Sulforaphane Treatment of Children with Autism Spectrum Disorder

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Abstract

This clinical trial in autism spectrum disorder (ASD) tests a nontoxic approach to therapy of ASD.

Background: Direct treatment of underlying mechanisms in ASD is limited. Cellular dysfunction in ASD may involve a number of related metabolic pathways. A clinical clue may be found in the "fever effect" in ASD, in which febrile illness dramatically but temporarily ameliorates disordered behavior. Fever stimulates heat shock proteins (HSP) and cellular stress responses that may ultimately lead to improved synaptic function and increased long-range connectivity. The expression of gene transcription by NFE2L2 (Nrf2), which is reduced in ASD, may also increase during fever. **Sulforaphane (SF)**, an isothiocyanate obtained from 3-day-old broccoli sprouts, induces HSP and Nrf2 as well as "cell-protective" responses. SF has several possible modes of action that may benefit ASD through common cellular mechanisms underlying heterogeneous phenotypes. SF crosses the blood brain barrier and is bioavailable orally.

Preliminary data: In a randomized, double-blind, placebo-controlled pilot trial in 44 male adolescents and adults (13-30 years), results showed SF was well tolerated without significant side effects. On average, participants on SF (particularly those with a history of fever effect) showed significantly more improvements in ASD symptoms than placebo participants. Significant improvements for SF participants included social interaction, aberrant/abnormal behavior, repetitive/stereotypical behavior, and verbal communication.

Current study: Our randomized, double-blind, placebo-controlled phase-2 clinical trial at UMass has three aims: To determine: (1) if orally administered SF has measurable effects in children (ages 3-12 years) with ASD; (2) if treatment with sulforaphane is safe and well tolerated; (3) To elucidate cellular biomarkers that support the mechanisms of action of SF in ASD. We hypothesize that SF will have positive effects, and that these effects will be more marked and lasting in the developing – compared to the mature – brain.

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