

Thermalism and Sport

Conference

Dr. Juan Ramón Pina Membrado

A STUDY OF THE ANTI-AGING AND ANTI-FREE RADICAL EFFECTS OF SULPHUROUS WATER (World Pioneering)

***COUNCIL OF ANDALUSIA
ANDALUSIAN SPORTS INSTITUTE***

**Alhama de Granda Spa
16-18 November 2006**

Spa Therapy Antioxidant effects on elite athletes from the San Cugat del Vallés Centre of High Performance Sport (CAR).

Dr. Juan Ramón Pina Membrado. Medical Hydrologist. (University of Montpellier. France.) Pharmacist. Holder of a Diploma in Health. Founder and Medical Director of Laboratories Averroes. Medical Director of Font Vella Spa.

INTRODUCTION

The ancient Egyptians (3000 BC) were the first to utilise Mineral-Medicinal Waters and their by-products for therapeutic uses. The Greeks (6thC BC) and subsequently the Romans gave a great impulse to thermal treatment. During the Middle Ages these practices fell into disuse and were only maintained by the Arabs (12thC). Not until the Enlightenment (18thC) do we observe a rebirth of interest in Mineral-Medicinal Waters and their medical applications which has continued until today.

Within the existing extensive range of Mineral-Medicinal Waters, Sulphurous Waters are those that have the largest number of therapeutic uses, something that makes them particularly valuable in the thermal world. One of their most surprising properties is the hematopoietic and recuperating effect on the organism after situations of stress and physical exhaustion, something that, according to the Chronicles of Pliny the Elder, the Romans were already taking advantage of during the Gallic Wars.

Thanks to our everyday clinical practices, we have been able to observe the excellent results obtained after treatment with Sulphurous Waters on pathologies

that are of interest to Rheumatology, Dermatology, Pulmonology, Otolaryngology, Allergology, Proctology and Gynaecology. Nevertheless we have yet to investigate their reconstituting and protective effects on the organism and this is the reason we have designed the current study on athletes with high aerobic endurance. Before giving details of the study, we will examine the therapeutic agent used: Sulphurous Water.

SULPHUROUS WATERS (SW)

Definition

SW is water that contains Hydrogen Sulphide (H₂S) in concentrations higher than 1 mg/l. and smells like rotten eggs. There are two types: calcic and sodic.

Calcic SWs are of shallow origin, cold, of high mineralisation, high sulphate, calcium and magnesium content, and low in silica and radioactivity.

Sodic SWs are of deep origin, hot, of low mineralisation, bi-carbonated, low in calcium and magnesium, high in silica and with high radioactivity.

Microbial Flora - Glairines

Another unique peculiarity of SWs is the suspended presence of sulphur cycle bacteria (glairines or baregines) that, as we will see, greatly increase the therapeutic effects of this type of mineral-medicinal waters.

Glairines are mucilaginous pectin gels, of filamentous aspect and very greasy to touch, that float on the surface of the SA. Their colour is variable depending on which type of bacteria is predominant: greenish (cyanobacteria), reddish (red sulphur bacteria) and whitish (white sulphur bacteria). Every SA spring has its own microbial floral mix of sulphur-oxidising and sulphur-reducing bacteria but all have in common that they will be prokaryotic and anaerobic given that H₂S is one of the strongest poisons known.

In our Averroes Spring we have identified and catalogued more than 40 species of bacteria; of all of these we have selected only 3 because they are the most useful in therapy and in the composition of our medicines. The Glairines must be handled with extreme care in therapies because they have the property of increasing up to 3,000 times the concentration of Sulphur of the original SA. As an example, we will give both the beneficial and detrimental details of some of these.

OSCILLATORIA

- Cyanophytes, blue bacteria from sulphur.
- Autotrophs.
- Obligate phototrophs.
- Photosynthesis like higher plants.
- O₂ production.
- In conditions of anaerobiosis they are capable of oxidising H₂S to S producing granules of extracellular sulphur.
- Filamentous, elongated form.
- 3 micron diameter.
- Cells wrapped in a vein.
- Movement by rotation on an axis.
- Contain floating gas bubbles.

