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Jamaican Gold – Jamaican Sprinters

ed. by Rachael Irving and Vilma Charlton

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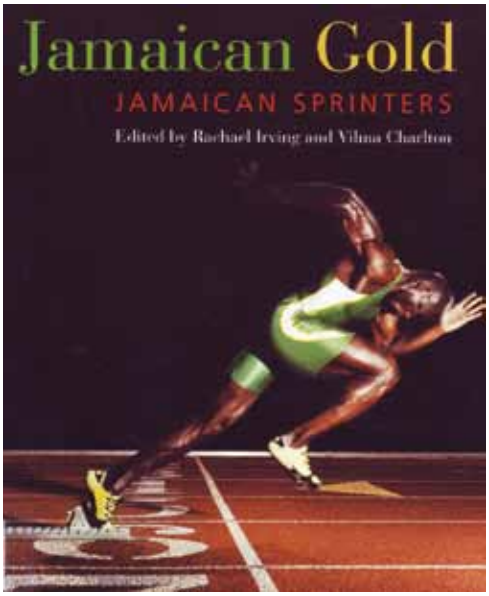

Rachael Irving and Vilma Charlton
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The performances of Jamaican sprinters in recent years and particularly Usain Bolt's phenomenal world records at the 2008 Olympics and 2009 IAAF World Championships in Athletics have attracted international interest and stirred the desire to unravel the secret of the success of the Jamaican athletes.

Against the current background of successes it is sometimes forgotten that already more than 50 years ago there were Jamaican athletes who captured the attention of sports fans worldwide. The sparkle started at a time when Jamaica was not even an independent nation but still a colony of Britain. At the 1948 Olympics in London, Arthur Wint won Jamaica's first gold medal in the 400m. Four years later at the 1952 Olympics in Helsinki, the quartet of Leslie Laing, Wint, Herb McKenley and George Rhoden edged out the favourite US team in the 4 x 400m relay by a tenth of a second and set a new world record of 3:03.9 seconds. In 1962 Jamaica became independent, and since then its presence at the Olympics under the black, green and gold flag has been remarkable: In 1968, Lennox Miller won silver in the 100m in Mexico City, in 1976, Donald Quarrie joined him in the rank of medallists, winning gold in the 200m and silver in the 100m, Merlene Ottey took the Jamaican women close to the pinnacle in 1980 with a bronze in the 200m in Moscow and other women followed her with silver medals (Grace Jackson, Juliet Cuthbert) until 1996 when Deon Hemmings became the

first Jamaican woman Olympic champion with gold over the 400m hurdles in Atlanta and in 2004 Veronica Campbell-Brown followed with a gold in the 200m in Athens.

It was, however, in August 2008 that the Jamaican sprint supremacy became overwhelming. At the Beijing Olympics, Jamaican sprinters collected seven out of twelve available medals in the men's and women's 100m and 200m events. They not only collected medals but set three world records and an Olympic record. Jamaica's performance at the 2009 IAAF World Championships in Berlin reinforced the title and image of "Sprint Capital of the World".

The book *Jamaican Gold – Jamaican Sprinters* edited by Rachael Irving and Vilma Charlton tries to give an answer to the question why such a small nation is so highly represented on the medal podium.

The book consists of five sections: "The Science of Jamaica's Sprinting Ability" (Section 1), "Brand Jamaica: The Lives of Some Sprinters" (Section 2), "The History Of Jamaican Sprinting in Pictures" (Section 3), "The Cultural Norms that Make Jamaicans Unique" (Section 4), and "Protection Issues" (Section 5). These sections include 16 chapters altogether, four chapters of which deserve particular attention because they get the closest to explaining the Jamaican sprint miracle.

