



bread**micro-community**guide



Bread Micro-Community Guide

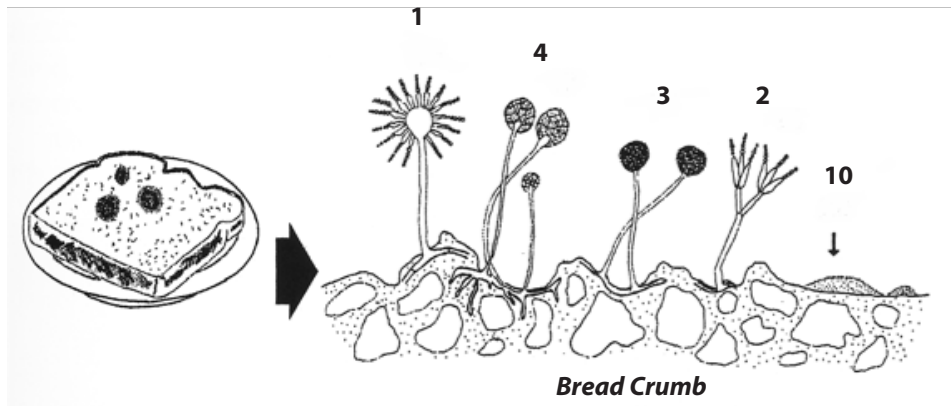


Figure 1 Bread Micromunity.

Bread is a mixture of flour and water that is baked. Flour is a ground powder made from cereal grains (usually wheat and corn), seeds, or roots. The caloric content of flour is mostly carbohydrates (80%), proteins (15%), and fats (5%). Combinations of a wide variety of flours give bread an almost unlimited set of sizes and textures. Bread may be leavened (aerated) using either chemical or microbial processes – both add carbon dioxide to aerate the dough. Microbe-based leavening adds carbon dioxide gas to the dough – creating increased texture and volume, making the dough more chewable. Yeasts (particularly *Saccharomyces cerevesiae*) are used to leaven bread dough. Yeast cells metabolize (an aerobic process called fermentation) dough carbohydrates to make alcohol and carbon dioxide gas. These yeast cells are killed during baking, and the alcohol is volatilized.

When bread comes out of the oven it is usually considered sterile – without any life forms. Its dry surface usually prevents microbes from gaining an entry into the softer, moister core. Baked breads contain moisture, and moisture is critical for microbes to grow. If breads are cut or placed into a closed container (e.g. plastic bag) it will “moisture equilibrate” and allow floating microbe spores to settle and germinate. As a consequence, bread will grow contaminated (usually with molds) over time. Other microbes (such as bacteria) can find the nutrient sources of bread appetizing! One microbe, *Serratia marscecens*, has a red-colored pigment giving bread or bread-contaminated surfaces a red color (see Figure 2).

Expect to See ...

Use the Guide to Bread Microbes

MOLDS (Fungi)

- 1 *Aspergillus spp.*
- 2 *Penicillium spp.*
- 3 *Mucor spp.*
- 4 *Rhizopus spp.*
- 5 *Fusarium spp.*

BACTERIA (Monerans)

- 6 Mixed bacteria types
- 7 *Bacillus spp.*
- 8 *Serratia marcescens*
- 9 *Streptomyces spp.*


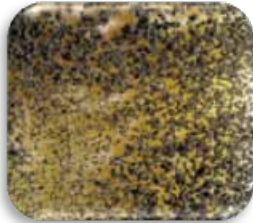





YEASTS








- 10 *Saccharomyces cerevesiae*



Figure 2 Bacteria growth (*Serratia marcescens*) on a commercial bread line (support tray).

Bread Microbe Identification Guide

QUICK ID	MICROBE	TSA COLONY CHARACTERISTICS	RB COLONY CHARACTERISTICS
Amber – rough	<p><i>Streptomyces spp.</i> [BACTERIA]</p> <p>TSA ></p> <ul style="list-style-type: none"> • Size: 2– 5mm • Circular to irregular; cauliflower shape • Raised, rough; wrinkled 		
Black – woolly	<p><i>Aspergillus niger</i> [MOLD]</p> <p>TSA ></p> <ul style="list-style-type: none"> • Size: 4+ cm • Fast-growing; woolly or carpet-like • White with black reproductive bodies; forms a carpet <p>RB ></p> <ul style="list-style-type: none"> • Size: 4+ cm • Fast-growing; woolly or carpet-like • White with black reproductive bodies; forms a carpet 		
Blue	<p><i>Penicillium italicum</i> [MOLD]</p> <p>TSA ></p> <ul style="list-style-type: none"> • Size: 4+ cm • Fast-growing; woolly or carpet-like • White with blue reproductive bodies; forms a carpet <p>RB ></p> <ul style="list-style-type: none"> • Size: 4+ cm • Fast-growing; woolly or carpet-like • White with blue reproductive bodies; forms a carpet 		
Cinnamon – suede	<p><i>Aspergillus terreus</i> [MOLD]</p> <p>TSA ></p> <ul style="list-style-type: none"> • Size: 4+ cm • Fast-growing; suede-like; forms a carpet • White with tan or cinnamon reproductive bodies <p>RB ></p> <ul style="list-style-type: none"> • Size: 4+ cm • Fast-growing; suede-like; forms a carpet 		

