

QUESTIONNAIRE

(*) – mandatory fields

	Details about organisation
* Organisation name	Tbilisi State Medical University
Organisation acronym	TSMU
* Organisation Activity Type (RES - Research, HE - University, SME - Small and Medium Enterprise, IND - Industry, OTH - Other)	HE
* Keywords of main research areas	Geomagnetic storms, Human vegetative regulating mechanisms, Sensomotoric Work
* Head of organisation (first name, family name)	Giorgi Menabde
* Post code	0177
* Country	Georgia
* City	Tbilisi
* Street, House	Vazha-Pshavela ave, 33
* Telephone (+ country & city codes)	+99532395432
* Fax (+ country & city codes)	+99532392284; +99532399679
* E-mail	iad@tsmu.edu

* Description of organisation and its research achievements for the last five years (~ 5000 signs)
Vegetative Regulating Mechanisms in Healthy Persons at Various Geomagnetic Conditions
Aim of the Study
Evaluation of Vegetative Regulating Effects and Productivity of Sensoro-Motoric Work Fulfillment in Healthy Persons.
Objectives of the Study :
Investigation of practical health quality in studying patients and selection of population
Vegetative regulating mechanisms in smooth (tranquil) geomagnetic situation (by the method of varying pulsometria)
Evaluation of vegetative regulating mechanisms in natural and simulated geomagnetic storm conditions
Definition of fulfilment quality of simple sensor-motoric task in various geomagnetic conditions
Materials and Methods of the Study
The days with K-minimum index value ($K \leq 2$) were considered as the calm days and the days with K- maximum index value ($K \leq 5$) as storm days, respectively
The following statistic features were calculated:
Medium arithmetical (M), Dispersion (D), Variating range (TINN), Excess coefficient (Zx), Medium arithmetical error (m), Medium square deviation (SDNN), Coefficient of asymetry (AS), Medium standard deviation (SDANN).

First of all the curve of variation (hystograma) from geometrical methods

From this hystograma the following data can be determined: Mode (M_o), Mode amplitude ($A M_o$) and range of variation (BAP or $M \times D M_n$ or TINN – Triangular Interpolation of NN intervals). Their derive should be calculated as well – Index of Tension (TI), $TI = A M_o / 2 M_o \times M \times D M_n$.

There are produced three area of frequency by using of Spectral Analysis of Biosignal

- a) High frequency diapason – breathing waves – *High Frequency (HF)*, reflects parasympathic cycle of heart rate modulation
- b) Low-frequency diapason (so called slow waves of the I stage) – *Low Frequency (LF)*, they are called as vasomotoric waves indicating to vascular tonus – they are the markers of simpathic nervous system
- c) Very low-frequency diapason (so called slow waves of the I stage) – *Very Low Frequency (VLF)*, it shows influence of vegetative regulation centers on heart rate

Previous calculations give us the possibility to get the following indices: index of centralization (*Index of Centralization - IC*) $IC = (HF + LF) / VLF$ da index of vagosympathic relation LF / HF

Studying person was placed in non-magnetic (made of non-magnetic materials) solenoid (height – 200cm, diameter – 100cm). Setting of studying person in solenoid towards of inductivity and force-line distribution in electromagnetic field.

Studying process was consisted of 5 stages (with permanent registration of RR interval) and was conducted in following subsequences: after 15-20 min of general adampative period, at I stage ECG registration was started in the second branch during 5 minutes. At the second stage EMF was started at one of the fixed rate: index of starting inductivity in Solenoid field was 4.9 nanotesla growing step by step up to 350 nanotesla during 5 minutes; Then, at the third stage, field rate and tensity was not changed during 5 minutes; Then, at the forth stage EMF inductivity was decreasing step by step from 350nanotesla to 4.9 nanotesla during 5 minutes; And the final the fifth stage was dedicated to registration of RR interval (10 minutes) on the background of shut off EM generator (process of restitution).

Sensoro-motoric reaction was studied by using of Landolt rings in computer regime there were appearing light rings with 3 or 5 sections on screen background. Studying person should respond to every stimulus monosematically – by pushing “mouse” left button.

Phonic studies showed that vagosympathic studying persons balance was not equal and due to this fact studying objects were devided into 3 groups: I group Persons with balanced vagosympathic balance at rest; II group Persons showing strengthening regulating mechanisms of parasympathic nervous system; III group Persons with strengthening of sympathic regulation mechanism.

