reflexes or response reactions in the activities of many systems of the organism. The postgraduate recorded osseous reflexes as circulatory, respiratory, motion, perspiration, skin temperature, dermal galvanic resistance and changes of bioelectric activity in the marrow itself [4, 5, 6].

When in 1953 head of the tuberculosis section of the IECM professor J. Vexler appointed bone surgeon G. Jankovskis as postgraduate his foremost task became to ascertain the causes of the exact location of tuberculosis in the bones. A further solution of G. Jankovskis scientific theme, however, was inspired by the late I. Mežulis. He advised the young postgraduate to delve into the monography by V. Chernigovsky and A. Yaroshevsky, who were trying to solve the and question of hemoreception by the bone marrow [7].

This was that determined the future experimental direction of G. Jankovskis, his research strategy and plan.

Having finished his thesis "*Bone marrow reflexes in a healthy bone and in bone tuberculosis*" (1957), G. Jankovskis not only proved the reflectory character of bone reflexes in general, but mainly the fact that under normal conditions symmetrical bones have the same sensitivity, but the sensitivity of different bones varies. In the case of an experimental model of bone tuberculosis, bone sensitivity is increased compared to that of a normal bone [5].

From 1957–1961 Jankovskis worked under the guidance of Prof. N. Stoligvo in the tuberculosis section at the IECM and investigated the influence of corticosteroids on the threshold of bone sensitivity. It was proved that the threshold of bone irritation decreases and reaction increases. This is at present also observed in-patients after corticosteroid therapy, which is followed by osteoporosis (broken bones etc.).

G. Jankovskis had to choose which direction of investigation of osteoreception to follow. The first direction was to continue the causes of localisation of bone tuberculosis. The second direction would be to clarify the connection of nerves endings existing in bones with those of organs spinal cord, brain ant other organs and systems and to prove the significance of bone irritation in the treatment, diagnostic and prevention of various diseases.

G. Jankovskis started another direction of research, as until now the investigation of scientists, world medicine had no clear answer whether the osseous system like that of the skin, vision, muscle, digestive, cardiac and vascular systems possessed receptors – specific end formations of sensory nerves, which are able to receive and change the interior and exterior irritation energy during the process of stimulation and conduct it to the brain. In world scientific literature up to 1953 there had been only a few publications (S. Brusov and V. Lebedenko 1930; A. Jaroshevsky 1948; V. Chernigovsky and A. Jarochevsky 1953 and other), in which the bone marrow was pointed out in the reflectory zone [7, 8, 9].

Unfortunately, there did not exist specific and versatile investigations about the connection of the existing nerves in the bones with those of the spinal cord, brain, organs and systems, that is, the physiologic structure of the osseous sensory system, its action and functional connection with other sensory systems. At the beginning G. Jankovskis conducted his research with experimental animals at the I Riga tuberculosis hospital headed by K. Segliņš. In 1961 the Medical academy of the USSR and IECM helped him to create a Laboratory of experimental physiology LEP – a group of scientists, who simultaneously started investigations in two main directions: 1) to find out the connection of nerves in the bones with those of the spinal cord, brain, organs and systems. That is, to discover the OSS by making clear the physiological structure of OSS by investigating its activity and by proving its functional connection with other sensory systems; 2) to find out the possibility to use ORT for the treatment of various diseases, their diagnosis, prevention and prognosis of treatment results.

Jankovskis in joint collaboration with the first scientific coworker, later the first post graduate G. Praulīte and the first engineer of the laboratory A. Strukovs proved to be true the apriori expressed idea by Russian physiologist I. Pavlov about the role of osteoreception in the function of movement analyser. In an experiment on frogs it was proved that in keeping up the functional state of irritation of the neurons of the CNS in movement, reactions in the marrow and the nerve component of the marrow also take place [10].