LYNGBIA

- Cyanophytes, blue bacteria from sulphur.
- Autotrophs.
- Obligate phototrophs.
- Photosynthesis like higher plants.
- O₂ production.
- In conditions of anaerobiosis they are capable of oxidising H₂S to S producing granules of extracellular sulphur.
- Filamentous, elongated form.
- 2 micron diameter.
- Cells wrapped by a vein.
- Movements by rotation on an axis.

- Contain floating gas bubbles.

CHROMATIUM OKENII

- Red sulphur bacteria.
- Autotroph.
- Obligate phototrophs.
- Do not produce O₂.
- Obtain reductive capability from H₂S producing granules of extracellular sulphur.
- Size 5 microns.
- Movement by two polar flagellum.

THIOCAPSA PFENNIGH

- Red sulphur bacteria.
- Autotroph.
- Obligate phototrophs.
- Do not produce O₂.
- Obtain reductive capability from H₂S producing granules of extracellular sulphur.
- Size 1.6 microns.
- Spherical shape.
- Immobile.

THIOTRIX

- Colourless sulphur bacteria.
- Autotroph (chemolithotrophs).
- Aerobic.
- Obtain reductive capability from H₂S producing granules of extracellular sulphur.
- Lacking catalases, use H₂S for peroxide reduction.
- Filamentous form (trichome).
- Grouping in rosettes.
- 1.5 micron diameter.
- Immobile.

BEGGIATOIA

- Colourless sulphur bacteria.
- Autotroph (chemolithotrophs).
- Aerobic.
- Obtain reductive capability from H₂S producing granules of extracellular sulphur.
- Lacking catalases, uses H₂S for peroxide reduction.
- Filamentous form (trichome).
- 2.5 micron diameter.
- Movements by wriggling, flexing and contraction.

CHLOROBBIUM LIMICOLA

- Green sulphur bacteria.
- Autotrophs.
- Obligate phototrophs.
- Do not produce O₂.
- Obtain reductive capability from H₂S producing granules of extracellular sulphur.
- Bacillary shape.
- 0.5 micron diameter.
- Immobile.

Therapeutic Properties of SAs

The Royal Society of Medical Hydrology has recognised SAs as having the following pharmacological properties:

- Anti-inflammatory and anti-anaphylaxis
- Anti-allergic
- Immune-stimulant
- Repair and regeneration of the rhinosinal, pharyngeal and bronchial mucosa.
- Regeneration of articular cartilage.
- Anti-pruriginous
- Keratolytic and keratoplastic depending on the doses.
- Emollient and skin remover in eczematous dermatitis.
- Hepatic decongestant and detoxicant (glucuronide-conjugation).
- Hematopoyesis (*), hypoglycemiant (*) and hipocolesterolemiant (*).
 (*) Not scientifically demonstrated with the exception of Hematopoyesis in a study with High Aerobic Resistance Athletes using Hydropinic Therapy.

Uses of SWs in Sports Medicine

Our clinical experience with SWs at Averroes Spring enables us to recommend the following uses (only the most significant):

RHEUMATOLOGY: Arthritis, arthrosis, tendinitis, bursitis, abarticular processes, contusions, haematomas, warming up, prevention of post stress sore muscles, physiotherapy, rehabilitation.

PNEUMOLOGY: Flu, colds, and above all in EPOC (asthmas, bronchitis, emphysema and bronchiectasis).

OTOLARYNGOLOGY: Rhinitis, polypus, vegetations, pharyngitis, laryngitis, repetitive otitis, hyposima, nasal respiratory failure.

GYNEACOLOGY: catamenial edema, annexitis, metritis. The SW must be administered in sitting baths with vaginal cartridges.

ANTIOXIDANT EFFECTS OF SULPHUROUS WATERS (SW) ON HIGH PERFORMANCE SPORTSPEOPLE

Objective

The objective of this study is to analyse the protective and antioxidant effects of Laboratorios Averroes SW on national level triathlon athletes.

Materials and Method

Sample Characteristics

The sample was composed of 16 National Triathlon Athletes aged between 23 and 31 with a homogenous level of performance.

