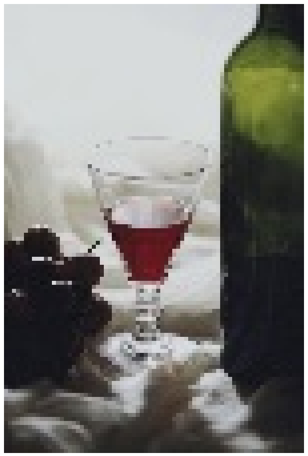
When grapes destined to become white or blush wines are ripe, they are picked and immediately processed in the winepress. Here, they are gently squeezed for about 2 hours and the juice is pumped (or fed by gravity) into holding tanks. In the tanks, the juice is chilled, allowing sediment from the fruit to drop to the bottom. After this takes place, clean juice is racked away from the sediment and is now ready to be inoculated with yeast.
Fermentation takes place slowly over a period of a few weeks, at around 55-60 F. Some white wines, such as Chardonnay, are fermented in oak barrels to give the wine oak flavours. When fermentation is complete, the wine is chilled for clarification and then filtered prior to bottling. Oak fermented wines can also go through a secondary fermentation called malolactic fermentation, or simply "ml" for short. During this fermentation, malic acid is converted into lactic acid, changing the texture of the wine from crisp and light to a creamier, buttery feel.


COOH
HOCH
HCH
COOH
L(−)- malic acid
malate carboxylyase
COOH
HOCH + CO2
CH3
L(+)- lactic acid

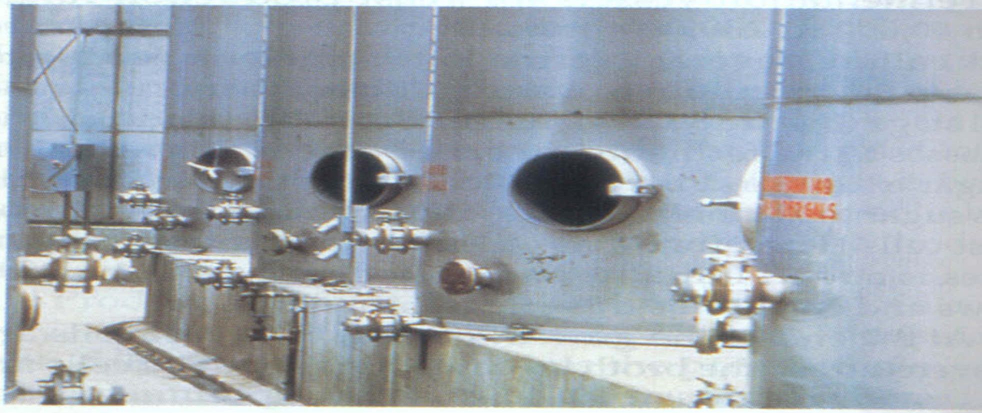


When picked, red wine grapes are initially processed in the crusher - destemmer. This machine separates the grapes from the stems and gently crushes them into a pulpy material referred to as "must." The must is then transferred into tanks or fermenting bins where it will "cold soak" for a few days, gaining colour and fruit flavours. After a few days the must is inoculated with yeast and fermentation begins. Once fermentation has started, CO2 and alcohol are produced. The CO2 pushes the skins to the top of the tank or bin, away from the juice, forming what is called the "cap." Skin contact is critical at this stage because the juice will pick up colour and tannins from the skins. Therefore, the cap must be kept in contact with the juice as much as possible.

This can be accomplished in a couple of different ways. The first, called "punching down," is the simple process of manually pushing the cap back down into the juice. In the days of old, this was accomplished by stomping them with your feet. Nowadays, some use a stainless steel Birkenstock footprint with a long rod attached to it (talk about modern technology!). The second is used for larger quantities of wine and is called "pumping over." This process uses a pump attached to the bottom of a tank. The juice is then pumped over the top of the cap and circulated this way for about 15 - 20 minutes. Whether you're punching down or pumping over, you still must do this twice a day (sometimes more!), until fermentation is complete.

