INFLUENCE OF TEMPERATURE GRADIENTS ON HUMAN HEALTH

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Abstract
The researches was carried out under the frame of PN II – Partnerships in the project Detection of Thermal Gradients Generated by Global Climate Changes on Romanian Territory through the Phenomena of “Heat Island” Mitigation Solutions Included. The paper presents the effect of the temperature gradients on human health. It is very well known that high temperatures represent an aggression on human body. In summer day, a high temperature induces a stress from the cardiovascular to respiratory system, skin, and neurological system.

The thyroïdal pathology in Romania has a high incidence. It was developed a study regarding the evaluation of the necessary amount of synthesis thyroid and anti-thyroidal hormones as a function of environmental factors: geographical area, the specific temperatures of the zone and live condition urban versus rural. The criteria used for the study was the map of temperatures provides by the project partner National Administration of Meteorology Bucharest.

The study shows the variations of TSH value having less values in spring-summer season and higher values in winter season. For this reason, the medication has to be adapted to the climatic conditions.

Keywords: climate changes, thyroïdal pathology, temperatures gradients

1. INTRODUCTION

Reliable measurements of the global mean temperature using scientific instruments have been available now for about 140 years; the values of the last one thousand years can be estimated with a reasonable degree of reliability at least for the northern hemisphere. In 1998 the global mean temperature reached a new high, which far exceeded all the values of the last one thousand years (Munich Re [1]). The particularly steep increase in temperature in the course of the last few decades cannot be explained by natural influences, such as fluctuations in solar activity. The leading scientists in the field of climate research are now convinced that man is, at least partly, responsible for a warming of the climate and that this will have massive repercussions.

The study carried out was based on the results given by the satellite detection of gradient temperatures during the year 2008 (DESATEMP, [2]).

2. MATERIALS AND METHODS

The group of study has 634 patients, male and female, over 18 years old suffering of thyroïdal pathology: hypo-thyroidal, hyper-thyroidal, euthyroidal de novo or under treatment, coming in the Institute of Endocrinology C.I.Parhon in 2008 and 2009. There wasn’t patients suffering of malign thyroïdal tumor, a surgery in the last three months or being under nutritional diet.

The subjects were studied in summer time comparing with winter time, from different regions of Romania, as shown in Fig.1.

![Figure 1 Geographical distribution of the patients](image-url)
The study was conducted based on the gradient temperatures maps provided by National Administration of Meteorology Bucharest for the year 2008. The selected areas of study was delimited by the pick value of temperature and the existence of “heat islands” – as shown in the Fig.2.

Figure 2: The map of “heat island” on 08/15/2008, hour 13.00 GMT

3. RESULTS

In the group of patients, a number of 236 (37,22%) were hypo thyroidal, 122 (19,24%) hyper thyroidal and 276 (43,54%) euthyroidal (Fig.3).
The means value of TSH was determined for each category of patients, for summer season and winter season.

Figure 3: Thyroidal functional status of the studied patients

Hypothyroid patients have the geographical distribution showed in Fig.4.

Figure 4: Geographical distribution of hypothyroid patients

The results of TSH are presented in the Table 1 and Fig.5.

<table>
<thead>
<tr>
<th>Hypothyroid patients</th>
<th>TSH-summer season (µUI/ml)</th>
<th>TSH-winter season (µUI/ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SW</td>
<td>9,32+/−8,3</td>
<td>14,9+/−2,3</td>
</tr>
<tr>
<td>SE</td>
<td>9,42+/−2,2</td>
<td>23,3+/−3,5</td>
</tr>
<tr>
<td>Subcarpathian+N</td>
<td>9,37+/−6,1</td>
<td>17,85+/−1,15</td>
</tr>
</tbody>
</table>

Comparing the mean values of TSH it can observe that the necessary thyroid hormones is less in summer months than in winter with the value of p=0,12.

