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PHYSIOLOGICAL CHANGES IN ATHLETES AS A RESULT OF TAKING MICROFILTERED STERILIZED SEAWATER

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PHYSIOLOGICAL CHANGES IN ATHLETES AS A RESULT OF TAKING MICROFILTERED STERILIZED SEAWATER

Summary:

Objective: The aim of this work is to objectively study the results obtained from the use of seawater by top athletes. The positive but subjective responses[1] from athletes on taking cold micro-filtered seawater[2] lead us to think that it could be the ideal product for aiding physical recovery. It is therefore a question of looking for the data which allows us to confirm this.

Materials and method: 11 semi-professional indoor soccer players were studied. A double-blind trial was carried out by the Head of Exercise Physiology at the San Antonio Catholic University in Murcia. A maximal triangular treadmill stress test was carried out, along with a rectangular treadmill stress test with a continuous load equivalent to a speed corresponding to 70% of the maximum consumption of oxygen.

The test duration was 60 minutes. Twenty minutes before the test a blood sample was taken from each of the athletes. The athletes then consumed 20 ml of the liquid being studied or the same quantity of the placebo. The blood parameters analysed from the blood samples taken were: pH, partial oxygen pressure, partial carbon dioxide pressure, sodium, potassium, calcium, bicarbonate, lactate and glucose. One minute before the test the athlete was weighed and a further blood sample was taken using the same method outlined above.

Two further blood samples were taken during the test, using the same method, at minutes 30 and 59. The athlete also consumed 20 ml of the same liquid as before at minute 40 of the rectangular test. The third test used an identical methodology to the second, with the only difference being the liquid consumed: if the previous week the athlete had consumed the liquid being tested, he now consumed the placebo and vice versa.

Results: The results in terms of the blood variables show little variation in the parameters: pH[3], Chlorine, Calcium, Lactate and Potassium. The most significant variations are those for Sodium, with an increase of 2.8% with respect to the placebo, Bicarbonate stability, which did not fall below 23.3 mg/dl throughout the study, and the upward trend for glucose which contrasts to the downward trend for the placebo.

Conclusions: Combine the information from the study with the experience of the athletes leads us to deduce that the use of cold micro-filtered seawater by athletes helps them to recover from fatigue thanks to the increase in Sodium, which helps avoid Hypotonic Hyponatremia[4], and Bicarbonate, which helps avoid acidosis[5], and to the mobilisation and facilitation of the glucide reserves when required by the body. This facilitates hydromineral homeostasis[6].

Key words: Seawater, Athletes, Recovery, Fatigue, Glucose and Bicarbonate, Homeostasis.

INTRODUCTION

On the basis of comments made by elite athletes from different sports, such as surfing, beach volleyball, volleyball, football, indoor football, skateboarding, handball, basketball and sailing, the aim of this study has been to objectively examine the results obtained from the use of seawater by elite athletes, some of whom are world champions in their speciality.

The positive but subjective comments made by these athletes about taking cold micro-filtered seawater make us think that it could be an ideal product for physical recovery. Athletes taking hypertonic seawater find that they are less tired before, during and after physical and mental training, and while training they have more stamina and at times can even increase the intensity of their training. Injuries are prevented in teams that have regularly taken seawater during the season and the cramp that is so common in certain athletes and which prevents them from regularly practicing their sport is eliminated.

The aim is to look for the data which will allow us to confirm these benefits. In this first study we concentrate on evaluating the differences in blood parameters between the product being studied, cold micro-filtered seawater, and a placebo.

MATERIALS AND METHOD

POPULATION

11 indoor football players were studied. They belong to a team which competes at the national level and are aged between 16 and 34 (24.5 ± 5.5 years). Before the study began each signed to give their informed consent to take part in the project. This included authorisation to carry out stress tests and take blood samples.

TYPE OF STUDY

Double-blind cross-over trial.

METHODOLOGY

Each athlete was subjected to a triangular stress test and two rectangular stress tests. The three tests were carried out with a week between each. The stress tests were carried out without the subject having undertaken exhausting physical exercise during the 48 hours prior to the test. All of the stress tests were carried out in the Functional Trials Laboratory at the San Antonio Catholic University in Murcia with an air temperature of 20.2 ± 1.3ºC and a relative humidity of 52.6 ± 9.3%.

