Helicobacter pylori-induced Molecular Alterations in Gastric Tissue Visualized by Imaging Mass Spectrometry

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INTRODUCTION

- *Helicobacter pylori* colonizes the human stomach and results in chronic inflammation
- Inflammation can lead to stomach cancer
- Stomach cancer is the third leading cause of cancer mortality worldwide
- Some *H. pylori* infected individuals develop disease, while most others remain asymptomatic
- **GOAL** → To utilize imaging mass spectrometry to explore the host-pathogen interface to better understand the mechanisms by which *H. pylori* causes disease

METHODS

- Gastric tissue dissected from gerbils exposed (n=5) or not (n=5) to *H. pylori*
- Tissues were oriented and flash frozen
- 12 µm sections were obtained and thaw-mounted on ITO-coated glass slides
- Matrix (DAN) was applied via a TM Sprayer (HTX Technologies)
- Lipid images were acquired in positive and negative ion mode a 75 µm resolution on a 15T FT-ICR (Bruker)
- Data were exported and analyzed with SCiLS
- Lipid extracts from serial sections were analyzed via HPLC-MS/MS (Thermo Orbitrap) for lipid identification

MORPHOLOGY (H&E)
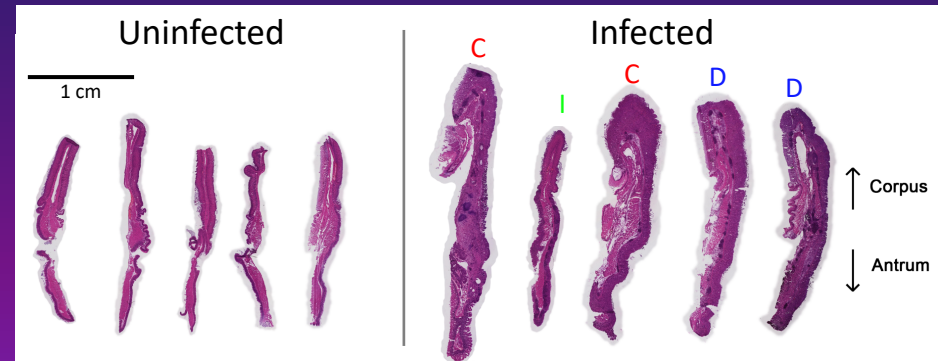
All infected stomachs had evidence of inflammation (I), but others also had evidence of cancer (C) or dysplasia (D).

IMAGING MS EXAMPLES: POSITIVE MODE
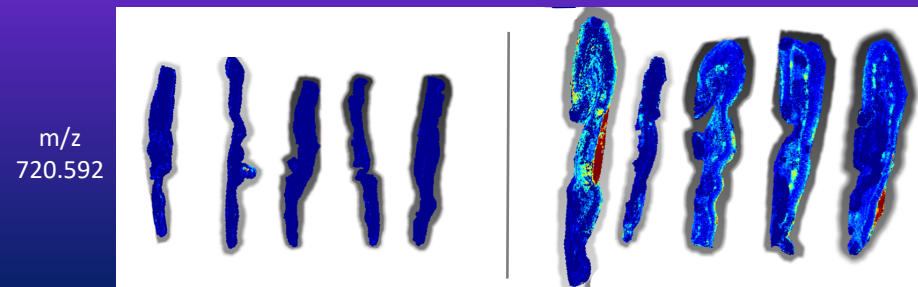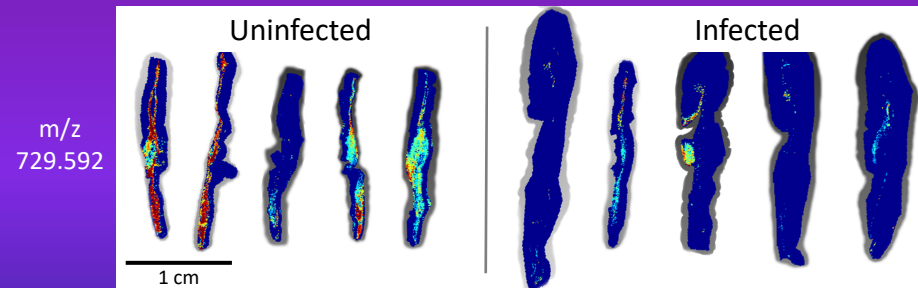
RESULTS

MODE	m/z	ID*	EXPRESSION
NEG	409.237	LPA 16:0	↓ infected
NEG	435.253	LPA 18:1	↓ infected
NEG	452.280	LPE 16:0 [LPC 13:0]	↓ infected
NEG	478.296	LPE 18:1	↓ infected
POS	701.560	SM d18:1_16:1	↓ infected
POS	718.576	Plasmenyl-PC P-20:0_12:0	↑ infected
POS	720.592	Plasmenyl-PC O-20:0_12:0	↑ infected
POS	729.592	SM d19:0_17:2	↓ infected
POS	754.539	PC 34:4	↑ infected
POS	757.624	SM d18:0_20:2	↓ infected
POS	792.592	Plasmenyl-PC O-16:0_22:6	↑ infected
POS	828.493	PE 40:7 [M+K+]	↑ infected
POS	848.482	PS 38:5 [M+K+]	↑ infected

*WHITE: tentative ID based on FT mass accuracy (<5 ppm error)
GREEN: ID based on matching with HPLC-MS/MS of gerbil stomach lipid extract and accurate mass

CONCLUSIONS

- Ten gerbil stomachs were successfully imaged for lipids in positive and negative ion mode
- A number of lipids with differential distributions were observed
- Further research will focus on understanding the biological basis of the differences