Poison in a Peanut Butter Sandwich: Can Turmeric Protect Against Cirrhosis?

Carl Turner and Dr. Barbara Trask
Background Information on Turmeric

- Rhizomatous plant
- Preparation
- Uses
  - Culinary
  - Cosmetics
  - Gardening
  - Folk Medicine
Medicinal Properties of Turmeric

- Digestive disorders
- Atherosclerosis
- Menstrual problems
- Bacterial infections
- Liver Diseases
- Cancer
Properties of Turmeric’s Active Ingredient Curcumin

- Extraction
- Antioxidant
  - Reducing agent
  - Prevent oxidative DNA adducts

Enol form of Curcumin
Will oral administration of curcumin 95 act as an anti-tumorogenic agent against MDA-MB-231 breast cancer cells on nude mice (nu/nu Mus musculus)?
Preparation and Procedure

- Athymic nude mice: 12
  - 6 control
  - 6 experimental
- Autoclave
- Peanut butter balls
  - BID
  - ~600 mg
  - 45 day pre-injection administration
Preparation and Procedure

- **Injection**
  - $5 \times 10^5$ human breast cancer cells
  - Subcutaneous

- **Daily Observation**
  - No tumors
  - Weight Loss
  - Death
Death Rates

Survival Rate

Survivorship (%)

Days

- Control
- Experimental
Pathology Report

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Summary

Assay: Summary
Pathologist: Ramona Skipstunas
The cause of death in both animals is subacute hepatic necrosis. Lesion pattern is most consistent with hepatotoxicity. This is not an infectious process.

Pathology

Assay: Biopsy, Multiple Tissues
Pathologist: Ramona Skipstunas

Gross report:
Both animals have coalescing, dark red indented areas on the surface of the liver. Dark red areas extend throughout the tissue on cut section.

Histopathology report:
Liver: Animal #5: There is subacute portal necrosis with infiltration of plasma cells, lymphocytes and few neutrophils. Necrotic hepatocytes and swollen degenerate hepatocytes border affected zones, which occasionally coalesce in bridging patterns. In many portal areas, there is mild biliary hyperplasia. Animal #10: Portal necrosis, as described above, is more severe and extensive involving approximately 80% of tissue. In addition, there is acute portal hemorrhage and perivascular neutrophil accumulations in some portal zones.

Spleen (both animals): Clusters of pyknotic cellular material are scattered throughout periarteriolar sheaths (lympholysis).

Lymph node (both animals): Pyknotic cellular debris speckles cortical follicles (lympholysis).

Tissues considered histologically normal include (both animals): small and large intestine, pancreas, kidney, urinary bladder, uterus, ovary, heart, lung, adrenal gland, bone marrow, skeletal muscle, esophagus, trachea and brain.
Comparison of Liver Histology

HEALTHY  CIRRHOTIC
Suspect: Peanut Butter-Derived Aflatoxins

- Naturally occurring toxic metabolite
- Fungi
- Habitat
  - Oilseeds (Peanut Butter)
  - Vegetation
  - Grain
Regulation of Aflatoxins

- Regulated by US FDA
  - Limit of 20 ng/g
  - Average Peanut Butter
    - 13 ppb
    - 1,000 times below safe level
Results

- While no information was able to be obtained regarding the anti-tumorigenic effects of curcumin through this study, these results suggest that daily ingestion of curcumin provides protection against hepatotoxicity, possibly versus oxidative damages caused by aflatoxins.
Future Research

- Test for aflatoxins in food
- Test livers for aflatoxin damage
- Test for GST gene in nude mice
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