Before the first test each athlete was informed, both orally and in writing, of the methodology to be used in the study and the possible side effects from it. Additionally, before the first stress test a case history, physical examination and baseline electrocardiogram were taken for each footballer. All of the subjects were found to be healthy.

1st TEST: Maximal triangular treadmill stress test with an initial speed of 7 km/h, with increments of 1 km/h each minute while maintaining a constant incline of 1%. The athlete was monitored electrocardiographically and connected to a respiratory gas analyser. The variables evaluated in this test were:

- Maximum load reached (km/h).

- Maximum heart rate (bpm).
- Maximum oxygen consumption (l/min).
- Maximum relative consumption of oxygen (l/kg x min).

The inspiratory flow and the volume of gases exchanged (oxygen and carbon dioxide) were monitored breath by breath using an open circuit gas analyser (Sensormedics MVmax 29C). The ventilatory thresholds were calculated using the Wasserman criteria (1987).

2^{nd} TEST (Annex 1): A rectangular treadmill stress test, with a continuous load equivalent to a speed which corresponds to 70% of the maximum oxygen consumption, calculated in the previous stress test, maintaining an incline of 1%.

The test duration was 60 minutes.

Twenty minutes before the start of the test a blood sample was taken from each athlete by way of micro punctures of the finger pad using a lancet. The blood was transported in 100 μl capillary tubes (radiometer clinitubes D957G 100 μl) and analysed in real time using a portable blood lactate analyser (brand ISI Sport model 1500 L), an analyser of blood pH, gases and electrolytes (Radiometer model ABL 77) and a portable glycaemia meter (accu-check compact). The athlete then took 20 ml of the liquid being studied or the same quantity of the placebo. The blood parameters measured from the blood sample were: pH, partial oxygen pressure, partial carbon dioxide pressure, sodium, potassium, calcium, bicarbonate, lactate and glucose.
One minute before the test started the athlete was weighed and a further blood sample taken in the same way as before.

Two further blood samples are taken during the test, in exactly the same way, at minutes 30 and 59. The athlete also took 20 ml of the same liquid as before at minute 40 of the rectangular test.

As soon as the test was completed the athlete was weighed again in the same conditions as before.

3rd TEST: The same methodology as the second test. The only difference was the liquid consumed: if the previous week the athlete had consumed the liquid being tested, he now consumed the placebo and vice versa.

CHEMICAL ANALSIS OF THE COMPOUNDS BEING STUDIED:

- Liquid being studied: cold micro-filtered sterilized seawater.
    - Sodium --------------------10200 mg/l
    - Magnesium ---------------- 1400 mg/l
    - Calcium -------------------- 860 mg/l
    - Potassium ------------------ 395 mg/l
    - Chlorine ------------------- 18800 mg/l
    - Sulphate -------------------- 2700 mg/l
    - Bicarbonate -----------------134 mg/l
    - Iron ------------------------- 0.003 mg/l
    - Zinc ------------------------ 0.015 mg/l

- Placebo liquid: Distilled water

STATISTICAL ANALYSIS

A descriptive analysis of each variable was carried out followed by ANOVA of a factor for repeated measures (dependent variables: glycaemia, lactacidemia, pH in the blood, partial carbon dioxide pressure in blood, partial oxygen pressure in blood, natremia, kalemia, calcemia, chloremia, bicarbonate in blood. Independent variable: type of liquid).

RESULTS

The change in each of the blood variables was studied over time and with changes in the liquid consumed. The most significant results were:

- Sodium (Chart 1): There were significant increases in natremia over time in the rectangular test, both for the athletes taking the liquid being studied ($p<0.0001$) and the placebo ($p<0.003$). The increases are greater for the athletes consuming the liquid being studied and the result is particularly significant ($p<0.012$) at the end of the test.

