ISSN: 0975-8585

Research Journal of Pharmaceutical, Biological and Chemical Sciences

Impact of Ecological Factors on Morphofunctional Indicators of Evolutive Somatotype of Girls of Various Nationalities.

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ABSTRACT

The article is dedicated to studying the process of adapting the organisms of Russian and Mordovian girls to unfavorable ecological factors. The ecological situation was assessed according to the results of social and hygienic monitoring. We used the trochanter index as a bioindicator of the organism that responds to the ecological state of the environment. We used it to rate the evolutive somatotype. Our researches showed that under the influence of unfavorable ecological factors the changes of indicators of the evolutive somatotype had a systematic character. They differed with Russian and Mordovian girls.

Keywords: ecological factors, girls, nationality, anthropometry, trochanter index, evolutive somatotype, arterial tension, Kerdo index.

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ISSN: 0975-8585

INTRODUCTION

The world ecological crisis is a principal problem of the modern times. Degradation of the biosphere that is a real threat for the further human society development is a direct consequence of reinforcement of the anthropogenic impact on it. Since the beginning of the XXI century, native and foreign scientists have been stating negative tendencies of the growth and development of population in the form of slowing the process of accelerating, retardation, asthenization and sex differentiation abnormalities [1-3]. Environmental pollutants are known to actively affect the organism phenotypic variation.

The analysis of the ecological situation in the Republic of Mordovia (MR) allowed to reveal the territories that had underdone radioactive and chemical contamination as well as the groups of persons of the increased risk who lived under unfavorable ecological conditions [4-5]. The level of the environment pollution is related to the person's organism, its morphological and functional properties through the constitutional type of the age evolution [6-7]. The issue related to ethnical constitutional peculiarities of the population adaptation to unfavorable ecological factors in various regions of Russia remains understudied.

METHODOLOGY

The goal of our research was to study morphofunctional parameters of the evolutive somatotype of Russian and Mordovian girls caused by ecological factors. The ecological situation was analyzed according to the results of social and hygienic monitoring in the Republic of Mordovia that had been performed since 2014. The object of the research included 105 girls aged 18 (75 Russian girls and 30 Mordovian girls) who lived in the Republic of Mordovia and underwent the affect of ecological factors. We measured their height in a standing and sitting position, the leg length, chest circumference, body weight, heart rate and arterial tension. We calculated Pirke index, Pinier index, body weight index (BWI), chest proportionality index (CPI), trochanter index (TI), Kerdo index (KI), and defined the evolutive somatotype according to V.G. Shtefco (1993) and S.G. Vasilchenko (1990) [6-7].

DISCUSSION AND RESULTS

The Republic of Mordovia belongs to the Privolzhsk Federal District of the Russian Federation. We assessed the ecological situation in the Republic of Mordovia according to the results of social and hygienic monitoring for 2014. According to monitoring, the basic sources of pollution of the atmosphere in the Republic of Mordovia still include highway transport, industrial enterprises, enterprises related to electrical energy industry, and building materials [8].

The laboratory inspection of the atmosphere state on the territory of the republic is carried out by the Center of Hygiene and Epidemiology in the Republic of Mordovia, the Mordovian Republic Hydrometeorology and Environment Monitoring Center, and other departmental accredited organizations.

In 2014, 9,549 samples of the atmosphere of localities were researched in accordance with the state sanitary and epidemiological supervision. 1,601 samples or 16.8% of the total number were selected in urban settlements in the zone of industrial enterprises affect; 5,148 samples or 53.9% at highways in dwelling zones; 2,600 samples or 27.2% were selected at fixed monitoring stations. In rural settlements 942 samples of atmosphere were researched. The share of samples of atmosphere in urban settlements with the level of pollution that exceeds hygienic standards – admissible concentration limit (ACL) in the Republic of Mordovia in the reporting year is 0%.

