

# DRUGS IN SPORT

**David R. Mottram**

**Liverpool John Moores University**

**and**

**UK Anti-Doping Accredited Tutor**



# Overview

- WADA
- The Prohibited List
- Testing
- Extent of use
- Supplements
- London 2012 Olympics

# Performance Enhancement - A Recent Development?

- The ancient Greeks used mushrooms
- Roman wrestlers used mixtures of herbs
- In ancient Egypt, the rear hooves of the Abyssinian Ass was the prescription of choice.

# WHY DRUGS ARE USED IN SPORT

- Therapeutic Use
  - Long-term conditions (e.g. diabetes)
  - Short-term conditions (e.g. common cold)
  - Treatment of sport's injury
- “Recreational” Use
- Performance Enhancement
  - Supplements (nutritional and ergogenic)
  - Prohibited substances

# Doping control is the responsibility of the World Anti-Doping Agency (WADA)



- Set up in 1999 to harmonise doping control
- WADA's Anti-Doping Code has been accepted by almost all stakeholders



## Key Roles

- World Anti-Doping Code
  - Prohibited List of Substances and Methods
    - In-Competition
    - Out-of-Competition
  - Therapeutic Use Exemptions
  - Sanctions

# THE PROHIBITED LIST

What are the criteria for including substances and methods on the Prohibited List?

# PROHIBITED LIST

- Potential to enhance or enhances sports performance
- Actual or potential health risk to the player
- Use violates the spirit of sport



# WADA Prohibited List (January 2012)

## **I Substances and Methods Prohibited at all Times (In- and Out-of-Competition)**

**S.0 Non-Approved Substances**

**S.1 Anabolic Agents**

**S.2 Hormones and related substances**

**S.3 Beta-2 Agonists**

**S.4 Hormone and Metabolic Modulators**

**S.5 Diuretics and other Masking Agents**

**M.1 Enhancement of Oxygen Transfer**

**M.2 Chemical & physical manipulation**

**M.3 Gene Doping**

## **II Substances and Methods Prohibited In-Competition**

**All the categories under Section I, plus:**

**S.6 Stimulants**

**S.7 Narcotics**

**S.8 Cannabinoids**

**S.9 Glucocorticosteroids**

## **III Substances Prohibited in Particular Sports**

**P.1 Alcohol**

**P.2 Beta Blockers**

# Frequently used drugs from the Prohibited List

# ANABOLIC AGENTS

## Androgenic Anabolic Steroids (AAS)

- Exogenous  
Nandrolone, Stanozolol
- Endogenous  
Testosterone

## Other Anabolic Agents

- Beta-2 Agonists such as Clenbuterol

## Effects

Increased muscle mass and strength  
Normally taken during training

# Androgenic Anabolic Steroids

- Side Effects
  - Acne, testicular atrophy, menstrual irregularities, breast shrinkage
  - Atherosclerosis, salt & water retention, liver & kidney tumours

# The Dwain Chambers Case

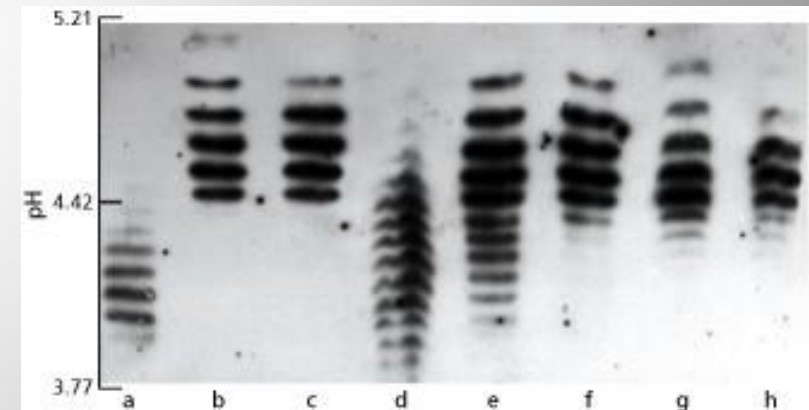
- Tested positive for the “undetectable” “designer” steroid Tetrahydrogestrinone (THG) in June 2003
- Served a 2-year ban
- British Olympic Association will not allow him to compete in Olympics
  
