

## Sourdough

(Marco Gobetti)



Sourdough

### Sourdough

Sourdough is a complex biological ecosystem, where naturally occurring lactic acid bacteria and yeasts dominate during *back slopping* (*refreshment*; see below), coexist in a defined and stable ratio, and lead to dough acidification and leavening (the process of the dough *rising*, becoming larger in volume and lighter, because of the development of bubbles of carbon dioxide in it).

### Where is it predominantly made and used?

Sourdough is one of the oldest examples of natural starter, which promotes the fermentation/leavening of salted (e.g., breads, bread substitutes, pizza, tortillas, snacks) and sweet (e.g., Panettone, brioches, rolls, croissants) baked goods. Sourdough is used worldwide, according to specific protocols, which come from country and region cultural heritages. Sourdough baked goods are made at home, and at artisanal and industrial plants. During the last decades, the use of sourdough markedly increased because of the exceptional sensory and nutritional properties compared with other leavening agents (e.g., chemical leavening and baker's yeasts; <https://www.britannica.com/topic/leavening-agent>; <https://www.warmoven.in/blog/know-your-leavening-agents.html>).

### What are its ingredients?

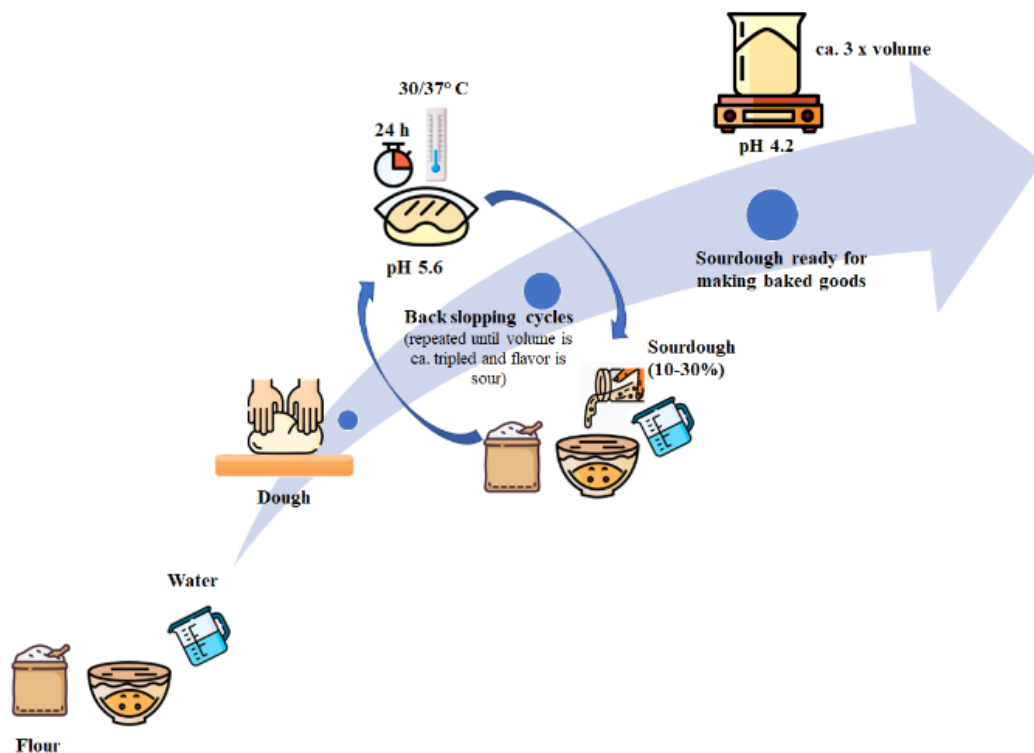
The ingredients for making the sourdough are the simplest you may imagine: flour and tap water. The flour may be from cereals (e.g., wheat, rye, barley), pseudo-cereals (e.g., amaranth, buckwheat, quinoa), legumes (e.g., lentils, chickpea, beans) or mixture of them. Other ingredients eventually

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to be used are salt and sweet products (e.g., honey, grape must, pear juice; these latter also increase the number of yeasts).

### How do we make it?

At home, and at artisanal and industrial plants the procedure for making the sourdough is the same. It starts by mixing flour and water until a firm dough is obtained, where all the added water is absorbed by flour. After the dough is made, it is left at 30/37°C or in the warmest place of the house for one day. Then, part of this dough is taken and added (ca. 10-30%) to fresh flour and tap water for making a new dough similar to the previous one. This operation is technically named *back slopping* or *refreshment*. The new dough is stored as the previous one, and from day to day the operation of back slopping is repeated until an increase of the dough volume (ca. tripled) is observed and a sour flavor is tasted. Now, the sourdough is ready for making leavened baked goods.



