NUTRITION AND HEALTH STATUS OF MAN IN ANTARCTICA

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ABSTRACT

The objective of this study is to insure in Antarctica an adequate amount of nutritious intake in order to fulfil the requirements necessary to sustain life in an extreme environment and to evaluate any behavioural changes in consequence of low temperature, isolation and lack of the light-dark cycle.

RESUMEN

El objetivo de este estudio es garantizar un adecuado aporte nutritivo en modo de reunir las condiciones necesarias para sobrevivir en Antártico.

METHODS

The project involved operating personnel at the Italian station of Terra Nova Bay (BTN) in Antarctica during October-November 2002. The representative sample consisted of 33 subjects between the age of 31 and 62, 31 males and 2 females, everybody was in excellent health and had different jobs. The volunteers were divided into two groups: group A: 18 subjects with a controlled diet, group B: 15 subjects with a free diet. For the subjects with a controlled diet we had recorded their food habits in order to personalize their diets with an adequate amount of nutritious intake. At baseline and at the last week of the sojourn in Antarctica blood and hair samples were taken to be analyzed.

Seven essential elements were taken into account, Ca, Cu, Cr, Fe, Mg, Mn and Mo. Determinations of the content of trace elements were performed by Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES) and by Dynamic Reaction Cell Inductively Coupled Plasma Mass Spectrometry (DRC-ICP-MS). The choice of these instruments was suggested by a wide range of concentration of the elements to be analysed.

On average we checked 5 volunteers daily, we took anthropometric measurements.

RESULTS

Humans who live in Antarctica for more than five continuous months demonstrate alterations in the hypothalamic-pituitary-thyroid axis probably due to a combination of factors including extreme variations in daylight hours. The limited period of observation and the difficulty in preparing the diets didn't allow for a recognition in any of the subjects an appreciable metabolic variation, except for iron, TSH that increased and for ferritin that decreased significantly. Among the 18 subjects with the controlled diet we observed a decline in: weight, body mass index (BMI), circumferences, skinfolds, fat mass and an increase of free fat mass. On the other hand the 15 subjects with the free diet showed only a decline in weight, BMI and tricipital skinfold. We also observed the hydration status: 33.3% of the subjects in group A were normal hydrated at the beginning of the trial period in contrast to 55.6% at the end of the period in BTN; 40% of the subjects in group B were normal hydrated at the beginning of the trial period in contrast to 53.3% at the end of the period in BTN. We observed a decline in calcium, copper and magnesium in their hair. From statistical treatment we observed significant differences between concentration values before and after the expedition (Ca 563-422 µg g-1, Cu 11.5-10.7 µg g-1, Mg 73-64 µg g-1). The other: Cr 0,27-0,31 µg g-1, Fe 12,3-13,3 µg g-1, Mn 0,25-0,23 µg g-1, Mo 0,07-0,07 µg g-1. This data will also be evaluated in relation to hair samples taken in Dome C.

CONCLUSION

This study, from the onset after the first, was accepted very well by the personnel at BTN and the compliance in the study was excellent. Although the study period was about 40 days, we noticed that all subjects, after the trial period, were in good condition, so this could be an incentive to continue this type of study to maintain a good state of health with improvement of psychological and physiological efficiency. During our study the diet intake was controlled and always resulted adequately, so the variations observed in the hair was probably due to environmental conditions such as: prolonged presence of light, stress, etc. Regarding hair: stresses and lack of exercise have an important bearing upon Ca balance observed in blood and hair; several studies have shown that people who are under extreme nervous strain or worry or who do not exercise sufficiently have negative calcium balances even when the dietary intake is good.The results observed were interesting, but only further research could evaluated the data obtained.

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