Assessing sport nutrition and science research

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The primary hurdle that scientists are current faced with the sports nutrition and neutraceutical/ supplement market is the major increase and proliferation of available ergogenic products that has far outstripped the scientific communities' ability to test for actual ergogenic effects or claims of such products. An ergogenic aid is any substance or phenomena believed to increase performance. An ergogenic aid can range from carbohydrate loading, to illegal substances such as steroids, to simply having a good warm-up. The crux of this situation is that research needs to be completed by an unbiased, outside source, in well establish and controlled laboratory setting using well established methods and then published in a well-respected peer-reviewed scientific journal to be truly valid. It can take years for a laboratory to accurately assess the efficacy of one single new product due to all of the specific issues and questions that need to be answered. Then, the results for this new product should even be confirmed by another independent lab to be truly believable. Many times the claims of products don't undergo this rigorous process. Below are some of the physiological issues that need to be considered by scientists and laboratories when researching nutritional erogogenic aids:

- is it instantly degraded in the stomach? (the stomach is very acidic)
- once anything is absorbed in the gut, it first faces the liver. How much does the liver metabolize and break-down and eliminate the substance?
- Kidney—how much of the original dose is lost in the urine?
- can the substances be absorbed 'intact' in the blood? Can you even measure an increase in the specific substance in the blood? If so, it 'might' have an ergogenic effect.
- Does the proposed ingredient even interact with the target site? (usually muscle) Is it taken up by the target site?
- How much is taken up the target site over time? How much of a dose is needed for uptake? Is it stored, or is there any acute wash-out?
- How does all of this dictate what is the proper acute dose, and for how long one needs to take it?
- Within the target site (usually muscle) can the substance be absorbed across the membranes?
- Finally, are all of these effects great enough to assess a 'measurable' positive performance effect?

After assessing the above physiological issues, then a clear assessment of the underlying science needs to be done to evaluate whether a substance has enough evidence to declare it is effective:

- Amount of substance—too little or too much might not show an effect? Optimal dose?
- Type of subject/consumer—might only work in untrained or trained individuals, or perhaps research only shows that it works in rats or cell-culture, but not as effective in humans.
- Task where substance might be effective. It might only be effective in power or explosive situations, or only in endurance situations.
- sensitivity of measure to assess performance, what was used (ie. time to exhaustion test, vs. time trial vs. amount of work completed vs. area on the curve vs. amount lifted vs. % change vs. absolute change – statistical analysis used etc.)
- Number of independent research groups and reputation of research group(s) working in this area, who has sponsored the studies, what journal has the data been published in, how many studies have shown a positive effect.

Finally, all of the particulars above need to be carefully assessed in weighing the evidence, not only for a single study but for all the studies with a specific substance (see Fig 2 below). This is where the process gets heavy. Generally, a well controlled meta-analysis (review) of a given substance and its possible efficacy is one of the strongest ways to assess this. An example is highlighted in Fig 2. Here you can see that there have been hundreds of studies done on the efficacy of caffeine since the 1890's. But, many of these studies have never been published in well-controlled peer-reviewed scientific journal. However, this enough strong evidence to show that in certain sports, under certain dosing regimes (2 to 4 mg CAF/kg BW about 90min prior to exercise) caffeine can enhance performance. Photo 2 in Fig. 2 below shows a different situation: an acute study showing no 'statistical' difference. However, when looking at the individual data, every single subject had a small improvement in performance, but the study lacked the statistical power to show a statistical difference. But, certainly, since the study was done at a strong laboratory, and published in a very good journal and well controlled, this data is very intriguing for further follow-up.

Figure 1. below shows a current up-to-date list of most major nutritional and/or supplements that have been consistently shown to enhance performance and/or recovery, or need more scientific scrutiny but appear worthy of further research, or that currently do not have enough evidence to consider. This list was complied from the following key opinion leaders and references.

BURKE, L. (2007). *Practical Sports Nutrition*, vol. 1. Human Kinetics, Champaign, IL.