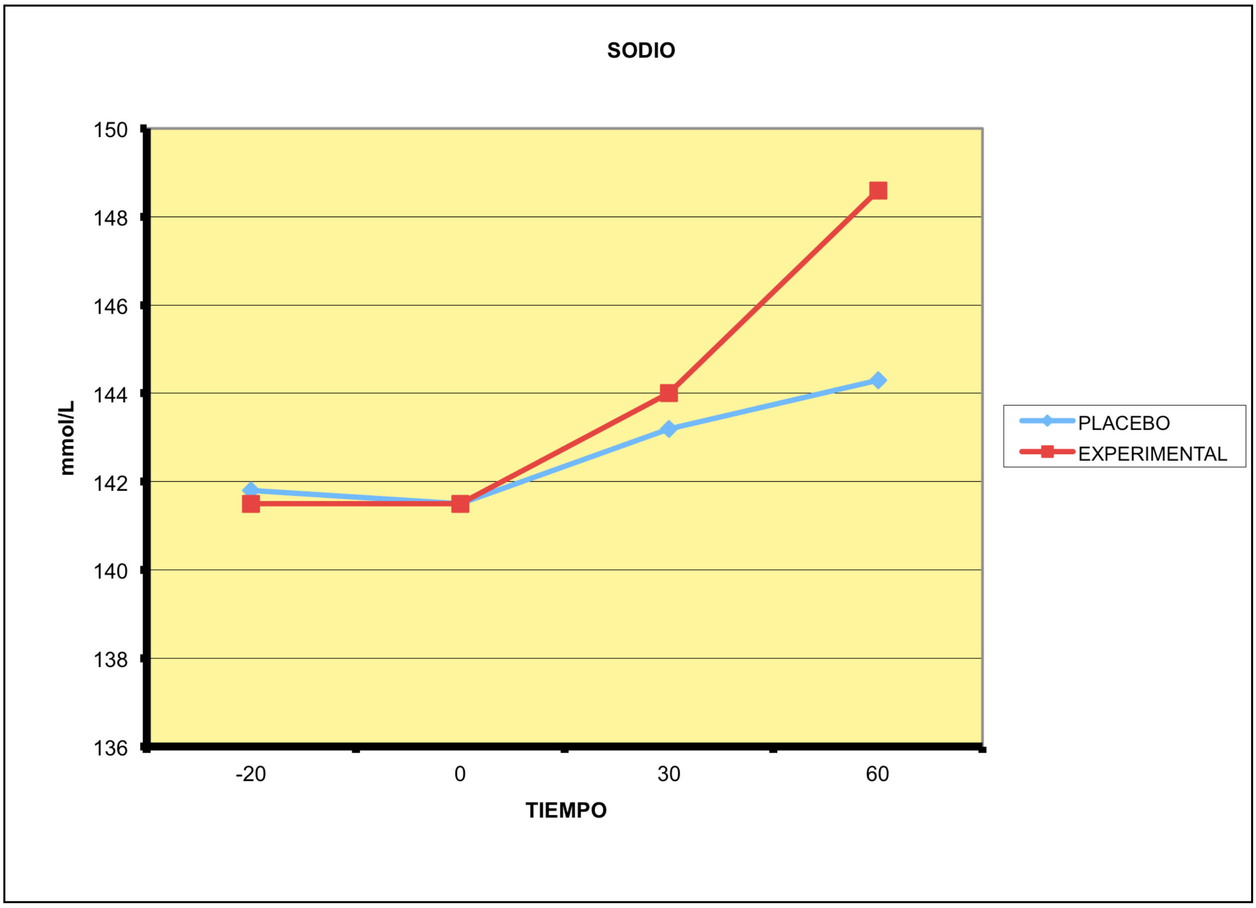

Chart 1: Changes in natremia during the stress test and with the consumption of different drinks.

- Chlorine (Chart 2): There are significant increases in the concentration of chlorine in the blood throughout the rectangular test, both for the athletes taking the liquid being studied ($p<0.0001$) and those taking the placebo ($p<0.003$). These increases are greater for the athletes who have taken the liquid being studied, this being particularly significant ($p<0.05$) at the end of the test.