In 1962 G. Jankovskis, G. Praulīte and J. Grāvīte, conducted research on experimental animals by combining cutaneous and bone marrow irritations, thus creating an osteoreceptive conditional reflex. G. Praulīte and I. Beldava researched the influence of osteoreceptor irritations on experimentally created parabiotic changes in the animal nerves of posterior extremities. Under the guidance of P. Ozoliņš, I. Bleiere in experiments on cats, using the same methods of resistography, proved that by introducing novocain solution in the bone marrow of extremities on one side, rapid diminution of resistance occurs, at the same time, resistance increases in other extremities. Similar observations were performed in the laboratory headed by A. Krauklis, where I.Siliņš succeeded in proving that by arresting blood circulation for 5 min. and by creating local

hypoxy the vascular pool fills up much quicker than after intraosseous novocain blockade or without it. The effect mentioned is undoubtedly significant in explaining the beneficial influence of the mechanism of osteoreceptor blockade in cases of endarteritis and other diseases, where the blood circulation is damaged.

In 1962 G. Jankovskis summed up the results of his hitherto performed experimental investigations and clinical observations in an article: "*On the role of osteoreceptive zones in the treatment of various diseases*" – endarteritis, pain syndrome, pain in malignant tumours as well as in sclerotic osteomyelitis in stomatology clinics (clinical observations by V. Būmeisters). Bone irritation is also used in arthroses, spondyloses, periostitis, exostoses, causalgia, pleuritis, angina pectoris and other diseases, choosing corresponding reflexogene zones from every disease [11].

The comparatively numerous cases of symptomatic and causal treatment made G. Jankovskis turn his attention to the investigation of some physiological and pathophysiological processes in the bones, bone marrow as well as in the peripheral and central nervous system.

In the same year 1962 an investigation carried out by A. K. McIntyre on the existence of cortical projections of impulses in the interosseus nerves of the cat's hind limb in world scientific literature was published [12].

Investigations conducted on animals and clinical observations, as well as information and licensed research in the world about sensory systems and reflexotherapy encouraged Latvian scientists to advance a hypothesis about the existence of osteoreception, particularly those, which G. Jankovskis had carried out with G. Praulīte in 1961, which enabled to advance the hypothesis about the representation of osteoreception in the brain (cerebral trunk) and shifting of bone excitation to the nuclei of the efferent movements of the trunk [10].

G. Jankovskis with colleagues delivered his first report on the physiological structure of the osseous sensory system at the X-th Pavlov Congress of Physiology society in Erevan in 1964 [13].

The correctness of this hypothesis was proved by scientific research at the LEP in the course of 40 years by discovering a hitherto unknown phenomenon – the existence of the osseous sensory system in vertebrates and human beings. Scientists have discovered the structure of this system, examined its activity and concluded that OSS is closely connected with the others of the sensory systems. The brain receives momentous information from more than 200 bones of the skeleton.

The brain transmits them in the necessary directions – to respiration, blood circulation system, skin, bones, muscles, glands of internal secretion and other systems, influencing the work of these systems.

The knowledge's of OSS enable to clarify specific effects of bone irritation i.e. to influence the regulation processes on which the functional state of the bone is dependent. New possibilities have been found to affect the bone with the purpose

to activate the adaptation and compensation mechanisms of the organism and to normalise its functional processes.

Thus OSS investigations are the theoretical foundation of elaborating a new method of treatment – osteoreflexotherapy, osteodiagnostics, and study of the functional condition of the bone and use of ORT in the prevention and prognoses of treatment results. The essence of the method is reflected in its name – osteoreflexotherapy: by irritating osteoreceptors, through the CNS it is possible to evoke reactions (reflexes) in many systems of the organism [2, 3, 4].

That is why ORT is named bone reflexotherapy. Therefore ORT is called a physiological treatment method, that is treatment with bone reflexes, without using medical remedies.

The new knowledge concerning the physiology of the OSS essentially extends our former view of the physiology of OSS by revealing the multifold role of bones in the life of the organism. At present it is clear that bones support, move, balance and orient the body in the gravitation field of the Earth and the Moon, carry out depository functions of minerals, ensures hematopoesis, take part in the regulation of the vegetative, somatic and psychic functions of the organism [2, 3]. Latvian scientists have each contributed to the project of OSS and ORT.

G. Jankovskis has highly estimated the contribution of G. Praulīte in the elaboration of the osteoreception problem – mainly the fundamental theoretical experimental research in two main directions. She proved the existence of osteoreception in the sensomotor zones in animals and human beings, in the thalamus, hypothalamus, nucleus caudatus, cingulum lobe; she has worked out an osteoreceptive potentials registration method caused by osteoreception in humans and elaborated the osteoreceptive conditional reflex. In 1989 G.Praulīte together with colleagues proved the changes in the number of neuromediators in the osteoreceptor zones in the brain when irritated osteoreceptors in experimental animals [13, 14, 15, 16, 17,]. This study is certainly of great importance in the investigation of the ORT mechanisms.