- Athletes are prepared to take drugs that have not undergone safety checks

# HORMONES AND RELATED SUBSTANCES

- Erythropoietin (EPO)
  - Increases red blood cells
  - Increases oxygen supply to muscles

# Erythropoietin (EPO)

- There has been a validated test for EPO since the Sydney Olympics in 2000
  - Immunoassay can distinguish between endogenous EPO and recombinant EPO



## BETA-2 AGONISTS

- All Beta-2 Agonists are prohibited, except:
  - **Salbutamol** (max 1600 micrograms over 24 hours)
  - **Formoterol** (max 36 micrograms over 24 hours)
  - **Salmeterol**
- When administered by inhalation.
- A urine concentration of Salbutamol greater than 1000ng/ml or Formoterol greater than 30ng/ml is considered an Adverse Analytical Finding



# WADA Prohibited Methods

## BLOOD DOPING

### BLOOD DOPING

- Effects
  - Increase oxygen carrying capacity of the blood
- Potential Problems
  - Infection (Septicaemia, Hepatitis, AIDS)
  - Allergic reaction (Anaphylaxis)

# The Jan Ullrich Case

- Ullrich, along with 13 other riders was removed from the T-Mobile Team before the 2006 Tour de France
- They were among 58 riders caught up in the Spanish police investigation into blood doping (Operación Puerto)

# WADA Prohibited Methods

## CHEMICAL AND PHYSICAL MANIPULATIONS

Tampering with samples during testing

Examples:

- Urine substitution
- Sharing urine
- False bladders
- Inhibition of urine excretion

# WADA Prohibited Methods

## GENE DOPING

- **Gene Therapy** is the transfer of genetic material to human somatic cells (non-reproductive cells) for the treatment or prevention of disease or disorders
- **Gene Doping** is the use of this technology for the improvement of performance in sport

# STIMULANTS

- Effects
  - Increased alertness and aggression
  - Delay in fatigue
- Examples
  - Amphetamine & Cocaine (recreational use)
  - Ephedrine & Pseudoephedrine (used in coughs & colds)

# **STIMULANTS**

## **Drugs available Over-The-Counter (OTC)**

Medicines that can be bought from a pharmacy have caused great problems for athletes

# The Andreea Raducan Case

- At the 2000 Sydney Olympic Games she tested positive for Pseudoephedrine
- Given the drug by her team doctor
- Strict Liability rules were applied
- She was stripped of her Gold Medal

# The Alain Baxter Case

- Tested positive for Levamethamphetamine in a US version of Vicks Nasal Inhaler at the 2002 Olympics in Salt Lake City
- Under Strict Liability rules, lost his bronze medal
- His appeal was upheld, acknowledging that he did not attempt to cheat
- IOC refused to give back his medal
- WADA subsequently introduced a new rule on “Specified Substances”