QUICK ID	MICROBE	TSA COLONY CHARACTERISTICS	RB COLONY CHARACTERISTICS
<p>Cream</p>	<p><i>Saccharomyces cerevesiae</i> [YEAST]</p> <p>TSA ></p> <ul style="list-style-type: none"> • Size: 0.1– 0.5mm • Circular, small to pin-point • Glossy to buttery 		
<p>Green – felt</p>	<p><i>Aspergillus fumigatus</i> [MOLD]</p> <p>TSA ></p> <p>RB ></p> <ul style="list-style-type: none"> • Size: 4+ cm • Fast-growing; felt-like; forms a carpet • White with green to blue-green reproductive bodies 		
<p>Green – woolly / felt</p>	<p><i>Penicillium chrysogenum</i> [MOLD]</p> <p>TSA ></p> <p>RB ></p> <ul style="list-style-type: none"> • Size: 4+ cm • Slow-growing; felt-like; velvet to woolly • White with green to blue-green to yellow-green reproductive bodies 		
<p>Gray to Green – woolly</p>	<p><i>Mucor spp.</i> [MOLD]</p> <p>TSA ></p> <p>RB ></p> <ul style="list-style-type: none"> • Size: 3-9+ cm • Fast-growing; woolly • Initially white, then white-yellow to gray or green showing gray to dark green lollipop-shaped reproductive bodies on stalks 		
<p>Maroon to Pink – convex</p>	<p><i>Serratia marcescens</i> [BACTERIA]</p> <p>TSA ></p> <p>RB ></p> <ul style="list-style-type: none"> • Size: 0.5– 1mm • Circular, glossy • Maroon to orange (with transparent margin) • Convex 		

QUICK ID	MICROBE	TSA COLONY CHARACTERISTICS	RB COLONY CHARACTERISTICS
Pink – flat	<p><i>Bacillus spp.</i> [BACTERIA]</p> <p>RB ></p> <ul style="list-style-type: none"> • Size: 2– 4mm • Circular to irregular • Flat to raised 		
White with pink center – woolly	<p><i>Fusarium spp.</i> [MOLD]</p> <p>TSA ></p> <p>RB ></p> <ul style="list-style-type: none"> • Size: 4+ cm • Fast-growing; woolly • Initially white, then pink or yellow colored area in center 		
Pink – spreading	<p><i>Pseudomonas spp.</i> [BACTERIA]</p> <p>RB ></p> <ul style="list-style-type: none"> • Size: 2– 4mm • Circular, glossy • Convex to spreading 		
Pink – dry	<p><i>Sacchromyces cerevesiae</i> [YEAST]</p> <p>RB ></p> <ul style="list-style-type: none"> • Size: 0.1 – 0.5mm • Small, convex, dry • White to pink 		
Transparent – flat	<p><i>Bacillus spp.</i> [YEAST]</p> <p>TSA ></p> <ul style="list-style-type: none"> • Size: 2– 4mm • Circular to irregular • Flat, rough 		

QUICK ID	MICROBE	TSA COLONY CHARACTERISTICS	RB COLONY CHARACTERISTICS
Translucent– dry / rough	<p><i>Bacillus spp.</i> [BACTERIA]</p> <p>TSA ></p> <ul style="list-style-type: none"> • Size: 2– 5mm • Circular, rough, wrinkled • Flat to raised 		
Tan– dry / rough	<p><i>Streptomyces spp.</i> [BACTERIA]</p> <p>TSA ></p> <ul style="list-style-type: none"> • Size: 2– 5mm • Circular to irregular; cauliflower shape • Raised, rough; wrinkled 		
White / Milky – moist	<p><i>Sacchromyces cerevesiae</i> [YEAST]</p> <p>TSA ></p> <ul style="list-style-type: none"> • Size: 1– 2mm • Translucent (milky); dull surface <p>RB ></p> <ul style="list-style-type: none"> • Size: 1– 2mm • Translucent to pinkish 		
White – hairy	<p><i>Streptomyces spp.</i> [BACTERIA]</p> <p>RB ></p> <ul style="list-style-type: none"> • Size: 0.5– 1mm • Circular, with pink center • Raised; filamentous 		

SOURCE: Paddle images Luis Camus, MD

Important Information:

VIEWING:

Seal vials with transparent tape. **DO NOT OPEN**; view colonies through vials.

DISPOSAL:

Twist to remove paddle from vial. Fill vial to the 40mL fill-line with a 1:9 part dilution of household bleach (5.25% sodium hypochlorite). Replace paddle in vial. All a 15-minute contact time. Remove paddle. Discard bleach solution. Replace paddle in vial and dispose. Alternatively loosen cap and microwave for 30 seconds (High power), then dispose.