The state of atmosphere was also controlled at 4 fixed monitoring stations of the Mordovian Hydrometeorology and Environment Monitoring Center. Such related substances as mercury, formaldehyde, benzpyrene, heavy metals, and nitrogen oxide were controlled. Formaldehyde and nitrogen oxide showed higher ACL. The quality of water in the distributing water supply system during the latest three years has remained at the same level according to its chemical composition (the share of water samples that do not comply with hygienic standards in accordance with sanitary and chemical indicators was 39.4 – 38.7%, and 16.7 – 16.4 in the Russian Federation accordingly). The basic reason of discrepancy of drinking water samples in the natural character of subsoil water where the increased amount of fluorides is registered. According to microbiological indicators, the share of samples that do not comply with hygienic standards was 4.5%.

In the reporting year the centralized domestic water supply of the population of the Republic of Mordovia was carried out due to 1,500 water-well holes and 988 water mains.

In 2014, the situation with the state of subsoil sources of centralized domestic water supply and the quality of water in water intake areas did not considerably change in comparison with 2013.

In 2014, 156 (10.4%) sources of centralized domestic water supply out of 1,500 ones did not comply with sanitary and epidemiological requirements.

The share of water samples from the distribution network of the centralized domestic water supply that do not comply with sanitary requirements is as follows: 39.4% according to sanitary and chemical indicators in 2014; in 2013 this indicator in the Russian Federation was 16.4%. The share of water samples from the distribution network of the centralized domestic water supply that do not comply with sanitary requirements according to microbiological indicators was 4.5% in 2014; and in 2013 this indicator in the Russian Federation was 4.2%.

In 2014, 11.8% of the total amount of samples of water from water supply networks did not comply with hygienic normative standard according to organoleptic indicators; 6.2% - according to general mineralization; 26.5% - according to the content of chemical substances that excess ACL of santox, including 26.5% according to the content of fluorine.

The water is supplied to rural settlements in the republic from centralized and non-centralized water sources. 150 wells are used as non-centralized sources of drinking water supply, including 145 wells used in rural settlements for drinking purposes. In 2014 the share of non-centralized sources of water supply that did not comply with sanitary and epidemiological requirements was 8.0%, and 7.6% - in rural settlements.

The relative share of objects of non-centralized water supply that do not comply with normative requirements remained on the level of the previous year. The share of samples of water of non-centralized water supply that do not comply with sanitary requirements according to sanitary and chemical indicators is 34%, which is considerably higher than the average Russian indicator of 2013 – 0.71%.

The share of samples of water of non-centralized water supply that do not comply with sanitary requirements according to microbiological indicators was 13.7%.

According to unsatisfactory samples of non-centralized water supply, administrative acts on cleaning and disinfection with subsequent abstraction of water samples were made in relation to property holders.

The share of population provided with good drinking water in the republic is 62.4% (506,490 persons), in urban settlements it is 70.3% (346,327 persons), and in rural settlements - 50.1% (160,163 persons). 62.1% of the population of the Russian Federation, or 88,954,755 persons, were provided with good drinking water in 2013 [8].

Basic problems related to hot water supply systems include wear of heat mains, untimely of schedule preventive maintenance, and violation of the temperature conditions of hot water provided to the population from closed systems of centralized hot water supply.

In total in 2014 in the Republic of Mordovia 835 samples of hot water from the distribution network (124 samples concerning sanitary and chemical and 710 samples concerning microbiological indicators) were researched. 17 samples – 13.7% - of them did not comply with hygienic normative standards according to sanitary and chemical indicators. According to microbiological indicators the percent of substandard samples was 1.4%.

32 administrative reports were made in relation to officials and legal entities according to Article 6.5 of the Administrative Code of the Russian Federation for the committed violations of the sanitary legislation (discrepancy of the quality of hot water according to microbiological, sanitary and chemical indicators (excess of ferrous iron), non-compliance with parameters of the temperature of hot water in places of water draw-off. 16 reports were made in relation to legal entities [8].

