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Processing of the non-starch polysaccharides of wheat for the optimization of their functional and nutritional characteristics.

Traitement de la fraction des polysaccharides non amylacés de blé pour l'optimisation de leurs caractéristiques fonctionnelles et nutritionnelles.

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Introduction

Dietary fibers (DF) are defined as carbohydrate polymers which are non-digestible in the upper intestine. DF provide many known health benefits including the reduction of coronary heart diseases and hypertension and the prevention of colon cancer, diabetes and obesity [1].

Arabinoxylans (AX) and β -glucans are non-starchy polysaccharides which represent the largest part of DF in wheat [2]. Polyphenols, known for their antioxidant capacity, interact with DF. Hence, DF can impact the polyphenol bioaccessibility during digestion and may limit their bioactivities [3].

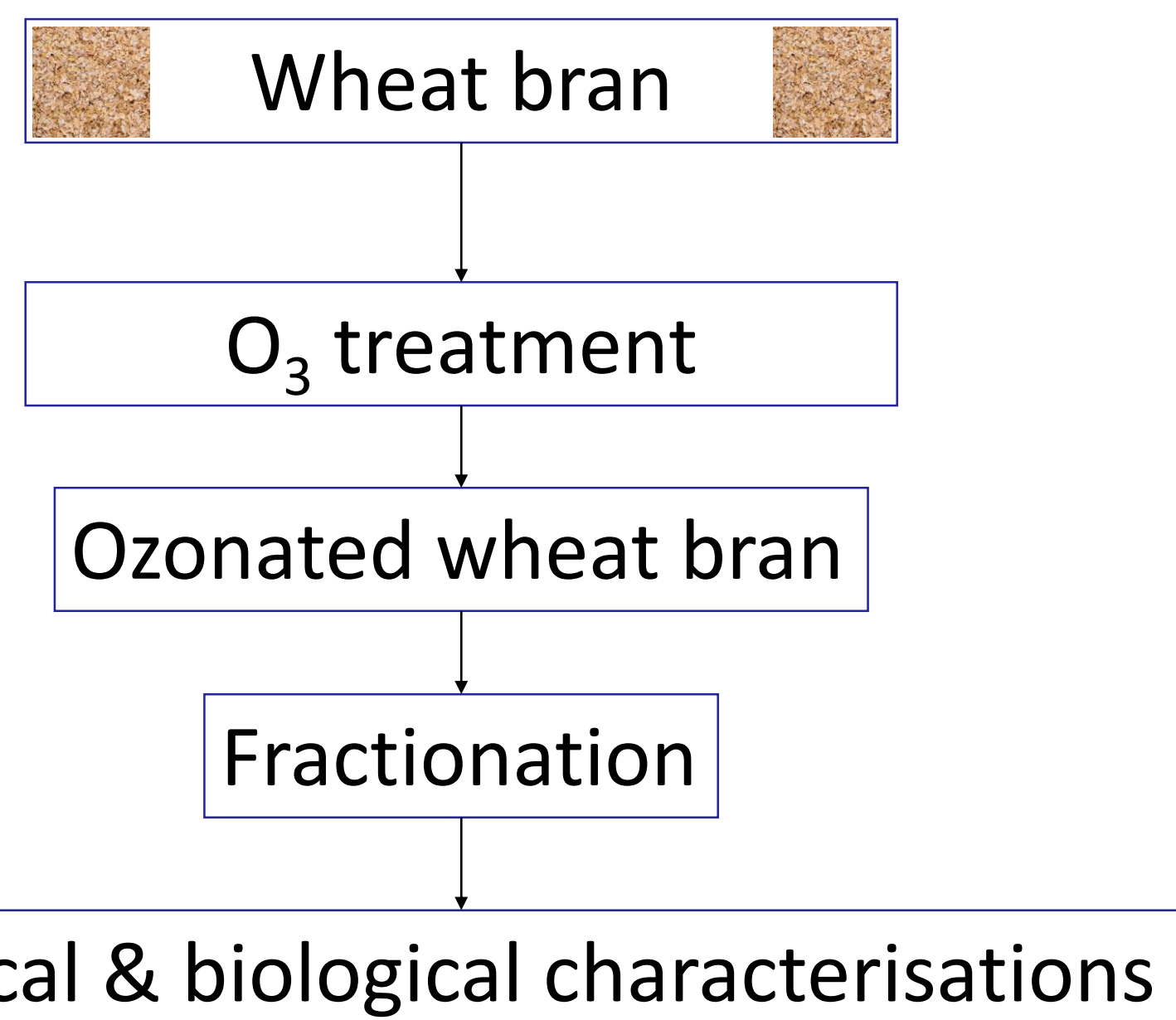
The goal of this project is to improve nutritional and health benefits of wheat non-starch polysaccharides by ozone treatment.

