

Influence of Phytochemicals Present in Mint Extracts in Preventing or Reducing Oxidative Stress in Human Serum Albumin (HSA)

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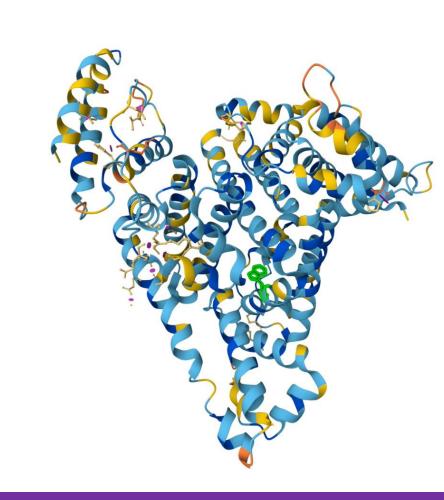
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Background and Significance

Human Serum Albumin (HSA) is the most prevalent protein in the human body. Due to its major binding sites, HSA functions as an efficient transporter of hormones, fatty acids, and pharmaceuticals in the circulatory system. Damaging reactive oxygen species (ROS) that bind to native HSA induce toxicity by changing its conformation and function. Due to the existence of a single tryptophan (strong fluorophore) in the hydrophobic region of HSA, it is possible to study ligand binding and conformational changes in HSA using optical spectroscopy.

Many phytochemicals have antioxidant properties, giving them the ability to scavenge harmful free radicals, reducing or preventing the risk of different diseases. The present study investigates the structural alterations induced in HSA by ROS and explores the protective effects of some phytochemicals including luteolin-7-O-rutinoside—present in *Mentha piperita* (mint) and *Mentha spicata*.

