Abnormal axons in autism disrupt communication

Autism is a common disorder that afflicts children early in life with serious consequences for families and society. Autism affects communication with others as well as communication between the different brain areas, which is carried out by axons acting as cables. Faculty members Basilis Zikopoulos and Helen Barbas of CELEST, an NSF-funded Science of Learning Center, recently found that a protein that makes axons grow is in excess in a frontal brain area that controls attention, accompanied by excessive number of thin axons that link neighboring areas. In contrast, there were fewer large axons that link distant areas in the autistic brains, and the insulation of axons was thinner below another area associated with emotions. These findings may help explain why individuals with autism do not shift attention to stimuli in the environment when necessary, engage in repetitive behavior, and avoid social interactions. Research to discover the causes of the excess in this protein and abnormalities in axons may lead to development of therapies for autism.

Legend for Figure: Bundles of axons reconstructed in three dimensions from serial electron microscopic images show more branching of medium-sized axons (magenta) in the anterior cingulate cortex in the brain of autistic (bottom) than control (top) individuals. Axon branches are color coded by size of the parent axon (small: cyan; large: yellow; extra-large: black; Adapted from: Zikopoulos B and Barbas H, 2010. Journal of Neuroscience 30: 14595-14609).