The criteria for inclusion in the study were as follows: active, injury-free male athletes, aged between 18 and 31 years old, subjected to the same training load for the duration of the study and having homogenous performance.

One week before starting the Experiment Protocol the subjects took part in an on foot road trial with their speed increasing until exhaustion (Leger and Boucher, 1980). The aim was to determine the individual speed that each should apply in the following field trials (MAS-Maximum Aerobic Speed).

Before beginning the Protocol the subjects were informed of the potential risk which consisted of the possibility of Thermal Crisis. They were also offered a Withdrawal Guarantee: the subjects could withdrawal from the study at any moment without previous explanation. Finally, a signed individual consent document was also required.

Experiment Protocol

The study was carried out blindly. The steps followed were:

- Extraction of a forearm, venous blood sample to establish the basal level.
- Ingestion of a Placebo substance for 3 weeks.
- Extraction of a forearm, venous blood sample immediately before the trial.
- Long duration, sub-maximum trial: 2 hours running at 70% MAS.
- Extraction of venous blood immediately after the end of the trial and 24 and 48 hours later.
- 4-week cleansing period.
- Extraction of venous blood to establish the basal level.
- Ingestion of Averroes Spring Sulphurous Water for 3 weeks.
- Extraction of venous blood sample immediately before the trial.
- Long duration, sub-maximum trial: 2 hours running at 70% MAS.
- Extraction of venous blood immediately after the end of the trial and 24 and 48 hours later.

Over the entire period of the trial the subjects had to comply with the following requisites: continue their normal lifestyle (diet, weight and physical exercise), not take any medicines or dietary supplements, submit themselves to the training programme designed by the research team and during all of the blood extractions remain seated to avoid prolonged venous ecstasy.

PLACEBO: This was designed and prepared by our Technical Director and consisted of Tap Water mixed with a *Gentiana Lutea Radix* decoction stored in amber coloured 500 ml PET bottles with a sealed lid labelled Sample A.

AVERROES SPRING SULPHUROUS WATER: sodium sulphide, paucimineralised, hypotonic, acratopog, bicarbonate, alkaline (pH 9.4) with strong silicate (SiO₂: 95 mg / l), Hydrogen Sulphide (H₂S: 8 mg / l) stored in amber coloured 500 ml PET bottles with sealed lids labelled Sample B.

SULPHUROUS WATER

SULFURETUM

Sulphurous Water Nasal Spray

Pharmaceutical Presentation of Sulphurous Water by LABORATORIOS AVERROES
www.labsaverroes.com

Hydropinic Treatment

The Triathlon Athletes were given the Hydropinic Treatment (drink) that we give to our patients in our clinic for two basic reasons: on one hand it gives excellent clinical results; on the other, there are no secondary effects such as thermal crisis. The model we follow is the following:

- **FIRST WEEK:** 250 ml Averroes Spring Sulphurous Water/24 hours. 125 ml on an empty stomach and 125 ml mid-afternoon.
- **SECOND AND THIRD WEEK:** 500ml Averroes Spring Sulphurous Water/24 hours. 125 ml on an empty stomach, 125 ml mid-morning, 125 ml before lunch and 125 ml mid-afternoon.

The convenient presentation of the Product allowed the subjects to carry it around all day with them, something which guarantees the scrupulous following of the prescription. What is more, as it is water, its consumption could be part of the total of the daily needs of this element.

The same model and other considerations are applicable in the case of the Placebo.

Study Hypothesis

When competing endurance sportspeople (ultra-endurance) suffer important damage to the organism, is primarily centred on three Systems:

- Locomotive: skeletal-muscular, bone and cartilage.
- Liver
- Metabolic: generation of Reactive Oxygen Species and general inflammation.

