PostScript

LETTERS

Sodium ingestion and hyponatraemia: sports drinks do not prevent a fall in serum sodium concentration during exercise

In a well controlled and designed study, Baker *et al*[1] clearly showed the effects of ingesting large volumes of water or a carbohydrate/electrolyte sports drink (CES) on serum Na^+ concentration ($[Na^+]$) during exercise in older, active adults (54–70 years). The data show that ingesting any hypotonic fluid, be it water or a Na^+-containing sports drink (about 18 mmol/l), in volumes that are similar to or more than weight losses produces a fall in $[Na^+]$—a finding that mirrors the study of Twerenbold *et al* published in this journal.[2] Readers should know that any fluid of concentration less than 150 mmol/l is considered to be hypotonic to the plasma.

In the study of Baker *et al*,[1] the ingestion of a CES produced a lower rate of fall in $[Na^+]$, as also found by Twerenbold *et al*[2] and also by Barr *et al*.[3] However, the authors failed to conclude that the consumption of any hypotonic fluid at these rates nevertheless causes a steady decline in serum $[Na^+]$. Instead, Baker *et al*[1] concluded that a CES better restores plasma volume and is therefore a more effective fluid replacement in older adults during intermittent exercise. This conclusion ignores the fact that, in their trial, serum $[Na^+]$ in both the men and women fell during exercise, regardless of the type of fluid they were ingesting, and that a falling serum $[Na^+]$ will eventually lead to hyponatraemia and its associated symptoms and medical complications.

One female subject in the study of Baker *et al*[1] lowered her $[Na^+]$ by nearly 10 mmol/l in just 150 minutes when voluntarily consuming 2.7 litres of CES. I have replotted her data to show that, had she continued drinking the CES at that rate and given a relatively constant rate of decline, after four hours her serum $[Na^+]$ would be about 128 mmol/l. After five hours it would have reached 125 mmol/l, and after six hours it would likely have been 122 mmol/l (fig 1). As these are serum Na^+ concentrations at which cerebral and pulmonary oedema develop,[4] and at which emergency medical treatment is necessary, this finding is of particular significance.

In 2000, the average 42.2 km marathon finishing time for women in North America was 4:57 (h:min). In the 2005 San Diego marathon alone there were 9069 women finishers, of whom about 2985 finished in 4–5 h, 2379 finished in 5–6 h, and 2531 in 6–9 h.[5] If these marathon finishers were to consume CES at the rates advocated by Baker *et al* and elsewhere[6] to prevent ''voluntary dehydration,'' the number of hyponatraemic cases and their associated medical complications would be sure to increase, placing undue pressure on medical directors and their staff who must diagnose and treat this preventable yet complicated condition.

Of particular concern is the fact that sports drink companies, as well as the American College of Sports Medicine (ACSM) drinking guidelines,[6] currently advocate that sports drinks that contain Na^+ should be consumed to prevent hyponatraemia during prolonged exercise. However, the data of Baker *et al* clearly show that the consumption of any hypotonic fluid in quantities to prevent ''voluntary dehydration'' will inevitably produce a fall in serum $[Na^+]$, which can eventually lead to symptomatic hyponatraemia.

To help prevent any further increase in the number of cases of this preventable condition, I feel that this alternative interpretation of the data of Baker *et al* should be brought to the attention of the readers of this journal.

J Dugas
University of Cape Town, PO Box 115, Newlands, Cape Town 7725, South Africa; jdugas@sports.uct.ac.za

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Competing interests: none declared

References

1 **Baker LB**, Munce TA, Kenney WL. Sex differences in voluntary fluid intake by older adults during exercise. *Med Sci Sports Exerc* 2005;**37**:789–96.
2 **Twerenbold R**, Knechtle B, Kakebeeke TH, *et al*. Effects of different sodium concentrations in replacement fluids during prolonged exercise in women. *Br J Sports Med* 2003;**37**:300–3.
3 **Barr SI**, Costill DL, Fink WJ. Fluid replacement during prolonged exercise: effects of water, saline, or no fluid. *Med Sci Sports Exerc* 1991;**23**:811–17.
4 **Ayus JC**, Varon J, Arieff AI. Hyponatremia, cerebral edema, and noncardiogenic pulmonary edema in marathon runners. *Ann Intern Med* 2000;**132**:711–14.
5 Coca-Cola Zero Rock 'n' Roll Marathon, 2005. Online. www.rnrmarathon.com (accessed 15 Jul 2005).
6 **Convertino VA**, Armstrong LE, Coyle EF, *et al*. American College of Sports Medicine position stand: exercise and fluid replacement. *Med Sci Sports Exerc* 1996;**28**:R1–7.

