What we know:

• H2S is a toxic gas with rapid, potent CNS action.
• Despite its toxicity, H2S is produced endogenously at very low levels & serves vascular function roles.1
• Gut Sulfate-reducing bacteria (SRB) produce H2S.
• Large, but not small, intestine can neutralize H2S.2
• In the context of small intestine bacterial overgrowth (SIBO), H2S can thus more readily permeate systemically via the small intestinal wall.

What we don’t know:

• Effects of gut-derived, moderate levels of exogenous H2S on various organs remains unclear.
• The neurocognitive effects of chronic moderate exposure to exogenous H2S are unknown.

Specific Aim and Hypotheses:

• Examine the cognitive effects of H2S and SIBO.
• H2S is expected to be negatively associated with cognition, and to be further exacerbated by SIBO.

Methods

• Fifty-three participants were recruited (age=42±15; 21M).
• Individuals with serious neuropsychiatric and/or GI diagnoses were excluded.
• Before their visits, participants followed dietary restrictions outlined by the North American Consensus on Breath Testing, and avoided GI medications.3
• Upon arrival, participants consumed 10g of lactulose – an indigestible starch.
• Breath samples were collected every 15 min for 3 hours. Specifically:
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  • Breath samples were collected every 15 min for 3 hours. Specifically:
  • SIBO was detected using H2 and CH4 concentrations over time (Quintron Inc.)
  • Analogous measures of H2S were performed (Figure 2; OralChroma Inc.)
• Neuropsychological testing was done during the 15-minute waiting periods (Table 1).

Table 1. Neuropsychological Tests Administered

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Discussion

• Here we show a gradient of progressively worsening cognitive effects across different combinations of SIBO & SRB gut presence, with SIBO(−)/H2S(+) being the worst.
• Despite other findings that H2S may have anti-neuroinflammatory roles, its effects on cognitive performance appear to be consistently negative.
• Further neuroimaging examination is warranted to elucidate the above inconsistencies.
• A larger N is needed in order to establish robust effects of GI Group on cognition.
• Due to the low reliability of breath H2S, we are implementing direct plasma H2S measurements (Figure 5).

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3. The contrast between the SIBO[−]/H2S[−] and SIBO[+]/H2S[+] groups was significant (p < 0.05).
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6. Effects on the Brain

Pathogenicity

Pre/anti-inflammatory toxic compounds can permeate the blood-brain barrier

SIBO Small Intestinal Bacterial Overgrowth

Beneficial when well-balanced. Pathogenic when in dysbiosis

Large Intestinal Biome

H2S has vascular roles in tiny doses, but moderate effects are unknown

Bacterial byproducts are poorly contained by intestinal wall

We hypothesize that SIBO+SRB Bloom is especially harmful

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