ALS

Lifestyle Approach

What is ALS

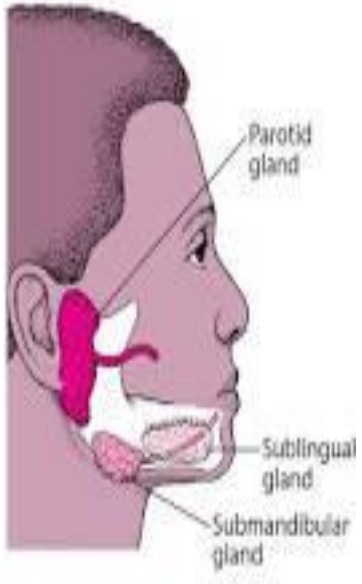
- Amyotrophic lateral sclerosis (ALS) is a severely debilitating disease characterized by progressive degeneration of **motor neurons**.

ETIOLOGY

- It could be the consequences of complex interactions among host factors, **microbiome**, and the **environmental factors.**
- Recent data suggest the novel roles of **intestinal dysfunction and microbiota** in ALS etiology and progression.

Gastric Empying

- There is report that gastrointestinal motor dysfunction occurred in ALS with delayed **gastric emptying and delayed colonic transit times** in patients (Wingate, 1999). **Pancreatic and parotid deficiencies were observed in ALS patients** (Charchaflie et al., 1974).



Gluten

- There is a possible link between ALS and sensitivity to **gluten** based on an Israel study (Gadoth et al., 2015). In certain cases, an **ALS syndrome might be associated with autoimmunity and gluten sensitivity.** These reports suggest that ALS patients show **GI symptoms, maybe at the early stage** of their disease or before their diagnoses.

Digestion/Microbiome and ALS

- We are the first to report the elevated intestinal inflammation, **reduced beneficial bacteria**, and shift of microbiome profile in ALS (Wu et al., 2015; Rowin et al., 2017; Zhang et al., 2017; Zhang et al., 2021). Later, studies in human ALS and experimental animal models also reported the **altered microbiome in the ALS** (Fang, 2016; Labarre et al., 2017; Blacher et al., 2019; Figueroa-Romero et al., 2019; Burberry et al., 2020)

Digestion and ALS

- high prevalence of constipation (46%),

Microbiome and ALS

- Our study (Rowin et al., 2017) evaluated **infection and markers of intestinal inflammation** and the human gut microbiome in stool samples from ALS patients. **A majority of patients had signs of intestinal inflammation.** This is the first comprehensive examination of inflammatory markers in the stool of ALS patients.

Microbiome ad ALS

- A previous study (Zhang et al., 2009) reported that the level of plasma lipopolysaccharides (LPS), a bacterial endotoxin, significant increased and had a positive correlation with activation of blood monocyte/macrophage in sALS groups, and LPS was most elevated in patients with advanced sALS disease (Zhang et al., 2009).

- Circulating endotoxin and systemic immune activation in sALS suggested intestinal leakage and local inflammation in these sALS patients.

Healing Foods

- Earlier studies suggested that polyphenols (e.g., **resveratrol, curcumin**, epigallocatechin gallate, **quercetin**, and **phenolic acids**), which can be found in fruits, vegetables, coffee, tea, and whole grains, may have a promising neuroprotective effect in ALS. It was observed, *in vivo* and *in vitro*, that these bioactive compounds may have the potential to regulate mitochondrial biogenesis, improve energy metabolism, reduce toxic protein aggregation, reduce microglia and astrocytes inflammation, and improve motor functions and survival (Solanki et al., 2015; Novak et al., 2021).

Resveratrol

- Resveratrol, an antioxidant compound found in grapes, has been widely studied due to its neuroprotective properties. **Resveratrol may reduce the *in vitro* neurotoxicity** of cerebrospinal fluid (CSF) from ALS patients, preventing neuronal loss and improving Ca^{2+} homeostasis, which seems to be related to the antioxidant capacity of resveratrol.

Probiotics

- A prospective study reported that probiotics may promote beneficial effects in ALS patients. The administration of probiotics to ALS patients increased the relative abundance of groups related to propionate and butyrate production in gut microbiota, which may improve energy provision.

Butyrate

- In our previous work, we observed the administration of butyrate, a beneficial microbial metabolite, delayed the disease progress and significantly extended the survival time of the SOD1 ^{G93A} mice and prolonged the life span by 38 days on average (Zhang et al., 2017). Butyrate treatment improved the gut microbiome and restored the Paneth cells and the signaling of lysozyme 1 and anti-microbial peptide defensin 5 alpha in the SOD1 ^{G93A} mice.

Case 1

- Female
- Walker
- G tube
- Communicate with computer
- Increased mucous
- Food drop
- Poor Balance

Case 1

- On many vitamins and minerals
- Plant based formula

Case 2

- WC
- GT
- Aphasic
- Total care
- Plant Based formula

Case 3

- Female
- Walker
- Unable to stand
- Slurred speech
- Unable to left up arms
- Minimal mobility on hands

Case 4

- Total care
- WC
- Trach
- Aphasic
- Gtube
- Plant based formula

Case 5

- Male
- Walker
- Foot drop
- Frequent falls
- Lower extremities weakness