

# Curiositas

## QUIZ 1



*Fernando Frazão/Agência Brasil, CC BY 3.0 BR, via Wikimedia Commons*

1. Who is this?
2. What is the cause of the abnormal areas on the skin?
3. Does the technique enhance performance?

**Andrew D Spence (Academic Clinical Lecturer, Queen's University Belfast), Aaron Vage (PhD Student, Centre for Medical Education, Queen's University Belfast).**

## QUIZ 2

Blood test	Haemoglobin (g/L)	Haematocrit (%)	Arterial O <sub>2</sub> content (ml/dl)
1	140	45	22
2	140-160	48	16-20
3	180-200	54	20-26



*TheHellRace, CC BY-SA 4.0, via Wikimedia Commons*

1. What can cause these blood tests in the same person?
2. How is this image linked to (1)?
3. How effective is it, does it result in improved performance?

**Andrew D Spence (Academic Clinical Lecturer, Queen's University Belfast), Aaron Vage (PhD Student, Centre for Medical Education, Queen's University Belfast).**

## QUIZ 3



*de:Benutzer:Hase, CC BY-SA 3.0, via Wikimedia Commons*



*Rob Annis from Indianapolis, USA, CC BY 2.0, via Wikimedia Commons*

1. Who are these cyclists?
2. What common association do they share?
3. How are they linked to court cases in 2004 and 2013?

**Aaron Vage (PhD Student, Centre for Medical Education, Queen's University Belfast), Andrew D Spence (Academic Clinical Lecturer, Queen's University Belfast).**

## QUIZ 4



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1. Who are these people?
2. What do they have in common?

**Aaron Vage (PhD Student, Centre for Medical Education, Queen's University Belfast), Andrew D Spence (Academic Clinical Lecturer, Queen's University Belfast).**

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# Curiositas: Answers

## QUIZ 1

1. Michael Phelps, a retired American swimmer, is the most decorated Olympian in any discipline, having won 23 gold medals. His career spanned five Olympic games, during which he undertook such arduous training regimens that he needed to consume over 10,000 calories per day<sup>1</sup>. Along with gym and pool exercises, some professional swimmers seek an edge and turn to an alternative method to enhance performance: cupping.

2. Cupping has been used as a complementary therapy to treat illnesses for the past 3000 years and, more recently, by sports persons to reduce muscle fatigue/pain. It is suggested that cupping causes a negative pressure on the area targeted, thus increasing tissue perfusion and reducing inflammation<sup>2</sup>. Others describe physiological effects including immunomodulation where skin stimulation causes the neuroendocrine changes that produce therapeutic effects<sup>4</sup>.

3. A systematic review described studies reporting beneficial effects of cupping on the perception of pain and disability, and a reduction in creatine kinase, elevated levels of which may indicate muscle injury<sup>5</sup>. These studies however were particularly prone to bias, thus evidence of the practice in performance is inconclusive. Regardless, for now, given the desire for even potential marginal gains, it seems the practice is likely to continue.

<sup>1</sup>Olympic Channel Writer. Michael Phelps' 10000 calories diet: What the American swimmer ate while training for Beijing Olympics. Available at: <https://olympics.com/en/news/michael-phelps-10000-calories-diet-what-the-american-swimmer-ate-while-training-> Accessed 25/11/2022.

<sup>2</sup>Hou X *et al.* Immediate and Delayed Effects of Cupping Therapy on Reducing Neuromuscular Fatigue. *Front Bioeng Biotech.* 2021;9:678153.

<sup>3</sup>Chen B *et al.* Alternative medicine: an update on cupping therapy. *QJM.* 2015;108:523-525.

<sup>4</sup>Guo Y *et al.* Cupping regulates local immunomodulation to activate neural-endocrine-immune worknet. *Complementary therapies in clinical practice. Compl Ther Clin Prac.* 2017;28:1-3.

<sup>5</sup>Bridgett R *et al.* Effects of Cupping Therapy in Amateur and Professional Athletes: Systematic Review of Randomized Controlled Trials. *J Alt Compl Med.* 2018;24:208-219.

## QUIZ 2

1. Polycythaemia can occur due to states of chronic hypoxia including pulmonary disease or cardiac septal defects, genetic disorders, haematological conditions and medication such as testosterone<sup>1</sup>. Exposure to a hypoxic environment can also contribute; the blood tests in the table show approximate parameters for a person living in three different locations (sea-level, Tibet, and the Andes)<sup>2</sup>. Athletes have taken advantage of these physiological alterations to increase oxygen carrying capacity.

2. During high altitude training, the body's reaction to chronic hypoxia is to increase erythropoietin (EPO) production from the kidneys, which in turn facilitates erythrocyte maturation in the bone marrow before release into the vasculature<sup>3</sup>. However, persistent hypoxia can have detrimental effects: complex reaction time slows, there is psychomotor retardation and at >4000 metres, learning and spatial memory is impaired<sup>4</sup>.

3. It is accepted in the athletic community that training at high altitude is associated with superior performance<sup>5</sup>. Evidence shows haemoglobin and red cell volume increase at altitude and return to near-sea levels 16 days post-descent. Furthermore, plasma EPO levels increase until day 4 at altitude<sup>6</sup>. Timing of altitude training around competitions is therefore crucial.

<sup>1</sup>Hodges V *et al.* Pathophysiology of anemia and erythrocytosis. *Crit Rev Oncol Hematol.* 2007;64:139-158.

<sup>2</sup>Villafuerte F *et al.* High-Altitude Erythrocytosis: Mechanisms of Adaptive and Maladaptive Responses. *Physiol J.* 2022;37:175-186.

