Genetic polymorphisms influence on sports injuries and muscle damage

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GENETIC POLYMORPHISMS INFLUENCE ON SPORTS INJURIES AND MUSCLE DAMAGE

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FIGURE 1. SPORTS INJURIES & MUSCLE DAMAGE

MUSCLE

ESR1 rs2234693: C allele, unlike the T allele, offers protection against muscle injury.

ACTN3 rs1815739: XX polymorphism or X allele was associated with a higher risk or incidence of non-contact muscle injury.

HGF polymorphisms: are related to the incidence or severity of non-contact muscle injury.

METABOLISM

MCT1 rs1049434: injury incidence of AA genotype > TT in elite football.

IL6 rs1800795: associated with non-contact ACL rupture in Polish soccer players.

ACE rs4646994: DD genotype may have a protective effect against muscle damage.

EXTRACELLULAR MATRIX

MMP3 polymorphisms: could affect the muscle sensibility to injury.

COL5A1 rs12722: could relate to the severity of non-contact muscle injury.

1. INTRODUCTION

Sports practice or physical activity has been acknowledged to be **beneficial for health.** However, it **may** also **induce injuries.** Indeed, when related to 1 000 hours of practice, injury incidence during training is 3.7 in football and 3.0 in rugby union and even increases to 36.0 and 81.0 (respectively) during matches. **Injuries negatively affect** the players' **performance and health** and may have financial implications for the athletes and/or their clubs. Therefore, **avoiding** players' **injuries became a priority** and strategies are developed to limit them. Training workloads focused staff attention as their monitoring allows to maximize the training processes and performance and reduce the occurrence of injury. Internal and external outcomes are used to characterize the workload. For the **same** external **workload**, the internal **responses differ for each people** leading to different levels of fatigue or exercise-induced muscle damage.

2. OBJECTIVES

While a high training load and a certain amount of muscle damage are necessary to induce adaptations and promote performance increase, excessive muscle damage favor injury occurrence. Great muscle damage **inter-individual variations** have been **observed following** the **same** external **training load.** Scientific evidence support that several factors are involved in the occurrence of injury or exercise-induced muscle damage. Besides exercise characteristics, individual risk factors, such as **genetics**, seem to **be** a **component** to **take into account in injury** mechanisms. Particularly, single genetic polymorphism (**SNP**), a variation in DNA sequence, may alter proteins structures and their function within the cell. Studies support that **SNP may be considered a predisposing factor.** Identifying injury-predisposing polymorphisms is of interest to improve training load prescription. **This poster aims to present a review of SNP that affect muscle damage and sports injuries.**

3. RESULTS & DISCUSSION

Several **studies support** the **role** of **SNP** in **altering muscle structure** and potentially compromising its integrity. Results suggest that **individuals with specific genetic variations may** exhibit a **higher susceptibility** to muscle damage or **sports injuries** compared to others. These polymorphisms (Figure 1), which affect the structural composition of muscle components, could make them sensitive to exercise-induced mechanical stress. Furthermore, variations in the inflammatory response and metabolic processes, such as impaired lactate transport across muscle membrane, may further weaken the muscle and increase the risk of injury. Hence, the **presence or lack** of these **SNP appears** to **contribute significantly** to the **substantial** inter-individual **variability** observed on **sports injuries** or induced muscle damage whereas the external workload exercise is similar.

4. CONCLUSIONS

The **present study supports** the **interest** to **assess** genetic **polymorphisms** in athletes to **better individualize training strategies** and workload. During the last decade, several **SNP** involving muscles, ligaments, or tendons may **affect positively or negatively** the risk, incidence, and severity of injuries have been identified. Among them, ***ACE***, ***ACTN3***, ***COL5A1***, ***IL6***, ***MCT1***, ***MMP3***, and ***HGF*** seem to play an important role in sports injuries and muscle damage mechanisms.

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