All reservoirs in the republic belong to the second category of water use and are not used for drinking water supply. There are no reservoirs of the first category. In 2014 the share of samples from reservoirs of the second category that do not comply with sanitary requirements according to sanitary and chemical indicators decreased by 12.4% in comparison with 2013. The share of samples from reservoirs of the second category that do not comply with sanitary requirements according to microbiological indicators increased by 14.9% in the reporting year. An obvious reason of the discrepancy of water from reservoirs according to microbiological indicators is the transfer of ice water to reservoirs. Repeated researches of water from reservoirs after the arranged events complied with hygienic normative standards. The share of samples from reservoirs of the second category that do not comply with sanitary requirements according to parasitological indicators decreased in comparison with 2013.

All samples of water from reservoirs researched for radiologic indicators and occurrence of pesticides (53 samples were researched) comply with the hygienic normative standards. The selected samples of soil (sand from beaches) studied for the occurrence of harmful substances (salts of heavy metals), microbiological, parasitological and radiologic indicators complied with hygienic normative standards.

In the reporting year according to the instructions of the Administration of the Federal Service for Supervision of Consumer Rights Protection and Human Welfare in the Republic of Mordovia, during the period related to preparing for the bathing suit season, the Administrations of the city district of Saransk and municipal regions of the republic performed works on improving recreation zones of reservoirs and brought them into compliance with the requirements of sanitary standards; river sand on beaches was timely replaced.

Every week Heads of Administrations of the city district of Saransk and municipal establishments of regions, and population of the Republic of Mordovia received information about the state of reservoirs and the quality of water in them via mass media, television, radio and the Administration website [8].

The basic reasons of polluting the soil on the territory of the residential construction still include the lack of schemes related to clean-up of settlements and their imperfection, increase in the number of household wastes, wear and deficit of specialized transport means and containers for collecting household and food wastes, the lack of conditions for washing and disinfection of refuse-collection containers, the lack of the centralized system of sewage facilities in a number of settlements, unsatisfactory state of sewage networks, the lack of selective refuse collection from the population in the republic regions, occurrence of unauthorized landfills in the republic regions.

The share of soil samples that do not comply with hygienic normative standards according to sanitary and chemical indicators remained on the level of the previous year, and is considerably lower than the indicator for the Russian Federation in 2013. It is 8.2%. The samples were researched within social and hygienic monitoring and did not comply according to insignificant excess of benzpyrene. The reason of non-compliance of the samples with hygienic standards is highway transportation passing on through streets that are located near the residential construction.

The share of soil samples that do not comply with the hygienic normative standards according to microbiological indicators remained on the level of the previous year and was 4.0%. In 2013 this indicator in the Russian Federation was 8.8%. The researched samples of soil did not comply with hygienic normative standards according to the content of enterococcus. The repeated researches of the soil samples complied with hygienic normative standards.

The share of soil samples that do not comply with the hygienic normative standards according to parasitological indicators decreased by 0.5% (from 1.4% to 0.9%). In 2013 in the Russian Federation the share of soil samples that do not comply with the hygienic normative standards according to parasitological indicators was 1.5%. Female cells of helminthes and ascarides were found in all unsatisfactory samples.

The share of soil samples that do not comply with hygienic normative standards on the territory of child care centers and playgrounds according to sanitary and chemical indicators was 2.0 % (2.2% in 2013). The share of soil samples that do not comply with hygienic normative standards on the territory of child care centers according to microbiological indicators was 0.0% (0.0% in 2013). The share of soil samples that do not comply with hygienic normative standards on the territory of child care centers and playgrounds

according to parasitological indicators was 1.5% (1.5% in 2013). The repeated researches of soil samples after the conducted events (sand replacement) complied with hygienic normative standards.

According to laboratory researches the content of harmful substances in the soil of the settlement zone, protective sanitary zones (PSZ) of sources of drinking water supply complies with the requirements of sanitary standards and regulations according to sanitary and chemical indicators (availability of pesticides, salts of heavy metals: mercury, lead, cadmium).

During the latest three years, the soil in all 88 samples that were researched on the territory of PSZ of sources of drinking water supply has complied with hygienic standards according to sanitary and chemical, microbiological, parasitological indicators and for the occurrence of radioactive substances in it.

