Recent studies have linked autism (ASD or autistic features) to poor mito functioning. Understanding these disorders, their symptoms and evaluation may help families determine if further testing is important for their child.

Mitochondrial Disease

These diseases, which affect up to 1 in 4000 individuals, can result in widespread clinical problems. These include vision and hearing loss, seizures, low muscle tone, muscle weakness, migraines, chronic fatigue, developmental delays, autism (ASD or autistic features), kidney and liver disease, diabetes and other endocrine problems, and alterations in blood pressure, heart rate and temperature regulation. Affected individuals can have some or many of these symptoms and problems. Often, but not always, the symptoms of mitochondrial disorders progressively worsen over time, particularly when individuals are subject to stressors such as illness or surgery. Although some forms of mito disease only affect one person in an extended family, most types are inherited, creating a greater impact on families at large.

You are not alone

Navigating the road of complex medical problems can be confusing and overwhelming. Many parents and families find themselves alone and sometimes bewildered as they try to determine the best course of action for their loved one. Understanding the facts and options, and what constitutes an appropriate evaluation and workup, can empower families to obtain the best care for their child or loved one and help provide them with the best possible outcome and quality of life. Making use of resources such as foundations, support organizations and chat rooms (particularly to seek opinions about subspecialists being considered for care) can alleviate stress, avoid potential conflicts of interest of providers, and guarantee the best care.

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Mitochondrial Disorders and Autism

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Bridging the Gap

Mitochondrial dysfunction has long been linked to neurological conditions, its association with ASD is a topic of more recent interest, research and discussion. ASD, a complex neurobiological disease, currently affects an estimated 1 in 110 individuals. ASD influences individuals' ability to communicate and relate to others, while predisposing them to rigid routines and repetitive behaviors.

Studies completed by a group in Portugal in 2005 and 2007 suggested that 4.1% of patients with autism had underlying mitochondrial disease. This analysis would classify mitochondrial disorders as a rare but definable cause of ASD. However, a more recent study in the US published in the *Journal of the American Medical Association* (JAMA) (Giulivi et al., 2010) suggests a much stronger link between autism and mitochondrial dysfunction, reporting that children with autism are far more likely to have defects in their ability to produce energy than typically developing children. In addition to other signs of mitochondrial impairment, the study discovered widespread reduced mitochondrial enzyme function among the autistic children. Complex I was the site of the most common deficiency, found in 60% of the autistic patients, and occurred five out of six times in combination with Complex V. Other children had problems in Complexes III and IV. Although many questions remain to be answered, the study results point to a stronger link between mitochondrial dysfunction and autism than was previously believed to exist. Importantly, this association was established utilizing a cell population (lymphocytes, a type of white blood cell) that is easily obtainable via blood draw.

Which ASD patients should be evaluated for mitochondrial disease or other genetic disorders?

All ASD patients should undergo a basic genetics workup. Although *some* of the first tier tests (see our website) can be obtained without a subspecialist's input, interpretation of the data may be difficult without the involvement of a genetics specialist. Decisions regarding whether a specific patient requires a more in-depth investigation for mitochondrial or other rare metabolic or genetic diseases should be undertaken by a mitochondrial expert and/or a biochemical geneticist. Such a decision should be based on a number of factors, including screening results, laboratory testing, family history, physical findings, and clinical features. In general, the genetics workup and ongoing management of an ASD patient (should a genetics diagnosis be made) is best completed by someone trained in genetics with mitochondrial and metabolic disease experience and expertise.

Why is it important to know if an ASD patient has mitochondrial disease?

Most people or families seek a diagnosis for two general reasons. First, a mitochondrial diagnosis can lead to interventions that will improve the life and health of the affected person. Although mitochondrial disease is not yet curable, an affected person's quality and duration of life can be improved by aggressive metabolic management by a mitochondrial expert. Knowing that a patient has a mitochondrial disorder is also important for ER staff and other healthcare professionals, as certain protocols should be followed to prevent the adverse affects that can occur particularly at times of illness and stress. Secondly, obtaining a clear diagnosis may assist families with future pregnancy planning, as well as providing a basis for determining risks to other family members. In addition, mitochondrial medicine is rapidly changing with clinical trials underway. Enrollment and participation in ongoing treatment trials and research protocols requires that a patient be definitively diagnosed with a mito disease (for example, identification of the gene defect).

Diagnosing Mito Disease

Some patients present with a collection of clinical features & findings that enable them to be diagnosed by a comprehensive history, examination & minimal testing. Recently, non-invasive enzyme tests have been developed that use tissues other than muscle tissue, such as buccal swabs and lymphocytes. Gene testing also has expanded, so that a simple blood draw can provide information on over 700 mito related genes. These newer tests open the door to a larger patient population, facilitating widespread access to mitochondrial testing without the risks, cost & invasiveness associated with traditional muscle biopsies.

Symptoms & Testing

Please see our website for the complete list of symptoms and tiered type testing. Following are just a few of the possibilities:

Possible Symptoms — muscle weakness, hearing loss, gastrointestinal problems, seizures, short stature, vision loss, diabetes, developmental delays, fatigue, unexplained vomiting, dysmotility, hypotonia, migraines, autistic features, strokes…

Tier 1 Testing — Chromosome MicroArray Studies, Complete Metabolic Panel, Plasma Acylcarnitines…

Tier 2 Testing — PTEN, RETT Syndrome, (VLCFAS), DNA Testing, Mitochondrial DNA Testing…

In January 2011, a review in Molecular Psychiatry reported findings that suggest children with ASD have a spectrum of mitochondrial dysfunction of varying severity. This article emphasized the need for ASD children to be screened for possible mitochondrial dysfunction citing improvement in a number of children with ASD and mitochondrial abnormalities following the institution of mitochondrial disease management.