# STIMULANTS

## Drugs available Over-The-Counter (OTC)

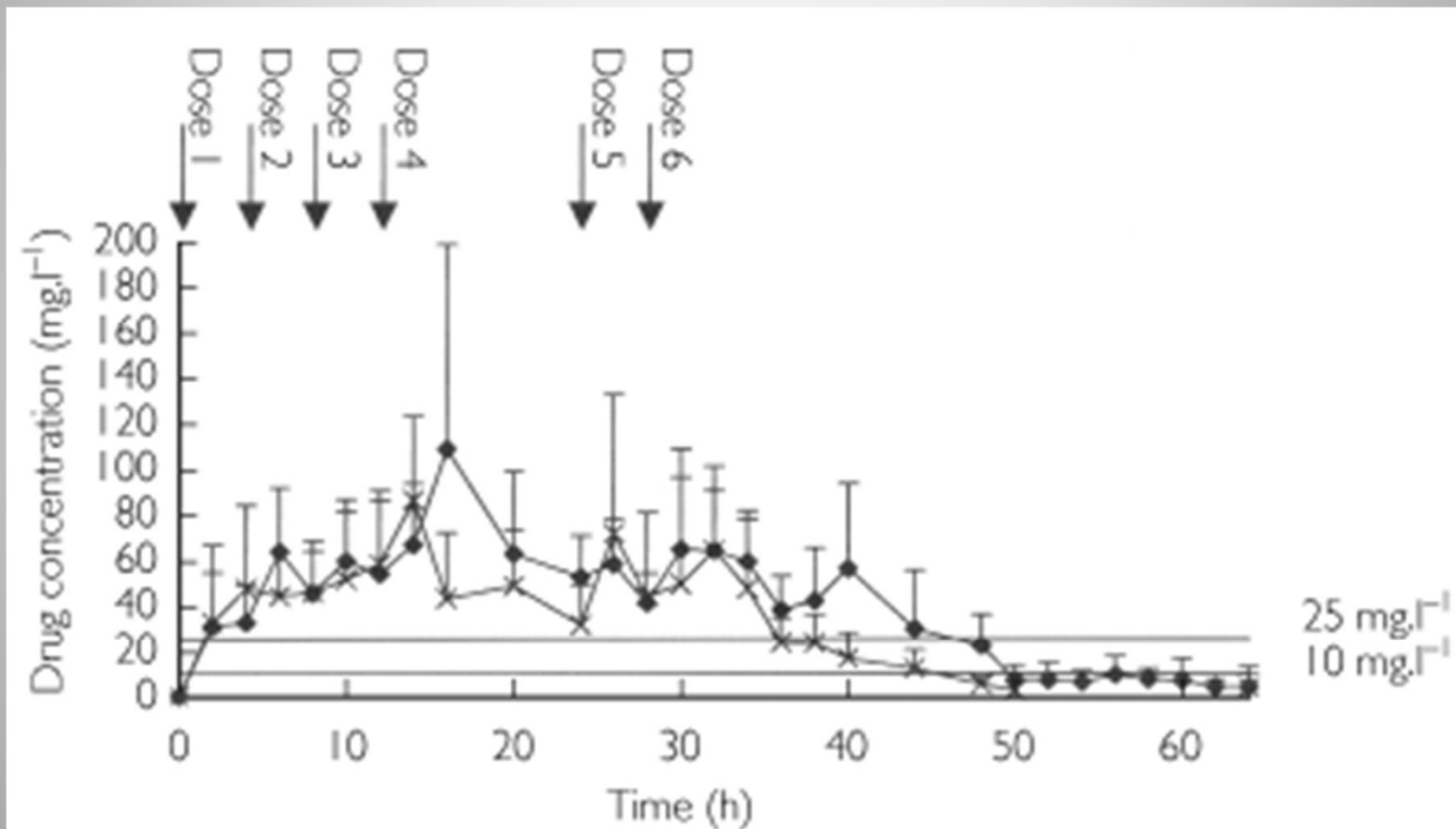
- In January 2004, WADA removed many of these OTC drugs from the prohibited list
- However, they were placed on a **Monitoring Program**

# STIMULANTS

## Drugs available Over-The-Counter (OTC)

- Some OTC drugs remain on the prohibited list
- Urinary concentrations above which WADA laboratories must report findings:
  - Cathine > 5 micrograms/ml
  - Ephedrine >10 micrograms/ml
  - Methylephedrine >10 micrograms/ml
  - Pseudoephedrine > 150 micrograms/ml

# Pseudoephedrine and Phenylpropanolamine concentrations following multiple dosing (Chester, Mottram, Reilly & Powell (2003) Br. J. Clin. Pharmacology 57:62-67)





## Liverpool JM University - WADA Research Project (2006)



- “The Impact of Changes to the Prohibited Substances List on the use of OTC Medication by Athletes”
  - Questioned 557 elite athletes in 10 sports in 4 countries
    - Extent of use
    - Knowledge & understanding
    - Views & opinions
    - Demographic differences
  - Inform WADA on future policy

- 38% of athletes had used OTC products on the Monitoring List in the past 12 months.
- There was a significant difference ( $p < 0.001$ ) between countries