P. Ozoliņš, G. Jankovskis, A. Mertens, M. Vītola, I. Beldava and A. Apine have concluded that bone irritation influences the extension power of muscles [18, 19, 20]. A. Lazda proved sympathetic afferentation from bone marrow [21].

The scientific activities of I. Beldava have proved that the current of nerve impulses from the bones are of great significance so that the brain can keep the optimal level of its functional state (homeostasis of the brain), which enables the person to receive information for the CNS and react to it adequately [22]. I. Beldava, G. Jankovskis and A. Mertens have enlarged the hitherto existing conceptions about the regulation of body posture. They proved that besides the 4 sensory systems mentioned by Russian neurologist V. Behterev (CNS receives impulses from the skin, muscles, vestibular apparatus and eyes) the osseous sensory system also takes part [23, 24]. This enables not only to eliminate damaged body posture, by affecting osteoreceptors, but also to make use of ORT to

ensure body posture for prophylactic purposes. I. Beldava, G. Jankovskis, A. Mertens together with psychiatrists T. Kancāns, S. Volkovs, Z. Sočņeva and I. Eglītis have discovered that the emotional state of man and his ability of sensory perceptions is, to a certain extent, dependent on the condition of bone. It is possible to weaken or to completely eliminate with bone irritation the observed psychic borderline conditions – depression and senestopathy in 50% patient with painful bones, but together with M. Vītola, B. Līviņa, I. Blumberga, narcologists A. Glāzītis, A. Kuzmins and psychiatrist M. Dīriņa have worked out ORT treatment methods for drug addiction, alcohol abstinence syndrome and toxicomania [25, 26, 27, 28, 29].

A. Mertens has also made important contributions to the solution of problems of osteoreception and osteoreflexotherapy. In his candidate of medicine thesis he proved the existence of osteoreception in the cerebellum and hippocampus; he was the first to find out the role of bone irritation in correcting orientation of kittens in space with damaged bone-marrow in cases of rinsing it out [30]. Later A. Mertens together with I. Taivāns, V. Orlovs and J. Iljina in experiments on animals conducted detailed studies on the existence of osteoreception in the cerebellum and nuclei Deiters [31]. A. Mertens together with G. Praulīte and M. Vītola proved the character of osteoreceptive stimulation on the tonic activity of motoneurons, through showing the pathways along which the bone influences the muscle. A. Mertens has summarized the results of his study in a monography [32]. Lately, A. Mertens together with M. Vītola and A. Čūrišķis were working on a scientific project – changes in the functional condition of bones in osteoporosis, by estimating the intraosseal pressure, propagation velocity of ultrasound in bones, bone temperature and other indices [33]. The first investigation in ORT about the positive influence of bone irritation in the treatment of bronchial asthma is also connected with the name of A. Mertens (V. Logins, G. Jankovskis, A. Mertens and G. Celmiņš) [34].

M. Vītola in the doctor thesis showed the mechanisms of bones blood circulation regulation, established the difference between blood circulation in skin, bones and muscles and their close connection [35, 36]. The data obtained has convinced that ORT is a method by means of which it is possible to change blood circulation in bones and surrounding tissues and organs, thus influencing the pathological process. An essential part in ORT is played by experimental studies and clinical observations about the influence of irritation of osseous nerve ends and the blood circulation of their surrounding soft tissues – skin and muscles. Just as well as other organs and tissues, bones can carry out their functions (hemopoesis, ion exchange, functions of support and movement, orientation in space etc.), only by receiving proper blood supply. At rest it comprises about 11% of cardiac volume in a minute. Irritation of osteoreceptors greatly influences the blood inflow and outflow circumstances. Various bone diseases often are related with disorders of blood circulation, which is manifested by venous stasis. Irritation of osteoreceptors stimulates return of venous blood from the bones,

which, in its turn, ensures improvement of blood circulation [35]. The study of a close connection between blood circulation in muscles and bones enabled us to revise the effectivity and suitability of some physiotherapy procedures.