In Chapter 1, "Why Jamaica Rules in Sprinting: University Research Explores the Reasons", Irving and Charlton report about a collaborative study conducted at the University of Glasgow in Scotland and the University of the West Indies (UWI) in the Caribbean. Both universities have embarked on examining the role of genetics, environment and physical education and training in Jamaica's athletic success. Initial results from work done over a two-year period suggest a genetic predisposition in Jamaicans. The researchers discovered that DNA analyses carried out on 120 Jamaican Olympians, with controls consisting of 200 ordinary Jamaicans, showed that 75 per cent of the Olympians have the strong 577RR variant of the alpha actinin 3 (ACTN3) gene, a gene which is associated with fast-twitch muscle fibres that allow for high velocity or power sprinting. The actinin 3 gene is a performance-related gene, and one must have the strong form 577RR (homozygous) or the weaker form 577RX (heterozygous) to produce the protein alpha actinin 3 associated with power sprinting.

That 75% of the ordinary Jamaicans tested have the 577RR variant shows that Jamaicans are genetically predisposed to be sprinters, because of their shared ancestry with West Africans; however, the gene has to be switched on or off by environmental factors and physical conditioning. If the environment is not conductive, one may have the gene but fail to perform well on the track.

In addition to carrying out DNA analyses on Jamaicans who participated in the 1948 Olympics right through to those who participated in the Games of the twenty-ninth Olympiad, tests were also conducted on one hundred national athletes (those who participated locally and in the Caribbean) and three hundred persons from the Cockpit Country and Trelawny region of Jamaica. The latter cohort was included because many Olympians either have emerged from that area or have links there. Interestingly, the profile of the persons from the Cockpit Country is similar to that of the Olympians.

The persons from the Cockpit Country have a high frequency of 577RR, the ACTN3 variant associated with elite sprinting. The mere having of the 577RR variant of the actinin 3 gene does not explain why Jamaicans dominate in international sprint events. There must be something driving this gene and/or other genes to perform to the full potential. It is postulated that there are special minerals in the Cockpit Country, akin to bauxites, that the plants uptake and Jamaicans eat in yam and other tubers. Many Olympians, such as Usain Bolt, Veronica Campbell-Brown, Donovan Bailey and Deon Hemmings, come from that region. Even more of the parents of Olympians are from the Cockpit Country.

In Chapter 2, "Charting the Ancestry of Elite Jamaican and US Sprinters", Rachael Irving, shows that the transatlantic slave trade, which started in the early sixteenth century and lasted over three centuries, was instrumental in moving millions of people from Africa to the Americas: an estimated 11 million people from with about one third from West Africa. The mitochondrial DNA (mtDNA) genome of the descendants of these transported people has retained an imprint of the process. A database of thousands of MtDNAs, including MtDNA sequences from Africa, are publicly available and mitochondrial lineages of West African ancestry in the Caribbean and North America have been identified through genomic analyses.

Mitochondrial DNA has been linked to physical performance and trainability, but more important is that mitochondrial DNA markers or haplogroups can be used in the creation of detailed phylogenies or biogeography charts to explore the matrilineal relatedness of people. Mitochondrial haplogroup distributions are sensitive to population history and some studies have looked at haplogroup distributions in the Caribbean. The few studies to date that have included Jamaica have suggested a predominately West African ancestry with few genetic inroads by Europeans and Asians.

There is growing interest in the genetic trace of the ancestry of Caribbean and US elite sprinters because of the disproportionate success of these athletes in international events. Historical records indicate that the current male record-holders for the sprint (100m to 400m) and hurdles events, including the late Florence "Flo-Jo" Griffith-Joyner, women's world record holder for the 100m and 200m, descended from West Africa. While MtDNA haplogroup distributions in the Caribbean and United States are well researched, the lineage trace of elite Jamaican and US sprinters has never been undertaken before this study.

Researchers from the University, of the West Indies, the University of Glasgow and Florida State University collected samples from 107 and 119 elite Jamaican and US athletes respectively. Samples were also collected from 293 Jamaicans and 1,148 African Americans who have not participated in sports at the national level. The first hyperviable region (HVR-1) of MtDNA was sequenced for each participant and samples were haplogrouped according to the comprehensive full mitochondrial DNA genome phylogenetic tree. The haplotypic distribution for the Jamaican and African-American cohorts was evaluated.