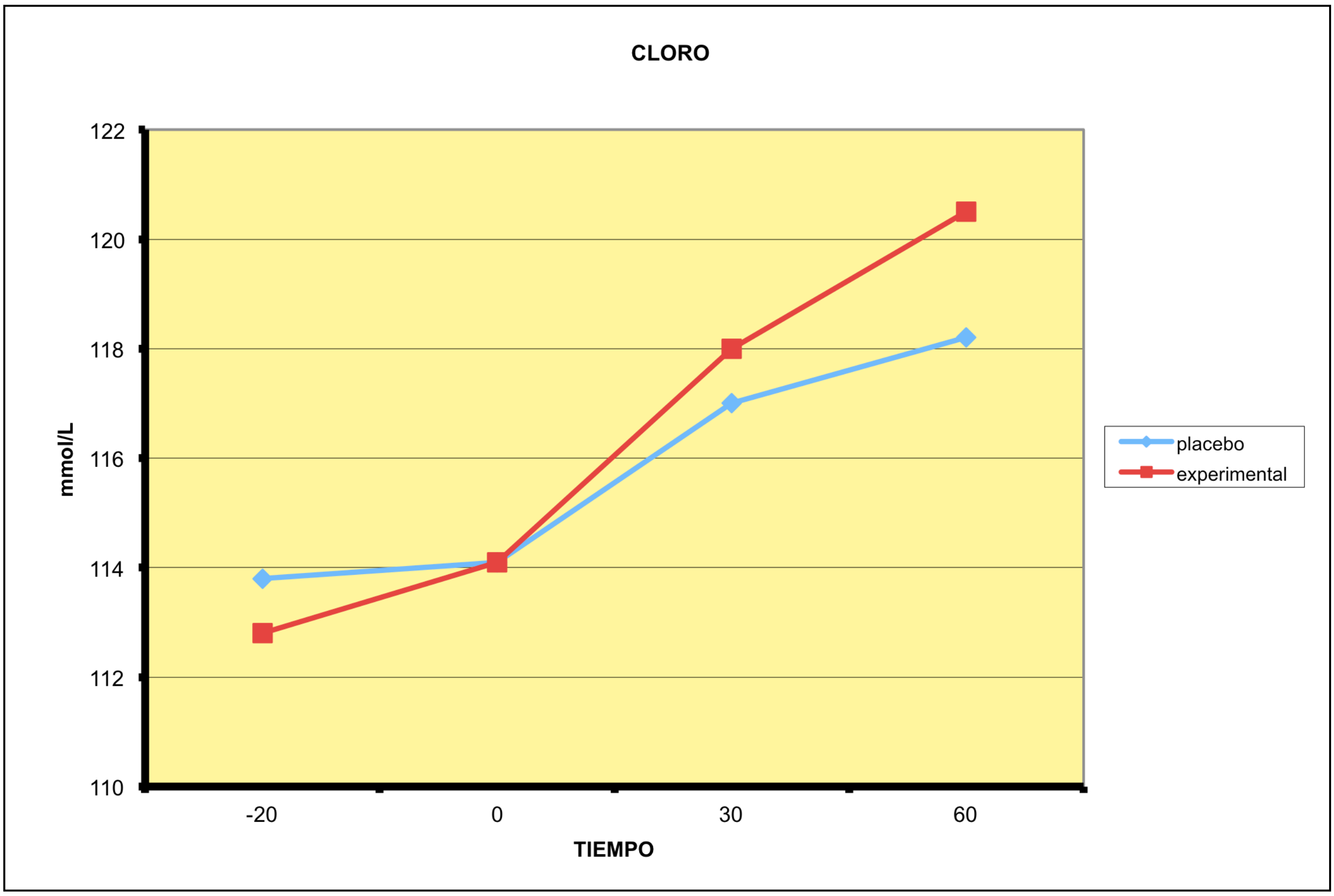

Chart 2: Changes in chloremia during the stress test and with the consumption of different drinks.

- Potassium (Chart 3): There are significant increases in kalemia during the rectangular test, both for the athletes taking the liquid being studied ($p<0.0001$) and the placebo ($p<0.001$). There appears to be no difference in this variable on the basis of the liquid drunk.