Ozone (O_3) is a green process mostly known for water disinfection but already used in industry for wheat grain decontamination (Oxygreen process [4]). As well as limiting the contaminants, ozone is also used to bleach and to decrease the bitterness of wheat [5]. Preliminary results on wheat bran have shown that O_3 increased soluble dietary fiber (SDF) content [Unilasalle].

Materials and Methods



Mélangeur ST200 STOLZ – Plateforme O_3



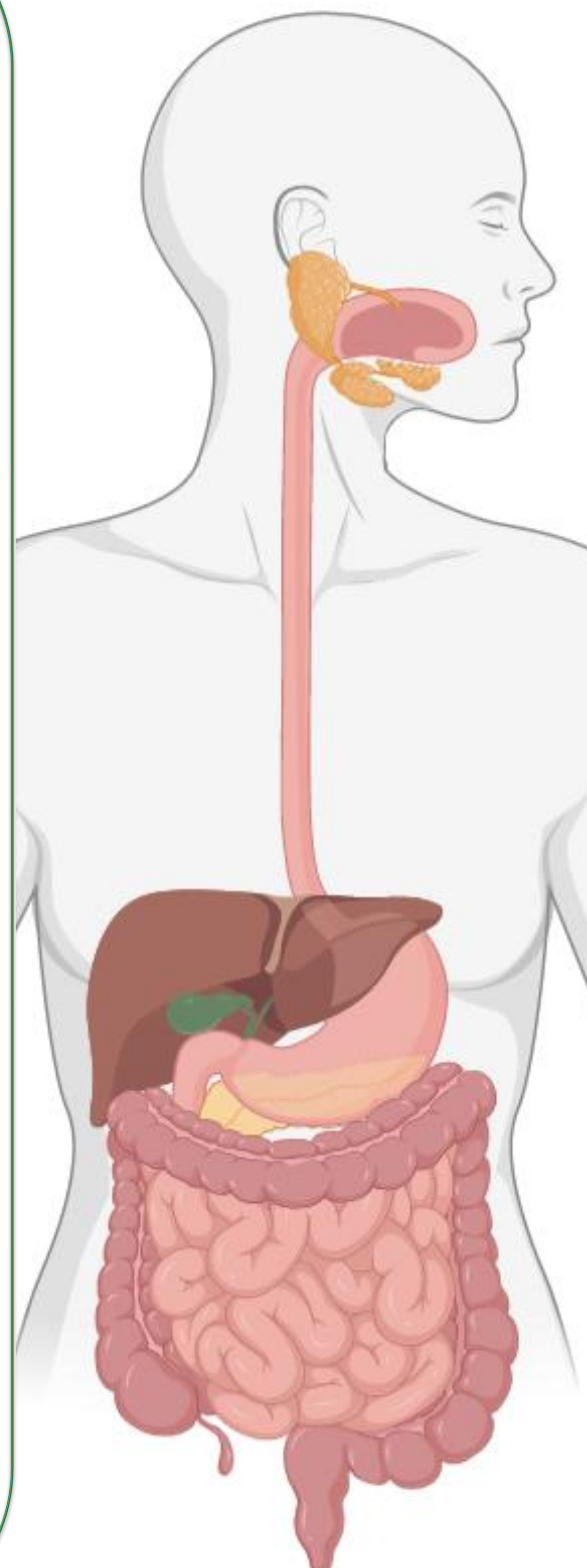
Parameters used to modify O_3 consumption.
 Aw = Variable
 $[O_3]$ = Variable
 Time = Stable
 O_3 flow rate = Stable
Ozonation Marker:
 pH

Expected Results

Improvement of the bioactive compounds' bioavailability – Changes in AX and β -glucans molecular distribution.