The Christian Brothers Winery

(a)



The Christian Brothers Winery

(b)

The Christian Brothers Winery

(c)

Figure 30.21 Commercial wine making in California (USA). (a) Equipment for transporting grapes to the winery for crushing. (b) Large tanks where the main wine fermentation takes place. (c) Barrels where the aging process takes place.

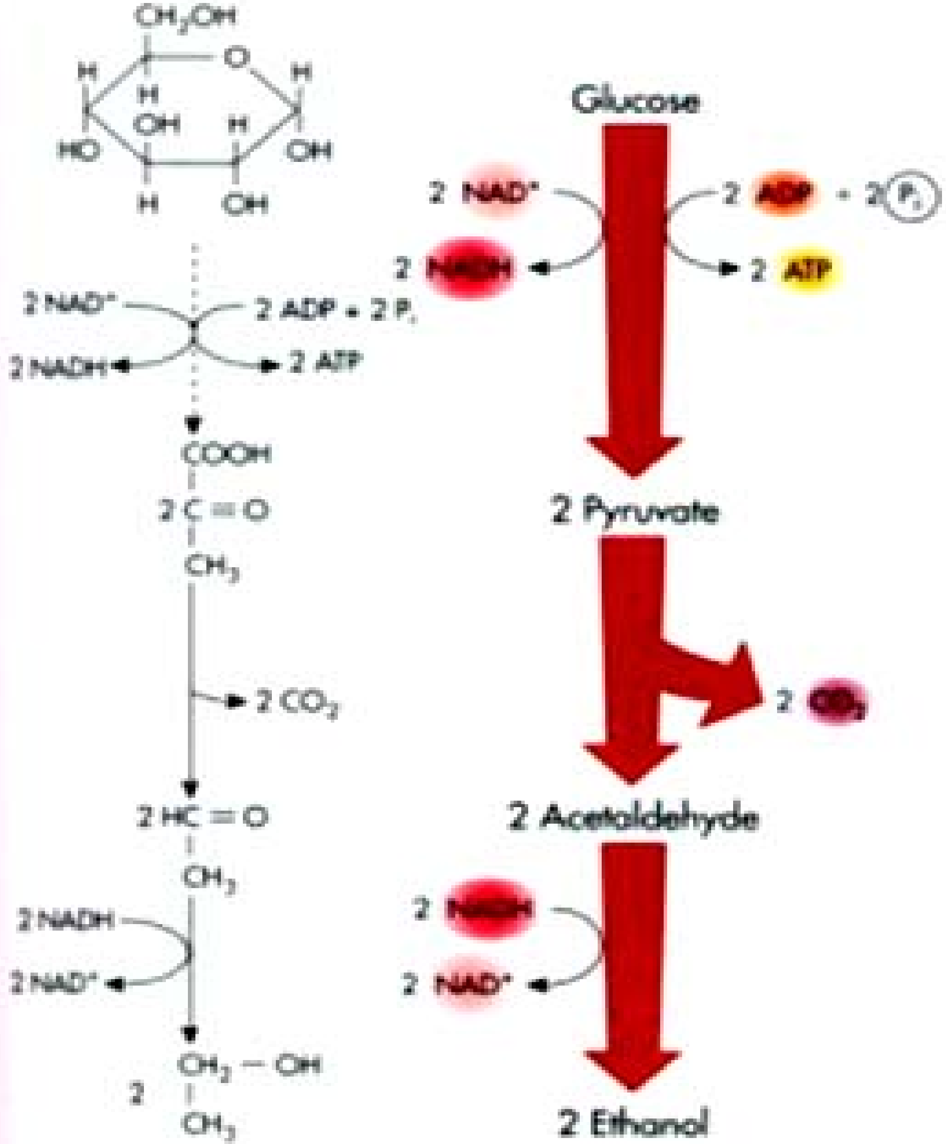


Fig. 4-15 Ethanolic Fermentation Pathway. The ethanolic fermentation pathway results in the formation of ethanol and carbon dioxide. The fermentation of carbohydrates to these end products forms the basis of the beer, wine, and spirits industries.

