



# MICROPLASTICS IN OUR MEALS: RAISING AWARENESS OF MICROPLASTIC CONTAMINATION THROUGH USE OF PLASTIC KITCHEN UTENSILS

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## AIM

This project aims to investigate if different food preparation techniques such as chopping, stirring, and blending can introduce harmful microplastics into the food that we eat.

## BACKGROUND

Plastics are made from different polymers (e.g. polyethylene, polypropylene) and additives. Many household items (e.g. bowls, jugs and chopping boards) are made from plastic.

It is estimated that in excess of 390 million tonnes of plastic per year is produced globally (Plastics Europe 2022). Degradation of this plastic leads to the release of microplastics which are small particles or fibres 1µm-5mm in size.

Microplastics have been found as a contaminant in water, soil, air and food packaging. They are also found in food/drinks such as meat, seafood and bottled water. Microplastics get into our bodies through inhalation, drinking, and eating (Yue Li et al 2024).

Microplastics have been found in blood, urine, faeces and in many organs such as the heart, kidney, liver and lungs (Zhu L et al 2024).

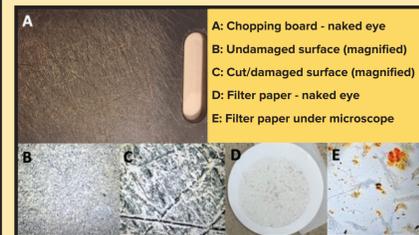
While there is insufficient evidence to directly link microplastics to toxic effects in humans, their abundance in human tissues and the environment is a cause for concern. Laboratory research on human cells and mammals such as mice links microplastics with inflammation of the digestive system, damage to lung tissue, memory impairment and impacts on fertility. Their long-term toxicity is not yet known (Yue Li et al 2024).

Microplastics can be generated through the use of plastic items such as bowls and jugs (Cole et al 2024). This project aims to investigate the generation of microplastics from use of kitchen utensils during chopping, stirring and blending and identify ways to reduce them.

## DID YOU KNOW?

Microplastics have been found in the human placenta (Ragusa et al 2021) and infant stools? Therefore, even newborn babies have been exposed to harmful microplastics in the womb.

**FIGURE 2:**  
Images of chopping board experiment



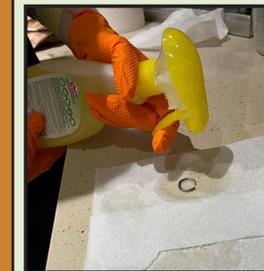
**FIGURE 3:**  
Selection of kitchen utensils used in this study



## TITANIUM ANODISING

- Titanium was identified as the most suitable alternative to plastic chopping boards
- Chopping boards for commercial kitchens should be coloured (for food safety reasons)
- Anodisation of titanium can create different coloured pieces of titanium
- Coloured titanium was found to be durable and resistant to wear

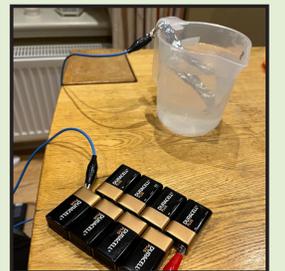
Step 1: Titanium cleaning



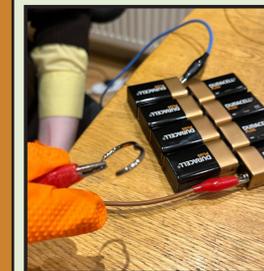
Step 2: Insertion of tin foil (cathode) into baking soda solution



