Institution:
University of the West of Scotland

Unit of Assessment:
26

Title of case study:
Harm reduction in Steroid (Ab)users; an international perspective

1. Summary of the impact (indicative maximum 100 words)

The research of Professor Julien Baker, the Director of the Institute for Clinical Exercise and Health Science (ICEHS), in conjunction with prestigious partners such as the World Anti-Doping Agency (WADA), has impacted on a number of key issues related to drug abuse in sport. This research has been instrumental in leading to a greater international understanding of the full extent of the problems associated with anabolic steroid and growth hormone supply and use for sports performance enhancing purposes and also the associated physiological consequences of using these drugs. This research has played a significant role in informing the international debates around steroid use and abuse and shaping policies for the detection and prevention of steroid (ab)use.

2. Underpinning research (indicative maximum 500 words)

Professor Baker's earlier (pre UWS) research into endocrine exercise physiology included the seminal UK study of how Anabolic-Androgenic Steroids (AAS) were being used across a random sample of individuals participating in various forms of exercise in gyms across Wales. This study revealed that, whereas it had been hitherto commonly felt that drug abuse was most likely to have been prevalent in "serious" athletes, in fact there was a far more widespread problem associated with the abuse of prescription medicines and human growth hormone which was rapidly growing amongst exercise participants at all levels and genders.

Professor Baker and his team at UWS have undertaken further related research and he has continued to develop the critically important collaborative relationship with the World Anti-Doping Agency (WADA), National Drug Testing Centre (in conjunction with Professor Cowan and Dr Kicman of King's College), resulting in a number of authoritative and debate shaping co-authored papers. For example, the paper entitled Counterfeiting in Performance and Image Enhancing Drugs (2009) details the extent of fake drug availability and the acute adverse effects from contaminated vials. This research (3.1) analyses the widespread additional problems of drug abuse which are being presented through counterfeit substances being supplied by overseas online distributors. Counterfeit substances, which may bear no relation to the described ingredients on advertising/packaging, are being supplied and these drugs may be either ineffective or actually harmful due to their reaction on the human system. Examples of the harmful effects include intramuscular abscesses and communicable diseases. In addition, an important area of joint research interest (with colleagues from King's College) is the challenging task of developing a reliable test methodology for the detection of human growth hormone (hGH) abuse in the human body. The necessity for reliable tests and the challenges in developing such tests have been highlighted and discussed in Professor Baker's UWS research (see 3.2, 3.3, 3.4, and 3.5 as examples) as a critical requirement to further understanding the extent of hGH abuse. As a naturally occurring substance in humans, it has consequently proven to be very difficult to reliably detect misuse of human growth hormone (a joint grant application of £200K has recently been submitted to WADA that would aim to develop a unique, new test for its detection).

Research into emerging trends in designer doping (3.2) profiles the so called "Designer Drug" problem and the fact that cocktails of drugs (polpharmacy regimes, see also 3.3) are being taken by individuals for a range of purposes (including the "cosmetic" benefits associated with fat loss and body shape profiling). This particular problem was found to be exacerbated by increased availability at low cost from online overseas suppliers. Usage of these drugs potentially leads to a range of damaging effects on the human condition. These include elevated blood pressure which can lead to increased cardiovascular and cerebral risk. Further related research (for example, 3.3, 3.4, 3.5) analyses the physiological effects and disease manifestations of performance enhancing drugs such as androgenic–anabolic steroids, growth hormone, and insulin and also provides guidance on the development of policies to detect and manage such use and abuse. This body of research has demonstrated that polypharmacy regimes may prove

especially difficult to detect because, if they are cycled correctly, the opportunity of proving a case of doping is almost impossible unless an athlete is actually caught in possession.

