

# MICROBIOLOGY FOR BAKERS

Baking is applied microbiology. That may seem like an odd way to look at it, but it is only a modest exaggeration. All yeast breads and sourdoughs owe their shapes and textures to the actions of microbes. (That is not true for unleavened breads or those made using chemical leaveners, such as baking powder.) And every kind of bread, leavened or not, is susceptible to spoilage or contamination by molds, bacteria, viruses, and other kinds of germs. So everyone who is serious about baking should understand the basic biology of the minuscule organisms that play such fundamental roles in the creation and ruination of our breads.

We begin this chapter with the fungi: the yeasts present at the beginning of most breads and the molds that put an end to the useful life of too many loaves. In sourdoughs, yeast thrive alongside various kinds of beneficial bacteria in a productive partnership, and the two grow in similar ways, which we discuss next.

Of course, bacteria are not always welcome inhabitants of our food. No discussion of microbiology in the kitchen would be complete without a primer on foodborne illness, the sources of contamination that cause it, and practical ways to keep the food you prepare safe to eat.

The good news is that bread is about the safest food around. Spoiled bread is unpleasant to eat, but it rarely sickens. When people do fall ill from eating baked goods, it is almost always due either to unsafe handling or, more frequently, to an

insufficiently cooked filling, glaze, or coating added to the bread after baking.

Compared with restaurant chefs, bakers have it easy when it comes to food safety. Chefs work every day with fresh meats and vegetables, and they serve dishes that include raw or only lightly cooked ingredients. So they must worry about, and protect against, the full spectrum of microbial contaminants: not just bacteria and viruses but also protists, parasitic worms, and prions. Even small mistakes can lead to an outbreak of foodborne illness. And even when food is handled properly, outbreaks occasionally occur anyway because the food arrives from the supplier already tainted. Because the risks are so great, chefs must follow a long list of rules set out by a national authority—in the United States, it's the Food Code published by the Food and

## Disclaimer

This book cannot and does not substitute for legal advice about food regulations in the United States as a whole or in any U.S. legal jurisdiction. Nor can we guarantee that following the information presented here will prevent foodborne illness. Unfortunately, the many variables associated with food contamination make eliminating all risk and preventing all infections virtually impossible. We cannot accept responsibility for either health or legal problems that may result from following the advice presented here. If you operate a commercial establishment and serve food to the public, consult the rules and health regulations in your area.

For more on chemical leaveners, see chapter 9 on Leaveners, page 2292.

Leavened bread relies on the action of yeasts (*left and right*), and too often it ends in spoilage by molds (*previous two pages*). These images, made on the electron microscope at our lab, show individual yeast cells at about 17,000 times actual size (*left*) and a granule of instant dry yeast containing thousands of yeast cells (*right*, at a magnification of 275x). After budding, yeasts have “outies”—circular scars where their offspring detached (*left*). For more on how yeasts reproduce, see [page 186](#).

