Radiation to the Olfactory Structure (OS) Correlates with Taste/Odor Changes during Pencil Beam Scanning (PBS) Proton Irradiation for Brain Tumors
T. Bevolo, M.Gao, V.Gondi, W. Hartsell
Northwestern Medicine Chicago Proton Center

Purpose
- Identify % of patients experiencing negative taste/odor changes during proton PBS treatment to brain tumors
- Correlate the location of the OS in relation to the dosage and layering when the instance of taste/odor change is identified

Materials and Methods
- 15 patients- 9 adults/6 pediatrics, 10-73 years old enrolled in a prospective study
- All were whole brain (single posterior field) treatments as part of craniospinal irradiation with a posterior fossa (PF) boost (two posterior oblique fields)
- Patients were given a buzzer and asked to buzz when they experience a change in taste/smell and buzz again when the taste/smell dissipates. Repeated for 3 consecutive days. Repeated for PF boost
- Monitor units/layer were recorded for each buzz and correlated with the spot distribution
- Post treatment survey to identify chemosensory description and intensity
- For each PBS layer (3819 total layers), we recorded:
  - Number of days taste/odor occurred
  - Dose to the OS
  - Proximity of the Bragg peak to the OS

Results
- All 15 patients experienced a change in odor. 5 indicated a change in odor and taste
- 9 patients buzz at the start of each layer indicated the taste/odor was not present during the 2 second beam pause for layer switching
- Taste/smell was reported as moderate to difficult to tolerate-(sewer, burning, chlorine)
- For layers causing changes on all 3 days, Bragg peak was inside OS 98% of the time (p=0.02)
- Mean dose to the Bragg peak=15.5 cGyRBE
- Fit to normal tissue complication model giving a TD50 of 4 cGyRBE

Conclusion
- Identified negative taste and odor change which occur during brain irradiation is directly related to the radiation dose delivery to the olfactory structure
- 100% of patients receiving proton PBS whole brain irradiation experienced negative taste/odor changes
- 33% of patients receiving PF boost experienced negative taste/odor changes