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A systems biology approach to autism research and treatment

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Autism is the fastest growing developmental disorder in the world today. The prevalence of autism in the US has risen from 1 in 2500 in 1970 to 1 in 68 children today. People with autism present with repetitive movements and with social and communication impairments. These impairments can range from mild to profound. The estimated total lifetime societal cost of caring for one individual with autism is \$3.2 million US dollars. Autism impacts many systems in the body, including the metabolic, mitochondrial, immunological, gastrointestinal and the neurological. These systems interact in complex and highly interdependent ways. Clinical evidence exists for increased oxidative stress, inflammation, and immune and mitochondrial dysfunction which can affect almost every cell in the body. To this date, little to no work has been done using a whole body systems biology approach to model the characteristics of this disorder. Identification and modelling of these systems might lead to new and improved treatment protocols, better diagnosis and treatment of the affected systems, which might lead to improved quality of life by themselves, and, in addition, might also help the core symptoms of autism due to the potential interconnections between the brain and nervous system with all these other systems being modeled. An ambitious project such as modeling autism would benefit from a Systems Engineering approach to Systems Biology. In particular, the risk/reward ratio for treatment needs to be examined. For example, many people with autism are prescribed psychotropic drugs off label. However, many of those pharmaceuticals have known mitochondrial toxicity. So while they might alleviate symptoms, they may worsen the underlying pathology. A greater understanding of how the systems in autism interact will positively affect treatment.

Biography

Mary Randolph-Gips is an assistant professor in both the Computer Engineering and Systems Engineering programs at the University of Houston -Clear Lake. She received two B.S.s in Electrical Engineering and Engineering Physics from the University of Kansas, and her PhD from the University of Houston. Prior to receiving her PhD she was a Space Shuttle Payload Operations Flight Controller. Her research interests include Systems Biology/Bioinformatics, Neural Networks and Systems Engineering applications to Spaceflight.

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