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The rise of intravenous nutrition products among professional team sport athletes – reasons to be concerned?

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Use of intravenous nutrition products in sport

The authors regularly interact with professional team sport players in European and American leagues and their multidisciplinary support teams, and we are aware of players receiving regular intravenous nutrition (IVN) products. Furthermore, this is often evident in blood biomarker profiles where specific nutrients are beyond the upper-bound measurement limit of the clinical laboratory. The precise prevalence of IVN use is not known, however, anecdotally some players are receiving IVN as often as weekly as part of a pre- or post-game routine. So called 'drip bars' and concierge IVN services are easily accessible, albeit seemingly devoid of appropriate regulation (1). These offer a menu of IVNs containing nutrients such as B vitamins, amino acids, glutathione, vitamin C and electrolytes, claiming to boost health and performance, restore hydration, accelerate recovery and so on. Further, players might request parenteral administration of nutrients such as iron and B12 from a team physician when not otherwise indicated. Typically, sports physician-administered IVNs are reserved for clinical presentations such as anaemia, significant deficiencies with accompanying symptoms, or in race medicine (e.g. severe dehydration/collapse caused by ultra-marathon running in the desert) (2). Whilst these are distinctly different from the self-directed IVN use described above, there is cross-over regarding the potential risks and benefits.

Guidance for players and practitioners in the peer reviewed Sports Medicine/Sports Science literature describing the evidence base and risks associated with IVNs is largely absent. IVNs are not mentioned in recent nutrition consensus statements, and this is consistent with the principle of reducing needle use in sport and a 'food first' approach taught in sports nutrition courses around the world. A ban on needle use by athletes at the Olympic Games has been in place for all recent Games except for appropriate medical use, and where a Therapeutic Use Exemption (TUE) is obtained. Similarly, the World Anti-Doping Agency (WADA) prohibit IV infusions over 100mls (per 12 hours) unless a TUE is obtained; however, these controls are not mirrored across all sports leagues.

Is there any evidence of benefit to athletes beyond placebo?

IVN products are often used as a means of addressing tiredness, fatigue, or recovery, but the evidence is sparce and not supportive. We are aware of just two studies assessing vitamin

injections in otherwise healthy participants; neither of which yielded an effect for the injection group. Mya-Tu *et al.* observed no effect of 1mg of cyanocobalamin (synthetic B12) or placebo injections (3/week) for 6 weeks in a double-blind manner, on various tests of physical performance, or any difference versus the placebo (3). A cross-sectional study of elite Polish track and field athletes reported 34% (n=82) received vitamin B12 injections across a 6-year period (4). Whilst a beneficial effect of vitamin B12 was observed on red cell parameters, there was no additional benefit when the athlete's vitamin B12 concentration was above 700 pg/mL. Furthermore, where a vitamin B12 deficiency exists, one study found no additional benefit of an injection over oral supplementation (5).

Risks

It is well known that the gut-liver axis actively protects the human from infection, from the acidity of bile to the intricate immune pathways in the epithelial mucosa, and the dynamic role of the gut microbiota providing protection against toxicity (e.g. heavy metals) (6). Bypassing these mechanisms appears foolhardy unless there is a significant clinical rationale, and no studies have addressed the long-term impact. However, via biomarker profiling we have observed vitamin B6 and cobalamin (vitamin B12) often beyond the measurement range of the laboratory, in a sub-group of professional players. These observations may be the direct result of IV therapies, although inadvertent intake via fortified foods may also be causative. Whilst the long-term effects of high cobalamin are unknown, the long-term effects of vitamin B6 are classically associated with peripheral neuropathy (7). Athletes regularly receiving parenteral iron risk liver disease, and indeed high body stores (hepatic iron concentration) have been observed in road cyclists (8).

Given that the long-term effects of supratherapeutic doses of B vitamins and other nutrients are unknown in athletes, it does not appear to be worth the risk, especially given the lack of evidence-based benefits. There are also the direct risks related to venous access including infection and thromboembolic complications. More than this is the reputational risk to sport if it is normalised for athletes to regularly partake in self-directed IVN use with a worrying shift away from what 'works' (according to scientific standards), to that which is unproven.

Furthermore, some athletes risk an anti-doping violation by participating in self-directed IVN use.

Future directions

A greater understanding of the prevalence of regular IVN use among athletes needs to be established. Qualitative study may provide important information on the draw and motivating factors for athletes to seek IVN, perhaps informing alternative strategies for education and resources to meet nutritional and performance needs. In parallel, governing bodies and players associations in the professional leagues need to provide guidance over the potential risks of IVN use. The 'food first' and 'no needle' messages need to be amplified among all athletes and multidisciplinary support teams to avoid what was previously a 'last resort' treatment becoming normal without scientific evidence of benefit.

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