The majority of Jamaican athletes (98%) possessed haplogroups characteristic of West Africa or West-Central Africa while the US athletes had mainly haplogroups suggestive of West and West-Central African ancestry, too, but also more haplogroups indicating a greater percentage of European admixture than the Jamaican sprinters (10% versus 2%).

It was found that the athletes from Jamaica and their controls had similar haplogroup distributions predicative of West and West-Central African origin, and although the controls had more admixture with Eurasia and Asia, it was not significant. The study proved that mitochondrial haplogroup distributions in elite Jamaican sprinters and ordinary Jamaicans (controls) are similar and are primarily derived from the same source populations in West and West-Central Africa.

Mitochondrial haplogroups and biogeography frequency charts are based on specific population histories. This lineage research indicates that Jamaican and African-American sprinters are mainly of West or West-Central African ancestry. The greater mitochondrial diversity in African-American sprinters as compared to the Jamaican sprinters indicates that isolation, differences in number and source of Africans imported, and colonisation history may impact population genetics and the performance of US sprinters.

Talking about "Some Biomedical Mechanisms in Athletic Prowess" (Chapter 3), Errol Morrison and Patrick Cooper contend that there is substantial, documented evidence that the success of individuals of West African de-

scent in athletic activities involving speed and power is based an biomechanical and biochemical differences between themselves and white and Asian athletes and biochemical differences between themselves and all other Africans. The essence of the authors' hypothesis is their claim that the biochemical differences – essentially differences in glucose conversion rates – between West African and West African-descended populations and all other groups, including other black Africans, began but did not end with the sickling of the haemoglobin molecule. In the uniquely lethal West African malarial environment, individuals with the sickle-cell trait possessed a significant selective advantage. Although sickling is caused by a single amino acid substitution, valine for glutamic acid, the authors argue that the mutation triggered a series of physiological adjustments, which, incidentally, had favourable athletic consequences.

These adjustments, or compensatory mechanisms, include a higher percentage of fast-twitch muscle fibres, greater activity in the phosphagenic, glycolytic and lactate dehydrogenase metabolic pathways, and greater rate of ventilation, all of which have been scientifically tested and evaluated. These alterations affect the individual's process in storing and utilizing energy for skeletal muscle contraction and enhances the person's ability to build lean muscle mass.

Black athletes, primarily because of a higher ratio of fast-twitch muscle fibre, convert glucose into energy more rapidly than their white counterparts. Energy for muscle contraction, including all physical and athletic activities, is created by the breakdown of glucose by processes which result in the formation of adenosine triphosphate (ATP). The first stage of the process, known as glycolysis (anaerobic metabolism), is cytosolic and produces ATP at a rate more than twice that of the second, intramitochondrial stage (aerobic metabolism). Both black and white athletes will convert glucose to ATP by glycolysis and by mitochondrial metabolism, but in different ratios. This difference in the relative efficiency or effectiveness of these metabolic pathways in the athletes plays a decisive role in performance and is largely responsible for the greater athletic success of African Americans and others of West African descent.

Muscle biopsies have concluded that people of African descent have significantly higher levels of activity in their phosphagenic, glycolytic and lactate dehydrogenase metabolic pathways than their Caucasian counterparts. The production and regeneration of ATP take place in the glycolytic and phosphagenic pathways. Higher levels of activity result, therefore, not just in faster production of ATP but also in its more efficient regeneration. Faster production and increased regeneration of ATP, however, do not fully explain African-American biochemical superiority in athletic events requiring speed and power. There is also considerably greater activity in the lactate dehydrogenase pathway of people of West African descent. A primary function of this pathway is to reduce muscle fatigue by converting lactic acid back to glucose and re-feeding the muscles. This cyclic set of reactions, from muscles to liver and back to muscles, is known as the Cori cycle.

