Hormones: The Inside Story

Episode 4 – Should we have the steroid Olympics?

This is Hormones: The Inside Story, the podcast from the Society for Endocrinology where we take a look at the tiny things pulling the strings inside your body. I'm Georgia Mills.

This time, using performance-enhancing drugs such as steroid hormones in sport is widely seen as cheating, and this so-called doping is banned by many sporting organisations. But, still - every year there is some kind of doping scandal, people are still taking this stuff. I'm sure I'm not the only person to have wondered, should we just have the steroid Olympics? Why can't we just use science to get the best performance possible?

So, this episode - should we have the steroid Olympics? I'll be finding out whether this idea could ever get the green light, and what these substances are and how they work. But first, when did doping start, and how did it get banned? Let's go back in time to meet a sporting celebrity of the Victorian era. Edward Weston.

Douglas - He's one of the first international sporting celebrities, really.

This is Douglas Small, he's a historian writing a book about a particular performance-enhancing substance - I won't tell you which one yet - who became intrigued by Weston's story. He was an American known for an unusual sport.

Douglas - This very kind of late Victorian sport of long distance competitive walking. Either a single athlete or a group of athletes more usually, will walk around a track for hours and hours and hours on end.

Georgia - Hang on. Victorians went to see people walking in circles.

Douglas - It is exactly as thrilling as it sounds. But for the Victorian audience, this was absolute catnip.

Although this portly gentleman with a bushy white moustache and a cheeky grin might not look like today's sporting stars, his visit to the UK caused quite a stir.

Douglas - He's described as having a very Yankee highfalutin style.

And as well as playing for the crowd, this guy could WALK.

Douglas - I think his first match is against a guy called William Perkins. And the challenge is essentially that it's a continuous 24-hour walking race. And at the end of that time, Western has covered, I think, 109.5 miles. Whereas Perkins has to retire after about 65 miles. And he's described as having had to be forced to retire with bleeding feet and in lamentable condition.

He talked the talk and walked the walk. So what was Weston's secret? How did he out-walk the best of Britain, a nation known for our rambling?

Douglas - they take an enormous funnel and they pour like a jug of whisky basically into each of his boots.

Then there's also his technique.

Douglas - And he's described as being something between the twitching of a galvanised corpse and a postman's walk.

If *only* there was a video of this. But there was one final trick which may have made all the difference...

Douglas - It's discovered in one of his races that he's been chewing coca leaves, which, if you don't know, is what you get cocaine out of.

Weston was doping! Douglas found this while writing his book about - you guessed it - cocaine. And I know - cocaine not a hormone - although it does affect the regulation of a hormone called dopamine.

But when this doping was revealed, the fallout was very different to what Douglas expected.

Douglas - The reaction is almost overwhelmingly one of enthusiasm and interest, that there's very little sort of criticism of Western for taking these drugs. This is part of his process as a sportsman.

Douglas discovered that it was seen in a similar way to training, or eating well.

Douglas - *Victorians* would have thought, well, OK, it's perfectly legitimate for a professional sportsman to take these drugs because this is their job. So it's just a tool that allows them to do their job.

So when did this go from something that people thought was reasonable, to cheating? Well there are two theories Douglas has. One is that Victorian society had considerable double standards. Here's an example.

Douglas - *There's a quite famous German American bicyclist called Margaret Gast.*

At the tail end of the Victorian era she's trying to set a long distance biking world record. She is also using performance enhancers, but this time it's not discussed quite so favourably.

Douglas - *Some of the language around it has shifted. So it's this idea that these drugs are beginning to become something which is. connotative of pushing the human body to its absolute limits, that there's something a little bit dangerous or something a little bit kind of suspicious about forcing people to these levels of performance using these drugs.*

Suddenly the safety and morality is a bit more blurry.

Douglas - *The wider culture tends to start to think that drugs are problematic when groups of people who are already viewed as being somehow problematic start taking those drugs. In other words it's not the drugs themselves, but the patterns of how it's been used and, more often than not, who is using it.*

You can start out when someone like, let's say, respectable professional white men, as long as they are taking these drugs, it's acceptable and it's fine. The moral value of those drugs begin to shift when minoritised populations like women or ethnic minority populations start to take those drugs themselves.