Impact of ozone treatment on fiber chemical composition

Parameters	Expectations
Soluble and Insoluble fiber content	<ul style="list-style-type: none"> SDF increase [6] \nearrow SCFA production, \searrow Postprandial glucose response, \nearrow Cholesterol absorption
Phenolic compounds and antioxidant (AO) characterization	<ul style="list-style-type: none"> \nearrow Bioavailabilities \nearrow AO capacity, \searrow Reactive Oxygen Species (ROS) production
Non-starch polysaccharids characterisation	<ul style="list-style-type: none"> Change in molecular distribution of AX: <ul style="list-style-type: none"> \nearrow Immunomodulatory & AO activity, \searrow Glucose response, \nearrow Satiety [7] β-glucan depolymerisation [6] \nearrow Prebiotic effect: <ul style="list-style-type: none"> \searrow carcinoma cells proliferation [8, 9]
Physical characterisation	<ul style="list-style-type: none"> \nearrow Viscosity Water holding capacity Particle size
Functional proprieties	<ul style="list-style-type: none"> \nearrow Cholesterol adsorption capacity [10] \nearrow Glucose adsorption capacity Enzyme activities



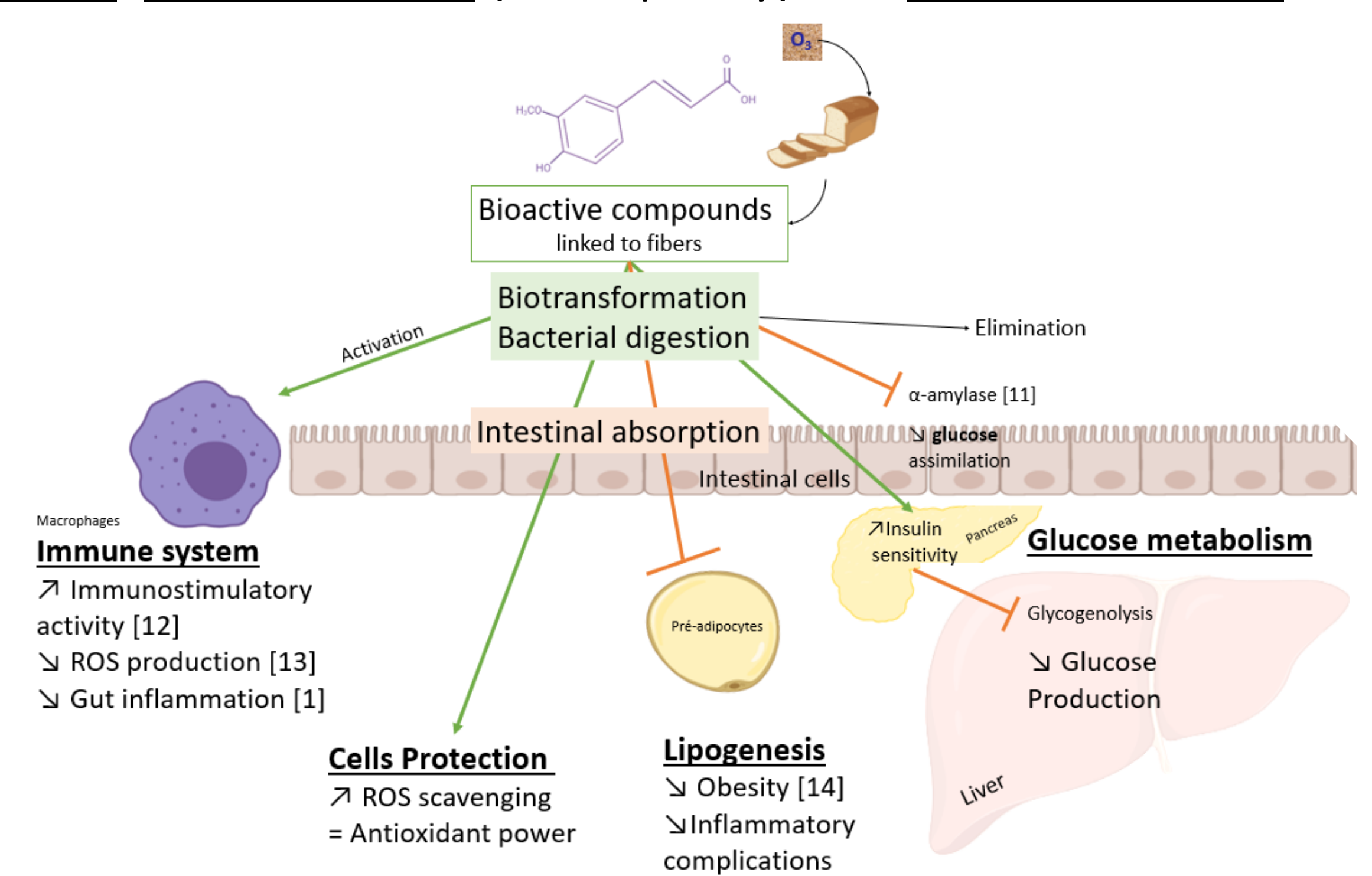
Characterisation of biological impacts

In vitro digestion characterisation (SHIME®)

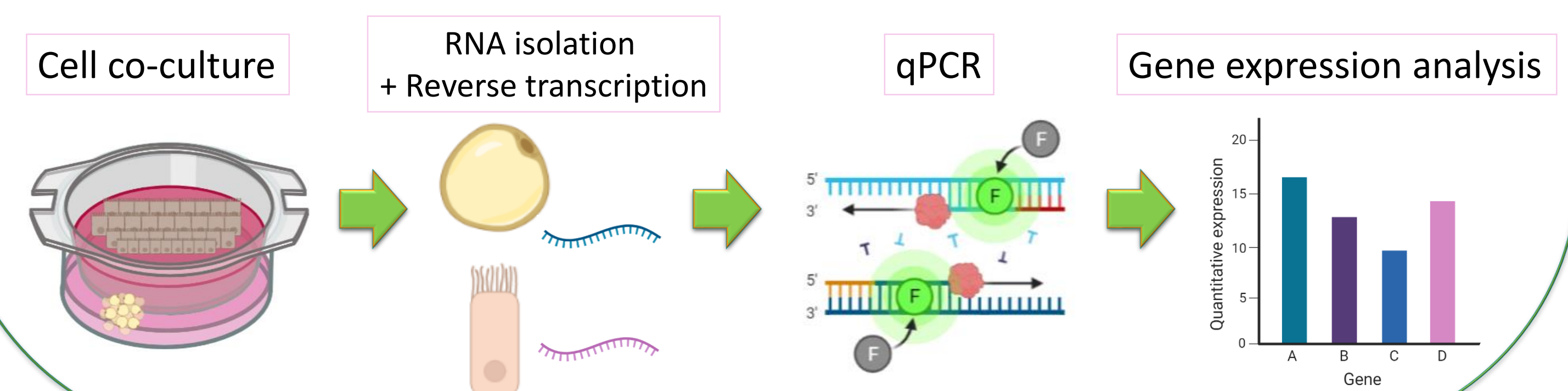
Prebiotic effects: Fibers fermentation and microbial studies.
 \nearrow Short-Chain Fatty Acids (SCFA), \searrow Inflammation.

Cell culture models

Impact of modified bioactive compounds on glucose absorption, lipogenesis, cell protection (AO capacity), and immune system.



Genetic analysis of cell regulation and signalization mechanisms



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