M. Vītola, G. Jankovskis, I. Beldava, A. Mertens together with pediatrician I. Kairisa and neurologist L. Biezā have worked out ORT treatment of enuresis and encopresis in children, but together with ophthalmologist I. Valeine have discovered that acuity of vision is, to a certain extent, dependent on the functional condition of the bone; it is also possible to treat myopia in children with bone irritation [37].

A. Čūrišķis in his doctor's thesis presents the functional characterisation of osteoporosis in the spongy bone tissues of the lower extremities, when measuring intraossal pressure (IP) and intraossal temperature (IT) in patients of various age groups [38]. The IP is increased in osteoporotic spongiosa; in the bones of the lower extremities the IP gradients exists in the distally longitudinal axial direction. The t° gradients in the distal direction exist in the spongiosa of lower extremities.

K. Strēlis has done a lot in the development of sports medicine, thus enabling to help athletes with microtrauma, Schlatter's and other diseases by making use of ORT [39].

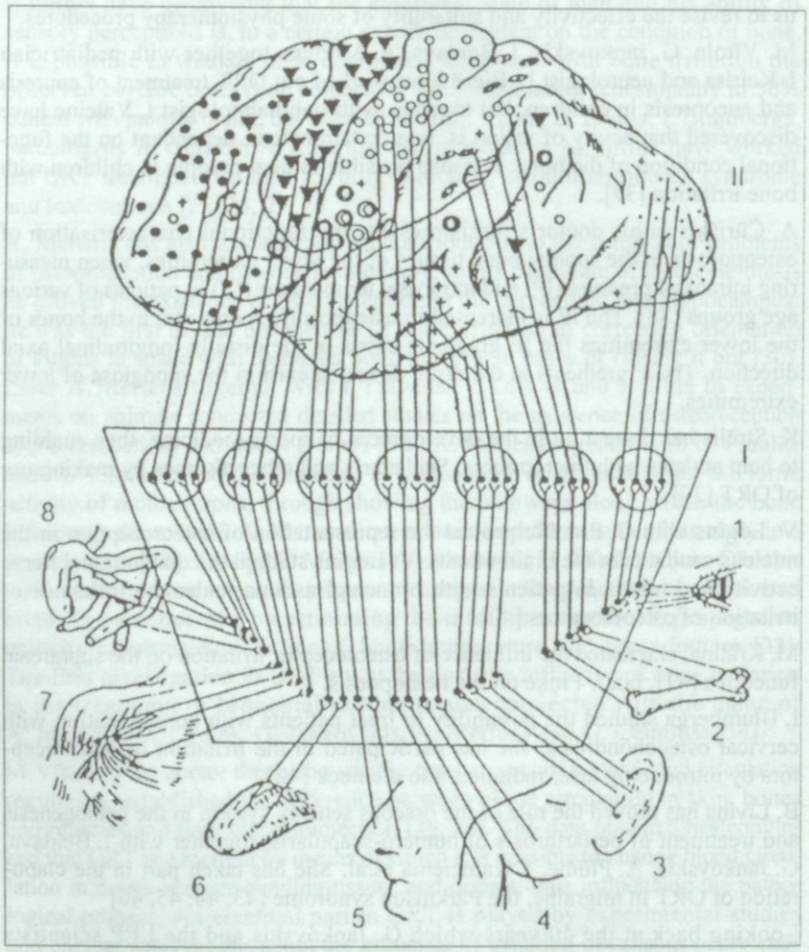
V. Logins with G. Praulīte proved the representation of osteoreception in the nucleus caudatus in the brain of cats. V. Logins studied the diaphragmal nerve activity and others in-patients with bronchial asthma under the influence of irritation of osteoreceptors [40].

M. Krātiņa, elucidated the influence of osteoreceptor irritation on the suprarenal functions [41], but I. Piņķe on the hemopoesis.