We researched the impact of ecological factors on morphofunctional indicators of evolutive somatotype of girls who live in the Republic of Mordovia. In total, we researched 105 (75 Russian and 30 Mordovian) girls who live in the Republic of Mordovia.

We compared morphofunctional indicators and calculation indices of Russian and Mordovian girls.

Table 1. Anthropometric and functional characteristics of Russian and Mordovian girls (M±δ)

Indicators	Nationalities	
	Russian (n = 75)	Mordovia (n = 30)
Height in a standing position, cm	163.71±6.16	163.33±5.70
Height in a sitting position, cm	85.84±3.12	85.37±2.55
Leg length, cm	82.80±4.45	83.77±4.44
CO, cm	82.05±5.31	83.07±4.89
Body weight, kg	57.49±9.25	57.29±8.72
HR, beats per minute	78.16±11.87	79.37±12.89
ATsc, Torr	112.98±12.33	112.59±12.52
ADd, Torr	69.10+9.89	70.96±12.47
Pirke index, %	90.71±2.56	91.31±2.55
Pinier index	24.17±12.19	22.96±10.93
BWI	21.41±2.97	21.41±2.58
CPI, %	50.14±3.15	50.86±2.53
KI, %	10.11±16.22	9.44±18.41
TI	1.97±0.07	1.95±0.06

According to Table 1, there is a tendency to decreasing of TI with Mordovian girls (TI of Russian girls = 1.97, and 1.95 of Mordovian girls, the t criteria = 1.76, statistical significance p = 0.08). The average value of TI with Russian girls is within normevolutive type of constitution. It is on the border of normevolutive and hypoevolutive types for Mordovian girls.

As we can see from Tables 2 and 3, it is defined that antropometric characteristics and functional indicators of the system of blood circulation depend on evolutive somatotype of Russian and Mordovian girls. This dependence is more prominent with Russian girls. It is proved by a number of statistically significant differences according to morphological and functional parameters between various evolutive somatotypes.

Girls with pathological and dysevoutive somatotypes lived in ecologically unfavorable regions of Mordovia (Insarsk, Torbeevsk, Krasnoslobodskoy, Chamzinsky, and Kochkurovsk) as well as in cities (Saranks and Razuevka).

Russian and Mordovian girls had different height depending on TI and evolutive somatotype. Thus, the difference of the height indicators (150 cm for Russian and 168 cm for Mordovian girls) in case of pathological somatotype with TI ≤ 1.85 is statistically significant (p = 0.027). In case of normevolutive and hypoevolutive somatotypes the indicators of the body height coincided.

ISSN: 0975-8585

Table 2. Dependence of anthropometric characteristics and functional indicators of the system of blood circulation on evolutive somatotype of Mordovian girls (n = 30) (M±δ)