USA	46%
Australia	43%
Canada	32%
UK	24%

- Respondents' primary reason for using OTC drugs

To treat symptoms of illness	73.3%
To enhance performance	0.7%
Both of the above	2.7%
Declined to answer	23.3%

- Athletes demonstrated limited knowledge about WADA rules concerning OTC medicines
  - Only 35.1% correctly identified whether drugs were prohibited or not
- Athletes would seek advice but this was not always from a reliable source



## LJMU - WADA Project



- Overall the trend of athletes' opinion was that OTC stimulants:
  - May be performance enhancing
  - Posed a risk to health
  - Their use was against the spirit of sport
  - Should remain **off** the Prohibited List



# CANNABINOIDS

- Actions of Cannabis
  - Affects almost every system in the body
  - It has anxiolytic, sedative, analgesic & psychedelic properties
  - It impairs cognitive and psychomotor performance; slows reaction time; produces motor incoordination; defects short-term memory

# CANNABINOIDS

This is a performance  
enhancing drug?

# CANNABINOIDS

Marijuana use – a hazard to others



# Substances Prohibited In Particular Sports

# SUBSTANCES PROHIBITED IN PARTICULAR SPORTS

## ALCOHOL

Alcohol is prohibited in-competition in the following sports:

Aeronautic

Archery

Automobile

Karate

Motorcycling

Powerboating

These sports apply a blood threshold of 0.1g/L

# SUBSTANCES PROHIBITED IN PARTICULAR SPORTS

## BETA BLOCKERS

- Produce anti-anxiety effects and reduce heart rate and hand tremor
- Therefore banned in sports involving:
  - hand steadiness (e.g. archery, billiards, boules, bridge, golf)
  - extreme stress (e.g. ski jumping, powerboating)



# THERAPEUTIC USE EXEMPTION

Chris Hoy, 100% me Ambassador



# THERAPEUTIC USE EXEMPTION

- A process by which an athlete can obtain approval to use a prescribed prohibited substance or method for the treatment of a legitimate medical condition.



Medical Condition	Prohibited Substances
Attention Deficit Hyperactivity Disorder	Methylphenidate; Dextroamphetamine
Arterial Hypertension	Diuretics; Beta Blockers
Asthma	Terbutaline
Diabetes Mellitus	Insulin
Post-infection Cough	Pseudoephedrine; Oral Glucocorticosteroids
Musculoskeletal Conditions	Narcotics; Oral, Rectal, i.m or i.v. Glucocorticosteroids

# Dope Testing



# Dope Testing

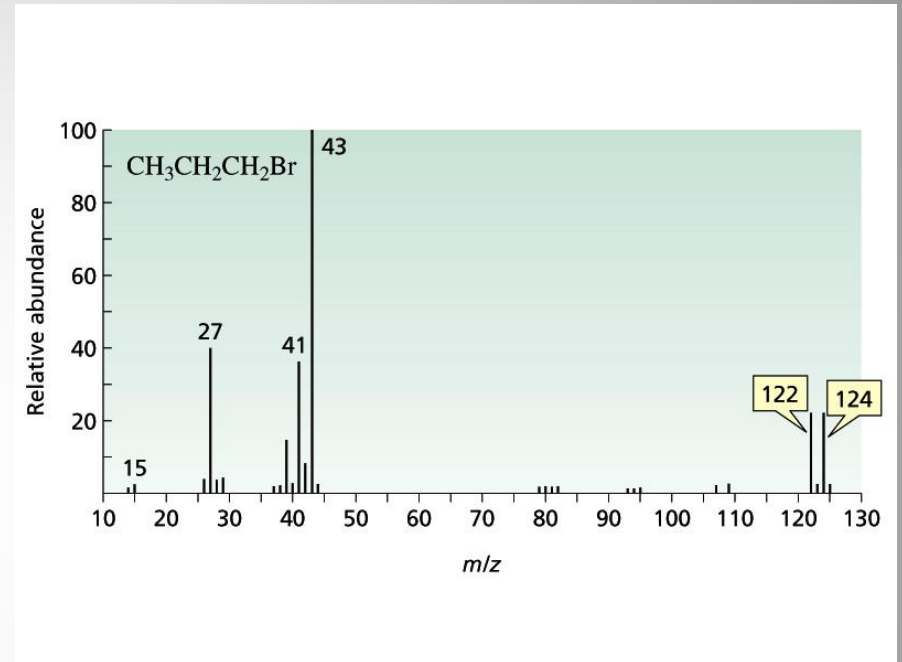
- Controlled through 35 WADA-accredited laboratories
- UK testing is through UKAD
- Testing is within competition or out-of-competition (OOCT)