<sup>3</sup>Haase V. Regulation of erythropoiesis by hypoxia-inducible factors. *Blood Rev.* 2013;27:41-53.

<sup>4</sup>Wilson M *et al.* The cerebral effects of ascent to high altitudes. *Lancet: Neurology.* 2009;8:175-191.

<sup>5</sup>Siewierski M *et al.* Athletic performance of swimmers after altitude training (2,300m above sea level) in view of their blood morphology changes. *Biol Sport J.* 2012;29:115-120.

<sup>6</sup>Heinicke K *et al.* A Three-Week Traditional Altitude Training Increases Hemoglobin Mass and Red Cell Volume in Elite Biathlon Athletes. *Int J Sport Med.* 2005;26:350-355.

## QUIZ 3

1. Lance Armstrong and Tyler Hamilton

2. The pair were teammates in the U.S Postal Service Cycling Team between 1998 and 2001; Hamilton playing an integral role that solidified Armstrong's first three Tour de France victories<sup>1</sup>. Seven times, Armstrong would go on to win the Tour during his career. However, on the 22nd of October 2012, Armstrong was stripped of all seven titles, having been found guilty of the systematic, long-term use of performance-enhancing drugs. After receiving a suspension from 2004 to 2006 for manipulating haematocrit levels, Hamilton too, would later confess to doping alongside Armstrong. Amongst other compounds such as testosterone derivatives and growth hormone, erythropoietin (EPO) was the drug of choice among cycling's enhanced community. EPO is a glycoprotein secreted by the kidneys, stimulating red blood cell production to counter hypoxia<sup>2</sup>. When taken exogenously, EPO acts to increase haematocrit levels, enhancing one's capacity for oxygen uptake and ultimately increasing cardiovascular performance<sup>3</sup>. But how did cycling's elite run sophisticated, long-term drug programmes whilst avoiding detection? Enter the facilitator, Dr. Ferrari. Coming to prominence as the team physician for Gewiss, Ferrari decided to start a private sports consultation venture in 1995; his most notable clients being the U.S Postal Service Cycling Team.

3. With heat mounting from the media concerning a doping endemic within cycling, Dr. Michele Ferrari was summoned to court in October 2004 and handed a one-year suspended sentence, after a series of statements (including Hamilton's) implicating his involvement in the administration and trafficking of prohibited substances within the sport of cycling<sup>4</sup>. Ferrari finally received a lifetime ban from professional sport in 2012, with Lance Armstrong naming him under oath in 2013, as one of the performance-enhancing drug specialists from which he obtained EPO.

<sup>1</sup>Aromstrong L. & Jenkins S. *Every second counts.* 2003. New York, Random House, Inc.

<sup>2</sup>Jelkmann W. Erythropoietin. *Front Hormonal Res.* 2016;47:115-127.

<sup>3</sup>Momaya A. *et al.* Performance-enhancing substances in sports: a review of the literature. *Sports Medicine.* 2015;45:517-531.

<sup>4</sup>Farrand S. Dr. Ferrari found guilty of doping by Italian court [online]. *Cycling News.* 2017. Available: <https://www.cyclingnews.com/news/dr-ferrari-found-guilty-of-doping-by-italian-court/> [Accessed 27/04/2022].

## QUIZ 4

1. Jannie du Plessis (left) is a South-African rugby union player, currently signed to the Sigma Golden Lions. In 2007, du Plessis became one of only four Springbok players to win the Rugby World Cup and Currie Cup in the same year<sup>1</sup>. Jamie Roberts (right) is an ex-Welsh rugby union player. Between 2008 and 2017, Roberts won two Grand Slams, a Six Nations Championship, and featured in two World Cups<sup>2</sup>.

2. Both du Plessis and Roberts qualified as medical doctors during their rugby careers; du Plessis from the University of the Free State (South Africa)<sup>3</sup> and Roberts from Cardiff University (Wales)<sup>4</sup>. Whilst Roberts chose to focus on his rugby career after graduation, du Plessis actively juggled both professions. These roles both collided in March 2009, when a colleague of du Plessis's (Brumbies player, Shawn McKay) was struck by a car outside a Durban nightclub. Du Plessis was able to help manage McKay's condition prior to the arrival of the emergency services, however, McKay sadly died in hospital several days later<sup>5</sup>.

<sup>1</sup>Turner G. 2022. Jannie du Plessis [online]. *Metro Biography.* Available: <https://metrobiography.com/jannie-du-pleassis/> [Accessed 08/11/2022].

<sup>2</sup>Hughes J. 2022. Jamie Roberts [online]. *Wasserman Rugby.* Available: <https://wassermanrugby.teamwass.com/players/jamie-roberts/> [Accessed 08/11/2022].

<sup>3</sup>Ruck. 2017. Seven rugby stars who are qualified doctors [online]. Available: <https://www.ruck.co.uk/seven-rugby-stars-who-are-qualified-doctors/> [Accessed 08/11/2022].

<sup>4</sup>BBC, 2013. Wales rugby centre Jamie Roberts qualifies as doctor [online]. Available: <https://www.bbc.co.uk/news/uk-wales-22154392> [Accessed 08/11/2022].

<sup>5</sup>Lambley G. 2021. Who is Jannie du Plessis? 10 things to know about the former Springbok prop [online]. *The South African.* Available: <https://www.thesouthafrican.com/sport/rugby/springboks/who-is-jannie-du-pleassis-10-things-to-know-about-the-former-springbok-prop-breaking/> [Accessed 08/11/2022]



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