The recycling of waste products, such as lactic acid, by the liver is vital to the proper functioning of the muscular and nervous systems, among others. Consequently, an athlete engaged in fairly prolonged anaerobic activity – sprinting, for example – would be far less effective without a mechanism to increase the supply of glucose. This is what is accomplished during the Cori cycle, the cyclic set of reactions initiated by increased activity in the lactate dehydrogenase pathway.

The authors arrive at the conclusion that it may be this array of somatogenetic variation, exhibited in the muscle-fibre biology, biochemical metabolic pathways and pulmonary physiology of the Afrocentric peoples displaced from West Africa to the New World which is responsible for the athletic prowess of this group of descendants. Not the least of coincidence seems to be the influence of the compensatory sickle-cell gene on oxygen transport and avail-

ability to the tissues. The reduced availability coupled with the reduced myoglobin in the preponderant fast-twitch muscle fibres, which are adapted for rapid energy (ATP) regeneration, all give a net outcome of muscle anatomical and biochemical advantages which proffer a superior performance in athleticism.

In Chapter 4, "White Men Can't Run: Where Is the Scientific Evidence?", Robert A. Scott and Yannis Pitsiladis cast a more sceptical light on the hypothesis that the superior sprint performances of the Jamaican sprinters and African Americans in general is a favourable biology concentrated by natural selection over the centuries as individuals were displaced from West Africa to the New World during the slave trade. These authors point out that genetic explanations of the Jamaican sprint supremacy have not been rigorously tested and that they are subject to the same limitations as genetic explanations of the East African running phenomenon, namely diverse genetic pools of founding populations and time constraints for genetic adaptations to occur.

Scott and Pitsiladis also emphasise that in Jamaica there exists an excellent and unique model that focuses on identifying and nurturing athletic talent throughout junior to senior level. They remind the reader of Patrick Robinson's conclusion made in his book *Jamaican Athletics: A Model for the World* (2007) that "the real explanation of the outstanding achievements of the system is that all of its actors are moved by a spirit that unifies them to work to ensure that Jamaican athletics lives up to its rich history and tradition of excellence". According to Scott and Pitsiladis, this theme echoes what is found in Ethiopia and Kenya. Given these unique circumstances, the superior performances of athletes not only from Jamaica but also from Kenya, Ethiopia come as no surprise to those studying closely these amazing athletes.

In Chapter 6, "Jamaican Yams, Athletic Ability and Exploitability", Helen Asemota examines the value and importance of natural tubers grown in Jamaica for nutrition and medicine. The food value of yams is based on the carbohydrate, protein, amino acid, vitamin and mineral content. The amount of lipids is negligible in terms of food value. Yams are generally thought of as a good source of native starches which have varying functional characteristics and could find some application in the food ingredients industry.

Many people in the mainstream media have begun to attribute the Jamaicans' sprint success overwhelmingly to yam consumption, because of the athletes' yam-rich diet. As a result, yam is now dubbed "the speed agent". The basis of yam being called so is one which is not entirely clear, but several schools of thought prevail. One perspective is based on the fact that a large percentage of Jamaicans top athletes are from the Cockpit region of the country, where yam is widely grown and consumed. Their athletic prowess could, therefore, be attributed to their yam-rich diet. Without scientific proof, this remains just a guess at best. Within this school of thought, however, there lies a more plausible explanation, which is still only a hypothesis. The phytosterols in yams have the potential to stimulate cell growth and as such may be responsible for enhanced stimulation of proteins essential to muscle function, including proteases, lactate dehydrogenase and actinin-3 protein, which are a part of fast-twitch muscle fibres. Activation of these fast-twitch fibres could in turn cause improvements in muscle speed and overall power. The possibility and rate of this happening has yet to be unravelled. Studies have shown that more than 6 per cent of all prescriptions in human medicine are steroidal hormones. Diosgenin, a saponin derivative of yams, is of great interest as it is easily converted into the starting material for synthesis of these steroidal hormones. This could lead to the question whether it could be that the presence of phytosterols in yams may indirectly result in enhanced muscle mass and speed.