3. References to the research (indicative maximum of six references)

3.1 Counterfeiting in performance- and image-enhancing drugs. Drug Test Analysis, 1: 135–142. doi: 10.1002/dta.30 Drug Testing and Analysis Volume 1, Issue 3, pages 135–142, March 2009 Graham, M. R., Ryan, P., **Baker, JS**, Davies, B., Thomas, N.-E., Cooper, S.-Mark., Evans, P., Easmon, S., Walker, C. J., Cowan, D. and Kicman, A. T. (2009),
http://onlinelibrary.wiley.com/doi/10.1002/dta.30/abstract

3.2 Journal of Steroids and Hormonal Science Volume 2: Issue 3:108.
Exercise, Science and Designer Doping: Traditional and Emerging Trends.
doi:10.4172/2157-7536.1000108 1-10.Graham MR, Davies B, Grace FM, Evans PJ,
Baker JS (2011).
http://www.omicsonline.org/exercise-science-and-designer-doping-traditional-and-emerging-trends-2157-7536.1000108.pdf

3.3 Physiological Effects and Disease Manifestations of Performance-Enhancing Androgenic–Anabolic Steroids, Growth Hormone, and Insulin
Chapter:(p.174) Chapter 7 Source: Neurovascular Medicine Author(s):
Michael R. Graham, **Baker JS**, Peter Evans, Bruce Davies. Publisher:
Oxford University Press DOI:10.1093/acprof:oso/9780195326697.003.0007
http://oxfordindex.oup.com/view/10.1093/acprof:oso/9780195326697.003.0007

3.4 Nova Scientific Publications, Hauppauge, New York Chapter
Grace F and **Baker JS (Ed.)** (2012). Perspectives on anabolic steroids and doping in sport and health.
ISBN 978-1-62081-243-3.
https://www.novapublishers.com/catalog/product_info.php?products_id=32566

3.5 Potential benefits of recombinant human growth hormone (rhGH) to athletes
Graham MR, **Baker JS**, Evans P, Hullin D, Thomas NE, Davies B
Growth Horm IGF Res. 2009 Aug;19(4):300-7. doi: 10.1016/j.ghir.2009.04.008. Epub 2009 Jun 17.
http://www.ncbi.nlm.nih.gov/pubmed/19539505

4 Details of the impact (indicative maximum 750 words)

Professor Baker's research work has had significant impacts in understanding drug abuse in sport and in enhancing sports performance as explained and evidenced below.

As a direct consequence of his reputation and research within the sports drug research field (3.1-3.5), strong collaborative links have been established with the World's leading authority on anti-doping in sport/exercise, namely the World Anti-Doping Agency (WADA). This relationship has led to a much more comprehensive understanding by WADA of the extent of anabolic steroid and growth hormone supply and the potential physiological consequences of using these drugs (5.1). One of the major unexpected findings from this collaboration was that, when growth hormone was administered at the correct dosages, there were beneficial effects observed. These included cardiovascular, respiratory function, lean tissue mass development and improvements in strength. However, the subjects studied tended to use higher than recommended dosages which were detrimental and potentially led to increases in cardiovascular, cerebral, and hepatic risk. Therefore it can be seen that his work has led to greater understanding of the health (and consequent economic) consequences of AAS abuse.

With regard to output 3.3 in particular, Professor Baker was invited by WADA to disseminate his findings at a Physiological Society meeting at King College (5.4). An invited audience comprised an international range of scientists and medical staff, support workers and practioners. Therefore Professor Baker's work

has contributed to international understanding of the potential physiological benefits and risks of AAS abuse. In addition, the research related to counterfeit performance enhancing drugs and self-administered polypharmacy regimes has been invaluable in informing WADA as to where analytical capability is most needed and thus this research has directly informed the policy makers within WADA in terms of shaping future practice.

