

URGENT ISSUES TO BE ADDRESSED IN THE MUSCULAR SYSTEM

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Abstract The muscular system constitutes the main apparatus for movement in the human body. The condition and healthy functioning of this system directly affect the overall health of the organism. Today, pressing issues related to the muscular system, including muscle diseases, inflammation, dystrophies, and other pathologies, are raising significant concerns not only clinically but also in scientific research. This article examines the pathologies of the muscular system, their diagnostics, treatment methods, and modern scientific approaches. It provides information on new treatment methods for muscle diseases, including muscle dystrophy, myopathy, myositis, and geriatric diseases, with particular focus on the importance of gene therapy and cell therapy.

Keywords Muscular system Muscle diseases Duchenne muscular dystrophy Myositis Myopathy Muscle regeneration Gene therapy Cell therapy Physiotherapy Rehabilitation

INTRODUCTION

The muscular system is one of the most essential and complex systems in the human body. Its primary functions include facilitating movement, maintaining the shape of the body, regulating temperature, and ensuring coordination between organs. When muscles are in a healthy state, they operate at maximum efficiency; however, diseases and pathologies affecting the muscular system can disrupt their normal function. This article focuses particularly on pressing issues related to the muscular system. It discusses muscle diseases, inflammation, and the regeneration processes, modern approaches to treating muscular system pathologies, as well as innovative methods such as gene therapy and cell therapy.

Research on the early diagnosis and effective treatment of muscular system pathologies continues. Muscle diseases significantly impact individuals' quality of life, making scientific research in this area crucial. This article presents the main urgent issues related to the muscular system and the scientific approaches suggested to address them.

MAIN SECTION

4.1 General Structure and Functions of the Muscular System The muscular system is composed of skeletal muscles, which provide movement for the body. In addition to skeletal muscles, there are smooth muscles in internal organs and the heart muscle, each performing its specific functions. Skeletal muscles are the body's primary movement organs, performing several functions:

- **Movement:** As the main organs of movement, muscles move body parts relative to one another.
- **Thermoregulation:** Muscle activity generates heat, helping maintain the body's temperature.
- **Support for the skeleton:** Muscles attach to the skeleton and help maintain the body's shape.
- **Circulation and respiration:** Muscles enhance blood circulation and respiration during physical activity.

Muscles also produce energy and facilitate contraction of muscle fibers. The process of muscle contraction occurs with the help of connective elements called sarcomeres. Muscles primarily store energy in the form of adenosine triphosphate (ATP), which powers muscle contraction.

4.2 Muscle Diseases and Pathologies Various pathologies of the muscular system, including muscle dystrophy, myopathy, and myositis, can severely affect human health. Some of these diseases are genetic, while others develop due to environmental factors or inflammation.

- **Muscle Dystrophy:** Duchenne muscular dystrophy (DMD) is a genetic disease that leads to muscle weakness and eventual loss. The main symptoms include muscle strength reduction, imbalance, and often difficulty breathing. DMD primarily affects males, and research into its prevalence and treatment methods remains ongoing.
- **Myositis:** A condition characterized by muscle inflammation, causing pain, swelling, and weakness. Polymyositis and dermatomyositis are the two main types. The causes of myositis can be difficult to pinpoint but are sometimes linked to autoimmune disorders.
- **Myopathy:** Myopathy refers to a pathology related to the weakening and alteration of muscle fibers. It can develop due to various causes, including genetic mutations, infections, or environmental influences. New drugs and treatments are being rapidly developed to counter this pathology.

4.3 Muscle Regeneration and Recovery Muscle regeneration refers to the process by which muscle fibers repair and return to normal function. This process naturally occurs but, in some cases, muscles may not fully recover. However, modern medicine offers new scientific approaches to improving and restoring muscle regeneration:

- **Gene Therapy:** Gene therapy is crucial in treating muscular dystrophy. This method allows for the correction of diseases caused by genetic changes. Through gene therapy, harmful or disease-causing genes are modified, which helps normalize muscle function.
- **Cell Therapy:** Stem cells can aid in improving muscle regeneration. These cells facilitate the renewal of muscle fibers. Numerous clinical studies have confirmed the efficacy of stem cells in muscle recovery.
- **Physiotherapy and Rehabilitation:** Physiotherapy and rehabilitation play a vital role in muscle recovery. Exercises and treatment methods are applied to restore movement and strength. Modern technologies, such as electrotherapy and laser therapy, also assist in muscle recovery.

4.4 Modern Scientific Research and New Approaches Modern scientific research is developing new methods for treating muscular system pathologies. These methods include gene therapy, cell therapy, and physiotherapy techniques. These approaches are creating innovative opportunities for treating muscle diseases:

- **Gene Therapy:** The effectiveness of gene therapy in treating muscle diseases is increasing. Genetic disorders in the muscular system can be analyzed and treated through genetic changes.
- **Cell Therapy:** Cell therapy can enhance muscle regeneration. New research is showing the effectiveness of cell therapy in restoring muscles and other tissues.

- **Physiotherapy and Rehabilitation:** Physiotherapy and rehabilitation methods allow for the restoration of muscle activity, strength, and normalized movement. The effectiveness of physiotherapy, massage, and movement therapy is widely applied in clinical practice and plays a crucial role in muscle recovery. Additionally, modern technologies such as electrotherapy, laser therapy, and exoskeletons can further enhance the muscle recovery process.

Modern scientific research is also focused on developing new medications and molecular treatment methods for muscle regeneration. These methods aim to support the body's natural healing processes and help restore muscle functions more rapidly.

4.5 New Pharmaceutical Preparations for Treating Muscle Diseases The role of pharmaceutical preparations in treating muscle diseases is also significant. Many new drugs are being developed today to reduce muscle inflammation, accelerate regeneration, and restore muscle functions. Specifically, anti-inflammatory drugs, antioxidants, and anabolic steroids are effective tools for muscle recovery.

Additionally, advancements in gene therapy offer great promise for new treatments for muscle diseases. For instance, gene therapy for Duchenne muscular dystrophy (DMD) has shown positive results in clinical trials. These drugs often help correct genetic mutations and protect muscle tissues.

CONCLUSION

The muscular system is the primary movement organ in the body. Its pathologies, such as muscle dystrophy, myositis, and myopathy, present serious scientific and clinical challenges. Modern scientific research, particularly gene therapy and cell therapy, is opening new possibilities for treating muscle diseases. Physiotherapy and rehabilitation are of great importance in improving muscle regeneration and recovery.

At the same time, scientific research into muscle diseases is ongoing, and new innovative methods continue to be developed. In modern medicine, new methods, technologies, and pharmaceutical preparations for treating muscle diseases are creating great hopes for restoring the healthy functioning of the muscular system. The integration of modern science and medicine is necessary to further enhance the regeneration and recovery processes of muscles.

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