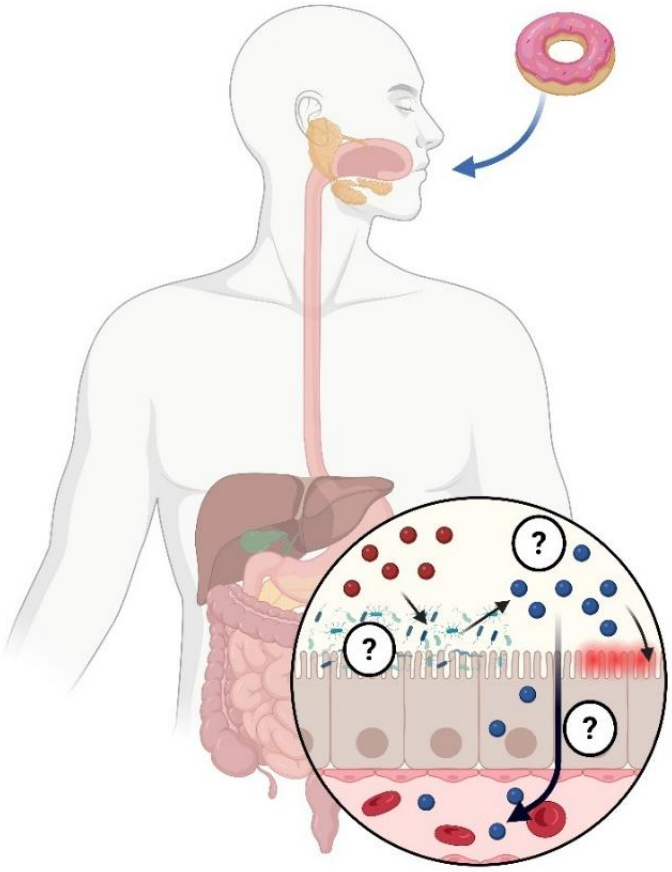
**The hidden metabolism of food additives: microbial breakdown of azo dyes in the gut**

**Artificial azo dyes** are widely used in the food and textile industries, making up the majority of colorants found in everyday products. These dyes have long been considered safe based on studies that focused mainly on their direct toxicity and potential to cause allergies. However, these safety assessments were made before we knew the vital role that **gut microbiome** plays in human health. Recent research has shown that some gut bacteria can break down azo dyes into aromatic amines, **potentially toxic** chemical byproducts. However, we still know very little about which bacteria are responsible, which mechanisms drive this degradation, and what effects the resulting substances might have on the gut or on the microbiome itself.




This project aims to answer these questions by broadening the understanding of **azo dye degradation by gut bacteria** and assessing the impact of their consumption on the host and microbiome diversity.

First, I will identify the gut bacteria capable of breaking down azo dyes through **anaerobic screening** of human and mouse faecal samples, utilizing **Nanopore sequencing** for strain identification. Next, I will use the Nanopore data, combined with untargeted mutagenesis approaches to pin-point which bacterial genes are involved in this breakdown process. I will also study the degradation products formed during this process, some of which have never been characterized in bacterial culture. Finally, I will combine **metagenomic** approaches and ***in vitro*** **model of intestinal epithelium** to examine whether these byproducts can affect the health of the gut, particularly by altering the microbiome composition or damaging the intestinal barrier.

By integrating microbiology, genomic methods and *in vitro* models the results of this project will offer a deeper understanding of how azo dyes commonly used in food interact with the gut microbiome. Additionally, this research could not only inform updated food safety regulations but also help consumers make more informed dietary choices.