And there's the idea of professional versus amateur sports. If you were a professional, it was kind of a given you might want do this

Douglas - Conversely, though, it was not completely but more frowned upon for amateur sportsmen to be taking these drugs, because if you were an amateur, you were supposed to compete as a gentleman. You were also supposed to compete in a manner which implied that you were not necessarily taking victory too seriously.

And then the modern Olympic Games are created.

Douglas - In the early 20th century the Olympic movement starts, it takes as its governing ethos this Victorian idea of amateurism.

So what starts to develop then is a sense that it wouldn't be appropriate for Olympic athletes to take these drugs because that would run contrary to this ideal of amateurism. So over time, you get this idea, which has now come to dominate contemporary sport, that the professional use of performance enhancing drugs is illicit, whereas it's, in some ways, much less overtly disapproved of in any kind of amateur context.

So taking performance-enhancing drugs wasn't always considered cheating. But values have shifted since Weston's time - and the drugs themselves have changed. Rather than pure stimulants like cocaine, these days the most popular performance enhancing drugs are hormones.

Richard - *The first records of doping using hormones also came in the 19th century as well.*

This is Richard Holt, Professor of Diabetes and Endocrinology at the University of Southampton.

Richard - *And this was really promoted, or at least The genie was let out of the bag by Charles Brown-Séquard who reported to the French Society that he had injected himself, first with the blood of testicular veins, then semen and then juice from a testicle from a dog or a guinea pig.*

And he described radical changes in his health with significant improvements in both physical and mental energy. Now, almost certainly he is describing a very potent placebo effect. But nevertheless, this inspired others to consider using hormones as a performance enhancement.

Eventually taking hormones went from a strange French men playing around with testicles to becoming much more common.

And rather than a placebo effect, these things do actually work.

Richard - *There are a long list of drugs which are banned by the World Anti-Doping Agency. These drugs do boost performance. They are powerful anabolic agents, and we can see that in normal health as well as in athletics.*

Anabolic agents are basically beefcake hormones...

Richard - *An anabolic agent is one which builds muscle. So, for example, if we think about both growth hormone and we also think about anabolic steroids, things like testosterone and derivatives of testosterone, they build muscle. And so, very crudely, that improves the strength of those particular athletes taking those drugs.*

These hormones grow their muscle in different ways

Richard - *Anabolic steroids directly increase the production of muscle tissue and also improve the strength of that particular muscle.*

But it's not just anabolic steroids, growth hormones can also improve performance

Richard - *In the case of growth hormone, we also know that it tends to be to reduce fat mass and that in doing so, it actually changes the power to weight ratio for a particular athlete. We know that it has quite profound effects on glucose and lipid metabolism and that effectively, both of those are important fuels for the athletes and can therefore improve the access of fuel to that to that exercising muscle.*

So the hormone increases muscle, reduces fat and increases delivery of fuels, like oxygen, to the muscle. An attractive prospect for someone trying to run faster or lift heavier weights. But, as you might expect, messing about with your hormone levels can have some unwanted or even harmful side effects.

Richard - *Let's just start off with the anabolic steroids. And I guess the side effects here depend on whether these are taken by women or taken by men. So we know, for example, from studies that came out of East Germany that many of the East German female athletes were systematically doped under the old East German regime. And the biggest consequence that these women had is one of virilisation. Virilisation is where women develop the secondary current sexual characteristics of men. So they would see deepening of their voice, they would see beard growth, they would see hair growth across their chests, as well as the body composition changes that they were that they were seeking for.*

And there are some generic changes that affect everyone

Richard - *So we know that taking anabolic steroids is bad for the liver. It can lead to jaundice, it can lead to damage to the liver tissue. And it also increases the risk of liver cancer. So if that's not enough, we also know that anabolic steroids are bad for the heart. It can lead to changes in cholesterol profile and increase the risk of heart attacks. And in fact, probably one of the commonest causes of heart attacks in young men is young men who've been abusing anabolic steroids. And then finally, as anybody who has got a teenage boy will be aware that anabolic steroids can also affect the psyche of the individual. So they can increase the likelihood of aggression or irritability. But sadly, they can also increase the risk of depression and mania. So these are not drugs that you want to be messing around with. They do really have quite significant side effects.*

And what about taking Growth hormone, well it turns out it's no better.