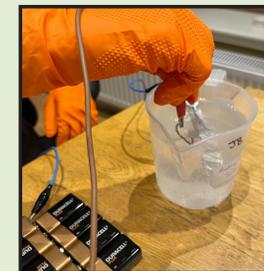
Step 3: Creating the circuit



Step 4: Connecting the titanium piece



Step 5: Insertion of titanium into the baking soda solution



Step 6: Removal of coloured titanium

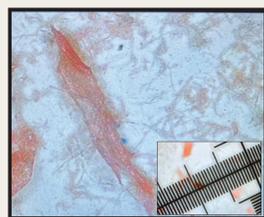


## IMAGES OF PARTICLES FROM CHOPPING BOARDS

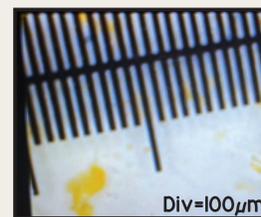
CBI - Wooden chopping board



CBI0 - Mauve chopping board



CBI2 - Yellow chopping board



CBI6 - Light green chopping board



CBI8 - Green chopping board



CBI9 - Blue chopping board



## METHODOLOGY

EACH CHOPPING BOARD/JUG/BOWL WAS ANALYSED IN TRIPLICATE AS FOLLOWS:

**1. CHOPPING:**  
Microplastics from chopping were investigated by chopping on 40 chopping boards

**2. STIRRING:**  
Microplastics from stirring were investigated by stirring water in 33 jugs

**3. BLENDING:**  
Microplastics from blending were investigated by blending water in 32 bowls

A knife was chopped down on each chopping board 50 times and washed with 500ml of water.

Each jug was half filled with water and stirred with a fork 50 times.

Each bowl was half filled with water and blended with a handheld blender for 30 seconds.

The water from each chopping board/jug/bowl was filtered and the filter paper was examined using a handheld microscope

Microplastics on the filter paper were identified by comparison with scrapings taken from each chopping board/jug/bowl

**FIGURE 1:**  
Filtration apparatus.



## RESULTS

105 plastic chopping boards, jugs, and bowls were analysed to investigate microplastic production (315 samples in total).

Stirring and blending created far less microplastics than chopping (Tables 1 and 2).

Use of coloured chopping boards made microplastics much easier to identify than those produced from white/clear plastic utensils.

This study showed that chopping boards are a significant source of harmful microplastics in the kitchen and are a major cause for concern.

Chopping on wooden boards did not create microplastics but many microscopic wood particles. No microplastics were observed when glass, steel or titanium utensils were used.

Titanium can be colour coated in a range of colours. The finish is durable and could be an alternative to plastic chopping boards for commercial use.

## CONCLUSION AND RECOMMENDATIONS

Stirring and blending appear to be less abrasive on plastic surfaces than chopping and therefore create less microplastics.

The results identify plastic chopping boards as a major source of harmful microplastics in food. This is of concern as plastic chopping boards are widely used in both domestic and commercial kitchens.

Recommendation is to switch to glass or titanium kitchen utensils in the home.

Coloured chopping boards are a requirement in commercial kitchens for hygiene and correct food segregation. Simply switching to titanium is not the solution.

Coloured coated titanium boards may be the alternative to coloured plastic boards in commercial kitchens

This study has shown that it is possible to coat titanium by anodisation in a range of colours. The finish is durable, resistant to wear and could be an alternative to plastic chopping boards for commercial use.

If the results from studies of plastic chopping boards continue to support extensive microplastic contamination of food, a ban on plastic kitchen utensils should be considered by the government.

Table 1: Microplastics From Chopping Boards

Chopping Board Material	Number of Chopping Boards	Estimated number of particles
Plastic	20	1,235 - 4,506 microplastics
Plastic	5	250 - 896 microplastics
Glass	3	No microplastics seen
Steel	3	No microplastics seen
Titanium	4	No microplastics seen
Wood	5	480 - 1,542 wood particles

Table 2: Microplastics from Stirring/Blending

Bowls & Jugs	Number	Estimated number of particles
Plastic Jugs	15	<10 microplastics
Plastic Jugs	14	11 - 34 microplastics
Glass Jug	4	No microplastics seen
Plastic bowls	29	2 - 15 microplastics
Glass bowl	3	No microplastics seen