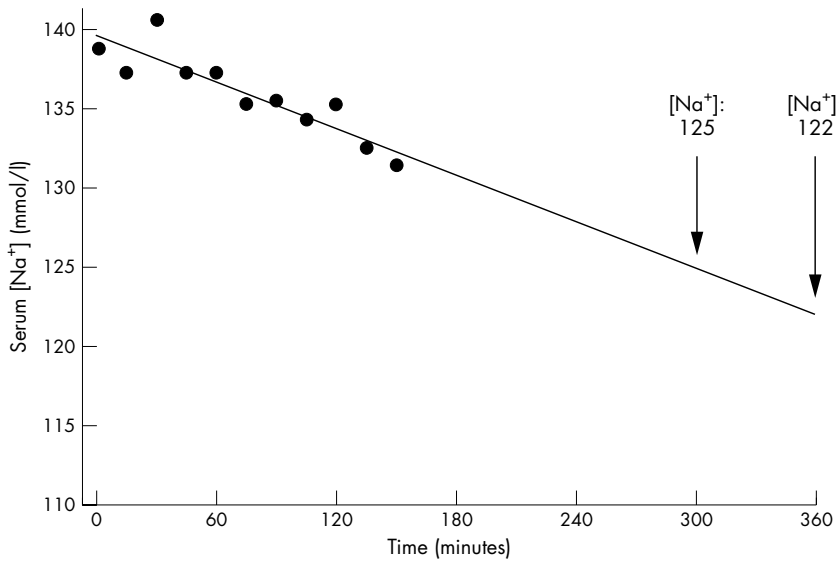

Figure 1 Linear regression (r^2 = 0.81; $p<0.05$) of the fall in $[Na^+]$ during exercise in one female subject in the study of Baker *et al*.[1] The rate of decline is approximately 3.3 mmol/l Na^+/l per hour when a carbohydrate/electrolyte sports drink is ingested at a rate of approximately 1.1 litres/h.

What do you think?

Since taking a year out of surgical training to investigate this new speciality by way of studying for the MSc, I look forward to the monthly arrival of your journal. The subject matter regularly presents a thought provoking mixture of original ideas and quality trial design.

There appears to be an obvious omission in the journal design though. Without a regular letters section, I think the reader misses out on the extended peer review process that for most journals allows experienced clinicians and scientists the opportunity to add their thoughts. Although I note a section exists on the website, it is more useful in the journal because this process of ''rubber stamping'' is what often highlights truly important work, at the same time exposing weak articles for what they really are.

Unfortunately it is probably easier for articles on minority subjects to get to print because of the paucity of suitable reviewers. On the few occasions that this happens, I would appreciate the chance to read the other side of the argument, or indeed to voice it.

D P Mather
St James University Hospital, Leeds, UK; daveypm@yahoo.com

BOOK REVIEW

Diagnostic imaging: orthopaedics

Edited by D Stoller, P Tirman, M Bredella. Published by Elsevier, 2004, hard cover, A$412.50, £175.35 (approx), €254.50 (approx), $307.62 (approx). ISBN 0721629202

Every once in a while, a very special reference work is published. This is one such example. The publishers announce in their blurb that they are proud to present ''a precedent-setting image and graphics-packed series that …represents the textbook of the twenty first century!''. I think they have delivered.

The book is split into nine sections. The first six of these cover all of the major joints, via a regional approach. Major muscle groups—for example, hamstrings—are included in the chapter relating to an adjacent joint. The final three chapters are concerned with bone marrow, bone tumours, and soft tissue tumours. There is no chapter on spinal problems; this must be the subject of another book in the series.

In terms of overall quality, it is outstanding. Each topic is covered in a stereotyped fashion, starting with terminology and imaging findings (split into the various diagnostic modalities), then follows a differential diagnosis.

A brief summary box encapsulates the key information that a clinician needs to know. The section finishes with selected references. These range from classic papers such as Detmer's 1986 one on chronic shin splints, through to references as recent as 2003.

A wise senior sports physician once told me that, to judge a textbook of sports medicine, look up the section on navicular stress fractures (about which there is reasonable consensus on diagnosis and treatment) and see what is written. I'm pleased to report that this book passes that particular test, although, being orthopaedically oriented, it is a little short on conservative treatment options. For this topic it merely states ''short leg cast'', with no indication of the usually recommended treatment time (six weeks) or of the fact that the patient should be non-weight bearing during that time. However, let us not forget that this is primarily a textbook of radiology. The image gallery shows six MRI pictures relating to navicular fractures, and a further three relating to differential diagnoses. One of the strongest features of the book is its use of graphics juxtaposed alongside images (usually MRI or plain films) which illustrate the pathology being described. Invariably, these are of high quality and add further weight to the expression ''a picture is worth a thousand words''.

Who should buy this book? It should be in the library of every major radiology practice or hospital department that has MRI facilities. It should be studied closely by every registrar in radiology before sitting their final exams. Orthopaedic surgeons and sports physicians have a good deal to gain from what should rank as the definitive work on diagnostic imaging of the extremities.

Is there anything not to like? Not much. I was disappointed to find that the major listing for brachial neuritis/neuralgic amyotrophy was under Parsonage-Turner syndrome. One of the characteristics of 21st century medicine should be that we seek to eliminate eponymous terms except where they are those used by the overwhelming majority of clinicians. The book is very strong on MR images, which reflects its North American origin. However, some more images from ultrasound or CT—for example, there are no ultrasound images of Achilles tendon pathology—would be of benefit.

