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Editorial

Inaugural Issue for Journal Neurobiomarkers and Therapeutics

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It is a great pleasure to present the inaugural issue of this Journal, which is envisioned to discuss pathogenic mechanisms in neuroscience, to study biomarkers of neurological diseases, and to identify new potential therapeutic targets.

1. Purpose and Objectives

We aim to publish in Jounal Neurobiomarkers and Therapeutics (*JNBT*) cutting-edge research on the genetic and molecular mechanisms underlying neurological diseases, with a focus on neuromuscular disorders. We seek a comprehensive understanding of disease progression and identify potential therapeutic targets. Integrating insights from genomics, transcriptomics, and proteomics in neurologic patients, to clinical bedside research, the use of animal and cell disease models is directed to a comprehensive understanding of disease progression and to identify potential therapeutic targets.

JNBT publishes articles that focus on neurobiomarkers in various areas: in the medical context, a neurobiomarker is a measurable indicator of a disease condition that can be evaluated in blood, cerebrospinal fluid, or tissue to examine the pathology, pathogenic process, or pharmacological response.

- Neuro biomarkers for Amyotrophic Lateral Sclerosis (ALS) and Spinal Muscular Atrophy (SMA)
- Genetic basis of neuromuscular disorders: Identification and characterization of disease-causing mutations, structural tissue variations, and epigenetic modifications.
- Molecular pathways in disease pathogenesis: Investigation of key signaling pathways, RNA dysregulation, mitochondrial dysfunction, and protein homeostasis in neuromuscular diseases.
- Gene therapy and genome editing: Advances in AAV-mediated gene therapy, antisense oligonucleotides, and RNA-targeted therapies for neuromuscular disorders.
- Translational approaches and targeted therapies: Development of small molecules, organoids, and cell-based therapies for future disease modification and symptom management.
- Insights from patient-derived style of life and Quality of life, useful in understanding disease mechanisms and evaluating therapeutic strategies.
- Neuromuscular junction and motor neuron degeneration: mechanisms underlying synaptic dysfunction, axonal transport defects, and neuroinflammatory responses in such disorders as acquired neuropathies.
- Biomarkers and precision medicine: Identification of genetic, transcriptomic, and proteomic biomarkers for early diagnosis, disease progression monitoring, and personalized treatment strategies.
- Emerging technologies and omics approaches: Applications of MRI and Imaging technology, spatial reconstruction, and multi-omics in unraveling neurological disease complexity.
- Challenges in clinical trial design and patient access to novel emerging therapeutics, such as monoclonal antibodies.

2. Future Directions

JNBT aims to play an innovative role in the academic and research community, exploring the use of MRI imaging, an important tool for demonstrating clinical changes and exploring the link between imaging and

pathology biomarkers. New tools, such as digital sensors, offer the opportunity to provide new diagnostic and therapeutic prospects for neurological disorders, and advance therapy in related disciplines, such as exercise physiology, epigenetics, and molecular biology, which have deepened our understanding of neurological disease pathogenesis, paving the way for novel therapeutic strategies.

JNBT will serve as a primary source of information, helping researchers and practitioners in the Neurosciences to stay up to date with the latest advancements in their fields. The *JNBT* will provide a platform for debates and critical analysis to catalyze intellectual growth and research, and will be of interest to expert biologists, medical practitioners, and competent scientists. It is possible to bridge the gaps between these compartmentalized disciplines by relying on progress.

To advance precision medicine in neurodegeneration, future strategies must employ a flexible combination of biomarker approaches capable of capturing the spatial, temporal, and clinical heterogeneity of diseases. These integrative approaches will enable personalized and adaptive interventions, improving patient outcomes in these complex disorders.

Neuromuscular diseases

Creatine Kinase (CK) is the most used biomarker for neuromuscular weakness, pain, and myalgia, which are common signs of these entities. Biomarkers like CK and myoglobin reflect shared pathomechanisms, such as muscle damage from increased cell membrane permeability. However, CK levels can decrease due to muscle mass loss. Diagnosis is made through clinical examination, specific exams as EMG, neurophysiological studies of nerves, and the neuromuscular junction. A neuromuscular clinician uses circulating autoantibodies, muscle biopsy, DNA/RNA technologies, MRI, and CT scan for a definite diagnosis. Biomarkers are currently rarely used as a primary endpoint in clinical trials in neuromuscular diseases. Biomarkers can be divided into disease-unspecific, shared-pathway, and disease-specific biomarkers. The type of biomarker evaluated depends on the intervention mechanism and is of special value for a specific disease-targeted therapy.

ALS and Spinal Muscular Atrophy (SMA)

Neurogenic diseases, especially chronic disorders, may display increased CK. Neurofilaments have been studied in drug trials in SMA It is essential to distinguish neurogenic from myopathic causes of diseases to apply the correct diagnostic algorithm. Although muscle biopsy analysis may provide molecular and morphological information, it is invasive; the nerve conduction studies and electromyography (NCS/EMG) are less invasive, and by such techniques, several muscles can be sampled, and myotonia may be detected. Some neurogenic disorders, such as bulbospinal muscular atrophy (Kennedy's disease), report up to 20× of normal CK levels.