Figure 5: TSH values for hypo thyroidal patients

For the hyperthyroid patients, having the geographical distribution represented in the Fig. 6, the calculated mean value of TSH increased for summer months versus winter months with p=0,46 (Table 2 and Fig. 7).
Table 2: TSH values for summer and winter season

<table>
<thead>
<tr>
<th>Hypothyroid patients</th>
<th>TSH-summer season (µIU/ml)</th>
<th>TSH-winter season (µIU/ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SW</td>
<td>0.14±/-0.07</td>
<td>0.17±/-0.03</td>
</tr>
<tr>
<td>SE</td>
<td>0.15±/-0.07</td>
<td>0.31±/-0.021</td>
</tr>
<tr>
<td>Subcarpathian+N</td>
<td>0.156±/-0.09</td>
<td>0.21±/-0.013</td>
</tr>
</tbody>
</table>

Euthyroid patients have the geographical distribution showed in the Fig. 8. For this group of patients, it can also observe a similar situation: the mean value of TSH decrease in summer time and increase in winter time (Fig.9)

4. DISCUSSION

Thyroid hormones plays an important role in a large domain of physiology and metabolism but genetics and environmental factors which

The results of calculated TSH are presented in the Table 3.

Table 3: TSH values for summer and winter season

<table>
<thead>
<tr>
<th>Euthyroid patients</th>
<th>TSH-summer season (µIU/ml)</th>
<th>TSH-winter season (µIU/ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SW</td>
<td>1.17±/-0.09</td>
<td>2.09±/-0.97</td>
</tr>
<tr>
<td>SE</td>
<td>2.23±/-0.5</td>
<td>2.9±/-1.04</td>
</tr>
<tr>
<td>Subcarpathian+N</td>
<td>1.31±/-0.9</td>
<td>2.2±/-0.35</td>
</tr>
</tbody>
</table>
normally affect quantitative variations of thyroidal hormones are, in fact, unknown. Directly or indirectly, the action of thyroidal hormones has an influence over each virtual level of physiological integration. Thyroidal hormones stimulate the process of thermo genesis (Dumitrache, 1997, 1998, 1999 [3],[4]). The thermogenic response has a latent period of time consisting in hours or days. The increasing of oxygen consumption is correlated with the sodium transport increasing, respectively with the increasing of the Na and K-ATP activity. At the beginning of live and in the childhood the thyroidal hormones are vital for a right skeletal and neural development (Green, 1987, [5]). A report concerning the state of people health in Belgium, a country with moderate climate, shows a correlation between TSH concentrations and circadian cycle, demonstrating in the same time, the existence of the cycles along the year, less in spring-summer and higher in autumn. The differences has less values, varying from a minimum of 1,48 μUI/1 to a maximum of 1,85 μUI/1, the difference being 25% (Kung, 1995, [7]). It seems that, the seasonal modifying of the thyroid hormones metabolism is reflecting an internal adaptive mechanism and some studies performed in extreme climatic conditions will clear and solve this question (Auer, 2001, [8]). Not only the thyroid pathology react to global climate changes, but the whole body. The number of allergies and respiratory diseases increase due to high level of CO2. Approximately 300 million people around the world suffered of asthma and 250 000 people died because of this disease. The high level of CO2 stimulates the excessive production of pollen having as result an increased number of people suffering of allergy. In urban areas the situation is more dangerous. Due to the phenomena of “heat islands”, the high temperatures and the humidity facilitate the development of a large number of weed and wild-growing plant. The global warming determines the increasing of ozone concentration at the soil level, producing the irritation of respiratory system and deteriorating the state of asthmatics.

5. CONCLUSION

The majority of the observed patients having a thyroidal pathology live in the south-west of Romania. The necessary of thyroid hormones, evaluated by the value of TSH, was less comparing with the subjects from the rest of the regions of the country. The explanation could be the high level of temperatures from this area, as shows the thermal gradient map. TSH value presents year-long variations. It has less value in the spring-summer season and higher in winter months. It can say that, the high level of temperatures influence both, the state of thyroid function and also the response to therapy of patients suffered by thyroidal pathology hyper- or hypo- functional. This aspect could influence the medical attitude regarding the dose of drugs and also the medical re-evaluation stages.

6. ACKNOWLEDGMENTS

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7. REFERENCES
