The first step: MILK
- You can’t make cheese without milk, and you can’t get milk without cows.
- Milk straight from the cow contains diverse species of bacteria.
- Skin on the cow’s teats also contains microbes.
- Pasteurization heats the milk to reduce the number of viable pathogens.

The second step: FERMENTATION
- Lactic acid bacteria (LAB) are added to the milk.
- LAB break down the primary sugar in milk – lactose – into lactic acid.
- In the past, cheese makers relied on LAB already present in the milk for fermentation but now, industrial starter cultures are added.

Did you know …
The holes in Swiss cheese come from Propionibacterium freundreichii?
As P. freundreichii ferments the lactic acid, it produces CO₂ which gets trapped and forms bubbles.

The third step: CURD COAGULATION
- The lactic acid produced by the LAB acidifies the milk.
- Acidification of the milk protein casein causes milk to separate into solid curds and liquid whey – a process called coagulation.
- Coagulation is also helped by the addition of rennet, which comes from the intestines of calves to help them digest milk.
- The active rennet enzyme chymosin degrades (or chews up) casein.

The fourth step: RIPENING
- The curd is physically cut to continue the release of whey, or moisture, from the cheese.
- Curds are separated from the whey and knitted and pressed together to form a large entity.
- Salt can be added to the curd which inhibits the growth of the starter culture.
- Secondary microflora of diverse species of bacteria and fungi start to grow – their unique enzymatic activities will contribute color, flavor, and texture to the ripening cheese.

The final step: AGING
- Microbes grow on the inside and outside of cheese.
  - Mold growth by Penicillium roqueforti gives the veins in blue cheese.
  - The orange-tinted bacterium Brevibacterium linens gives color and aroma to rinds of Limburger.

The Microbiology of Cheese

Milk Curds and Whey
Lactic Acid Bacteria

the “microbes after hours” series
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