

Ant 250i mod 3 slp

Science, Anthropology



The Number 4 March February Muscular Dystrophy Muscular dystrophy – a general for diseases that destroy and weaken muscles affecting their certain groups. More precisely, they are defined as “devastating genetic disorders cause progressive degeneration of skeletal muscle fibers leading to severe pain, disability, and eventually death” (Emery 687). The major cause for all kinds of muscular dystrophies is believed to be mutations that take place in individual genes encoding numerous proteins. Among the latter one can find extracellular matrix proteins, cytoplasmic enzymes, transmembrane and membrane-associated proteins, and nuclear matrix proteins (Blake 291, Campbell 675).

The most common muscular dystrophy is Duchenne’s muscular dystrophy – a disease found predominantly in males and diagnosed in a period between 2 and 6 years. It afflicts as approximately 1 out of every 3,500 births (Emery 687). DMD (abbreviation for Duchenne’s muscular dystrophy) is a result of muscle fibers degeneration and atrophy brought about by the absence/lack of dystrophin, a protein which is responsible for maintaining muscle fibers intact. Specifically, the loss-of-function mutations found in dystrophin are accountable for the disease. Dystrophin’s function is to encode a specific protein - 427-kD protein. The latter is located below the sarcolemma.

Dystrophin, in alliance with the associated proteins, called dystroglycan and the sarcoglycans, takes part in a mechanically powerful link which can be traced from the extracellular matrix to the cytoskeleton that underlies it (Rybakova et al 1209). Total or partial deficiency of dystrophin ruins the dystrophin-glycoprotein complex (abbreviated as DGC), which means that cytoskeleton present in the muscle fibers is no longer linked to the matrix

(Hoffman, Brown, and Kunkel, 919). Hence, no dystrophin leads to the DGC complex functional impairment, while the mechanical stress accompanying with contraction results in the degeneration or atrophy of skeletal muscle fibers, impairment of movements, plus muscle-wasting. It finally leads to the death of the afflicted male kids which is a result of respiratory or cardiac failure, or both (Rando 1575, Petrof et al 3710). According to Engwal & Wewer, the existing dystrophin deficiency found in skeletal, as well as cardiac muscles, leads to the fact that several secondary processes start activating. Among them one may find inflammation, interstitial fibrosis, and extracellular matrix degradation, which badly affect the DMD progression (Engwal & Wewer 1579).

Boys diagnosed with DMD are found to be born with the muscle function which is typically normal. Yet, as they grow, they get weaker in a progressive manner. Interestingly, the muscle biopsies from DMD affected ambulatory children in their early years display a picture that is quite mixed: the myofibers that are degenerating are found alongside those that are regenerating. The mentioned regeneration in muscular dystrophy can be traced to satellite cells (muscle stem cells) increased activity. In particular, these cells divide and also differentiate into what comes as myoblasts with high possibility of fusing with one another or ruining myofibers. Older DMD patients' muscle biopsies display fewer myofibers and a higher rate of replacement of the muscle with connective and adipose tissue. This is termed as fatty-fibrous infiltrate and is found in patients that move less (Goldstein & McNelly 29).

Therefore, the role of physical exercise in patients with MD is thought to be

controversial. It is widely believed that exercise leads to degeneration exacerbation, especially if one takes the diaphragm muscle which is being constantly used and shows the signs of severe pathology. As for the heart, it displays the signs of slower developing pathology in comparison with skeletal muscle, although it is similarly affected by the deficiency of both dystrophin and sarcoglycans, and is constantly active. That is why patients display signs of heart dysfunction not so early in life. The heart, also under constant activity and also affected by the loss of dystrophin and sarcoglycans, has a lagging pathology compared with skeletal muscle, where patients and animal models show signs of cardiac dysfunction later in life. Sadly, DMD afflicted patients can rarely survive beyond 30s.

In conclusion, despite the fact that scientific research has shed light on molecular ground of the processes that are associated with muscular dystrophy, this devastating disorder is still incurable (Bhatnagar & Kumar 155). Thus, many lines of investigation are to be carried out to find the ways of stopping the disease progression and renewing normal cellular function in patients with MD.

Works Cited

Bhatnagar, S., and Kumar, A. "Therapeutic Targeting of Signaling Pathways in Muscular Dystrophy." 2010. *J Mol Med (Berl)*, 88(2): 155-166. Web. 5 March 2012.

Emery, A. "The muscular dystrophies." *Lancet*. 2002 (359): 687-695. Web. 5 March 2012.

Campbell, K. "Three muscular dystrophies: loss of cytoskeleton-extracellular

matrix linkage.”

Cell. 1995 (80): 675–679. Web. 5 March 2012.

Hoffman, E., Brown, R, Kunkel, L. “ Dystrophin: the protein product of the Duchenne muscular

dystrophy locus”. Cell. 1987 (51): 919–928. 4 March 2012.

Rando, T. “ The dystrophin-glycoprotein complex, cellular signaling, and the regulation of cell

survival in the muscular dystrophies.” Muscle Nerve. 2001 (24): 1575–1594.

Web. 4 March

2012.

Petrof, B, Shrager, J, Stedman, H, Kelly A, Sweeney, H. “ Dystrophin protects the sarcolemma

from stresses developed during muscle contraction.” Proc Natl Acad Sci U S A.

1993(90): 3710–3714. Web. 4 March 2012.

Engvall, E, Wewer, U. “ The new frontier in muscular dystrophy research: booster genes.”

FASEB, 2003(17): 1579–1584. Web. 4 March 2012.

Rybakova I. N., Patel J. R., Ervasti J. M. “ The dystrophin complex forms a mechanically strong

link between the sarcolemma and costameric actin”. J. Cell Biol. 2000 (150): 1209–1214.

Web. 5 March 2012.