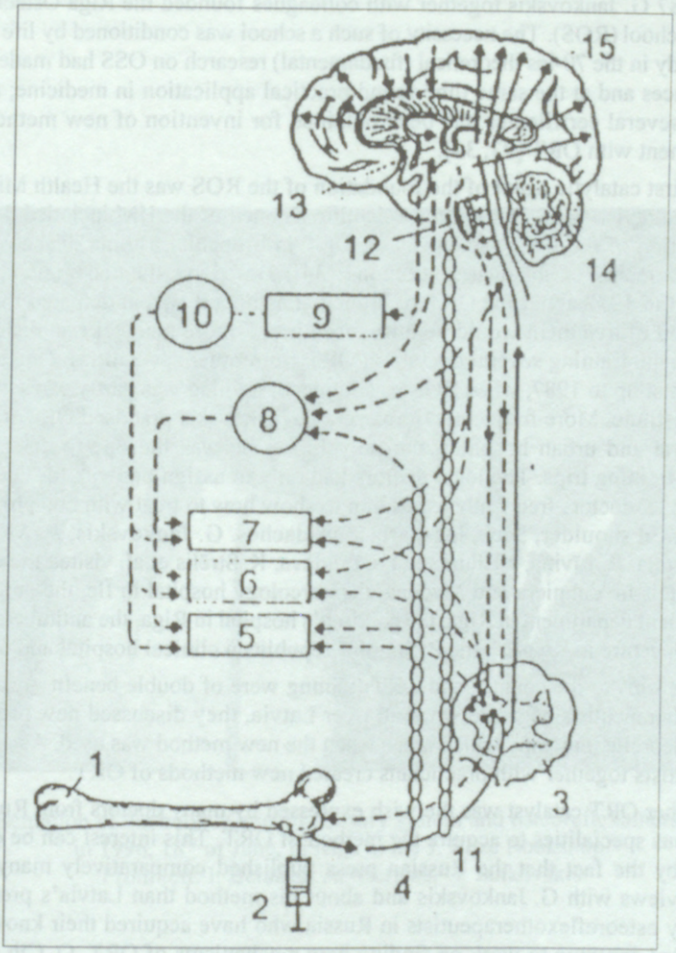
I. Blumberga studied the possibility to treat patients with bone irritation with cervical osteochondrosis; she has participated in the irritation of osteoreceptors by introducing laser radiation into the neck [42].

B. Līviņa has proved the role of the osseous sensory system in the pathogenesis and treatment of periarthrosis of humero-scapularis; together with I. Beldava, G. Jankovskis, A. Plūme, I. Kalnciema et.al. She has taken part in the elaboration of ORT in migraine, the Parkinson syndrome [43, 44, 45, 46]

Looking back at the 40 years which G. Jankovskis and the LEP scientists had been conducting research dedicated to osteoreception and osteoreflexotherapy, he admits that they have given him personal satisfaction and experience, without which he wouldn't have been able to attain his aim nor helped the others to reach theirs. "*I am convinced that each one of our large collective, who has taken part in the solution of this problem, has had a wish to create something permanent which would survive and remain in the history of medicine and physiology. We have succeeded*!" This is the way G. Jankovskis evaluated their achievement in his report "*40 years of Latvia's osteoreflexotherapy*", on the 18th of December 1997.



The physiological structure of the osseous sensory system (OSS) and other sensory systems: 1–8 receptors, situated in the eyes (1); in the bone (2); in the vestibulary apparatus (3); in the skin (4); in the nose (5); in the tongue (6); muscles (7) and viscera (8); I – transmission routes of nerve impulses; II – areas of sensitivity representation of osseous and other sensory systems of the brain



The mechanism of the influence of osteoreceptive irritation: 1 – nerve of the bone; 2 – syringe with a needle; 3 – spinal cord; 4 – ganglions of the vegetative nerve system; 5 – skin, muscles, bones; 6 – blood-vessels; 7 – viscera; 8 – biologically active substance; 9 – hormones; 10 – endocrine glands; 11 – spinal cord ganglion; 12 – reticular formation; 13 – hypothalamus; 14 – cerebellum; 15 – cortex (afferent ways marked with continuous lines; efferent ways – with interrupted lines)

II The Riga osteoreception school

In 1987 G. Jankovskis together with colleagues founded the Riga Osteoreception School (ROS). The necessity of such a school was conditioned by life itself. Already in the 70-ies theoretical (fundamental) research on OSS had made rapid advances and at the same time found practical application in medicine; at this time several certificates had been obtained for invention of new methods of treatment with ORT [23, 34].

