PostScript

LETTERS

Manufactured arguments: turning consensus into controversy does not advance science

In a recent article by Noakes and Speedy,¹ the authors enthusiastically manufactured a number of arguments in an apparent attempt to bolster their opinion that malfeasance is afoot in the world of athlete hydration. Their primary contentions were:

1. that the aetiology of exercise-associated hyponatraemia is in dispute;
2. that the 1996 position stand of the American College of Sports Medicine (ACSM) recommends that athletes drink as much as they can tolerate, an advice that predisposes athletes to hyponatraemia; and
3. that the ACSM made this recommendation to please a corporate sponsor.

Simply stated, each is a manufactured argument, in that the aetiology of exercise-associated hyponatraemia is well established, the ACSM wording is taken out of context, and the inference that there was a conspiracy to benefit corporate coffers at the expense of the athlete welfare is ludicrous and without basis. With that preface in mind, the Noakes and Speedy article warrants a closer look.

The authors' concerns regarding the welfare of athletes are highly commendable and are shared by the Gatorade Sports Science Institute (GSSI) and by The Gatorade Company. A large part of my role at GSSI is to maintain the longstanding and extensive commitment to sports science research and education that we proudly support. In fact, GSSI has considered the issue of exercise-associated hyponatraemia on numerous occasions, as can be verified by visiting www.gssiweb.org. In addition, Gatorade and GSSI have annually produced and distributed educational materials that have gone directly to hundreds of thousands of marathoners, Ironman-distance triathletes and ultra-distance competitors, the athletes most at risk of hyponatraemia.

Noakes and Speedy are correct that zealous overdrinking has been the primary cause of those cases of exercise-associated hyponatraemia that have resulted in death. This is not a topic of debate; there is widespread agreement that overdrinking is the root cause of most cases of exercise-associated hyponatraemia, as has been pointed out in numerous publications, including reports from GSSI.²⁻⁶ To be sure, there is continuing discussion regarding how sweat sodium losses might contribute to the risk of hyponatraemia, how sodium intake during exercise may reduce the risk of hyponatraemia, and how some athletes may actually be both hyponatraemic and dehydrated, but there is little doubt that gross overdrinking is associated with most cases of hyponatraemia.

A linchpin of the Noakes and Speedy paper is their criticism of the 1996 ACSM position stand on "Exercise and fluid replacement".⁷ Noakes and Speedy contend that the ASCM document

advocates that athletes should "drink as much as is tolerable" during exercise. This is a blatant misrepresentation of the actual wording of the position stand, as Kenney and Baker⁸ and Roberts⁹ pointed out in recent letters to the editor of the *British Journal of Sports Medicine*.

Dr Roberts noted that the actual wording of the ACSM recommendation is, "During exercise, athletes should start drinking early and at regular intervals in an attempt to consume fluids at a rate sufficient to replace all the water lost through sweating (ie, body weight loss), or consume the maximal amount that can be tolerated." It seems apparent that the latter part of the sentence refers directly to the former, and is merely an acknowledgement that some athletes will, for varying reasons, drink less than that required to stay well hydrated. Contrary to the repeated assertions of Noakes and Speedy, the ACSM position stand clearly does not recommend that participants should drink as much as tolerable during exercise. Moreover, Dr Noakes was one of the reviewers of the 1996 ACSM position stand and, as a reviewer, was afforded the opportunity to change its wording and had the chance to reject the final draft. In point of fact, Dr Noakes approved the position stand as it is currently worded.

Kenney and Baker⁸ concluded that scientific organisations such as the ACSM "... tell athletes to learn to drink fluids during exercise in volumes that approximate sweat loss in an effort to prevent both extremes – significant dehydration and hyponatremia". In agreement with those conclusions is the advice provided by GSSI—that is, athletes should drink enough during exercise to minimise weight loss, but should avoid overdrinking. Thus, as with the aetiology of hyponatraemia, there is also no reason for controversy on this point.

Nor is there any place for the authors' unsubstantiated insinuations of impropriety. Noakes and Speedy infer that members of the ACSM writing committee of the 1996 position stand were either duped or willingly forsook their professional integrity to please a corporate interest. That is a serious inference levelled against scientists who have devoted their professional lives to science of the highest quality and who volunteer considerable amounts of their time to a prestigious international organisation. It seems to me that the burden of proof for these allegations falls directly on the shoulders of Noakes and Speedy and therefore it is incumbent on them to once and for all provide proof in support of their thinly veiled allegations. The *British Journal of Sports Medicine* also bears a similar burden of responsibility for printing an article that is long on unsubstantiated opinion and short on empirical fact.