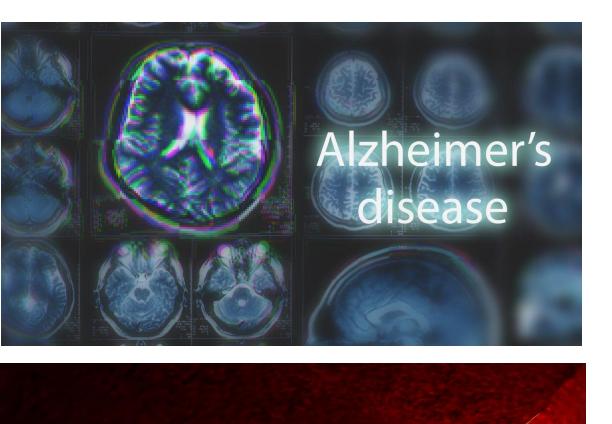
3D Model of HSA

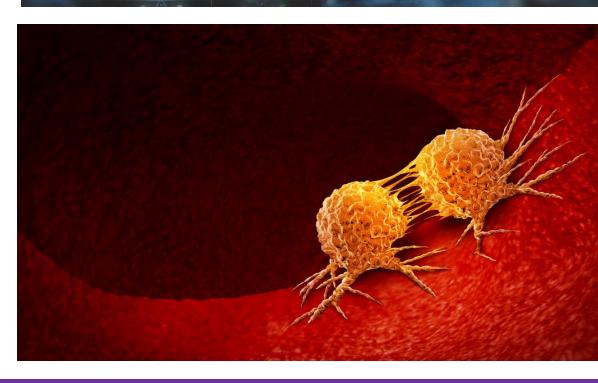


Therapeutic Properties Against Certain Diseases





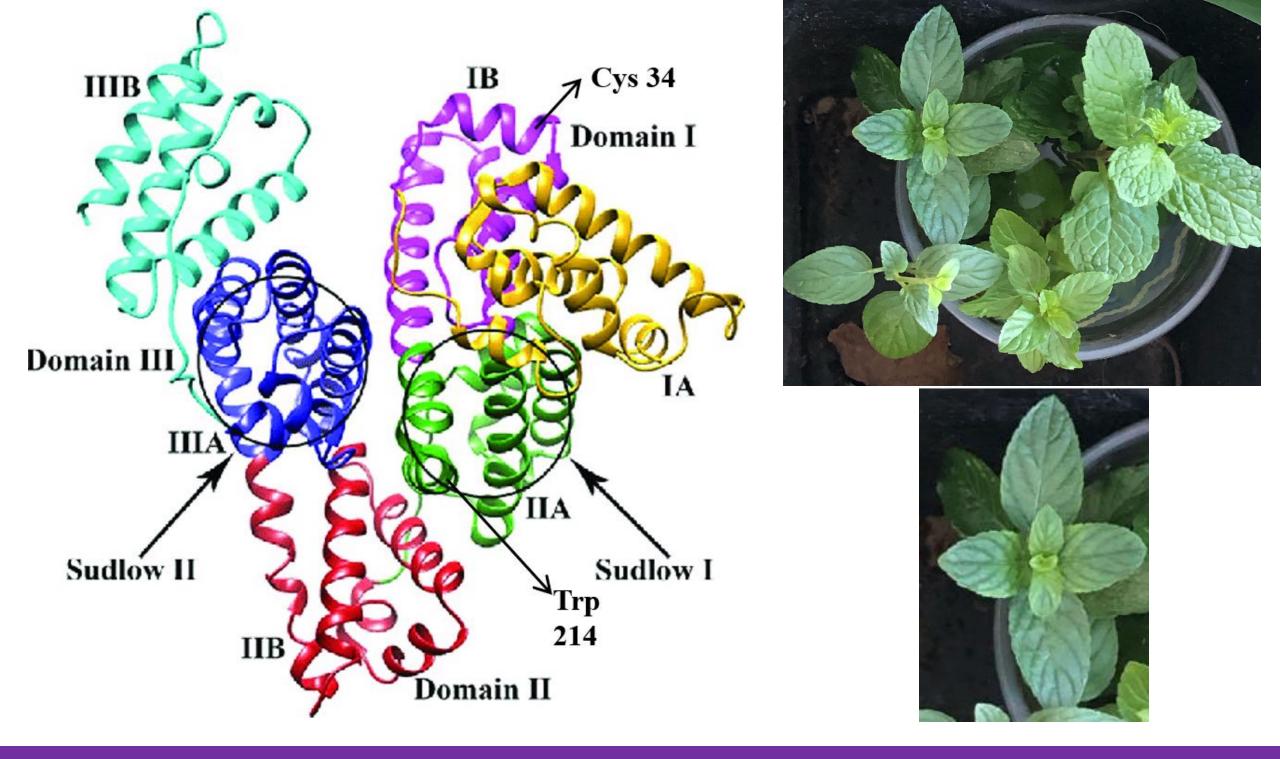




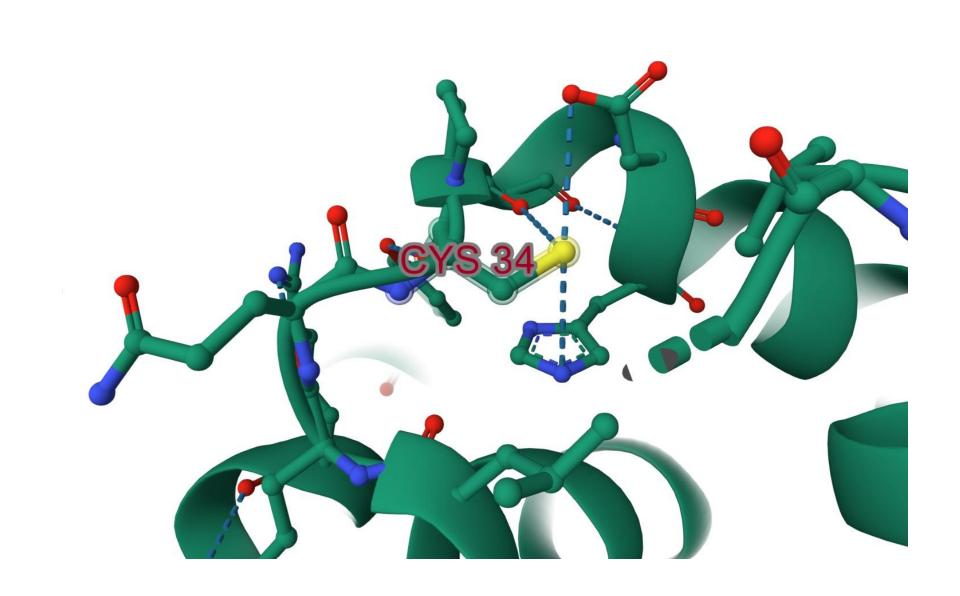
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Drug Binding Sites on Human Serum Albumin