The first catalytic agent of the foundation of the ROS was the Health Ministry of the Latvian SSR. In 1977 the Scientific Council of the HM included the first invention of the IECM scientists on ORT in bronchial asthma in the plan of achievements of medical institutions [34]. Based on the recommendations issued in 1977 about the ORT of bronchial asthma it was anticipated that this method of treatment would be introduced into 7 more medical establishments in Latvia, training several doctors in ORT from other specialities. One should note that up to 1987, when ROS was founded, training was partly carried out at the institute. More frequently, however, G. Jankovskis practised ORT training in rural and urban hospitals and polyclinics; he was the one to ensure that ORT training trips. The local doctors had only to assign patients for ORT; for example, doctors frequently asked him to show how to treat with bone irritation a painful shoulder, back, legs, arms, headaches. G. Jankovskis, A. Mertens, M. Vītola, B. Līviņa, I. Blumberga, I. Beldava, K. Strēlis et.al. visited the central hospitals in Valmiera and Madona, the narcology hospital in Īle, the narcology in patient department in Riga, the children's hospital in Riga, the antituberculosis health centre in "*Jugla*", the P. Stradiņš republican clinical hospital and others.

These trips to the country and ORT training were of double benefit – osteoreflexotherapeutists began to work all over Latvia, they discussed new problems in osteoreflexotherapy which arose when the new method was used. As a result, scientists together with practicians created new methods of ORT.

Another ORT catalyst was the wish expressed by many doctors from Russia of various specialities to acquire the method of ORT. This interest can be explained by the fact that the Russian press published comparatively many more interviews with G. Jankovskis and about his method than Latvia's press did. Many osteoreflexotherapeutists in Russia who have acquired their knowledge in Riga continue to work on finding new mechanisms of ORT. O. Cih (1988) at the Novosibirsk medical institute works on a complex of ORT and aquasolotherapy for the treatment of damaged bones and joints [47].

I. Trinitatsky, M. Maklecova, A. Junishenko (1989) from the Rostov medical institute confirmed ORT importance in the treatment of neurologic disorders in osteochondrosis [48]; in 1992 V. Lisenuk (the Ukraine) and R. Jakupov (Kazan) used ORT for treatment of the backache syndrome; they published their results in the international journal Acupuncture and Electrotherapeutic Reasearch in the USA [49]; I. Martirosova, A. Osetrova, V. Kazakova (1994) at the Kazan

Presentation of the book "Osseous sensory system and osteoreflexotherapy"
in 1996, 18th of June, in Riga at the J. Roze Bookshop.
From left: I. Beldava, A. Mertens, G. Jankovskis

Clinic of traditional medicine and Retraining courses for doctors have described the possibilities to use ORT in medicine [50]; A. Marushka, director of the Lithuanian-Russian-Korean Onnuri institute in Lithuania, introduced ORT to the world by publishing reports and delivering them in Lithuania, Poland, Korea, China etc. [51].

This new science about the bone as a live, irritable sensory system had been little described in popular science literature, there were no textbooks on OSS and ORT and it was not taught at Medical nurses school, the Riga Medical institute, the LU Biology faculty and other. It is essential to popularise knowledge about bone physiology and ORT because the discovery of OSS enlarges our former notion about the physiology of the bone system and the multifold role of the bone in the life activity of the organism.

For a long time there existed a simplified notion in physiology and medicine that the bones of vertebrates and humans carry out mainly mechanical functions – they passively support the body while muscles attached to the bones move it. Bones protect the brain and internal organs from external injuries, bones are the "depo" of mineral substances and take part in ion exchange. When observing the close functional connection of OSS with other sensory systems and organs, it became clear; that bones actively support and move the body, ensure its balance in the gravitation field on the Earth (and also on the Moon); they take active part in the regulation of somatic, vegetative and psychic functions. The bone is a live (irritable) sensory system – that is the discovery in sensory physiology and ORT is the one in reflexotherapy [2, 3].

The new knowledge about the bone as a live system and its multifold role in the vital activities of the organism enables us to understand and solve several current problems in medicine and biology. For example, it makes it possible to explain such significant process as osteoporosis and degeneration of joint cartilage, it makes us understand that osseous impulses changes is one of the most important causes, which calls forth bone generation around a metal or ceramic implant.