Noakes and Speedy refer to a "novel cardiovascular model of thermoregulation" that they contend has been "championed by the GSSI". They describe research showing that dehydration can lead to a reduced cardiac output and a subsequent diminished skin blood flow, potentially raising core temperature. But they conclude that, "According to this model, any sweating that is uncorrected by fluid ingestion must inevitably induce a vicious cycle of increasing heat gain terminating ultimately in heatstroke." Here, Noakes and

Speedy stumble over basic thermoregulatory physiology. Undoubtedly, the cardiovascular system plays a key role in human thermoregulation at rest and during exercise. To suggest otherwise ignores over 50 years of scientific endeavour that shows that at rest and during exercise, dehydration results in changes in cardiovascular function that promote an elevated core temperature compared with the euhydrated state. However, contrary to the manufactured argument of Noakes and Speedy, dehydration does not make heat illness inevitable; what is equally clear is that minimising dehydration by ingesting adequate volumes of fluid during exercise helps maintain blood volume, cardiac output, and skin and muscle blood flow, reduces the rise in core temperature,^{10 11} and improves performance.^{12 13}

One of the final statements by Noakes and Speedy reads, "... Dr. Cade [one of four physicians who invented Gatorade in the mid-1960s] ... preached in 1972 that sports drinks are a medicine that must be ingested during exercise in order to prevent heat illness and optimize performance ... and that the more that is ingested, the better." However, the 1972 article by Cade *et al*¹⁴ that is cited by Noakes and Speedy contains no such suggestion or anything close to it. If Dr Cade made such a comment in another forum, then that forum should have been referenced.

One would think that an article bearing the authors' self-professed claim of "case-proven" would warrant a particularly high standard of review, especially as Dr Noakes sits on the *British Journal of Sports Medicine* editorial review board. Apparently, that did not occur and what remains is an article rife with factual errors and unfounded inferences. Unsubstantiated speculation along with the absence of novel findings does not qualify as science; it is at best opinion and, in this case, painfully uninformed opinion at that.

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Lobbyists for the sports drink industry: an example of the rise of "contrarianism" in modern scientific debate

We welcome any discussion of our article which traces the emergence, especially in the United States of America, of exercise-associated hyponatraemia (EAH) as a novel disease, even though its aetiology had already been established by us. We appreciate that some may wish to distance themselves from involvement in this affair. But this is not a sound basis for an objective scientific debate. We choose to respond first to Dr Murray's letter.

In his position as Director of the Gatorade Sports Science Institute (GSSI), Dr Murray is a full-time employee of PepsiCo, which is a publicly listed company in the USA. The principal accountability of a publicly listed company like PepsiCo and its subsidiary, Gatorade, is to increase the wealth of its shareholders. This follows from the landmark case of Ford versus the Dodge Brothers heard in the Michigan Supreme Court in 1916.¹

In his otherwise uncritical review of the Gatorade phenomenon, Rovell² touches on this legal accountability: "This lack of change (in the Gatorade formulation) has caused some people to be sceptical as to the true function of the Gatorade Sports Science Institute (GSSI) which has funded more than 120 studies in the past 17 years. Is GSSI there to develop the latest and greatest sports drink formula for the masses, or is it there to use science to best defend the status quo? Is it really possible that nothing substantial has come along in sports drink science in the past four decades that would make Gatorade a better drink? There are, after all, very few product categories that fail to evolve over four decades" (pp 194-195). ".....But it is undeniable that GSSI was also created to be part of Gatorade's powerful marketing arm" (p 195). ".....Having the Gatorade Sports Science Institute does mean walking a fine line between educating the public on hydration and perhaps using GSSI to sell product. Gatorade brand managers will tell you that educating the public is the number-one goal, but it's impossible to ignore the fact

that GSSI is a part of Gatorade, which is part of Pepsi, which is a public company that is expected to make money" (p 206).

Thus although the publicly stated objectives of the GSSI may indeed be to "maintain the longstanding and extensive commitment to sports science research and education that we proudly support" as claimed by Dr Murray, the bottom line reality is that, if the GSSI does not increase the wealth of the shareholders of PepsiCo, it acts in contravention of the laws of the USA. For it is both "immoral" and illegal for a publicly listed company in the USA (and presumably elsewhere) to act charitably unless its philanthropic actions increase shareholders' wealth.¹

The content of the advertising material produced by the GSSI suggests that its identified commercial function is to maximise the sales of Gatorade by promoting any science which proves (1) that ingesting "more" Gatorade is better than drinking less, and (2) that Gatorade is superior especially to water (but also to all other sports drinks) for ingestion by athletes before, during and after exercise.