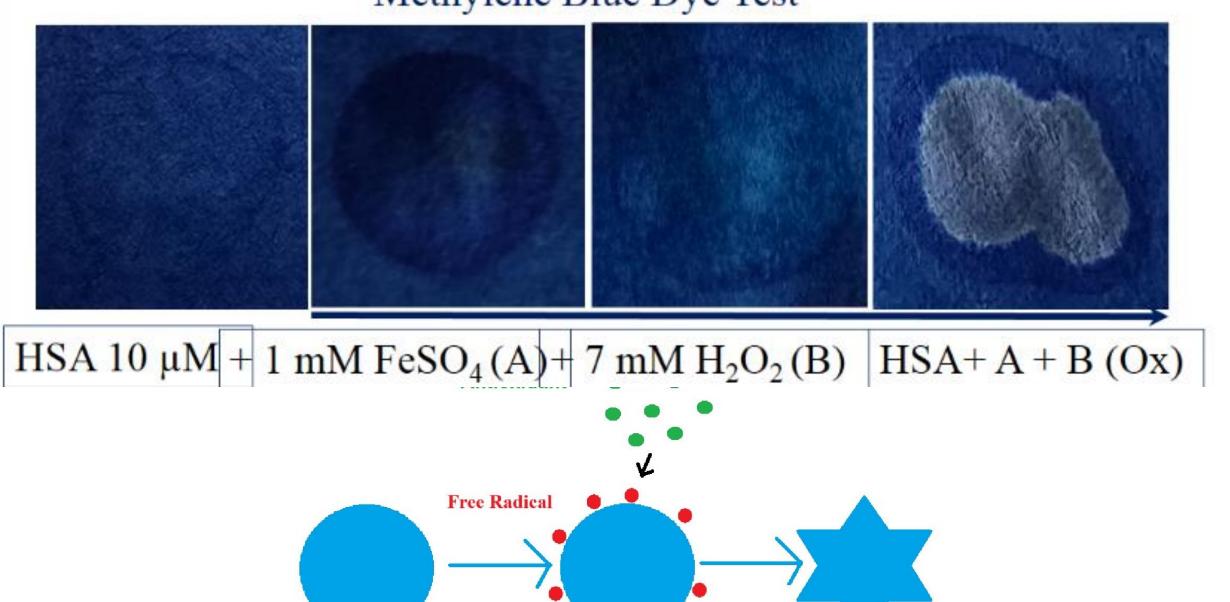


Cysteine-34 Contributes to Antioxidant Property of HSA

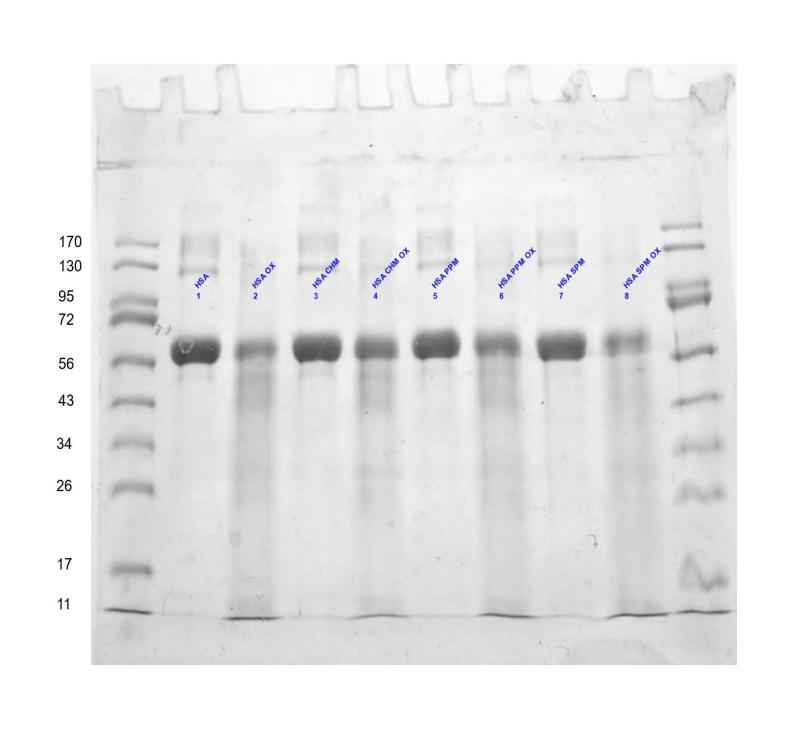


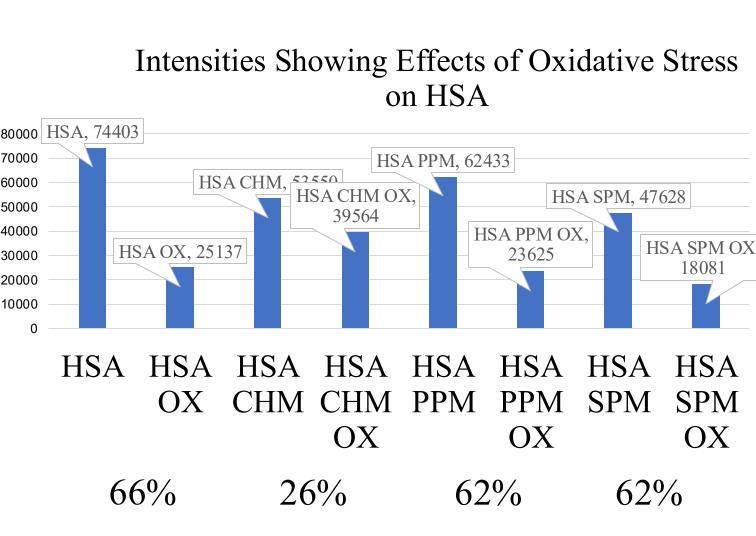
Studies on Oxidative Stress with the Methylene Blue Dye Test

Methylene Blue Dye Test



SDS-PAGE of HSA in Presence of Mint Extracts and Oxidative Stress





Observations

- After HSA is oxidized with and without the presence of a mint extract, a shadow of bands is formed down the gel column.
- Analysis using ImageJ and Image Lab show that chocolate mint reduced this intensity the least. Therefore, CHM is a more potent antioxidant than PPM and SPM.
- Cys-34 plays important role in the scavenging of the radical in the presence of CHM.
- An electron transfer process is mediated from the radical to the phytochemical through Cys-34.

Conclusion

- Based on our observations, mints contain potential antioxidants.
- The protein is in its native form.
- The phytochemicals help stabilize the protein's conformation.

Future Studies

- Perform spiking studies using HPLC.
- Use molecular docking to approximate location of HSA binding site with mint phytochemicals.
- Calculate the total flavonoid content, total antioxidant capacity, and phenolic acid content in chocolate mint, peppermint, and spearmint.
- Use FTIR to study structural changes in HSA upon oxidation and binding of mint extracts.
- Mint phytochemical effects on diseased mammalian cells.

References

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