

Chicken Skin Jig V1 — Design Brief/Results

Project Objective

Design a compact, reusable fixture that securely holds a chicken-skin sample under controlled tension or compression for laboratory testing, imaging, or handling. The device should reduce sample movement and make specimen preparation more repeatable.

Problem

Chicken skin is thin, flexible, slippery, and difficult to hold in a consistent position. Conventional clamps may damage the tissue, obstruct the test area, or produce uneven loading. A simple fixture is needed to secure the sample around its perimeter while keeping the central region accessible.

Intended Users and Context

Designed for Maman Biomedical staff working with ex vivo tissue samples. The jig is intended for benchtop use during UTM force probe measurement at mHUB.

Design Concept

The jig consists of two primary components:

- **Spike body:** Circumferential grip spikes engage the tissue around its perimeter.
- **Removable compression cap:** Fits over the body to compress or secure the sample.
- **Retention channels:** Guide rubber bands around the assembly and prevent them from slipping.

During use, the tissue is positioned across the opening and engaged with the spikes. Rubber bands and the removable cap then apply retention or compression while leaving the central sample area available for observation or testing.

Key Design Requirements

- Hold the tissue securely without significant slipping.
- Apply approximately uniform restraint around the specimen.
- Keep the central test region unobstructed.
- Minimize tearing or unintended damage to the tissue.

- Allow quick sample installation and removal.
- Be easy to clean or inexpensive enough to replace.
- Be manufacturable using FDM 3D printing
- Safely contain or shield sharp features during handling.
- Fit samples of approximately 1 inch in diameter and 12.25 mm in thickness

Evaluation Plan

Test the prototype for:

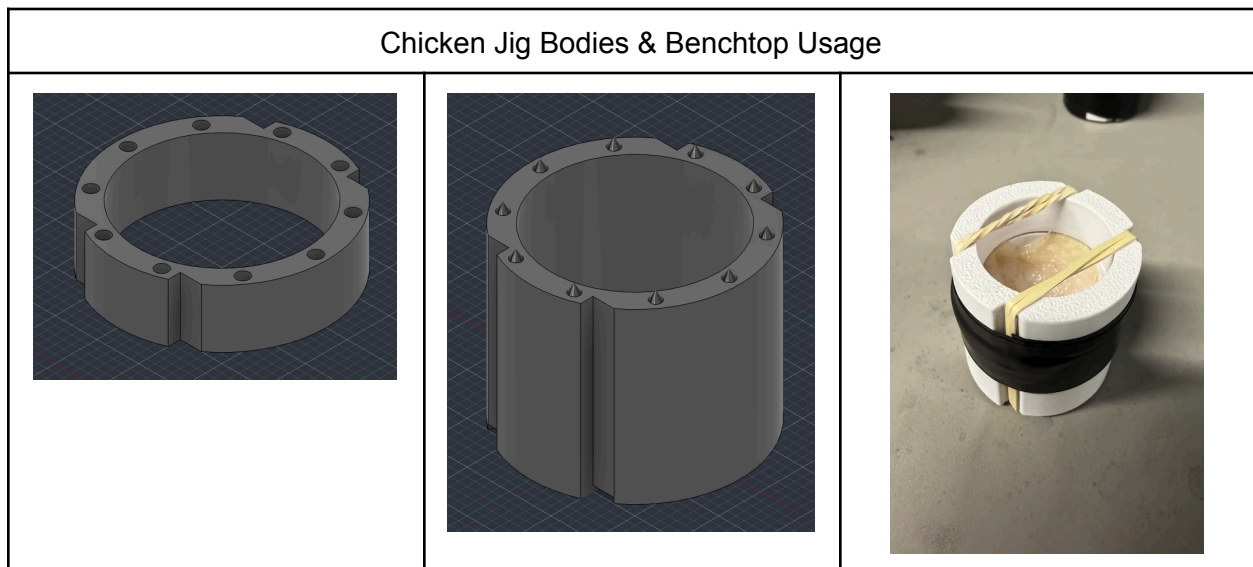
1. Sample installation time and ease of use.
2. Resistance to slipping under the expected test load.
3. Uniformity of tissue tension or compression.
4. Tissue tearing near the spikes.
5. Cap and rubber-band security.
6. Cleaning, reuse, and operator safety.

Prototype Status

Version 1 establishes the basic geometry and retention method.

The current design uses spikes and rubber bands, with a removable upper cap. The assembly contains two CAD components: the spike body and cap body.

- The cap body contains 10 millimeter holes to account for the spikes and to shorten print time and lower filament usage.



Results

The jig initially held the chicken skin securely. However, the tissue stretched and tore around the spikes, preventing consistent tension and producing unreliable results. Future versions should distribute force more evenly to reduce tissue damage.

Next Iteration

The next jig will provide additional space for both the skin and underlying tissue, reducing the risk of tearing. It will also distribute tension across a larger area, replicating how a doctor uses two fingers to stretch a patient's skin before inserting a needle through the dermal layer.