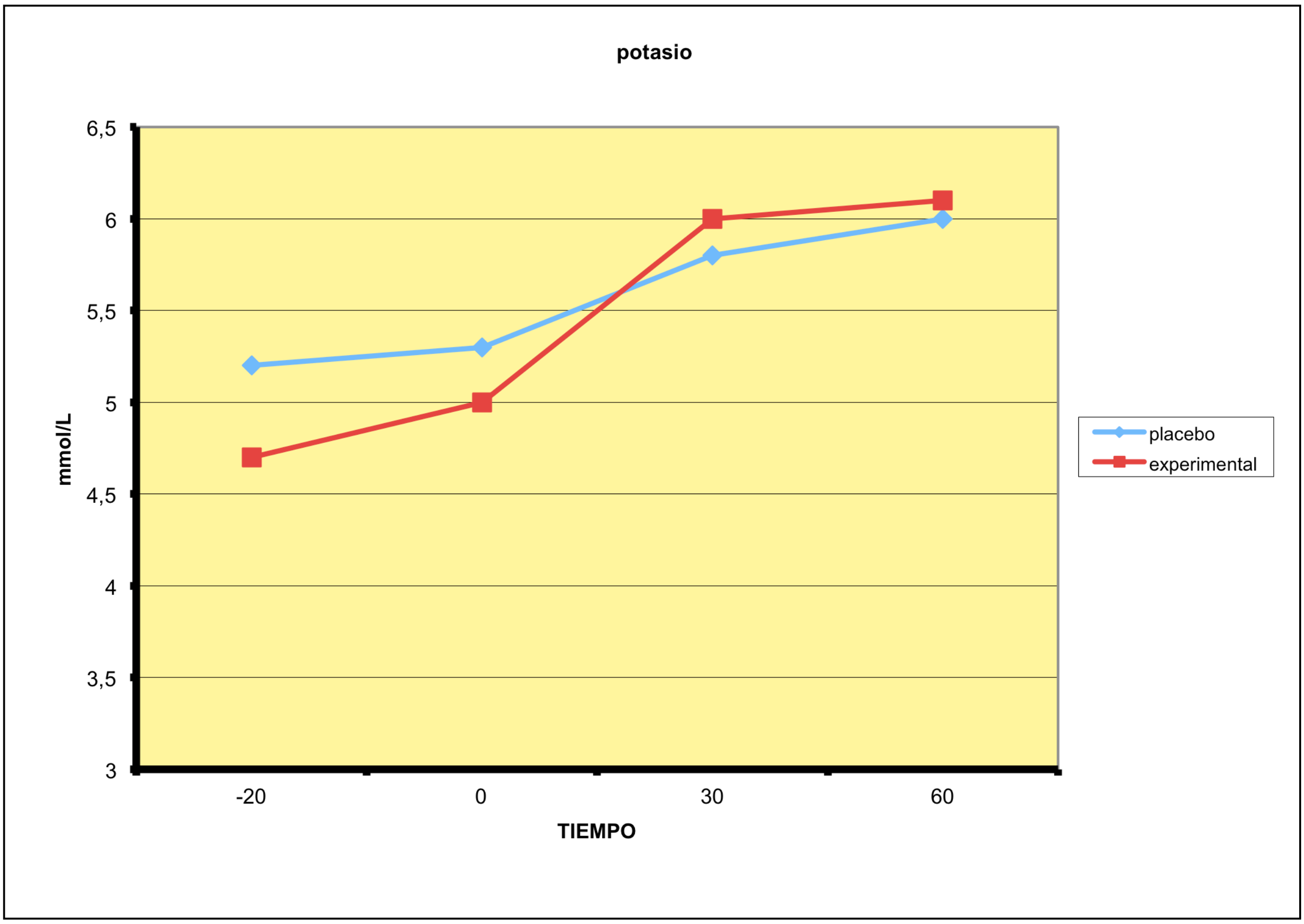

Chart 3: Changes in kalemia during the stress test and with the consumption of different drinks.

- Bicarbonate (Chart 4): There are significant reductions in the concentration of bicarbonate in the blood throughout the rectangular test, both for the athletes who took the liquid being studied ($p<0.0001$) and those who took the placebo ($p<0.003$). These reductions are greater for athletes taking the placebo, being particularly significant ($p<0.045$) at the end of the test.