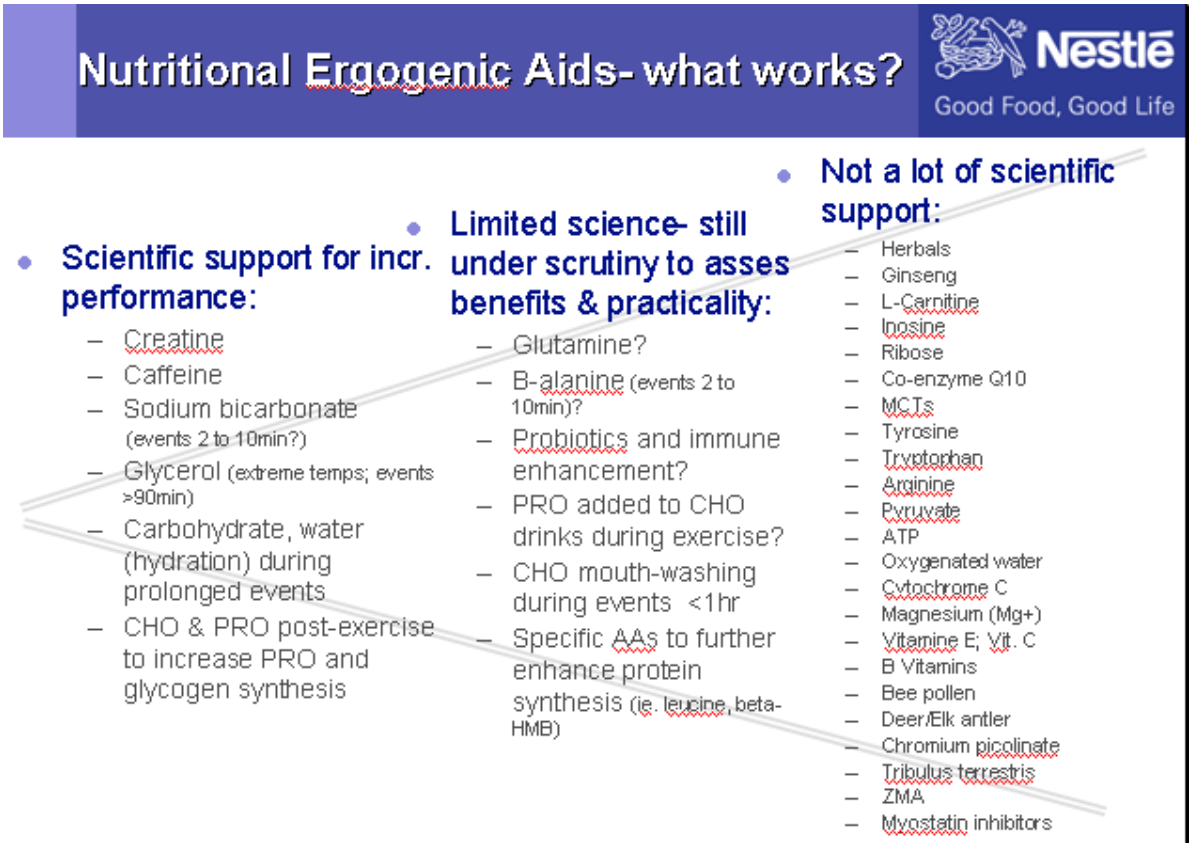
JEUKENDRUP, A. & GLEESON, M. (2004). *Sport Nutrition: An Introduction to Energy Production and Performance*, vol. 1. Human Kinetics, Champaign, IL.

MAUGHAN, R. J. E. (2002). *Nutrition in Sport: International Olympic Committee Encyclopedia of Sports Medicine*, vol. 7. Blackwell Science Ltd.

Also, this information can be cross-referenced and has been further evaluated by the Australian Institute of Sport, and is available on line at:

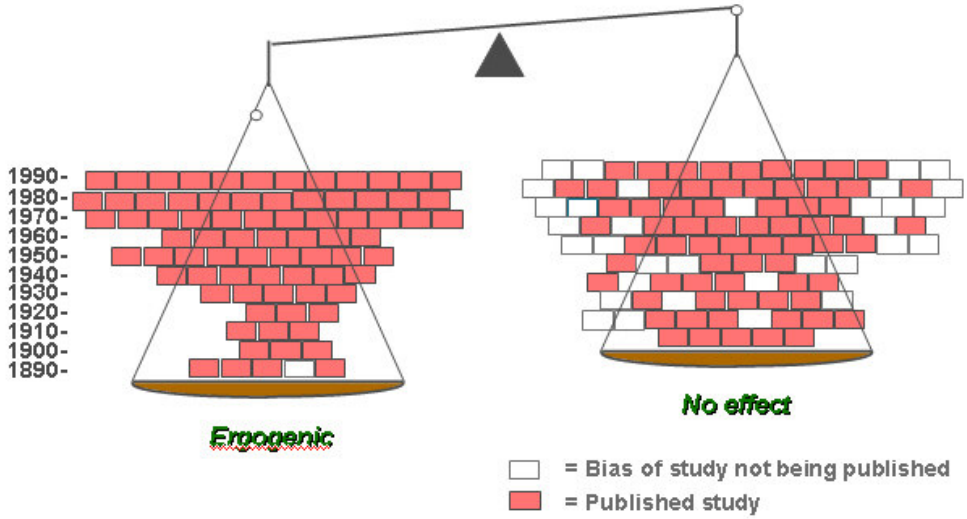
http://www.ausport.gov.au/ais/nutrition/supplements/classifications

Fig 1. Current list of ergogenic aids, supported by most in the scientific community, with enough evidence to suggest a positive benefit to consumers.



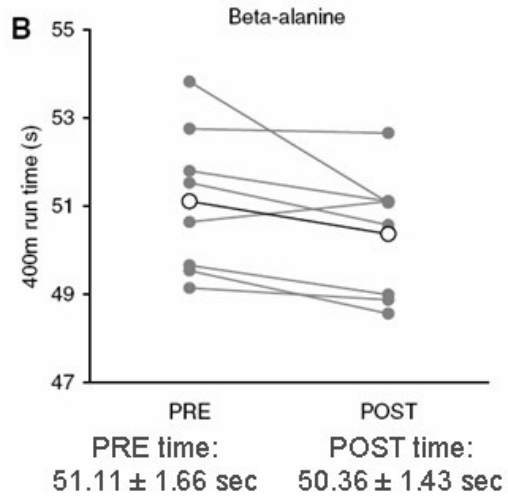
Efficacy- weighing the evidence

Example: caffeine intake and increased sport performance



Efficacy- weighing the evidence (2)

Example: B-alanine and 400m run performance- Derave et al. JAP, 2007



1) Time improvement: ~0.7 sec

2) But, not statistically significant

3) Only n =8 subjects

4) Done at reputable lab

5) Study not paid for by sports supplements company, but one of the authors works for a sports supplement company.