The context of neuromuscular disease suggests the future use of novel digital sensors applied to report clinically relevant features, such as heart rate variability, limb range of motion, velocity, orientation, gait, falls, facial and ocular kinematics, and speech.

In a survey of neuromuscular disorders, examining the recent human studies in ALS, spinal muscular atrophy, and Duchenne muscular dystrophy (DMD), one envisages a relevant future use of digital sensors as activity biomarkers.

Neurodegeneration and Proteinopathy

The TDP-43 accumulation occurs in Motor Neuron Diseases (MND), as in several neurodegenerative conditions that predominantly affect motor neurons, including dynactin, alsin genes, and other mutations in juvenile MND. Although some of these mutations have been identified in MNDs, there are hereditary motor neuropathies with variable clinical phenotypes that need biomarkers. The contributions of microglia to ALS have advanced considerably, paralleling progress in Alzheimer's Dementia. Early studies in superoxide dismutase 1 (SOD1) mouse models proposed that inflammatory responses from microglia play a pivotal role in ALS progression. This hypothesis has fueled numerous clinical trials testing anti-inflammatory therapies.

The collection of neurobiomarker data has important implications for the treatment of both sporadic and familial forms of MND and even fronto-temporal dementia, which are linked by a common molecular pathology: TDP-43 proteinopathy.

Metabolic Mitochondrial Disorders

Metabolic disorders are characterized by the deficiency or dysfunction of essential metabolites, and most commonly manifest with symptoms due to impaired functioning, exercise intolerance, cramps or contractures, especially in prolonged exercise.

Due to their incidence early in life and high relevance, metabolic and mitochondrial disorders are traditionally the interest of pediatric neurologists; however, some can present in adulthood, and increasing numbers of patients in transitional ages are followed in adult services. The neurometabolic disorders of inborn error of metabolism with CNS involvement apply, therefore, to both children and adult neurologists. Mitochondria play a crucial role in the production of reactive oxygen species (ROS), which are byproducts of oxygen metabolism. In several conditions, the imbalance between ROS production and clearance can occur, resulting in oxidative stress. This

oxidative stress can damage every cellular component, leading to various physiopathological consequences and changes in neurotransmitters, which might also affect brain mood, toward depression or euphoria. The mitochondrial adaptations aim to maintain cellular energy production and homeostasis under low energy states, as in the Mitochondrial Lactic Acidosis Stroke (MELAS) syndrome. Lactic acidosis is a biomarker of MELAS. Using new tools such as neurobiomarkers, the opportunity to provide early diagnostic and therapeutic prospects for neurological disorders, and advances in therapy are presented.

MicroRNA

MicroRNAs are important biomarkers for several neurologic conditions, such as Myotonic Dystrophy, ALS, metabolic disorders, and Neutral Lipid Storage Diseases, and are used in diagnostics and therapeutic follow-up. Muscle is an active tisue that sends signaling during exercise through myokines and microRNA, which are small non-coding circulating RNAs.Their role might have both a diagnostic biomarker function, but they are also used in therapy. Abnormal expression of microRNAs is connected to brain/muscle development, and the specific disease progression could provide novel biomarkers.

3. Call for Submission

In this inaugural *JNBT* issue, we welcome papers and reviews on original research in the molecular mechanisms and bench-to-bedside clinical observations.

The disorders of interest for *JNBT* range from muscular dystrophies and motor neuron diseases to Parkinson's Disease and movement disorders, which often arise from genetic mutations and are modulated by complex molecular mechanisms.

Recent insights on inflammatory pathways and modification induced by rehabilitation therapy through exercise are useful to both patients and physicians when seeking to foster a comprehensive treatment of neurologic disease and to identify potential therapeutic targets.

An extensive knowledge of this information among scientists and practicing physicians is still lacking: biomarkers derived from muscle tissue and brain neurons can be used to diagnose several diseases as predictive biomarkers, microglial dysfunction is now widely acknowledged as a key driver in the pathophysiology of various Neurodegenerative Diseases, such as ALS.

Recent advances in biomarker discovery and validation offer new avenues for personalized treatment strategies and stratified clinical trials.

This Journal highlights the potential recovery promoted by new drugs, such as monoclonal antibodies, for autoimmune disorders, investigates the role of training and exercise, as well as a correct lifestyle in nutrition, dietary, and vitamin therapy, in enzymatic defects, leading to a reduction in tissue damage, as documented by changes in blood biomarkers. The use of new tools such as digital sensors or neurobiomarkers gives the opportunity to provide new diagnostic and therapeutic prospects for neurological disorders. Advances in therapy presented in *JNBT* are expected to lead to better health and clinical improvement in patients' recovery and Quality of Life.

4. Conclusions

We are thrilled to have several aims in JBNT:

(1) Promote Interdisciplinary crosstalk: By creating a forum for researchers from diverse fields, it is possible to encourage collaboration that leads to the emergence of innovative solutions to complex health challenges.
(2) Advance research understanding: We are committed to publishing research that not only deepens our understanding of neurological diseases but also integrates insights from the psychological viewpoint to offer more comprehensive perspectives for patients.
(3) We aim to influence both academic and real-world medical practices by providing evidence-based insights that can inform clinical approaches.

Conflicts of Interest

The author declares no conflict of interest.

Use of AI and AI-Assisted Technologies

No AI tools were utilized for this paper.