

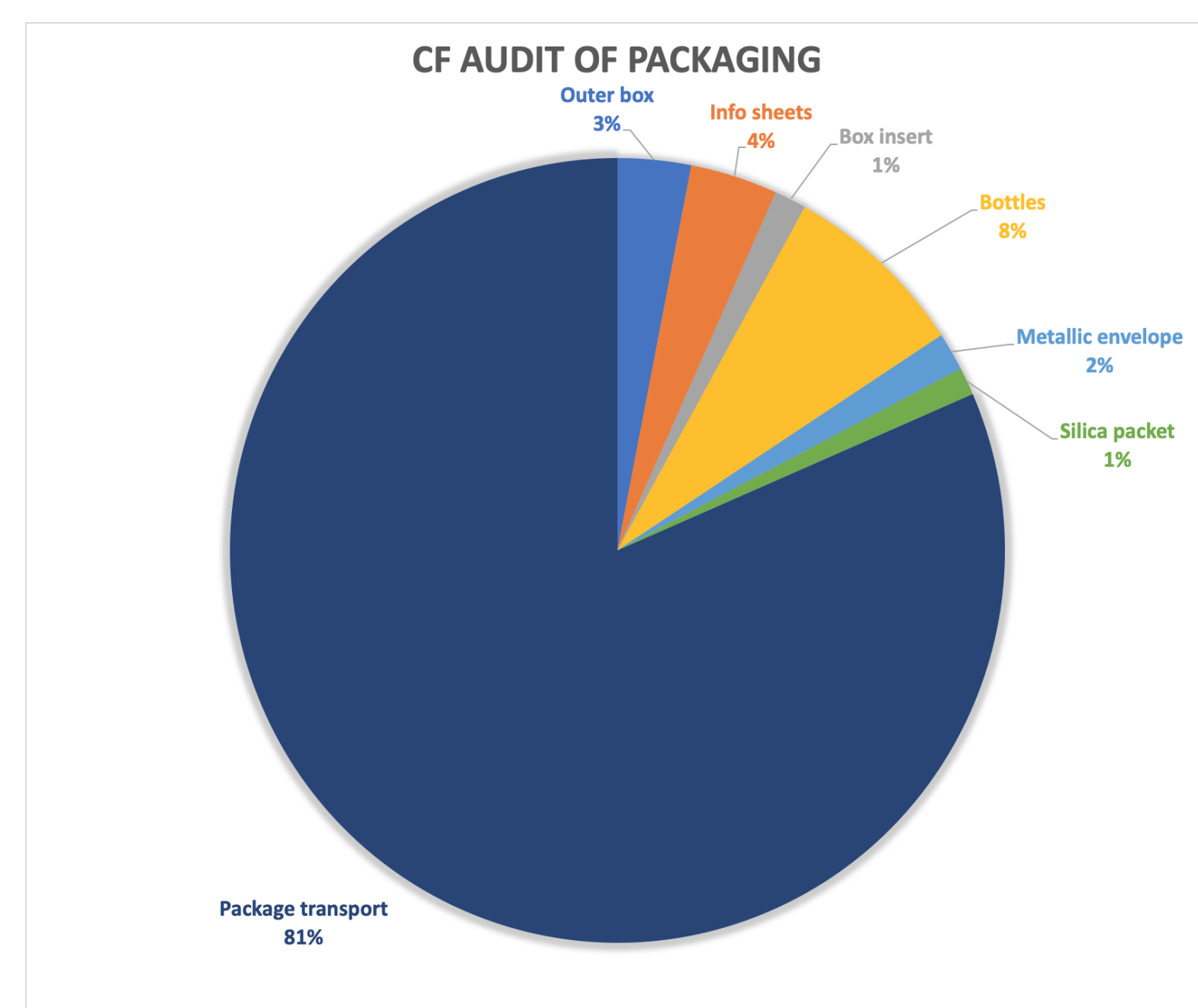
# MilliporeSigma Sustainable Packaging



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## INTRODUCTION

MilliporeSigma aims to increase their sustainability by reducing the carbon footprint of their food pathogen testing kit. The weight and size of the packaging impacts transportation, so both mass and material of each component are considered.



The packaging examined in this project includes the following components:

- Outer paper box
- Foam insert
- 2 packets of information
- 4 HDPE bottles
- Metallic envelope containing 100 sample tubes
- Desiccant packet

## PROBLEM STATEMENT

MilliporeSigma is working towards an ecological business model by replacing their flagship product's packaging with environmentally sustainable material in order to reduce its overall carbon footprint.

