GENES AND EXERCISE INTOLERANCE: INSIGHTS FROM MCARDLE DISEASE

Alejandro Lucia
European University and ‘i+12’ Research Institute, Madrid, Spain

Abstract

McArdle disease (or glycogenosis type V) is an autosomal recessive disorder of skeletal-muscle carbohydrate metabolism caused by inherited deficiency of myophosphorylase, the muscle-specific isoform of glycogen phosphorylase, which is the enzyme that initiates muscle glycogen breakdown in this tissue.

Owing to the aforementioned metabolic block, patients are unable to obtain energy from their muscle glycogen stores. This disorder only affects skeletal muscles and is probably the paradigm of exercise intolerance in humans. It thus provides a unique model of study for exercise scientists. In fact, patients present with some quite unique characteristics, such as the so-called second wind phenomenon, frequent rhabdomyolysis episodes (with muscle damage also occurring under basal conditions), or easy fatigability during barely all exercise tasks. Interestingly, they also exhibit a flat (or even decreasing) lactate curve in response to incremental exercise.

Although McArdle patients have been traditionally advised to refrain from physical activity, careful exercise and nutritional prescription can be their best allied because no effective enzyme replacement therapy or ‘molecular’ treatment is expected to be available in the near future.

Alejandro Lucia, MD, Ph. D.
alejandro.lucia@uem.es

Alejandro Lucia, MD, PhD, is a professor in Exercise Physiology and senior researcher at the European University and ‘i+12’ Research Institute (Madrid, Spain).

His main research interests are exercise benefits in disease conditions (eg, genetic disorders of muscle metabolism, adult/pediatric cancer, cystic fibrosis, pulmonary hypertension) as well as during pregnancy and aging. He also studies exercise effects in animal (murine) models of disease and is interested in the interplay between exercise (including at the competitive level), genetics and disease/health phenotypes, as well as in human longevity.

He has authored more than 400 peer-reviewed papers in PubMed journals, including top journals in essentially all...
biomedical areas, *eg* general medicine (NEJM), cancer (*Lancet Oncol, Leukemia*), sports sciences, gerontology, genetics, obstetrics, cardiology etc.