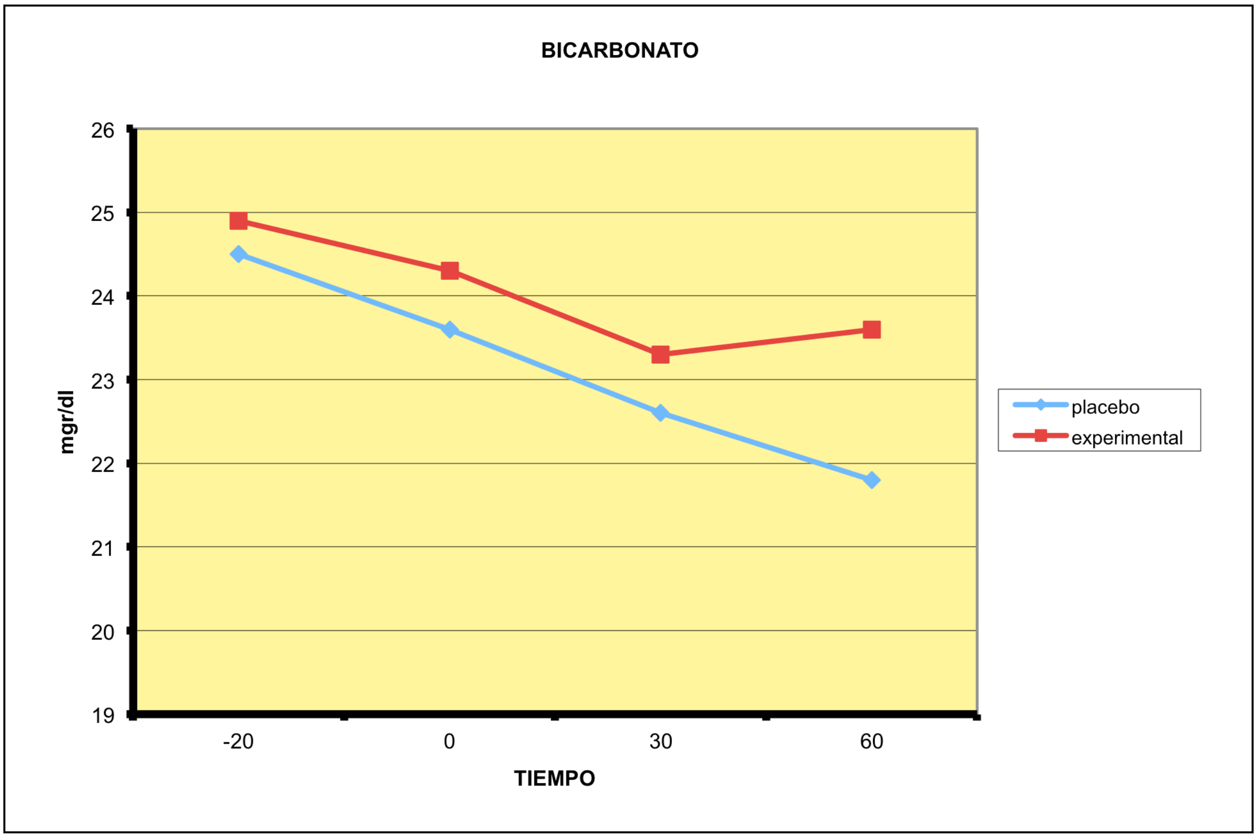

Chart 4: Changes in the concentration of bicarbonate during the stress test and with the consumption of different drinks.

- Glucose (Chart 5): there are no changes in this variable throughout the test or depending on the liquid consumed.

