

# DOPING IN HANDBALL

## CONCEPTUAL THOUGHTS FOR THE FUTURE OF THE SPORT

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### INTRODUCTION

Unlike in sports such as cycling or athletics, doping and the artificial improvement of physical performance has never been a major topic in handball. The very first doping tests in handball were conducted in 1972 in conjunction with the re-introduction of the sport to the Summer Olympic Games (handball was previously part of the Games in 1936). In 1986, Romanian goalkeeper Adrian Simion was the first reported doping case in handball.

At the last World Championships in Spain in 2013 (with a total of 84 games), a total of 96 anti-doping tests were taken, of which 23 were out-of-competition tests and 7 were blood tests. None of the tests returned a positive result. The 2012 testing statistics of the World Anti-Doping Agency (WADA) show a similar result: 3964

samples were obtained in handball (of which 2194 in-competition and 1720 out-of-competition tests). The majority of the tests were conventional urine tests (3914), the remaining 50 were out-of-competition blood tests. A total of 55 adverse or atypical analytical findings were reported, most of which related to the abuse of cannabis. These findings point towards a low prevalence of real doping and although the true prevalence cannot be based on the number of positive tests, reports from the field indeed suggest that doping is not widespread in handball. However, several positive cases involving heavier substances such as amphetamines or anabolic agents and suspicious behaviour of certain teams before and during competitions illustrate that the sport must be on its guard to preserve a level playing field and its

credibility among the sporting community. Like in other ball sports, it is often argued that performance in handball is a complex entity encompassing many different skills that are difficult to manipulate through doping, but with competition becoming much tighter at the top level, unscrupulous athletes will try to profit from any means that will provide them even a minimal edge on their competitors. Therefore, doping is relevant in handball, just as in any other sport. In this article, the topic of doping in handball is investigated by analysing the potential doping threats, possible solutions and associated issues for the sport.

### DOPING – RISK ASSESSMENT IN HANDBALL

In order to tailor a suitable anti-doping programme to the need of the sport, a concise risk assessment with regards to



potentially abused substances is warranted. The recent scientific literature provides an insight into the physiological demands of modern male and female handball<sup>1,2</sup>. Contemporary handball is a combination of aerobic and anaerobic efforts, mainly performed at ~80% of maximal oxygen uptake ( $\text{VO}_2 \text{ max}$ ). Players cover between 3.5 and 4.5 km per game, depending on their position on the field. The average speed of locomotion ranges around 6.4 km/hour, but is interspersed by very brief time periods of substantial anaerobic energy production i.e. short sprints (on average 50 sprints per player/match). More importantly, the studies revealed more than 1400 changes in activity (f.ex. from standing to walking or running) per player during the match, illustrating the high variability in match intensity. The variability is further increased by the numerous player exchanges during games, because unlike other sports, these are not limited in handball, thus providing additional periods of rest. Interestingly, the performance indices regarding these key match characteristics consistently decrease in the second half of the games, indicating a

significant impact of fatigue on the players and their performance.

Other studies have reported the most common anthropometric features of handball players and concluded that a large part of a team's success is related to the anthropological characteristics of its players, with teams that have taller players with a higher fat-free mass being more successful<sup>3</sup>.

Thus, substances and techniques that might improve the described physiological or anthropometrical qualities in players are at risk of being abused and should be monitored accordingly.

- **Anabolic substances** (steroid hormones, growth hormones etc) are known to increase fat-free muscle mass and physical recovery.
- **Amphetamine-like substances** could raise the alertness of the player and improve performance by helping the player assess match play situations and overcome fatigue.

Another factor to be considered is the general physical demand on the players. Top level clubs play more than 90 matches per season, which, in a very physical sport