This legal requirement to pursue profit poses the greatest ethical challenge to those with scientific training employed by for-profit companies. For their defining responsibility becomes the defence of the company's profitability and not to seek the truth. In this position, each of them must replace the skepticism he or she has imbibed as a scientist with an attitude of "contrarianism", presenting only that evidence which supports the company's commercial objectives.³ To do this, Hansen concludes that the contrarian must act as a lobbyist ignoring the defining characteristic of the scientist as described by Nobel Laureate Richard Feynman: "The only way to have real success in science is to describe the evidence very carefully without regard to the way you feel it should be. If you have a theory, you must try to explain what's good about it and what's bad about it equally. In science you learn a sort of standard integrity and honesty".

The way in which lobbyists deal with such moral ambiguity is brilliantly caricatured by the actions of the charming Nick Naylor in the recent Hollywood production *Thank you for smoking*, based on the novel by Christopher Buckley.⁴ In his position as chief lobbyist for the fictitious Academy of Tobacco Studies, Naylor represents the interests of the tobacco industry in the USA. Naylor is successful because he understands that his duty is to "win" arguments, not to present or advance the truth.

The point is that lobbyists like Naylor cannot act as usual scientists, according to the Feynman dictum. Rather, they must present, in the guise of an established scientific truth, a contrary position which is permanent and predetermined, and which has but one function—the advancement of the financial interests of the companies to whom they are accountable. To disguise their condition of compromise, lobbyists will usually assert that their exclusive interests are especially magnanimous, including, for example, the "welfare of athletes" and the "advancement of science", both of which they "proudly support". In fact, lobbyists should rather stick to their chosen jobs and leave benevolent actions to those who choose to be employed (at substantially more meagre salaries) specifically to serve humanity.

As the covert goal of the contrarian scientist-turned-lobbyists is neither humanitarian nor

the advancement of scientific truth, it is pointless for scientists to engage with them in scientific debate. Indeed, lobbyists retain their influence over the general public and the conduct of science, only for as long as their mission and mode of operation are not universally understood.⁴

As Dr Murray's response to our article does not fall within the scope of conventional scientific discourse, conducted respectfully and with dignity, according to venerated scientific traditions which aim to advance truth, we will restrict our response solely to the exposure of his most obvious distortions.

To begin with, we did not "manufacture" the three arguments which he has now created on our behalf. We presented a singular theory: that the evidence that EAH is owing to overdrinking was already established in 1986, and proved by us in 1991, but that this proof was not accepted for 20 years because, in our view, it "conflicted with the prevalent message that was being driven by the sports drink industry".

Were this purely a scientific debate, Dr Murray's duty would be to present the contrary evidence showing that the industry for which he acts as the principal lobbyist has, since 1986, done everything in its power to ensure that athletes do not overdrink during exercise. But his response fails to contest our core disputation. His silence proves that our contention is correct. Rather, using the skilful lobbyist's classic tactic, he creates three diversionary arguments which he claims we, not he, "manufactured". Thus, he changes the focus of the debate from one which his silence acknowledges he cannot win to another which he might "win" if he can distort the argument sufficiently to confuse those readers who are unaware of his tactics.

He is reluctant to enter into that debate as he knows that, as recently as January/February 2002 (ie, 11 years after EAH was proved to be due to overdrinking), the GSSI placed an advertisement in the *New York Runner* magazine, and presumably elsewhere, with the banner statement: "Research shows your body needs at least 40 oz. of fluid every hour (ie, 1200 ml per hour) or your performance could suffer". This conclusion is allegedly based on the results of "thousands of tests" conducted by the "scientists of the Gatorade Sports Science Institute" who have "studied it for over 15 years in research facilities all across the country".

But the advertisement fails to warn that this advice conflicts with the fluid replacement guidelines of the American College of Sports Medicine (ACSM), which states that athletes should drink "as much as tolerable" and not >1.2 l/h. Nor does that advertisement warn that such high rates of fluid intake are safe only for those athletes who have very high sweat rates because they are either very large or can run very fast in hot conditions. Rather, the athlete depicted in the advertisement appears to be a lean, light and small female runner, exactly the athlete at the greatest risk for developing EAH⁵ if she were to follow the command of the GSSI.

This advertisement certainly does not support Dr Murray's claim that the GSSI accepts the "widespread agreement that overdrinking is the root cause of most cases of exercise-associated hyponatraemia". Rather, in another classic sleight of the contrarian's keyboard, he makes Noakes the villain by accusing him of misrepresenting the ACSM guidelines. Perhaps if Dr Murray was more inclined to personal