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A fool's game: Blood doping in sport

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ABSTRACT

'Blood doping' involves the transfusion of blood into an athlete's circulation to boost their oxygen carrying capacity. The procedure has been used in endurance events such as cycling and skiing but is prohibited by the World Anti-Doping Agency. The validity of restrictions on performance enhancement including 'blood doping' has been challenged. However, the argument for legalisation fails to recognise the significant risks inherent to the use of blood products that include: immune reaction, bacterial contamination and the transmission of viral disease. The argument also fails to recognise the disparities in health resources that would render athletes from less wealthy nations at much greater risk. There are significant, health risks associated with blood doping; this seriously compromises claims for legalisation.

1. Introduction

As the 2014 Sochi Winter Olympics become a distant memory, the perennial controversy over drug misuse in sport remains contemporary. High-profile cases in cycling and track and field demonstrate that some elite athletes are prepared to risk their careers by employing the use of prohibited substances and methods to enhance performance (BBC Sport, 2013; Hamilton & Coyle, 2012). The true prevalence of such practices remains however remains speculative given the challenges of detection and the understandable reluctance of athletes to admit to 'doping' whilst still competing.

Red blood cell transfusion is a procedure undertaken with the primary objective of sustaining tissue and organ oxygenation secondary to haemorrhage or acute anaemia (Barshtein, Manny, & Yedgar, 2011). Blood doping, banned by the World Anti-Doping Agency (WADA), is a technique that boosts oxygen carrying potential to enhance 'aerobic' or 'endurance' capacity. It involves the transfusion of blood prior to a chosen event. The blood is usually, but not always, 'autologous', i.e., the donor and recipient are the same person. Detection of this technique at the 2006 Winter Olympics resulted in multiple life bans from sport for Austrian skiers and their entourage (Kelos, 2007). Similarly, a Spanish doctor received a suspended jail sentence for providing transfusions to athletes in 2013 (Staunton, 2013).

2. Why not blood dope?

Professor Julian Savulescu, an Oxford bioethicist, has questioned the validity of the WADA framework of prohibition (Savulescu, Creaney, & Vondy, 2013). He advocates for the legalisation of performance-enhancing drugs and methods and specifically includes 'blood doping'.

Savulescu's argument is based substantively on two points. First, that blood doping *per se* poses no significant harm to the health of the athlete. Related to this claim is his belief that a regulatory framework, rather than the current prohibition framework, would actually enhance athlete safety. He claims that blood transfusion (amongst other substances and techniques) can be "tightly monitored" and could have "safe limits" set. By this he presumes that all substances would have laboratory thresholds applied to reflect acceptable therapeutic use.

Other critics of the prohibition model also make claims for the protection of athlete health and safety. Lippi, Banfi, Franchini, and Guidi (2008), promote an alternative framework of "harm reduction" to "safeguard the athletes' health". Similarly, Mazanov and Connor (2010) assert that the dominant alternative to prohibition is harm minimisation ". . .justified on the grounds that protecting athlete's health should be the core of any policy designed to manage the role of drugs in sport".

Returning to Savulescu, his second point relates to balancing risks, stating "we need a balance between the values of safety,

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human contribution and participation, enforceability, and spectacle". He notes that sport may be inherently dangerous, reflecting on the high injury rate in the Tour de France where there have been 21 deaths during the history of the event. Here he recommends that each substance or technique should be assessed individually, specifically stating that ". . .blood doping and erythropoietin could be dealt with at a stroke by allowing blood doping up to a blood cell count of 50". By this it is presumed he infers a haematocrit of 50%.

To include blood doping in an argument against the current framework of prohibition is flawed. First, it fails to recognise fundamental safety issues inherent to the use of blood products. These risks are present for any individual undergoing any form of blood transfusion (autologous and non-autologous) and are not limited to the coagulopathic effects of a high haematocrit. They include risks for immune reaction, bacterial contamination and the inadvertent transmission of viral disease amongst more minor complaints of hypotension, transient anaemia, fluid overload and, rarely, serious lung injury (Covin et al., 2004). In the clinical setting, these risks are balanced against the risks of not transfusing. For the medical or surgical patient, in the setting of significant haemorrhage, these risks include multi-organ failure and death from a lack of perfusion and ischaemia. In a less severe scenario, untreated anaemia can result in angina, delayed healing and recovery, breathlessness and fatigue. Hence, for the patient the risks of transfusion are undertaken to prevent or mitigate harm but for the athlete the risks of transfusion are undertaken *only* to enhance performance. Although the risks of transfusion are similar for the patient and the athlete the rationale for undertaking that risk is very different. We argue that performance enhancement is not sufficient justification for exposing the athlete to the risks of transfusion.

