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## Determining the Interrelationships for Dietary Intake of Lipid Oxidation Products from Thermally Abused Oils, the Gut Microbiome, and Gut Health

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## DATA MANAGEMENT PLAN

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### Data Management Plan

Data will be collected, processed, organized, housed, and retained based on standards appropriate to the biomedical research community guidelines.

### Expected Data Type

Data will be collected as digital records, spreadsheets, pictures, and handwritten records. The source of data will be observation records or digital output from laboratory instruments. Data that we collect, generate, or derive will include the following for preclinical studies: peroxide and anisidine values for control oil, thermally abused oil and rodent diets; fatty acid profile for control oil and thermally abused oil; food intake; body weight; body composition (calculated as fat mass or lean mass relative to body weight); disease activity index; histopathology scores for mucosal inflammation and mucosal injury; colon length; colon tumor incidence, multiplicity, average size, and burden (Experiment 2 only); plasma concentrations of cholesterol, free fatty acids, triglycerides, lipopolysaccharide, C-reactive protein, IFN- $\gamma$ , IL-1 $\beta$ , IL-6, and TNF $\alpha$ ; fasting glucose and glucose tolerance; immunohistochemistry for ZO-1, occludin, inducible nitric oxide synthase (iNOS), cyclooxygenase 2 (Cox2), malondialdehyde (MDA), tumor necrosis factor (TNF), 8-hydroxy-2-deoxyguanosine (8-OHdG), and ki67; colon tissue concentrations of malondialdehyde and 4-hydroxynoneal; quantitative gene expression of immune and inflammation related genes (mouse PanCancer Immune Profiling Panel by NanoString); 16s rRNA sequencing data for cecal, mucosal, and fecal microbiomes (includes sequence counts, calculated alpha diversity and beta diversity, predicted functional KEGG terms and pathways); cecal and fecal amounts of short-chain fatty acids. Data that we collect, generate, or derive will include the following for *in vitro* experiments: a) Human colon normal cells, cancer cells, and mouse macrophages: cell viability; cytotoxicity IC<sub>50</sub> value; expression of *Il1b*, *Il6*, *Ifng*, *Tnf*, *Ccl2*, *Cox2*, and *Nos2*; glutathione oxidized and reduced states; intracellular reactive oxygen species (ROS); b) *In vitro* batch fermentation experiments: bacterial count; 16s rRNA sequencing data of cultured cecal or fecal microbiomes; concentration of short chain fatty acids.

### Data Format

Raw data will be gathered as hard copy documentation recorded permanently in laboratory notebooks and/or as electronic files, as follows: written material, MS Word .docx files; spreadsheets: MS Excel .xlsx files; digital images as .tiff, .jpeg, or other image file type at minimum 300 dpi resolution; statistical analysis files: Jmp and GraphPad Prism; other: MS PowerPoint .pptx and Adobe Acrobat .pdf. All hard copy data will be digitized as either images (jpeg) or PDF documents. Metadata and data standards appropriate to the biomedical research community guidelines such as FAIR, NIH's Common Data Elements (CDE), and Minimum Information for Biological and Biomedical Investigations (MIBBI) will be used.

### Data Storage and Preservation

We follow Utah State University's recommendation for storing and backing up data, the 3-2-1 rule: [three copies](#) of files on [two different storage types](#) with [one copy off site](#). All hard copy records will be archived and securely stored onsite at the laboratory. All digital data will be secured on individual computers, on a secure cloud server (Box.com) maintained by the university with restricted access, and on an external hard drive maintained offsite at the PIs home locked in a fire-proof safe. Digital data will be backed up periodically to the cloud and external hard drive. Regarding human subjects data: De-identified data are defined as data that are stripped of all identifying information and there is no way the data could be linked back to an individual through a key or other coding method. We will employ the [safe harbor](#) methods to remove all HIPAA identifiers. Only de-identified data will be stored digitally. Access to de-identified data

will be restricted to grant personnel (key personnel and the graduate student managing the project). Identifiable human data will be kept as hard copy records only, secured in a locked office in a secured building (key and pass card access restricted) on the USU campus.

### **Data Sharing and Public Access**

It is our intention to publish research data in publicly available journals, including all relevant raw data related to that work, which may be deposited as supplementary information at the journal website or made available through USU's Digital Commons repository.

Utah State University, through the Merrill-Cazier Library, provides institutional repository services through the bepress Digital Commons platform. [DigitalCommons@USU](mailto:DigitalCommons@USU) supports all file types and formats. Files are provided with persistent URLs, and if needed, Library staff can obtain DOIs for datasets. The system can produce license and copyright statements as needed and creates standard citations. All files are backed up at multiple sites, including cloud storage. Preservation copies are stored in Amazon Web Services, with redundant storage across multiple facilities and are regularly verified for integrity of data using checksums.

All original research records will be secured with access restricted to personnel involved directly in this research project. Access will be granted and managed by the PD and/or Co-PD; access to cloud storage via Box.com is managed using various permission level settings (e.g., view access only, or view/edit/delete access). Anyone seeking access to research records must do so in accordance with [Utah State University Policy 588](#).

### **Roles and Responsibilities**

The PD maintains responsibility for archiving and securing all research data. The Co-PD will provide assistance in managing data and will take the lead in data management should some contingencies arise.

No costs are required for managing data; Box.com provides unlimited storage to all research staff and a 4 TB external hard drive is already available to the laboratory.

### **Monitoring and Reporting**

The project and DMP will be monitored as specified by NIFA.