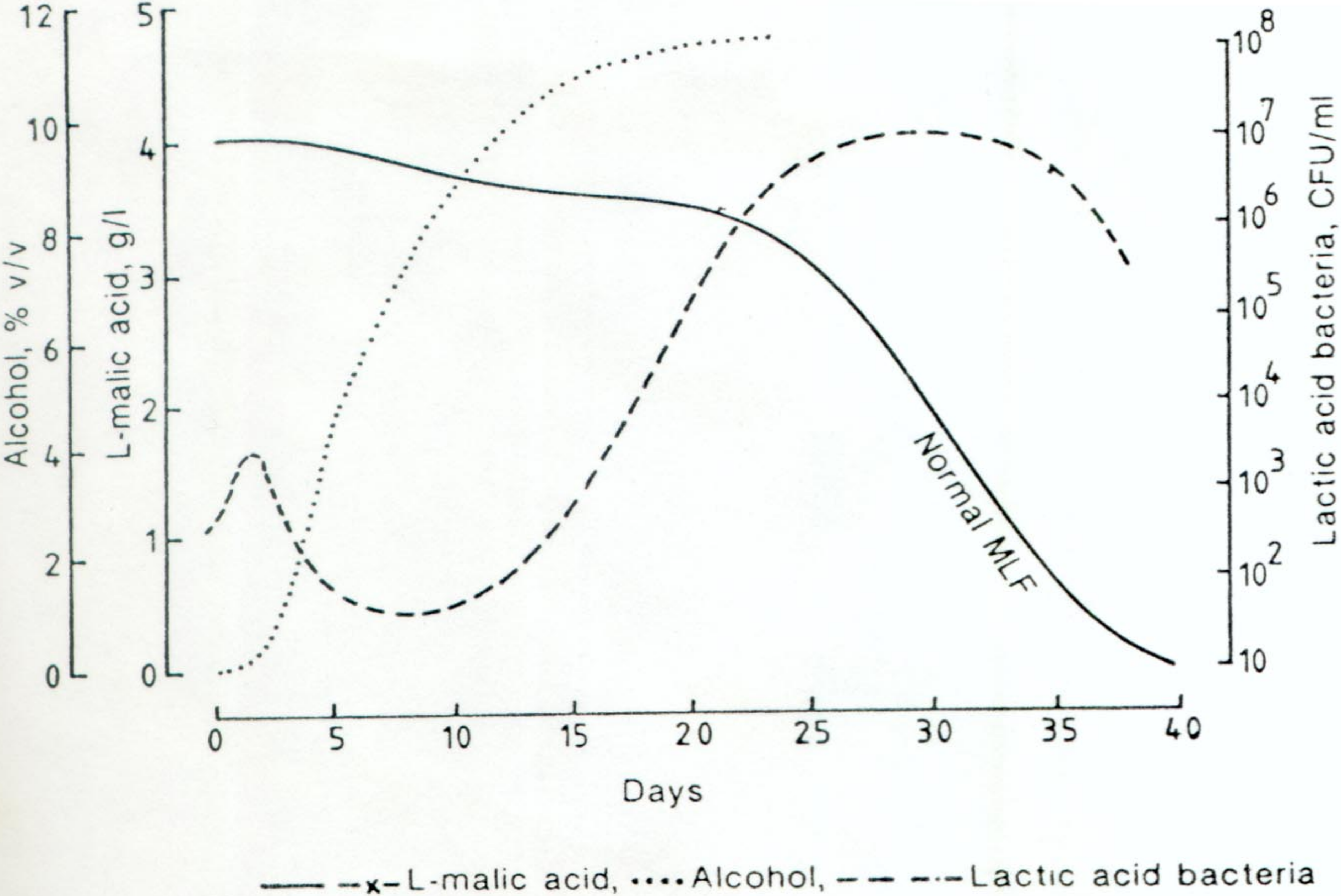
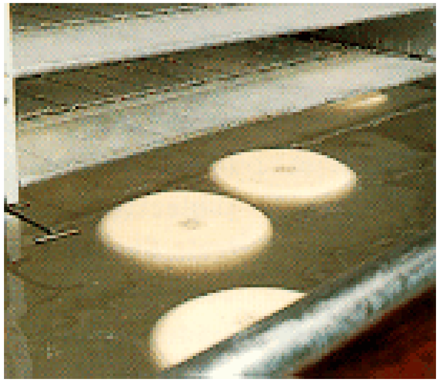
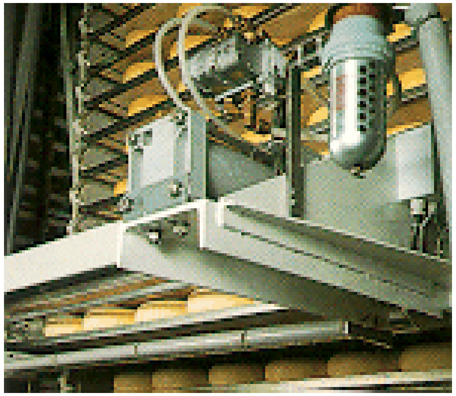