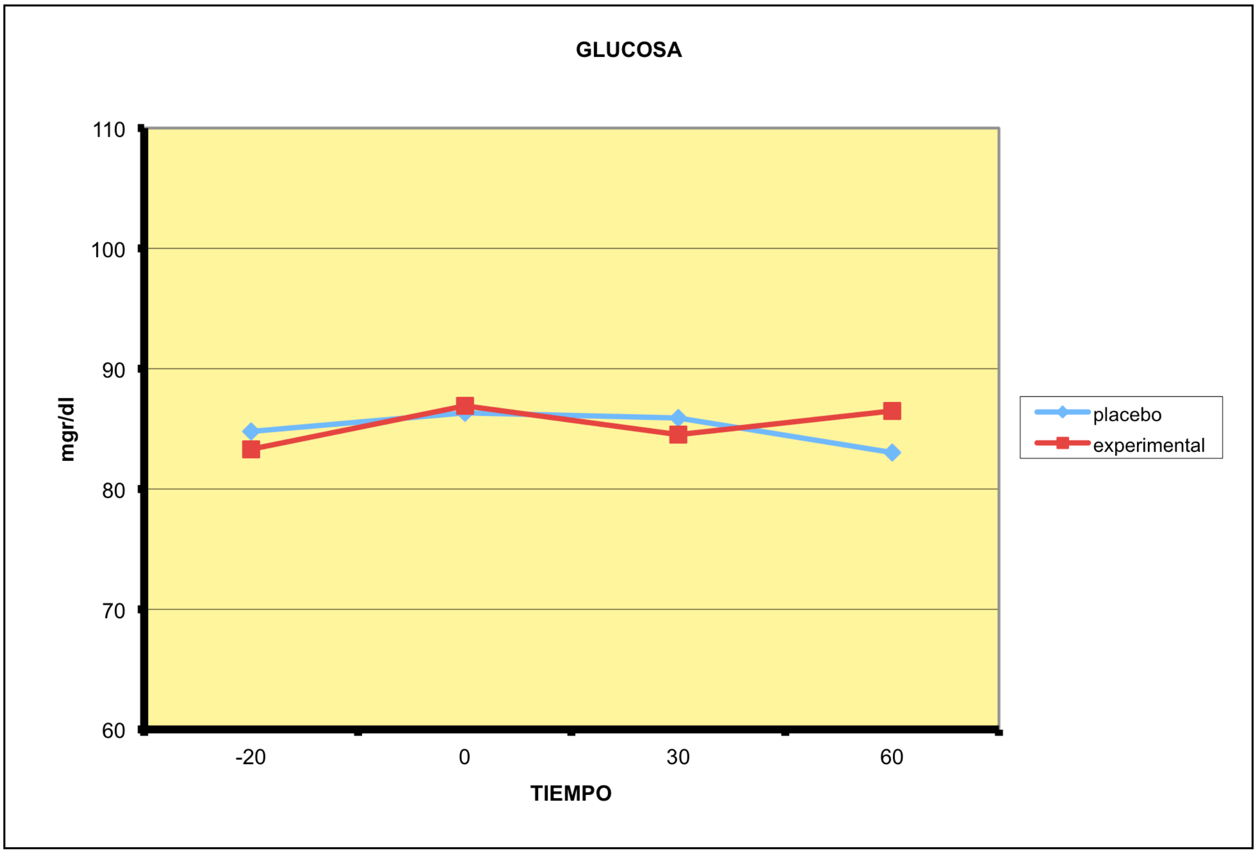

Chart 5: Changes in glycaemia during the stress test and with the consumption of different drinks.

DISCUSSION

The most interesting result from the study is the increases observed, most significantly in the charts for sodium, chlorine, bicarbonate and glucose.

Sodium, so important in controlling Hyponatremia in athletes, allows us to avoid a reduction of this intracellular ion and this brings an associated reduction in intracellular dehydration.

In turn, this increase in Sodium, given its relationship with glucose, will increase the effectiveness with which glucose is made available to the cells.

The increase in glycaemia in a product which does not contain this appears to be very significant. It makes us think that a mobilisation/facilitation of the glucide reserves is produced which makes them available in response to demand. This would in part explain the recovery that the athletes describe.

Chlorine increases because the drink is seawater and this increases in direct proportion with the sodium.

The increase in bicarbonate makes us think that the product produces a blood buffer effect which favourably controls cellular acidity.

It seems curious that there is an increase at minute 30 and this could be because the product places an ionic pool[7] [8] at the disposition of the body[9] [10] and this is used when necessary[11].

In light of the results and the comments made by the athletes, we would recommend that hypertonic seawater be taken as part of professional and semi-professional sports training programmes as a way of increasing resistance to the workload to which athletes are subjected over the season.

Although the results are not conclusive, we believe that they are important and we are therefore continuing with our work to see if these results can become more significant. The intention is to increase the duration of the exercise to confirm the trends which point to a better recovery by the athlete, and to take a blood sample several minutes after the exercise has finished which will give us resting values and allow us to confirm the results.

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