Overall, this book represents a triumph of what I would call the ''Desert Storm'' approach to imaging. By throwing a large amount of resources at anything, the chances of a successful outcome are greatly increased. The huge number of MRI scans performed over the past 20 years has revolutionised our understanding of certain pathological processes. Entities such as bone bruises and internal meniscal degeneration were not known about when I graduated in 1980. Thanks to works such as this, all clinicians now have access to the best quality examples with which to compare their own cases. To the editors I say ''bravo!''.

Rating

- Presentation 20/20
- Comprehensiveness 19/20
- Readability 18/20
- Relevance 19/20
- Evidence basis 17/20
- Total 93/100

C Milne

CALENDAR OF EVENTS

XV International Congress on Sports Rehabilitation and Traumatology

1–2 April 2006, Centro Congressi Lingotto, Torino, Italy

The congress will focus on the rehabilitation of winter and mountain sports injuries.

The deadline for poster presentation submissions is January 15th 2006.

Further details: Organising Secretary: Francesco Cervellati; Tel: +39 051 6112568; Fax: +39 051 6112567; Email: congressi@isokinetic.com; Website: www.isokinetic.com

UK Radiological Congress

15–17 May 2006, NIA, ICC & Austin Court, Birmingham, UK

UKRC 2006 will offer a conference programmes with speakers from the United States, Europe and Japan participating alongside internationally recognised UK speakers. The scientific programme will include a wide range of topics and some of the highlights include:

- Special focus sessions covering topics such as musculoskeletal radiology, breast imaging, nuclear medicine, neuroradiology, radiation cancer biology, radiotherapy, and MR imaging
- A one day course on the theory of ultrasound, which will cover the physics of ultrasound, ultrasound equipment, scanning techniques, image recording and reporting, and artefacts. The course will include practical demonstrations of ultrasound equipment in order to highlight many of the theoretical points
- The prominent themes of digital imaging and information technology, and their application to medical imaging and service delivery are included in digital imaging and service delivery programmes within the conference

Further details: Tel: + 44(0) 207 307 1410/20; Fax: +44(0) 207 307 1414; Email: conference@ukrc.org.uk / exhibition@ukrc.org.uk; Website: www.ukrc.org.uk

12th European Society of Sports Traumatology, Knee Surgery and Arthroscopy (ESSKA) 2000 Congress

24–27 May 2006, Innsbruck, Austria

Further details: Tel: +49 611 9771635; Website: www.esska2006.com

4th European EIS*CSA* Congress

25–27 May 2006, Graz-Österreich, Germany

Challenges in Exercise: Training and Therapy

Further details: Tel: 02 21 / 80 11 00-0; Fax: 02 21 / 80 11 00 29; Email: eiscsa2006@comed-kongresse.de; Website: www.comed-kongresse.de

Amsterdam Foot and Ankle Course

15–16 June 2006, Amsterdam, The Netherlands

This international course is a two day course on minimally invasive surgery of the hindfoot and ankle, featuring lectures, live surgery presentations, clinical demonstrations, a workshop, an interactive computer course and a fireside quiz. Each year the course has an international faculty.

Further details: www.anklecourse.com

IV Science and Racket Sports World Congress

21–23 September 2006, Madrid, Spain

The congress will be held at the Spanish National Institute of Sport in Madrid, and in conjunction with the 8th International Badminton Federation (IBF) World Science Congress.

The congresses will take place during the World Badminton Championships, also in Madrid.

Further details: Dr David Cabello (dcabello@ugr.es)

AIPN 8th National Injury Prevention Conference

27–29 September 2006, University of New South Wales, Sydney, Australia

Further details: http://www.aipn.com.au/conference.html

23rd Annual Meeting of the German speaking Association of Arthroscopy (AGA)

29–30 September 2006, Salzburg Congress, Salzburg, Austria

Further details: Tel: ++ 49 611 97716-0; Fax: ++ 49 611 97716-16; Email: aga@intercongress.de; Congress homepage: www.aga2006.de; Online registration: www.registration.intercongress.de; Homepage of AGA: www.aga-online.de

Topics will include: arthroscopic cartilage therapy; rotator cuff and subacromial space; advances in cruciate ligament surgery; and what's new.

Joint German Congress of Orthopedics and Trauma Surgery

2–6 October 2006, Messe/ICC Berlin (Germany)

Further details: Tel: ++49 611 97716-0; Fax: ++49 611 97716-16; Email: info@intercongress.de; Congress homepage: www.orthopaedie-unfallchirurgie.de

Congress language will be German (no simultaneous translation). English sessions will take place in a separate lecture hall on two days. Twenty-four credit points are expected to be certified (6 per day, 3 per half-day).

BASEM Conference 2006

5–7 October 2006, Oxford, UK

Further details: Email: BASEMinfo@aol.com; Website: www.basem.co.uk