The new conception about the manifold role of bones in the vital activity of the organism partly explain the various reactions or rearrangement in cases of hypodynamics, hypokinesia, weightlessness and overload. For example, we know from everyday practice that the more uniform and lengthy overload the skeleton is subjected to the more often we observe periarthrosis of humero-scapularis, epicondilitis ("tennis player's elbow") and other diseases of the skeleton; in the pathogenesis, diagnostics and treatment the functional position of the bone is of importance and the possibility to influence it with bone irritation (ORT). Absence of physical load and insufficient movement in patients with skeletal pathology also cause osteoporosis, muscle atrophy, disturbance of body posture and spatial orientation, 10–15% of plasma and erythrocyte mass decrease, psychoemotional threshold conditions – depression, senestopathy and others [52, 53, 54].

Thus the collective knowledge of the osseous nerves and their connection with the CNS, organs and systems, of the close functional connection of bones and muscles (muscle load is also a load for bones and the other way round), about a certain dependence of emotional conditions (mood changes), sensory reception, vision acuity and others on the functional conditions of the bones enlarges and deepens our previous views about strengthening and recovery of health. This also makes us understand better the beneficial influence of movement on the physical and psychic health of man; only an active, mobile way of life is the basis of good physical and mental health. Every person can ensure this for himself by regularly loading more than 200 bones of his skeleton (standing, walking, skiing, dancing, running etc.). As a result the bone irritation reaches the brain which in its turn sends the nerve impulses into different directions: to the respiratory and blood circulation systems, the skin, muscles, bones, secretory glands and other systems and organs, thus influencing the functional condition of individual organs and systems. Thus daily bone irritation to a certain extent takes part in the regulation of these systems and ensures an even and balanced mood.

In 1996 with financial support of the Soros foundation a textbook for students and a manual for osteoreflexotherapeutists "Osseous sensory system and osteoreflexotherapy" was published by G. Jankovskis, I. Beldava A. Mertens.

III Osteoreflexotherapy as a trade, science, art

Since 1957 (24 April) thousands of patients were treated with ORT in Latvia and beyond its borders. ORT has given the opportunity to thousands of people to return to their previous work, i.e., those who with aging of the organism, prolonged bed rest and other causes have changes in the bones of the skeleton and muscles with following pains during the day and night, pains on movement and have movement limitations, incorrect body posture, difficulties in spatial orientation, depression, senestopathies and other disturbances. ORT helps the renewal of movements in painful joints, eliminates pain in the elbow, shoulder, knee, hip and other joints and spine, it influences withdrawal from alcohol, headache, vertigo, trigeminal neuralgia, it helps to heal up bone fractures, stabilises sleep, improves pathologically depressed mood, decreased accommodation spasm, in children, treats bronchial asthma, stammering, bed wetting and other diseases.

The attention of doctors is drawn to the positive treatment results. Thus, ORT is economically advantageous. ORT is a physiologic treatment method – osseous reflexotherapy, where no drugs are used for the treatment of various diseases.

In osteoreflexotherapy the segmentary or, so-called, G. Jankovskis principle irritation of the painful bone is used. That is why one may call ORT a metameric method; when carrying it out one has to take into consideration the neural connection of the neural segment with the metamer of various organs and systems of organs. We may say that the bone system is reflectory connected with itself as well as with other systems and these other systems on their turn influence the skeleton [13, 23].

We are reminded how the doctor's work was characterized by famous Latvian doctor and scientist Pauls Stradiņš. "*Medicine – is a trade, science and art at the same time*". It is important not only to choose the zone to be irritated, but also the structure of the bone tissues. Osteoreflexotherapy performs irritation of all bone components.

IV ORT — method of the 21st century

The ORT mechanisms studied, which were investigated by neurophysiology, neurosurgical, biochemical, immunological, biophysical, psychophysiological, clinical physiological, clinical, rentgenological and other methods of research, make it possible to do away with certain mysticism, which, not infrequently, accompanies talks about ORT in general. This enables to use ORT successfully for the treatment of diseases of functional regulation, but also several diseases (pseudoarthroses, arthroses, osteochondroses), in neurology, traumatology, orthopaedics, pulmonology, ophthalmology, psychiatry, space medicine and biology, in work and sport physiology and other medical branches. It is however clear that ORT is not a panacea for the treatment of all diseases. Such a view can discredit the method.