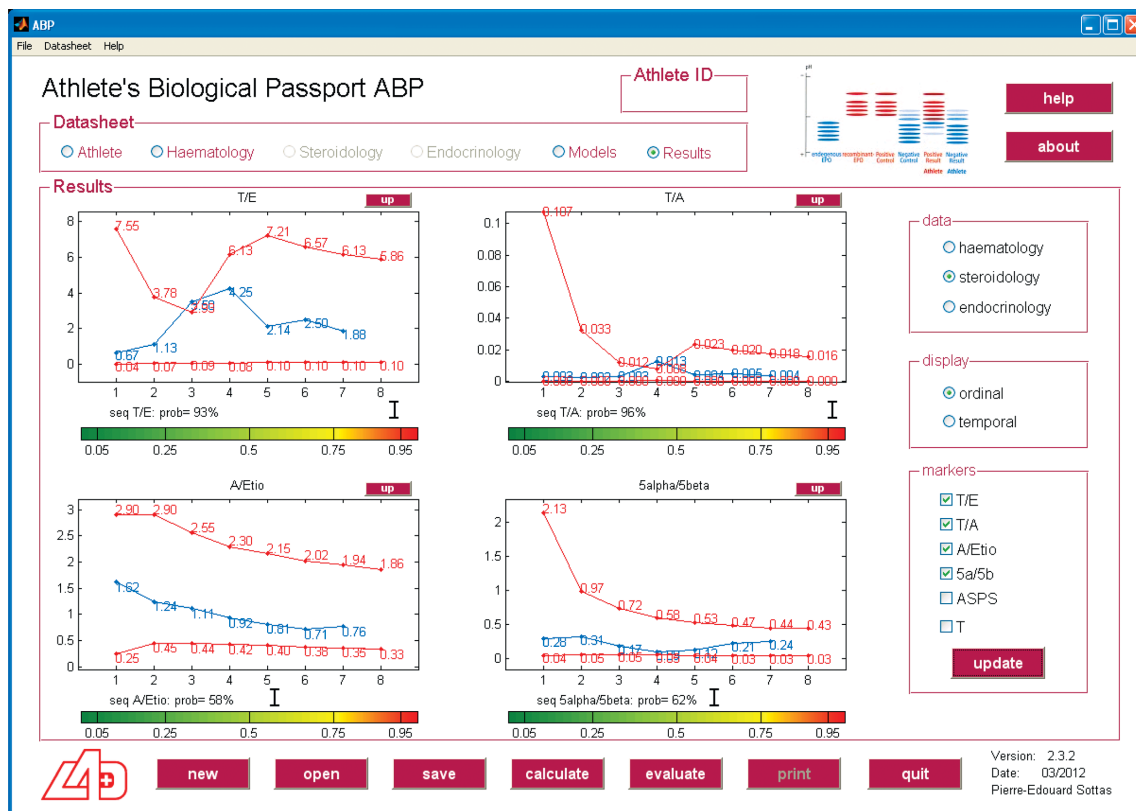
like handball, imposes heavy stress on the organism of the players and increases the risk of injuries. Thus, players will seek means of increasing their ability to recover and to cope with the extreme training and competition load and the resulting fatigue. The substances susceptible to being abused in this context are essentially similar to the ones cited above.

#### A TESTING STRATEGY FOR HANDBALL

The current anti-doping regulations of the International Handball Federation (IHF) are implemented and supervised by the IHF Anti-Doping Unit, an independent working body. They mirror the current WADA code. In the regulations, there is no specification on which specific matches (categories) or how many players per match are to be tested. This is unlike other federations, where this is often clearly defined based on the category of the matches. The IHF regulations are quite broad in this context and leave margin for interpretation, possibly aimed at giving flexibility to the testers.

Based on the risks identified in the previous paragraph and matching the regulations, a suited testing strategy could be tailored as follows.

*teams that have taller players with a higher fat-free mass are more successful*



**Figure 1:** Athlete Biological Passport, steroidal module. Longitudinal monitoring of steroid metabolites. The horizontal axis depicts the sample numbers. The blue line represents the data measured in the athlete. The red lines define the individually calculated limits. A measure outside the red lines indicates abnormality of a sample.

The anabolic agents aimed at increasing muscle mass, power and improving recovery will very likely be abused in preparation of major events, as they are mostly detectable over a prolonged period of time in conventional urine anti-doping tests (anabolic steroids). Other substances in this context, such as growth hormone, have a shorter detection window and are found using another testing matrix i.e. blood. Thus, an out-of-competition testing scheme with targeted urine tests approximately 2 to 4 weeks before the start of major competitions is most likely to best cover the abuse of these substances. Such a stringent out-of-competition testing approach has had a significant impact on the abuse of anabolic substances in other sports such as athletics. Given the fact that modern doping substances are often difficult to detect in urine, additional blood samples might also be of use in this context.

Conventional post-competition testing of randomly chosen or targeted players after matches would cover doping with stimulants and represents the classical doping tests. Such tests should remain the backbone of each doping testing strategy for sports with low test prevalence (such as handball) in order to remind the players about the existence of an anti-doping system.

Recently, a significant number of these in-competition tests unfortunately returned adverse analytical findings for cannabinoids, recreational drugs that are probably not performance-enhancing in handball but nevertheless forbidden by the current regulations. Very often, the concerned players declared not to be aware of the ban on these substances. For this reason, education on forbidden substances and the related risks should be another major part of any anti-doping strategy (see below).

#### THE ATHLETE BIOLOGICAL PASSPORT

A recent development in the area of anti-doping is the Athlete Biological Passport<sup>4</sup>. This method of indirect doping detection longitudinally tracks various biological markers that are affected by doping interventions in a subject. Thus, the doping substance itself is not detected but rather its effects on the organism. By analysing the individual variance of the tracked markers in an athlete, likelihoods of abnormality can be determined for each test result. The normal range for each marker of each athlete is estimated through comparison with an un-doped reference collective and the athlete's own, previous values. Figure 1 represents a blood profile of a male athlete (see further explanations below).

