The Effect of the Gut Microbiome on Bone and Cartilage of Osteoarthritic Animals

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Osteoarthritis

• Osteoarthritis (OA) is the most common form of arthritis, affecting millions worldwide.
• OA occurs when the cartilage between the joints break down; leading to pain, stiffness, and swelling.
The microbiome of the human gut, comprises of thousands of different microorganisms.

“Microbes in a community”
Microbiome Influence
Metabolic Disease

- Metabolic Syndrome
- Obesity
- Chronic Inflammation

- Patients have higher risk of OA
Hypothesis

Alterations in the gut microbiome that cause inflammation will accelerate the degeneration of cartilage.
4 groups with a range of inflammation and treatments

<table>
<thead>
<tr>
<th>MOUSE TYPE</th>
<th>INFLAMMATION</th>
<th>OBESITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wild Type (Control)</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>TLR5KO</td>
<td>Mild</td>
<td>Mild</td>
</tr>
<tr>
<td>TLR5KO: Antibiotics</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Wild Type: High Fat Diet</td>
<td>Moderate</td>
<td>Moderate</td>
</tr>
</tbody>
</table>
Methods

• 20 weeks: One bout of loading at 9 N
• One leg is loaded while the other leg is remains unloaded.
• Euthanized two weeks later, collect joint microct, sectioning joint, collect fecal matters for microbial analysis
• Trace the bone struts of the epiphysis of the tibia bone of each slice.
• Exclude tracing the growth plate.
MicroCT Scan: Final Analysis

- BV/TV [1]
- Tb.N* [1/mm]
- Tb.Th* [mm]
- Tb.Sp*[mm]
Cartilage Thickness

Draw 5 straight lines to measure the cartilage of the tibia plateau, Took histological image
Cartilage Thickness
Future Steps

Epiphysis to metaphysis, trace different regions of tibia.
Find the correlation between the microbiome and osteoarthritis.