Recent studies carried out on endurance sportspeople such as Marathon and Spartathlon athletes have illustrated the damage produced on the structures described above. This assertion has been demonstrated analytically and quantified in a series of parameters in the blood, before and after competition, with all blood parameters remaining stable except the following:

- Skeletal damage: Increase in Creatine Phosphokinase (CPK).
- Hepatic damage: Increase in AST (GOT) and ALT (GPT).
- Metabolic damage:
 - Inflammation- Increase in white globules
 - Haemolysis- Reduction in haematites
 - Oxidative stress- Increase in ROS

Our working hypothesis was very simple: if we internally administer Averroes Spring

Sulphurous Water to high endurance athletes over a period prior to competition, we will produce a protective effect against muscular, hepatic and metabolic damage. To test this we will only have to measure, before and after competition, those parameters that are altered during competition.

Results

14 ml of forearm blood was extracted and the parameters described in Scientific Literature (aforementioned), amongst many others, were measured; what is more we incorporated new parameters that according to our judgement could bring more light upon the question such as:

- Alkaline Phosphate (AP).
- Hyaluronic Acid.

TABLE

KEY:

(*) P<0.05, (**) P>0.001.	HTC – Hematocrits (%).
CPK - Creatine Phosphokinase	HGB – Haemoglobin (g/100ml).
WBC – Leukocytes (10 ³ /mm ³).	CAT – Catalase (U/gr Hb).
RBC – Hematites (10 ⁶ /mm ³).	

Comments

After the Hydropinic Treatment, the results obtained were highly indicative and consistent with the “physiological” answer that is produced in high level competition:

- ↓↓↓ CPK (p<0.001): Drastic decrease in rbdomiolisis.
- ↓ WBC (p=0.037): Decrease in inflammation.
- ↑↑ RBC (p=0.017): Notable increase in Haematopoiesis.
- ↑↑ HGB (p=0.018): Notable increase in the Level of Haemoglobin.
- ↑ HTC (p=0.039): Increase in Hematocrits.
- ↑↑ CAT (p=0.010): Increase in Antioxidant Activity.
- ↓ AST, ALT: Reduction in Hepatic inflammation.

CONCLUSION

Sulphurous Water is that which contains three peculiarities, unique in Medical Hydrology: Hydrogen Sulphide (H₂S) in concentrations higher than 1 mg/l, smell reminiscent of rotten eggs and a high quantity of suspended bacteria (Glairines or Baresines).

In Thermalism, Sulphurous Waters are those that possess the highest number of therapeutic uses due to the fact that the Sulphur they bring to the organism (S⁰ and

S²⁻) is absorbed almost completely via all the spa routes: topical, atmiatric, vaginal-proctologic, intestinal and hydropinic. Of all of these routes, as one would expect, the *Hydropinic Therapy* is that which creates the most powerful pharmacological effects and for this reason should be handled with special care and by highly specialised personnel.

Amongst the many therapeutic properties of Sulphurous Water are four that are unique within the group of Mineral-Medicinal Waters: hematopoietic, hepatic cleansing, antioxidant and revitalising. Until now these surprising properties were only confirmed by clinical experience which has always stimulated our curiosity. For that reason, after 18 years of research, we decided to test them scientifically, designing and carrying out the current Study of Peroxidation in High Resistance Athletes.

In essence the study was set up to test the protective effects of *Hydropinic Therapy* with Averroes Spring Sulphurous Water on the injurious effects that are inevitably produced on the organism of High Resistance Athletes after competition. Those variables in blood that in practice are always affected during intense exercise were analysed and the result could not be more eloquent: statistically significant reductions in the CPK and the Leucocytes were confirmed as was an increase in Hemites, Hematocite, haemoglobin and Catalase. **None of the subjects suffered a thermal crisis.**

All of this allows us to roundly confirm that *Hydropinic Treatment with Averroes Spring Sulphurous Water* administered to High Resistance Athletes just before Competition, offers a protective effect from the damages that are produced in the organism after competition, manifested in the following ways:

- Decrease in Rabdomiolisis.
 - Decreases in inflammation.
 - Increase in Haematopoiesis.
 - Increase in Antioxidant Activity.
 - Protection against hepatic damage.
1. In healthy subjects the therapeutic effects of HYDROPINIC TREATMENT with AVERROES SPRING SULPHUROUS WATER only occur when there is a deviation from *physiological normality*.
 2. The results of the current Study also allow us to infer that elderly and chronic ill patients would also benefit enormously from *Hydropinic treatment*.