Professor Baker's research (3.2, 3.4 and 3.5) has also had direct impact for the Welsh Rugby Union (WRU) (see 5.2). The recommendations and guidelines arising from Professor Baker's research work on the potential dangers of steroid abuse in sport have directly informed the strategic approach, operational policies and procedures of the WRU in relation to steroid abuse. Guidelines have now been designed in order to ensure that Clubs at all levels throughout Wales are cognisant of the challenges involved in preventing steroid abuse. As a result of Professor Baker's work, the WRU has now introduced an educational induction programme involving seminars on the dangers of AAS abuse, has initiated a test regime, and now offers counselling for affected players. The early identification of problems is paramount to reducing harmful effects. Professor Baker's research has demonstrated that sports drug abusers are less likely to seek help (despite simple possession not being a legal offence) as some users believe that their abuse of such drugs is illegal or otherwise stigmatised. The reduction of barriers to health seeking behaviours by the use of the WRU guidelines and signposts are therefore of critical importance in helping to alleviate or prevent health problems. Thus it can be seen that the research work of Professor Baker has had direct impact for the WRU in their capacity as the leaders of community development of rugby in Wales and on the health of AAS abusers.

In 2010, Professor Baker was invited to contribute to the Advisory Council on the Misuse of Drugs (ACMD) report (5.3) that was sent to the Home Secretary and the Secretary of State for Health. The report was commissioned due to the ACMD's increasing concerns about the use of anabolic steroids by the general public, and in particular young people. The purpose of the report was to consider the evidence of harms and provide advice on potential harm reduction mechanisms. The ACMD set out to consider the available evidence regarding anabolic steroid use/misuse, physical and social harms. Given Professor Baker's findings with regard to counterfeit drugs (3.1) and, in particular, the points relating to the ease of purchase of such drugs and their potential harmful effects arising from skin commensal organisms, his work was instrumental in informing the debate and facilitating the resultant practical advice on the use of such drugs. It should also be noted that this report also referenced several other influential pre-UWS research papers by Professor Baker.

Further international impact is evident by the inclusion of Professor Baker's findings on the prevalence of counterfeit drugs (3.1) in a review report (5.5) which was funded by the United States National Institute on Drug Abuse and which is disseminated via the US National Library of Medicine. This position statement, which reviewed the abuse of Androgens and appearance and performance-enhancing substances worldwide, is used by a wide variety of stakeholders who have an interest in Androgen dependence.

Two further authorities reports (5.6 and 5.7), disseminated by the Australian Crime Commission, rely on evidence from Baker et al (3.1) identifies the scale of the international problem in relation to AAS counterfeit supply and the associated potential health and safety issues for users.

In summary, Baker's work has been demonstrated to have shaped public and sports policy within an international arena, educated stakeholders on harm reduction, and potentially safeguarded and protected the health of countless AAS users of all ages.

5 Sources to corroborate the impact (indicative maximum of 10 references)

5.1 Letter from Head of R & D, Drug Control Centre, World Anti-Doping Agency, King's College, London.

5.2 Letter from Head Coach Wales 7s, The Welsh Rugby Union Limited/Millenium Stadium plc.

5.3 Advisory Council on the Misuse of Drugs Consideration of the Anabolic Steroids Home Office document in collaboration with the Welsh Assembly Government. The paper was sent to the Home Secretary 2010 and outlined the problems associated with Steroid Abuse.
https://www.gov.uk/government/publications/advisory-council-on-the-misuse-of-drugs-consideration-of-the-anabolic-steroids--2

5.4 Short-term insulin administration in sport adversely affects lipid profile and packed cell volume despite increasing body mass index was presented as the first paper of its kind to the Physiological Society meeting at Kings College London invited audience by WADA, special interest group.
http://www.physoc.org/proceedings/abstract/Proc%20Physiol%20Soc%2014C12

5.5 Illicit Use of Androgens and Other Hormones: Recent Advances available at http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3337343/

5.6 Other Drugs Part 1
Available at http://www.crimecommission.gov.au/sites/default/files/files/IDDR/2011-12/IDDR-2011-12-Other-Drugs.pdf#

5.7 Other Drugs Part 2
Available at http://www.crimecommission.gov.au/publications/illicit-drug-data-reports/2010-11/index/other-drugs