# Drug Testing Procedure

- Selection of competitors
  - In-competition
  - Out-of-competition (National Registered Testing Pool)
- Sample collection (A & B samples)
- Declaration and Certification
- Transfer to the Laboratory (chain of custody document)

# Drug Testing Procedure

- Analysis of Sample A (Gas Chromatography/Mass Spectrometry)
- Reporting results
  - Negative
  - Positive
    - Analysis of sample B
- Sanctions



# WADA Consequences of Anti-Doping Rules Violations

Violations result in one or both of the following:

- **Disqualification**

Results in a particular competition or event are invalidated (forfeit of medals, points, prizes)

- **Ineligibility**

Athlete is barred from participating or funding.  
Normally:

- First violation - 2 years
- Second violation - Lifetime



# WADA Consequences of Anti-Doping Rules Violations

For **Specified Substances** susceptible to unintentional use, **where an athlete can establish that the use was not intended to enhance performance**, the period of ineligibility is:

- First violation
  - Minimum - warning and reprimand
  - Maximum - 1 year

What is the extent of drug  
misuse in sport?



# Extent of Drug Misuse in Sport

- Statistical evidence
  - Media speculation
  - Official data
- Published research
  - Surveys
    - **self-reporting**
    - **perceptual reporting**

## STATISTICS FROM WADA LABORATORIES (2010)

<b>Anabolic Agents</b>	<b>3,374</b>
<b>Stimulants</b>	<b>574</b>
<b>Cannabinoids</b>	<b>533</b>
<b>Beta-2 Agonists</b>	<b>209</b>
<b>Glucocorticosteroids</b>	<b>234</b>
<b>Diuretics &amp; other Masking Agents</b>	<b>396</b>
<b>Peptide Hormones</b>	<b>86</b>
<b>Beta Blockers</b>	<b>30</b>
<b>Narcotics</b>	<b>20</b>
<b>Hormone antagonists &amp; Modulators</b>	<b>75</b>
<b>Manipulation</b>	<b>6</b>
<b>Enhancement of O<sub>2</sub> Transfer</b>	<b>-</b>
<b>Alcohol</b>	<b>9</b>

## STATISTICS FROM WADA ACCREDITED LABORATORIES (2010)

- A Samples Analyzed = 258,267
- Adverse Findings (includes TUEs & multiple measurements) = 4,817

= 1.87%

# Why Are Drugs Misused in Sport?

- Commercialism & Professionalism
- Peer pressure
- Availability
- Media speculation
- Culture of substance taking in sport

# Culture of Substance Taking in Sport

- A UK Sport study indicated that 60% of respondents used supplements
- Of these, 72% were taking “health maintenance supplements” (e.g. vitamins). 28% were taking “ergogenic aids” (e.g. protein powders, fat loss products)

# Supplements

- Supplements are unregulated, aggressively marketed and easily obtainable
- Are they safe to use?

# Steroids and Nutritional Supplements

(IOC sponsored study: W.Schanzer, Cologne (2002))

- 634 non-hormonal supplements were obtained
- 14.8% contained prohormones (mainly of Testosterone and Nandrolone) which were not declared on the label
- The prohormones produce similar metabolites to Testosterone & Nandrolone

## Variation by country

<b>Netherlands</b>	<b>25.8%</b>
<b>Austria</b>	<b>22.7%</b>
<b>UK</b>	<b>18.9%</b>
<b>USA</b>	<b>18.8%</b>
<b>Italy</b>	<b>14.3%</b>
<b>Spain</b>	<b>13.8%</b>
<b>Germany</b>	<b>11.6%</b>

# How to Check if Medication is Prohibited

- Access:

[www.globaldro.com](http://www.globaldro.com)