Richard - Growth hormone also had side effects. *It can lead to fluid retention and high blood pressure. It can lead to diabetes. Again, it can affects the heart. It can cause joint problems and nerve problems, as well as changing the physical appearance of those individuals. So, again, not something to be messing around with.*

So these things carry significant risks. And so, the list of banned substances grows. So to make sure that everyone sticks to the rules, sporting bodies need ways of testing for these things. But that isn't as simple as it sounds when it comes to hormones that are naturally produced in the body anyway. Richard had the difficult task of trying to detect growth hormones.

Richard - *There are significant challenges in detecting growth hormone because growth hormone is a completely normal hormone, it should be there, it should be present in the blood. One of the other big challenges about testing growth hormone is that its levels fluctuate dramatically. So at its peak, often 100 plus times greater than when it's down in its trough. So we know that growth hormone goes up and down, we know that one of these stimulants for growth hormone secretion is stress and another being exercise.*

So if exercise - something you would imagine athletes do quite a bit, increases natural production of growth hormone, how do you catch the supplemented levels, leaving the natural fluctuations alone? There's one test, which measured the levels of growth hormones in comparison with other substances which should be there if it's been made in the body, but won't be there through supplementation.

Richard - *So the test is effective, but one of the main problems with it is that it has a short window of opportunity, probably only up to about 24 hours after the last injection of growth hormone, because what happens is that when growth hormone has been administered, the pituitary stops producing its own growth hormone, but that recovers very, very quickly.*

So a different type of test was needed. Richard was brought on board by scientist Peter Sonkson at University College London, to help finesse an alternative approach.

Richard - *The approach that we took was slightly different. It was one some measure proteins that change as a result of growth, growth hormone action.*

So the two proteins that we measured are IGF-1, which is a hormone that's produced predominantly within the liver in response to growth hormone action and also a second protein called type III procollagen. And this is a protein that comes from soft tissue, again, in response to growth hormone. *And what we see is that these proteins go up in response to growth hormone administration and they stay up for a longer period of time, which gives us a longer window of opportunity to detect athletes taking growth hormone.*

So after the growth hormone levels have dropped - these proteins remain, allowing you to identify the dopers.

Richard - *So the test was first launched at the London Olympic Games in 2012. And although there were no athletes that were caught at the London Olympics, six weeks after its introduction two Russian powerlifters were disqualified having had an adverse laboratory test for growth hormone using our test. They then subsequently admitted to having taken growth hormone.*

But unfortunately, this is not game set match. As soon as a test is developed another drug, or another way of hiding it pops up.

Richard - T*he athletes generally are going to be one step ahead of the anti-doping testers. So it's quite likely that athletes are already starting to develop other ways of manipulating the growth hormone axis. This is sophisticated stuff. These are well-funded and well-resourced labs,*

So this is not an easy thing to catch, or prevent. But there are local and global organisations like WADA, the World Anti-Doping Agency, who are looking into other ways of keeping sports dope free.

Amanda - Every athlete starts in sport clean. No athlete things. I'm going to join sport today because I want to inject steroids. So the premise for all of our work and in particular in education is that. Start in sport clean.

This is Amanda Hudson, who knows exactly what it's like to be on the receiving end of a drugs test.

Amanda - So I was a sprint hurdler back in the day and I played netball on the side - much to my dad's annoyance, he said I should focus on one sport! I was a relatively ok athlete, junior athlete, ranked number three or four in the country.

And I always remember being sat in a pen waiting to see if I was going to be drug tested. And I knew nothing. I knew nothing about the process. I didn't know what was going to happen. I didn't know what my rights and responsibilities were. My dad always gave me a Lucozade tablet before every race, which I was now panicking about. And it was quite a scary experience.

Amanda is now head of education at the World Anti-Doping Agency. But rather than trying to catch doping cheats in action, they're trying to prevent it happening in the first place.

This can be really as simple as explaining to people which substances are banned.

Amanda - So the list of banned substances in sport is a long list, it's quite complex and many athletes don't have medical degrees. So we have a real job to do, helping athletes understand where to find the information that they need to ensure they don't inadvertently break the rules. And that could be as simple as helping athletes understand that they need to check medications that they might buy in a

supermarket, in the pharmacy, before they use them because they might contain a prohibited substance.