Conclusions

1. Estimating of geomagnetic field effect on human body, condition of vegetative regulating mechanisms should be considered as one of the predictors
2. Strengthening of parasympathic vegetative influence is determined by the impact of geomagnetic storm of strtrong intensity revealed by the method of spectral analysis : increasing of breathing waves (HF) density and decreasing vasomotoric waves (LF) density
3. Vegetative effects, influenced by magnetic field of modelled, edge, low and superlow rate (20-200hz) and 350nt intensity, are characterized by expressed physiologic activities that are equal to strong magnetic storm
4. In conditions of strong geomagnetic storm, the quality of fulfilment of the

senso-motoric activities is determined by the tendency of decreasing sensoric activity determines worsening which is coincided with the strengthening of parasympathic vegetative effects

Practical Recommendations

For evaluation and monitoring of magnetosensitivity of human body the influence of magnetic field with the parameters of 20-200hz rate and 350nt intensity may be recommended

Geomagnetic data of environment together with meteorologic parameters should be involved in reglamenting algorithym of labor hygiene of people whose activities are connected with straining vegetative regulating effects, the more so, as they are coincided with the activities of motoric field

For treatment and/or prevention in conditions of magnetic storm, using of the means and physical factors, supporting and maintaining balance of sympatho-parasympathic vegetative regulating influences are recommended.

	Contact Information
* Contact person (first name, family name)	1. Kvatchadze Irine 2. Tsibadze Aleksandre 3. Tchitchinadze George 4. Dumbadze Zaza
* Department / Laboratory	Dep. of Physiology; Dep. of Biophysics.
* Position	1. Professor 2. Assoc. Professor 3. Assistant- Professor 4. Assistant- Professor
* Qualification and research experience	MD; Ph D
* Post address (house, street, city, code, country)	0177, Vazha-Pshavela ave, 33, Tbilisi, Georgia
* Telephone (+ country & city codes)	+99532398015
* Fax (+ country & city codes)	+99532392284
* E-mail	giorgichichinadze@yahoo.com ; irma@tsmu.edu

International co-operation / Participation in EU RTD programmes or other bilateral / multilateral actions
INTAS, TACIS, TEMPUS, COST, EUREKA, other RTD programmes (please specify programme/s, project title/s and year/s)

	* Please, use “X” to indicate the scientific area/s of your potential project
CHEMISTRY	
SOCIAL AND HUMAN SCIENCES	
ECONOMIC SCIENCES	
ENGINEERING SCIENCE	
ENVIRONMENT	
AGRICULTURE AND FOOD	
HEALTH	X
MATHEMATICS	
INFORMATION SCIENCE	
PHYSICS	
NANOTECHNOLOGIES	
ENERGY	
TRANSPORT	
SPACE	

* Summary of potential research project envisaged hosting of European researcher for the period of between 1 and 2 years
<p>In recent years it was supposed that the influence of magnetic field on human body was conditioned by its effect on vegetative nervous system (A. Tsibadze, I. kvatchadze, L. Tvildiani, 2003-2005).</p> <p>Proceeding from the aforesaid the goal of the future study was to evaluate the degree and character of geomagnetic field effect on functional parameters of air-traffic controllers including also on the indices of mental work quality.</p> <p>Proceeding from the project the goals of the study are the following:</p> <ul style="list-style-type: none"> • investigation of practical health in studying patients and selection of population, • evaluation of vegetative regulation mechanisms in non-magnetic storm days, • evaluation of vegetative regulation mechanisms in studying patients in natural and simulated geomagnetic storm, • definition of fulfilment quality of senso-motoric and psychoemotional tasks in studying patients in various geomagnetic conditions. <p>The following criteria will be defined to evaluate the heart rhythm variability: Medium arithmetical (M), Dispersion (D), Excess coefficient (Zx), Medium arithmetical error (m), Medium square deviation (SDNN), Coefficient of asymetry (AS), Medium standard deviation (SDANN).</p> <p>We consider that the given data will be the recommendation basis to work out individual preventive, early diagnostic and treatment measures for keeping the optimal level of human body functioning in various magnetic biologic conditions.</p>

	Please, confirm your agreement on data publication and dissemination
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I agree with the publication of the data on the web-site http://www.inco-ecca.net , and dissemination among Mobility National Contact Points of the EU MS and AC (YES / NO)	Yes
Date	08.12.08