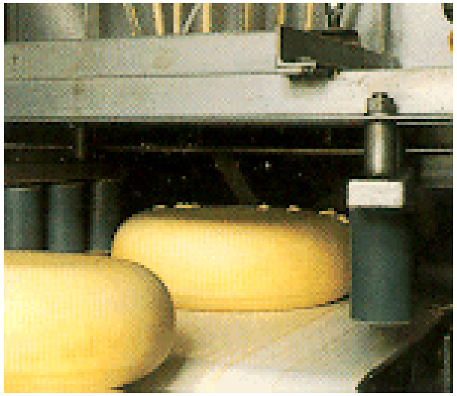
Fig. 1–5. Development of native LAB during alcoholic fermentation of must and wine. [modified from Prahl and Nielsen (1995).]

El queso


6
6
STREMSEL
6
6







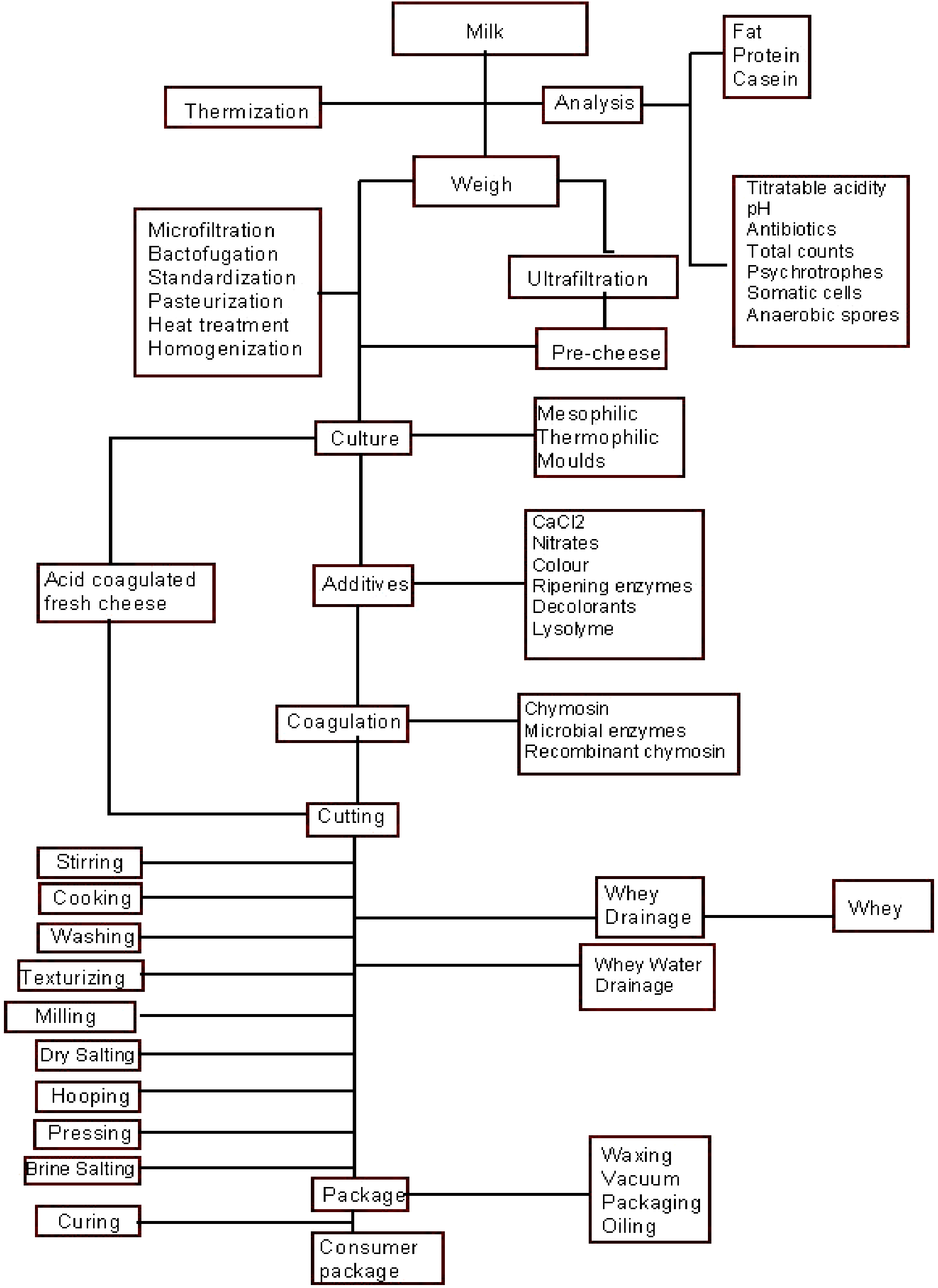


Figure 1.1 Flowchart of Cheese Making Processes. (After Irvine and Hill, 1985, Cheese Technology, In, Comprehensive Biotechnology, Cooney & Humphrey Editors, Pergamon Press, N.Y.)

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Table 15-16 Classification of Some Cheeses

Cheese	Microorganisms
Soft, Unripened Cottage	*Lactococcus lactis* *Leuconostoc citrovorum*
Cream	*Streptococcus cremoris*
Neufchatel	*Streptococcus diacetilactis*
Soft, Ripened, 1-5 Months Brie	*Lactococcus lactis* *Penicillium candidium* *Streptococcus cremoris* *Penicillium camemberti* *Brevibacterium linens*
Camembert	*Lactococcus lactis* *Streptococcus cremoris* *Penicillium candidium* *Penicillium camembert)*
Limburger	*Lactococcus lactis* *Brevibacterium linens* *Streptococcus cremoris*

Semisoft, Ripened, 1-12 Months

Blue	*Lactococcus lactis* *Penicillium roqueforti* *Streptococcus cremoris* *Penicillium glaucum*