Indicators	Evolutive somatotypes						
	Pathological TI ≥ 2.09	Dysevolutive TI = 2.04 - 2.08	Hyperevolutive TI = 2.01 - 2.03	Normevolutive TI = 1.95 - 2.0	Hypoevolutive TI = 1.92 - 1.94	Dysevolutive TI = 1.86 - 1.91	Pathological TI ≤ 1.85
Height in a standing position, cm	159.5±17.8	158.0±5.59*	170.05±10.60	164.1±3.60	164.66±9.29	162.0±3.41	168.0±4.24
Height in a sitting position, cm	84.0±8.48	84.25±5.06	87.5±3.53	85.7±1.88	86.0±4.58	84.0±2.16	87.5±2.12
Leg length, cm	76.0±8.48*	76.75± 2.21****	84.5±4.94	83.4±2.11	85.0±4.58	85.42±1.81	92.5± 0.7 ****
CO, cm	87.5±14.84	80.5±2.38	84.5±4.94	85.0±6.63	81.66±4.72	81.57±3.90	82.0±2.82
Body weight, kg	66.0±29.69	51.0±1.41	60.5±6.36	59.9±9.50	60.0±13.22	54.71±8.45	55.5±7.77
Pirke index, %	89.78±1.87	87.5±2.25*	94.77±4.25	91.49±2.53	91.45±0.85	92.88±1.67	91.99±0.19
Pinier index	6.0±26.87	26.5±3.1	25.5±0.7	19.2±5.78	23.0±8.71	25.71±9.17	30.50±6.36
BWI	25.11±6.06	20.46±1.04	20.79±0.39	22.25±3.48	21.91±2.25	20.75±2.48	19.61±1.76
CPI	54.67±5.14	50.96±0.89	49.56±0.18	51.8±3.94	49.59±0.18	50.33±1.68	48.80±0.45
HR, beats per minute	72.0±9.89	84.0±6.37	79.5±2.12	77.2±16.68	82.33±18.87	78.71±11.02	72.5±12.02
ATsc, Torr	113.5±9.09	122.25± 21.79	112.0±16.97	110.7±10.54	113.66±16.05	107.14±4.87	115.5± 12.02
ADd, Torr	74.5±20.5	82.0±24.38	64.5±6.36	70.6±7.6	72.33±14.89	67.14±9.51	68.5±7.77
KI, %	-6.43± 43.11	3.15±2.67	18.94±5.84	7.09±16.25	11.73±2.74	11.76±25.01	5.10±5.0

* p < 0.05. ** p < 0.01. *** p < 0.005–0.002. **** p < 0.001

Table 3. Dependence of anthropometric characteristics and functional indicators of the system of blood circulation on evolutive somatotype of Russian girls (n = 75) (M±δ)

Indicators	Evolutive somatotypes						
	Pathological TI ≥ 2.09	Dysevolutive TI = 2.04 - 2.08	Hyperevolutive TI = 2.01 - 2.03	Normevolutive TI = 1.95 - 2.0	Hypoevolutive TI = 1.92 - 1.94	Dysevolutive TI = 1.86 - 1.91	Pathological TI ≤ 1.85
Height in a standing position, cm	155.2± 5.80****	165.0±6.75	163.76±5.06	165.27±5.7	164.42±5.25	166.12±3.64	159.28± 4.86*
Height in a sitting position, cm	81.80± 2.04***	87.66±2.94	86.23±2.68	86.44±2.84	85.71±2.92	87.5±2.26	82.85± 1.57***
Leg length, cm	73.6± 2.6 ****	80.0± 3.52*	80.92± 2.49***	83.55±3.04	85.0±2.76	87.5± 2.13***	86.14± 2.26*
CO, cm	79.2±5.02	82.66±9.41	80.0±4.81	81.34±3.82	82.28±2.43	86.12± 4.82**	84.42±5.25
Body weight, kg	51.2± 6.68*	58.5±17.35	53.68±8.42	58.25±6.0	58.42±6.75	64.12± 8.99*	55.0±7.48
Pirke index, %	89.68±2.43	88.2± 3.96***	89.92± 1.37*	91.18±2.01	91.48±11.18	89.9±3.74	92.22± 11.76
Pinier index	24.8±8.31	23.83±20.0	30.07±10.16	25.67±7.16	23.71±11.76	15.87± 15.23*	19.85± 15.92
BWI	21.24±2.43	21.16±4.40	19.96±2.52	21.31±1.85	21.62±2.56	23.34± 14.08*	21.81±3.98
CPI	51.0±1.74	49.99±3.72	48.85±2.61	49.25±2.41	50.09±2.28	51.89± 3.56*	53.08± 4.45***
HR, beats per minute	67.0±9.46	83.5±10.01	78.23±12.36	77.48±10.91	82.28±10.11	79.75±10.19	81.71±18.95
ATsc, Torr	112.0±4.89	124.66± 10.55*	118.46±8.58	112.51±11.7	108.42±8.97	113.75±9.16	100.57± 19.72*
ADd, Torr	68.2±5.4	80.16± 14.13*	71.84±6.69	69.13±9.17	64.28±5.34	67.5±4.62	59.85± 13.78*
KI, %	-3.15± 14.73*	3.22±17.61	5.96±17.86	9.83±12.69	20.46±14.44	14.20±12.37	26.34± 8.34**

* p < 0.05, ** p < 0.01, *** p < 0.005–0.002, **** p < 0.001

The coincidence of indicators of the body weight was observed in three types of constitution: normevolutive, hypoevolutive, and pathological somatotypes with TI ≤ 1.85. In case of other types of constitution statistically invalid differences were observed, for example, in case of pathological somatotype with TI ≥ 2.09.