## CORE FUNCTIONS

The three primary criteria a new package design must fulfill are

- >20% decrease in a component's overall carbon footprint
- Acceptable visual presentation
- Effective restraint of interior components

## DESIGN AND DEVELOPMENT

### Prototype Options

- **Box Insert**



100% Recycled Cardboard  
• Completely recycled chipboard



Mushroom Foam  
• Sequesters carbon while growing – low impact



Cornstarch Foam  
• Light-weight, insulating bioplastic

- **Box**

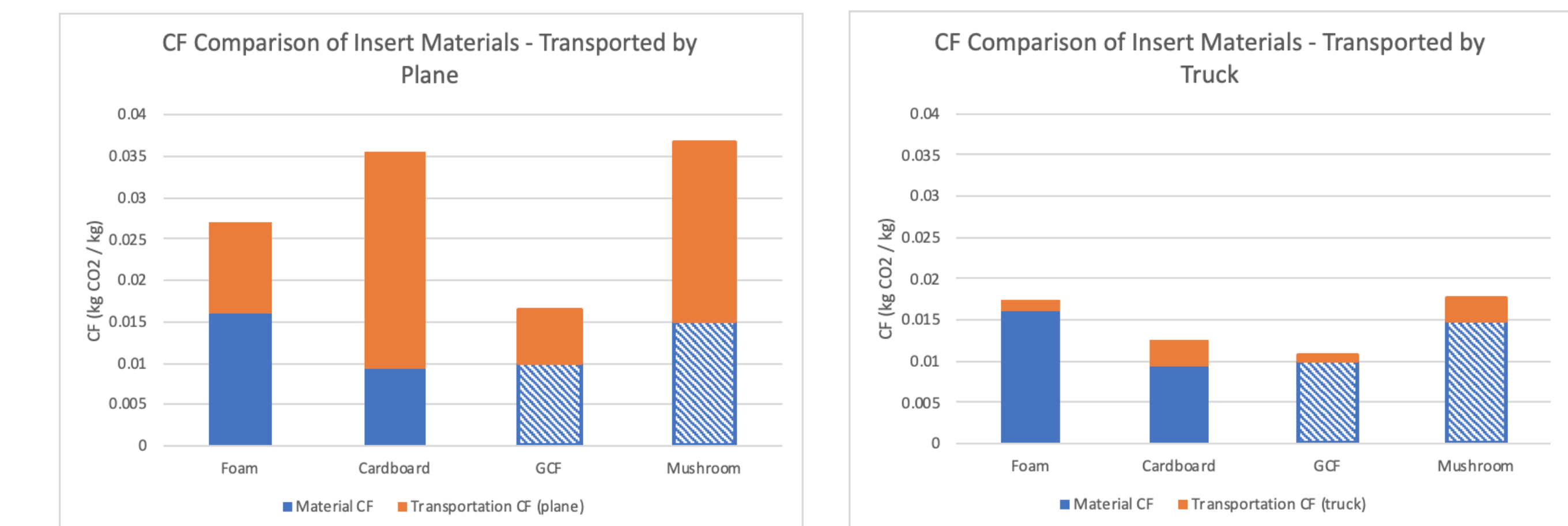


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## TESTING RESULTS

- Drop Testing – Instron drop tower used to simulate a 4 foot drop of the box with minimal damage observed to the packaging in all cases
- Environment Testing - refrigeration for 2 weeks with no visible impact on all components
- Vibration testing – most internal components stayed in place during manual vibration with original foam and mushroom holding the best
- Time Trial – difference of packaging times between old and new boxes was 4.0 seconds, with the corn starch foam insert prototype being the fastest packaging option
- Appearance Testing – maintenance of aesthetic appeal of outer and inner components

## CARBON FOOTPRINT EVALUATION



\*Material carbon data was not available for mushroom or green cell foams, and has been included as a reasonable range.

The data above show carbon footprint impact of our insert material options for both plane and truck transportation.

For products shipped by airplane, component weight was the most important factor in carbon impact. When considering truck transport, the material itself outweighs transportation weight in terms of carbon impact.

## CONCLUSION & FUTURE WORK

The cornstarch insert is our top recommendation followed by the mushroom design. As the rest of the kit's components were infeasible to develop prototypes for, further testing of kit components are highly recommended, and all research conducted on component alternatives will be handed off to MilliporeSigma personnel.

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### Mechanical Engineering Capstone Exposition

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