The athlete's biological passport has successfully been introduced in several sports such as cycling and athletics and has considerably affected the prevalence of certain doping techniques in these disciplines. Whereas in these sports blood doping was the major problem and thus markers that were able to flag blood manipulation were used (the so-called 'haematological module'), for handball, other doping techniques are relevant (as described above). Given that power and body mass are important factors for performance in handball and that anabolic substances are among the likely drugs to be abused, it would therefore be useful to monitor markers that are affected by the use of such substances. Recently, a new development of the Athlete Biological Passport has been introduced which is specifically aimed at detecting the abuse of anabolic hormones through dedicated biomarkers<sup>5</sup>. In the 'steroidal module' of the passport, selected urinary steroid concentrations are monitored. Specifically, testosterone, epitestosterone, androsterone, etiocholanolone, 5 $\alpha$ -androstane-3 $\alpha$ , 17 $\beta$ -diol and 5 $\beta$ -androstane-3 $\alpha$ , 17 $\beta$ -diol (and certain of their ratios) constitute the variables that are tracked over time and are interpreted as to their variation by a panel of experts (Figure 1). These experts identify

biomarker patterns suspicious of doping and subsequently give recommendations to the federations. The steroidal module is operational from 1 January 2014 and can then be implemented by all federations.

Until now, the French and the Hungarian handball federations have paved the way in this regard and carried out a total of 272 tests related to the Athlete Biological Passport.

#### DOPING PREVALENCE ESTIMATION

As stated above, the general assumption is that the prevalence of doping in handball is low. As this is based on the number of positive tests only, experience from other sports shows that these numbers are very often a poor indication of the reality and do not reflect the true prevalence<sup>6</sup>. Therefore, a prevalence estimation of doping might considerably help the risk assessment and the quantification of doping in handball. Such prevalence estimation could in part be performed through samples obtained within the framework of the Athlete Biological Passport on a large number of players during a major tournament: By comparing the distribution of the levels of certain doping-related biomarkers in the collective of athletes with a presumably undoped control group, the point prevalence of certain doping techniques might be estimated through calculation of the difference in the distribution of each marker between the two collectives. By associating these data with teams or nations, testing programmes can be adapted accordingly. This approach has been successfully implemented by the International Association of Athletics Federations<sup>6</sup>.

#### HEALTH ASPECTS

More than for 'direct performance enhancement' through typical doping substances that improve body composition, power, endurance or alertness, the sport of handball might be at risk of the abuse of drugs that can provide 'indirect performance enhancement'. Being a relatively injury-prone sport due to its physical component of body contact, the sudden changes in directions and the high number of matches played, it has been established that the use and abuse of non-steroidal anti-inflammatory drugs (NSAID) and other pain relievers flourishes in the sport and

many players consume these substances at large doses. Side-effects of these drugs include gastrointestinal bleeding and kidney impairment. Anecdotally, cases of heavy side-effects after massive use of these substances have been reported, some ending with severe organ damage and in one case, even kidney transplantation. Thus, aside from the aspect of performance enhancement, medical staff involved with handball should bear this relevant issue in mind.

#### DOPING PREVENTION

A key element for any anti-doping programme is education through doping prevention interventions. Such programmes are not without critics due to the fact that they mostly target young, developing athletes, for whom doping is, at an early stage of their career, not a real option or threat. This, however, changes radically later, when reaching the elite/professional stage and their entire life layout and earnings for their families may depend on success in their sport. Thus, such programmes might not show any sustained affect for the target group as the social framework shifts during the career of an athlete. In the specific context of handball however, where the majority of positive tests stem from cannabinoids, it can be speculated that prevention programmes might indeed tackle this specific problem by educating the athlete about the possibility of a positive doping test after cannabinoid consumption.

#### SUMMARY

Based on the available data, it can safely be assumed that doping is probably not common in handball. Nevertheless, with increased incentives for players and progressive professionalisation of handball, measures have to be taken to preserve the cleanness of the sport. Such measures could consist of several layers with regular in-competition testing paired with a targeted out-of-competition testing programme and, for the top level of the sport, a monitoring programme through the steroidal module of the Athlete Biological Passport. Doping prevention might be established from an early age onwards by educational features which instruct the athlete about the health risks of the various doping substances

and possible doping positives through recreational drugs such as cannabis, which currently constitute the major part of adverse analytical findings in handball.

By these means, the sport could preserve its credibility and the health of its athletes and at the same time pave the way for other ball sports with a concise and effective anti-doping strategy.

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