Differences were also revealed according to functional indicators of the blood circulation system (heart rate, arterial tension, Kerdo index). Specific evolutive somatotype is formed in the process of ontogeny under the influence of various environmental pollutants. To a large extent, it determines physical development of girls and their functional indicators. Herewith, considerable ethnic differences are observed.

Analyzing the obtained data and comparing it with the data from references on the studied scientific area, it is necessary to note that according to the data of monitoring in 2014 there is a number of problems related to ecological situation in the Republic of Mordovia. The occurrence of mercury in the environment in the Republic of Mordovia draws attention of scientists. In September, 2014 they entirely ceased the exploitation of the section on producing fluorescent bulbs in the central part of the city of Saransk and transferred technological equipment in the industrial zone. As a result, they ceased negative impact of emissions of the production of fluorescent bulbs on the population that lives on the territory of the sanitary and protection zone of the enterprise. As a consequence, the concentration of mercury vapor in the atmosphere in the nearby residential constructions was decreased to ACL. The problem of polluting the environment with mercury is characteristic of many countries of the world, for example, the occurrence of mercury in mining wastes in China or in the Upper Silesia in Poland [9−10].

The excess of ACL of formaldehyde and nitrogen oxide during the control of the state of atmosphere at 4 fixed monitoring stations of the Mordovian Republic Hydrometeorology and Environment Monitoring Center shows the danger for the health of the population of the city of Saransk. The researches of scientists showed that the occurrence of formaldehyde in the environment is related to contemporary technological processes [11]. The pollution of air indoors with formaldehyde leads to the progression of asthma with children [12]. According to specialists, the pollution of atmosphere with nitrogen oxide is related to intensive traffic and can lead to various human diseases including oncological ones [13−14].

It is characteristic of the Republic of Mordovia that the basic reason of the discrepancy of drinking water samples is the natural character of subsoil waters where increased content of fluorides is observed. It is known that high dozes of fluorine causes the abnormality of carbohydrate, lipidic, and protein turnover as well as metabolism of vitamins, enzymes and mineral salts. It leads to skeletal and teeth fluorosis. The problem of the increased content of fluorine in water is characteristic of many countries (India, China, etc.) [15-16].
Samples of soil researched in the Republic of Mordovia within social and hygienic monitoring showed a decrease in ACL of benzpyrene. This substance has cancer-causing and toxic characteristics. It causes breast cancer with women, and lung cancer with men [17−18].

The general ecological situation in the Republic of Mordovia was of interest for us. It can be assessed according to a comprehensive impact of negative ecological factors on the person's organism by using a biological indicator – trochanter index and evolutive somatotype. This method proved its efficiency and specificity.

CONCLUSION

These researches determined that unequal pollution of the territory was characteristic of the Republic of Mordovia. Dysevolutive and pathological somatotypes are formed with its inhabitants under unfavorable ecological factors. They have low functional possibilities that are necessary for the person's adaptation to mental and physical activity, and development of various diseases. Determining differences according to indicators of evolutive somatotype of Russian and Mordovian girls is an important result of the researches. The conducted researches allow to make the following conclusions:

- The pollution of components of the environment in separate regions of the Republic of Mordovia is unequal.
- Regional ecological peculiarities affected physical development and indicators of evolutive somatotype of girls of various nationalities.
- Changes in the organism of inhabitants of this region have a systematic character, because they are stipulated by the person's evolutive somatotype.