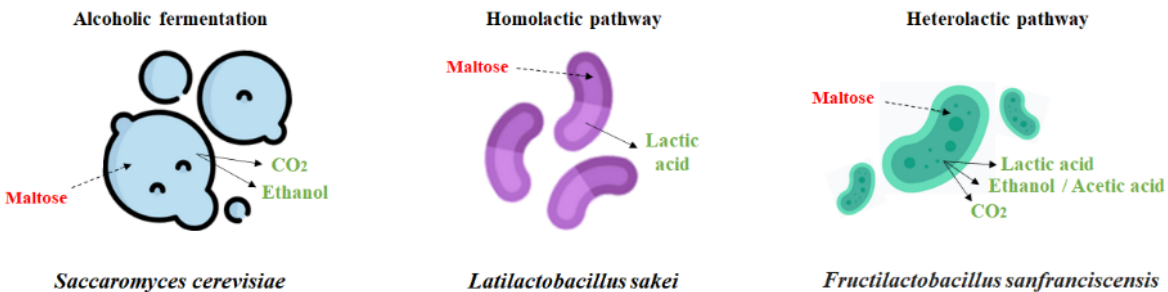
Procedure for making the sourdough

### The microbiology of the process.

As already stated, the microbes of the sourdough – lactic acid bacteria and yeasts – occur naturally, without any deliberate addition, and come from the environment and equipment of the bakery (the so-called house microbiota), and from the flour, mostly those living within the plant tissue throughout the growing (phenological) stages. The procedure for making sourdough inherently favor the dominance of lactic acid bacteria and yeasts, which are usually present in a stable ratio of 10 or 100:1, and which cooperate and are responsible for increasing the dough volume and development of the sour flavor. Each of the two microbial players do a precise job. Yeasts are responsible for the alcoholic fermentation, which produces ethanol (which is driven off during

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baking) and carbon dioxide (CO<sub>2</sub>), which is responsible for dough leavening. Lactic acid bacteria carry out the lactic acid fermentation, which is the responsible for acidification of the dough and for the acidic/sour flavor. During dough fermentation, lactic acid bacteria are also responsible for several other metabolic activities, which create the beneficial properties of the sourdough.



The job of the microbial players

### Variations, regional variations.

Because of the routes of entry/contamination by lactic acid bacteria and yeasts, two natural sourdoughs with the same microbial composition have never been found, leading to the consequence that almost all leavened baked goods have different sensory and nutritional attributes. This is the secret of the sourdough, which relies on its extreme diversity responsible for thousands and thousands different products having regional variations. In Italy, where the tradition is markedly tied to the use of sourdough, approximately 200 different types of breads are surveyed, with two of them having the Protected Denomination of Origin (PDO). However, the growing popularity of sourdough has led to the availability of commercial starter cultures which both reduce the time needed and provide some uniformity.

### Beneficial properties.

The exceptional sensory characteristics of sourdough have been extensively demonstrated, so most research and industrial efforts are currently focusing on nutritional benefits. Most of these benefits derive from the metabolic activities of the lactic acid bacteria because of their capability to acidify, degrade proteins and oligopeptides, and synthesize bioactive compounds. Compared with baker`s yeast bread, sourdough bread (i) has a lower glycemic index; (ii) is more digestible; (iii) favors a higher mineral absorption; (iii) has a higher fiber content; (iv) contains bioactive peptides and amino acid derivatives; and (v) has a beneficial influence on the metabolism of the intestinal microbes (e.g. synthesis of short chain fatty acids).

### Cultural roots and importance.

Egypt is the motherland of sourdough bread. In the Egyptian dialect, the pronunciation of ferment and bread uses the same Arabic term *aish*, which means life. The Catholic religion endows leavening and bread with meanings and metaphors; one of the most representative is “food of eternal life”. As the centuries passed, news about sourdough recurred again and again until the present day. Given the importance of the link between sourdough, cultural heritage and dietary habit, the first International Sourdough Library, which collects and stores traditional

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sourdoughs worldwide, including their recipes, pure microbial cultures, ingredients and history, was recently established in Belgium (St. Vith).



The first International Sourdough Library (St. Vith, Belgium).