Second, to argue that regulation could improve safety relies on access to a vigilant, well-resourced transfusion service. This is unlikely to be available on location at major endurance events but, more importantly, it would certainly not be available at venues in developing nations where blood "safety" remains a public health challenge. The argument is therefore biased by privilege, disadvantaging athletes from less affluent nations, placing them at greater risk should blood doping become a permitted, competitive norm.

Socioeconomic privilege in a wider sporting context has long been considered a factor in athlete preparation. Hypoxic tents, for example, may increase performance by up to 3% but they remain financially prohibitive for many athletes (NY Times, 2001). In this setting, inequity may clearly compromise competitive edge. However, the inequity for blood transfusion services is more important because lack of resources in this setting presents a serious potential compromise to athlete health and safety. Savulescu's position relies on the assumption that high standard transfusion facilities will be inherently available; for many parts of the world this is simply not true.

Finally, to quote the risks inherent to certain sports is an argument for addressing those risks, not for exposing athletes to more risk. The transfusion of blood should only be undertaken where there are clear clinical indications and its prohibition in the setting of sport is entirely appropriate.

3. ABO incompatibility

Blood transfusions may result in immune-mediated and non-immune mediated adverse reactions. Some of the most serious adverse reactions fall into the former category. These most commonly arise from mismatches in blood typing due to administrative or clerical error. ABO incompatibility reactions occur when type A or B blood is given to an inappropriate recipient with a consequential rapid, severe haemolytic reaction that has the potential for organ failure and death (Carnahan & Lee, 2012). There are approximately 360 ABO-incompatible transfusions in the United States each year (Lippi et al., 2009). In the United Kingdom, between 1996 and 2004, there were 100 deaths associated with blood transfusion (Stainsby et al., 2006). Of these, 70% were due to misidentification of blood products despite significant emphasis on patient and blood sample identification.

The Australia and New Zealand Society for Blood Transfusion (ANZSBT) note that the risk of error may actually increase in the presence of an autologous programme because autologous blood does not necessarily match the usual qualitative requirements of regular unpaid blood (Australia and New Zealand Society for Blood Transfusion, 2014). These observations are made within the context of well-resourced, developed-world transfusion services hence the claim that legalising and regulating blood doping would eliminate risk does not hold up to scrutiny. This is a vital discussion point for any debate regarding blood doping. The prevention of mortality and morbidity as a consequence of ABO incompatibility relies on 'getting the right blood in the right tube in the right person'. It doesn't matter whether the blood is autologous or non-autologous; errors in identification, labelling and storage can result in ABO incompatibility.

4. Bacterial contamination

Bacterial contamination, in the non-immune category, can result in serious morbidity and mortality. Symptoms mimic a typical haemolytic reaction with attendant high fever, gastrointestinal symptoms, rigours and hypotension. Some patients may advance to acute renal failure with systemic sepsis a leading cause of transfusion-associated death (Kopko & Holland, 2001).

Autologous transfusions are not protected from such reactions as all blood, regardless of its source, may be contaminated (Smith & Wright-Kanuth, 2003). Risk reduction for bacterial contamination relies on meticulous attention to screening procedures, skin preparation, blood collection technique and sample storage. As noted in the ANZSBT guidelines on autologous blood collection "bacterial contamination may equally effect any type of transfusion and has emerged as a statistically major transfusion risk (Australia and New Zealand Society of Blood Transfusion, 2002).

5. Viral transmission

Inadvertent viral transmission may also occur during blood transfusion. Autologous transfusion is not without this risk, as any form of blood transfusion remains subject to administrative and clerical errors that result in the incorrect blood component being transfused. The process of obtaining, storing and infusing blood is a complex process with opportunities for error at several critical points. Viruses, as well as bacteria, can also be transmitted via needle-stick injury (Mashoto, Mubyazi, Makundi, Mohamed, & Malebo, 2013).

Significant viral pathogens include, but are not limited to, Hepatitis B and C (HBV and HCV), Human Immunodeficiency Virus (HIV), Ebstein Barr Virus (EBV), Human Herpes Virus (HHV) and Cytomegalovirus (CMV). These viruses can cause infective illnesses which may be life threatening, particularly in the context of compromised immunity. A number of viruses are also risk factors for malignancy. For example, viral hepatitis carries a significant risk for hepatocellular cancer, the EBV is associated with lymphoma and the HHV8 with Kaposi Sarcoma.

6. Potential harm – HIV as an example

Arguably, the most clinically significant transfusion transmitted infection (TTI) is HIV, the cause of the Acquired Immunodeficiency