These are some of the facts and views presented in five of the six chapters comprising the first section of the book. Chapter 5, "Physical Therapy: Keeping Athletes on the Move" by Sharmella Roopchand-Martin, Carron Gordon,

and Gail Nelson characterizes injury management and different approaches to treatment of sports injuries that are used with Jamaican sprinters. It is coaches who will benefit the most from reading this chapter.

The remaining sections and chapters of the book shall be dealt with only briefly in this review. In Section 2, "Brand Jamaica: The Lives of Some Sprinters", the human triumph and lives of some Jamaican trailblazers are highlighted: Grace Jackson, Brigitte Foster-Hylton, Carmen Laing, Clifton Forbes, Vilma Charlton, Juliet Campbell, Deon Hemmings-McCatty, Cathy Rattray-Williams, Anthony Davis, Aleen Bailey, Leslie Laing, Lennox Miller, Asafa Powell, and Heith Gardner (in Chapter 7, "A Historic Picture ... Tells a Fine Story" by Jimmy Carnegie), Cynthia Thompson (in Chapter 8, "A Jamaican Pioneer: Cynthia Thompson's Story" by Vilma Charlton), Usain Bolt (in Chapter 9, "Usain Bolt: Phenomenal Track and Field Athlete" by Rachael Irving), and Melaine Walker (in Chapter 10, "Melaine Walker: Olympic Games and World Championships Gold-Medal Hurdler" by Rachael Irving).

Section 3 is a photographic essay presenting images of Jamaica's mastery in sprinting.

Section 4 deals with the cultural norms that make Jamaica unique. Aggrey Irons presents "Run for Your Life" (Chapter 11), a portrayal of Jamaicans'' fascination with running. "The Challenge of Teaching Physical Education in Jamaica" is dealt with by Vilma Charlton in Chapter 12, and "The Role of Boys' and Girls' Championships in Jamaica's Track-and-Field Glory" is discussed in an interview between sport historian Bobby Fray, Vilma Charlton, and Fred Green (Chapter 13).

Against the frequently made accusations that the success of Jamaica's sprinters might not only be caused by a favourable genetic disposition or by eating a lot of yam but might also be caused by doping, it is quite logical that in the last section of the book, entitled "Protection Issues", Jamaica's anti-doping policy is described. This is done in two chapters. Chapter 14 is about "Blood Doping in Sports and Detection Strategies" (by Donovan A. McGrowder), and Chapter 15 Rachael Irving stresses the "The Importance of Haematologic Passports" to protect the athlete's credibility based on sound scientific data. A completely different issue of athlete protection is the topic of the last chapter of the book. This chapter is entitled "Intellectual Property and the Business of Sports" and its author, Kai-Saran Davis, shows what can be done to protect the athletes' interests in the business of sports. His answer is that one of the major means of doing so is by ensuring that they protect any creation of their mind that may result from their existence as athletes and personality figures. Also of equal importance is that they must ensure the protection of their image. How this can be done is dealt with in detail.

In summary, *Jamaican Gold – Jamaican Sprinters* by Rachael Irving and Vilma Charlton is the most complete survey of the reasons for and the background of the success of Jamaican sprinters at international championships. Although the authors may not provide all the answers, they provide historical, scientific and cultural information that will help guide impartial analysis of the sprinting prowess of Jamaican athletes. So, the reader is offered sufficient information to form his or her own opinion about the highly topical and controversial issue of Jamaican sprinting success. *Jamaican Gold* is highly recommended reading to everybody interested in modern track and field and trying to understand some of the factors that make Jamaican athletes truly remarkable.

Reviewed by Jürgen Schiffer