ISSN: 0975-8585

REFERENCES

[1] Nikitin, Yu.P., D.V. Denisova and L.G. Zavyalova, 2003. Ten Years Trends of Some Indicators of Health and Life Style of Teenagers in the Period of Social and Economic Transformations: Population Study of 1989–1999. Bulletin of the Siberian Branch of Russian Academy of Sciences, 2: 27–35.

[2] Fubini, E.M., M. Masali and E. Eynard, 2001. Changes in secular trend of stature in Italian regional populations. Rivista di Antropologia. 79: 165−172.

[3] Danubio, M.E. and E. Sanna, 2008. Secular changes in human biological variables in Western Countries: an updated review and synthesis. Journal of Anthropological Sciences. 86: 91−112.

[4] Kaverin, A.V., A.A. Shchankin and V.A. Byzgaev, 2012. Ecological Risk of Diseases of Population of the Republic of Mordovia. Mordovia State Pedagogical Institute, pp: 104.

[5] Shchankin, A.A. and G.I. Shchankina, 2014. Ecological, Morphfunctional amd Methodological and Pedagogic Aspects of the Evolutional Constutution of Person. Mordovia State Pedagogical Institute, pp: 310.

[6] Shtefco, V.G. and A.D. Ostrovskiy, 1929. Schemes of Clinical Diagnostics of Constitutional Types, Biomedgiz. pp: 79.

[7] Vasilchenko, G.S., S.G. Agarkova and S.G. Agarkov, 1990. Sexopathology. Medicine, pp: 576.

[8] "On Condition of Sanitary and Epidemiological Welfare in the Republic of Mordovia in 2014" State Report, 2015. Administration of the Federal Supervision Agency for Customer Protection and Human Welfare in the Republic of Mordovia, Saransk, pp: 136.

[9] Li, P., X. Feng, G. Qiu, B. Meng, J. Wang and J. Zhang, 2013. Mercury speciation and mobility in mine wastes from mercury mines in China. Environmental Science and Pollution Research, 12: 8374−8381.

[10] Pyta, H., C. Rosik-Dulewska and M. Czaplicka, 2009. Speciation of ambient mercury in the upper Silesia region, Poland. Water, Air, & Soil Pollution, 1−4: 233−240.

[11] Xinlei, G., Jian L. and G. Wanzhen, 2008. Study on preparation of nano-tio2 by w/o microemulsion reactor and its photocatalytic degradation of air pollution. Colloid Journal, 3: 429−432.

[12] Hulin, M., I. Annesi-Maesano and D. Caillaud, 2010. Indoor air pollution and childhood asthma: variations between urban and rural areas. Indoor Air, 6: 502−514.

[13] Ghosh, J.K., J.E. Heck, M. Cockburn, J. Su, M. Jerrett and B. Ritz, 2013 Prenatal exposure to traffic-related air pollution and risk of early childhood cancers. American Journal of Epidemiology, 8: 1233−1239.

[14] Mbuyi, M.H.Ts, 2003. Air pollution at the bily kriz mountains in the Czech Republic. International Journal of Environment & Pollution, 1: 1.

[15] Reddy, A.G.S., P.N. Rao, K.M. Prasad and D.V. Reddy, 2010 Hydrogeochemical characterization of fluoride rich groundwater of wailpalli watershed, nalgonda district, Andhra Pradesh, India. Environmental Monitoring and Assessment, 1−4: 561−577.

[16] Wang, Z., X. Guo, Y. Lei, Y. Wang, Q. Zhang, G. Bai, Z. Fan and Y. Ding, 2009. Elevated levels of arsenic and fluoride, but not selenium, associated with endemic disease in the chinese village of Dazhuyuan, Shaanxi province. Fluoride - Quarterly Reports, 1: 34−38.

[17] Gerber, B., 2002. Umweltfaktoren und brustkrebsrisiko moglichkeiten der prevention. Der Gynäkologe, 6: 561−569.

[18] Lee, P.N., B.A. Forey and K.J. Coombs, 2012. Systematic review with meta-analysis of the epidemiological evidence in the 1900s relating smoking to lung cancer. BMC Cancer, 12: 385.