Accidental dopings aside though - a lot of it is intentional- so why would someone want to take performance enhancing hormones and all the risks that go along with it?

Amanda - There will always be the odd athlete who is predetermined to dope to enhance their performance, to try and keep their way to a medal. So I'm going to park those athletes to one side. The majority of others who make a doping decision, it's borne out of vulnerability and the obvious one is trying to improve performance for a reason, whether that's the first professional contract or making the Olympic team being selected for a world championship. We know that sometimes there's false falsehoods or myths in the sporting community that all athletes are doping and so the only way to succeed is through doping. And typically, the vulnerabilities can also occur towards the end of a career where athletes are struggling to maintain their performance.

And if we think about some other corners of the world, for some athletes, this is their way out of poverty.

So doping can stem from a moment of vulnerability, this means a lot of Amanda's work focuses on trying to help other people spot those vulnerabilities before they turn to doping.

Amanda - Research tells us that those around the athletes obviously have a good influence on athletes. So the coaches and their parents and the medics. So investing in education in those around the athlete helps to build their confidence that they can be more in tune with their athletes. They can spot vulnerabilities and help them by intervening and getting them on the right path before a doping decision is made.

But even with education and testing - Amanda is not hopeful this is a problem that will ever go away.

Amanda - The research into human nature tells us that there's always going to be a minority in a population who are willing to take more risks and bend the rules or even break them. So that still applies in sport.

With testing falling behind, and people always slipping through the gaps - some people have wondered if it might be better just to let everyone do it. Bring on the steroid Olympics! What do you say Richard?

Richard - Well, it is interesting and there has been quite a lot of debate about this, you know, should we just allow a complete free-for-all for doping? You know, so the arguments for having the anti-doping movement is around the harm to an athlete. But on the other hand, in sports, we allow people to do things that are potentially harmful. So, for example, in skiing, we allow people to race down mountains at 100 miles an hour, which is inherently a dangerous thing to do. But we allow it to happen. And similarly, if we think about rugby, there'd probably be more people who have been harmed in rugby scrums than have been harmed through taking performance enhancing drugs. And yet it's part and parcel of the ethos of that particular sport. And clearly, I'm not arguing that we should stop downhill skiing and we should certainly not change rugby, because that's all part of what the sport is.

And what about fairness? Because speaking as someone who was picked last for every team, is any element of sport fair?

Richard - You know, clearly, sport isn't fair. It's not just necessarily natural ability that we describe, but also access to training facilities, to nutrition, to psychological supports. I can say, well, you know, is it fair that Southampton doesn't have the same budget that Liverpool or Manchester City do? You know? And so there is an inherent unfairness in sport. But I think that really the issue about drugs in

sport is whether this is seen as being part of the ethos of the sport and at the moment, people don't see it as being part of these authors, and I think that I think that's right.

So maybe my desire for the steroid Olympics isn't such a great idea after all? Amanda.

Amanda - It would be interesting to see how many people would want to watch that race, particularly if they knew that probably the lifespan of those athletes would be significantly shortened. So that essence of sport where it's me, you, on a line, you know, just to see who's the quickest or who's the best at a certain sporting endeavour. That's the pure essence of sport. And what we don't want to do is damage the essence of sport by making it a competition about who has the best pharmacist behind them or who has access to the best drugs. And equally important is, you know, the health of the athletes, the fundamental rationale for the World Anti-Doping Code and kind of what we do is, is the fact that we want to protect an athlete's health and obviously by legalising doping would fundamentally go against that. So health and protecting the essence of sport is for me why we would never consider legalising doping.

So, although it's unlikely to be legalised or officially embraced by sporting bodies any time soon, doping is still going to be a part of professional and amateur sports, as chemists find ways to hack the natural systems and make them work to an athlete's advantage. But the price to health and reputation seems to be one that some will always be willing to pay.

Thanks to Amanda Hudson, Richard Holt and Douglas Small for their help this episode.

Next time we'll be going under pressure, as I find out about how hormones stress us out, and the strange ways this can meddle with our mind.

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This show was produced by me, Georgia Mills. Kat Arney is the executive producer and it was made by FIRST CREATE THE MEDIA. Thanks for listening, and goodbye.