



## Oral fluids: How pseudoscience gulls the gullible

**To the Editor:** Dr Khumalo discussed the health myth of 'eight glasses a day – the perils of pseudoscience'.<sup>1</sup> I presume that the water bottling industry misused the pseudoscience<sup>2</sup> of 'eight glasses a day' to develop a novel and unnecessary industry in much the way that the sports drink industry has misused science to assist the growth of the multi-billion dollar a year sports drink industry. While there may be one subtle difference – sports drinks do indeed aid performance in athletes competing in sporting events lasting more than about 60 minutes (compared with either water ingestion or not drinking<sup>3</sup>) – there is no evidence to my knowledge that bottled water is more healthy than the (sterile) tap water in most of the developed nations where most of the 'healthy' bottled water is consumed.

In this regard, it is interesting to speculate on how the sports drink industry might have used 'pseudoscience' to develop its particular brand.

**Step 1:** Develop a new 'disease' for which your product is the sole therapy. The sports drink industry turned a normal physiological process – fluid loss from sweating – that evolved to protect humans against disease (heatstroke during exercise in the heat)<sup>4</sup> into a novel disease ('dehydration') with a potentially fatal outcome ('dehydration-induced heatstroke'). There is no good evidence that fluid ingestion during exercise plays any significant role in thermoregulation.<sup>5,6</sup> The key determinant of the body temperature response to exercise is the metabolic rate achieved during exercise.<sup>6,7</sup> Therefore, if fluid ingestion allows higher exercise intensity during exercise, it might promote – not prevent – heatstroke. Similarly, there is no evidence that dehydration is anything other than an associated



feature of some cases of exertional heatstroke – without any evidence that it is the exclusive cause.

We have argued that exercise-induced heatstroke is most probably the result of some genetic predisposition to the development of a state of explosive endogenous thermogenesis in susceptible individuals.<sup>8</sup> This is the only explanation for the relative rarity of heatstroke. For example, 5 cases of heatstroke developed in the 2002 Argus Pick 'n Pay Cycle Tour in Cape Town, held in unusually warm conditions.<sup>8</sup> If environment alone were the cause of heatstroke, then the vast majority of the 28 753 entrants should have been affected. That they were not, must indicate that only certain individual athletes are at risk of heatstroke because of an individual susceptibility that is currently poorly understood – and not simply because those affected were the only cyclists who became 'dehydrated'.

Similarly, lobbyists for the sports drink industry<sup>9</sup> continue to propose that a sodium deficit induced by exercise contributes to exercise-associated hyponatraemia (EAH) and muscle cramping, despite clear evidence to the contrary.<sup>10-13</sup>

**Step 2:** Encourage scientists to undertake research (funded at your expense) that promotes the incorrect science developed in Step 1. Reward those scientists with admission to a core clique of lobbyists and contrarians.<sup>14</sup> It is helpful if those scientists are encouraged to believe that these rewards depend on them sustaining the pseudoscience.

**Step 3:** Assist these 'contrarian' scientists in their efforts to become influential members of the editorial boards of the major scientific journals in which authors, foolish enough to dare challenge the pseudoscience of Step 1, may wish to publish their work. In this way, the pseudoscience can never be exposed.

**Step 4:** Establish yourself as a key funder of influential organisations that produce statements that can be used to promote your product. When these organisations produce position stands, try to ensure that the drafting committee includes enough of your favoured scientists that the pseudoscience of Step 1 underpins those guidelines. At the same time, it helps to ensure that your favoured scientists can become influential members of those organisations, preferably the President or Vice-President.

**Step 5:** Ensure that top athletes are paid to use only your product.<sup>15</sup> This gives the impression that their superior athletic ability is purely due to their use of your product.

I should imagine that the same model has been embraced by the sports supplement industry<sup>16</sup> and probably certain pharmaceutical companies.<sup>17</sup>

## T D Noakes

Discovery Health Chair of Exercise and Sports Science Institute Director  
Department of Human Biology  
University of Cape Town  
noakes@iafrica.com

1. Khumalo NP. Eight glasses a day – the perils of pseudoscience? *S Afr Med J* 2007; 97: 545.
2. Valtin H. "Drink at least eight glasses of water a day." Really? Is there scientific evidence for "8 x 8"? *Am J Physiol Regul Integr Comp Physiol* 2002; 283: R993-1004.
3. Sawka MN, Noakes TD. Does dehydration impair exercise performance? *Med Sci Sports Exerc* 2007; 39: 1209-1217.
4. Liebenberg L. Persistence hunting by modern hunter-gatherers. *Current Anthropology* 2006; 47: 1017-1025.
5. Noakes TD. Study findings challenge core components of a current model of exercise thermoregulation. *Med Sci Sports Exerc* 2007; 39: 742-743.
6. Byrne C, Lee JK, Chew SA, Lim CL, Tan EY. Continuous thermoregulatory responses to mass-participation distance running in heat. *Med Sci Sports Exerc* 2006; 38: 803-810.
7. Noakes TD, Myburgh KH, du Plessis J, et al. Metabolic rate, not percent dehydration, predicts rectal temperature in marathon runners. *Med Sci Sports Exerc* 1991; 23(4): 443-449.
8. Rae DE, Swart J, Knobel GJ, et al. Heatstroke during endurance exercise: Is there evidence for excessive endothermy? *Med Sci Sports Exerc* 2008 (in press).
9. Murray B, Kenney L, Bergerson M, Stachenfeld N, Kundrat S. The vital role of sodium in exercise. Gatorade Sports Science Institute Podcast 2007. [www.gssiweb.com/podcast.aspx](http://www.gssiweb.com/podcast.aspx) (accessed 14 April 2008).
10. Irving RA, Noakes TD, Buck R, et al. Evaluation of renal function and fluid homeostasis during recovery from exercise-induced hyponatremia. *J Appl Physiol* 1991; 70: 342-348.
11. Hew-Butler TD, Almond CS, Ayus JC, et al. Consensus Document of the 1st International Exercise-Associated Hyponatremia (EAH) Consensus Symposium, Cape Town, South Africa 2005. *Clin J Sport Med* 2005; 15: 207-213.
12. Schwelanus MP, Drew N, Collins M. Muscle cramping in athletes – risk factors, clinical assessment, and management. *Clin Sports Med* 2008; 27: 183-194.
13. Schwelanus MP. Cause of exercise associated muscle cramps (EAMC) – Altered neuromuscular control, dehydration or electrolyte depletion? *Med Sci Sports Exerc* 2008 (in press).
14. Noakes TD, Speedy DB. Lobbyists for the sports drink industry: an example of the rise of "contrarianism" in modern scientific debate. *Br J Sports Med* 2007; 41: 107-109.
15. Rovell D. *First in Thirst. How Gatorade Turned the Science of Sweat into a Cultural Phenomenon*. New York: Amacom, 2005.
16. Wansink B. Position of the American Dietetic Association: food and nutrition misinformation. *J Am Diet Assoc* 2006; 106: 601-607.
17. Law J. *Big Pharma*. London: Constable & Robinson, 2006.