Amyotrophic Lateral Sclerosis also known as Lou Gehrig’s disease or Charcot’s disease, is a degenerative neuron disease.

Spin Labeling → Sample Concentration → Spectrometer

Dipolar Signal Without Baseline → Dipolar Signal With Baseline → Echo Signal
• ALS is the most widespread type of motor neuron disease

• Familial ALS and Sporadic ALS are the two types of ALS

• Symptoms of ALS are muscle weakness, especially in the limbs, cramps, twitching and difficulty in speaking

• ALS is common amongst veterans, smokers and males.

• Riluzole is the only drug that has been approved to treat ALS. However, there’s no single test to diagnose ALS.
• SOD1 exists as homodimer with each dimer containing one Cu$^{2+}$ and one Zn$^{2+}$ ion

• Mutant Cu,ZnSOD form pathogenic misfolded species which can lead to protein shock. This results in cell death in organisms.

• Over 150 SOD1 mutation account for fALS
Experimental:

Transformation of DNA

- Recombinant Plasmid
- E. coli Host Cell
- Transformed Cell

Incubator

Centrifuge

Protein Gel Electrophoresis

- Gel Filtration Column
- Nickel Column
Purification of SOD1

Protein gel of SOD1

Gel filtration trace of SOD1

SOD1 Monomer IS 17.5** kDa
Experimental:

- We can utilize the copper centers present in SOD1 and/or attach nitrooxide spin labels to specific residues on proteins.
- ESR can be used to measure distances distribution within and between proteins that ranges up to 90 Å.
- The nitrooxide linker generally produces broader distance distributions because of the flexibility of the linker.


**Conclusion and Future Work**

- ESR measurements on ALS mutants to measure the distance between Cu$^{2+}$ and NO$^*$ in SOD1.
- Broader distance distributions and a slight shift in disease causing ALS mutants on comparison to WT.
- Future work: SOD1 will be studied at lower conc. to better understand how it functions at native concentrations.

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