ORT methods can also be used for osteodiagnostics by determining treatment, by establishing the myelopathic function, condition of bone circulation and bone temperature. By puncturing the bone, the osteoreflexotherapeutists can, to a certain extent, determine density of bone tissues, i.e. degree of osteoporosis or osteosclerosis. ORT can also be used for prevention by improving the osteocitary function of bone, by doing away with osteoporosis, by improving the tension of striated or by lowering the tension of smooth musculature, in cases of bronchial asthma, gallstones and in other diseases.

ORT method can be used for prognosis of the efficiency of diseases treated by ORT. By determining pain sensitivity in the osteoreceptor field and its adaptation to the influence of first time electrostimulation, it is possible to determine after the first ORT performance whether the next ORT procedure will give good results or the patient should choose another kind of treatment.

While mentioning the ORT prospect, G. Jankovskis drew attention to the fact, that in 1992 his coworker psychiatrist osteorefleksotherapeutist T. Kancāns, in a talk with journalists declared ORT to be the method of treatment of the 21st century. "*The possibilities of ORT have not yet been fully studied. We will be able to make use of only in the next century*". This is proved by the routine of Latvian scientists. Special attention at present is paid to osteoporosis – a disease as a result of which bone mass decreases, bones become brittle, bone fracture risks increase (particularly in the hip, spinal vertebrae and lower arm) – and to slowing down the ageing process of the organism. As we know, osteoporosis in one of the most widespread skeletal pathologies among medical problems, which have been declared by the WHO. Osteoporosis affects every fourth woman after the age of 50, every second after 65, while at the age of 80, 100% are affected.

Therefore investigation of the mechanism of the pathogenesis of osteoporosis and its prevention is a question of first importance in Latvia as well as abroad.

As we know, when the organism is aging, changes occur in all systems and organs. However, each organ and system ages differently. For example – the bone begins to age at 40, muscles at 30. The skeletal muscle mass at the age of 80–90 is 2,5x smaller than in young age – weakness and muscular atrophy arises. World literature mentions as one of the most important factors lack of load on the skeleton and atrophy of the skeletal muscles, which is observed in old people, in those who lack movements, particularly, spacemen who spend a long time in a state of weightlessness. The present preventive measures have not yielded the necessary effect, because they had not avert muscle atrophy and loss of bone mass and disturbances of body posture (PB) and spatial orientation (SO) [52, 53, 54]. The mechanism of loss of Ca from the bones is not yet fully known. However, the direct mechanisms of loss of Ca in weightlessness have been clarified – loss of load on the skeleton. However, human flight to Mars and back, which has been planned to take place next century, will be faced with a problem – increased risk of fractured bones when returning to Earth and premature osteoporosis in the following life. Although we have no experience in space medicine we think that by irritating the osteoreceptors, it is possible to stabilise the body posture of the spaceman and his orientation in time and space during flight, when returning to the Earth from lengthy flights in space, as well as to move and work under condition of lowered gravitation (on the Moon). This is confirmed by our observations and clinical data: as soon as osteoreceptors are irritated and the functional condition of bone changes, BP improves in various stages of stability. Although each bone of the skeleton has its definite role in the BP and SO regulation, the best way to stabilise PB and SO is by irritating osteoreception of the thigh, heel bone and the protuberance of the 7 cervical vertebra. That means that regulation of the BP and SO signals of bones also take part. BP and SO stability is to a certain extent dependable on the functional conditions of the bone.

As we know, the 90-ies of the 20-century and the 21-century will witness a serious disease i.e. a prolonged syndrome of static loads. This is manifested by pains in the bones, muscles, decrease of vision acuity, disturbed sleep etc. in men whose every day work is connected for example with computers. There the ORT is going to have wide opportunities – not only to treat, but before that to carry out prevention with bone irritation [3].

While speaking about investigations in the future G. Jankovskis considers that work should be conducted into two directions. The first one – fundamental research, by means of which one has to clarify osteoreceptor existence in CNS, neurochemical changes in CNS, blood circulation, and somatic, vegetative, psychological effect mechanisms caused by osteoreceptor stimulation. The second direction – is to activate ROS work, so that doctor should use ORT in the complex therapy of practical treatment.

Research into the OSS and ORT continues.

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