Brick	*Lactococcus lactis* *Brevibacterium linens* *Streptococcus cremoris*
Gorgonzola	*Lactococcus lactis* *Penicillium roqueforti* *Streptococcus cremoris* *Penicillium glaucum*
Monterey	*Lactococcus lactis* *Streptococcus cremoris*
Muenster	*Lactococcus lactis* *Brevibacterium linens* *Streptococcus cremoris*
Roquefort	*Lactococcus lactis* *Penicillium roqueforti* *Streptococcus cremoris* *Penicillium glaucum*

Hard, Ripened, 3-12 Months

Cheddar	*Lactococcus lactis* *Lactobacillus casei* *Streptococcus cremoris* *Streptococcus durans*
Colby	*Lactococcus lactis* *Lactobacillus cased* *Streptococcus cremoris* *Streptococcus durans*
Edam	*Lactococcus lactis,* *Streptococcus cremoris*
Gouda	*Lactococcus lactis* *Streptococcus cremoris*
Gruyere	*Lactococcus lactis* *Lactobacillus helveticus* *Streptococcus thermophilus* *Propionibacterium sheranii* or *Lactobacillus bulgaricus and* *Propionibacterium freudenreichii*
Swiss	*Lactococcus lactis* *Lactobacillus helveticus* *Propionibacterium shermanii or* *Lactobacillus bulgaricus* and *Propionibacterium' freudenreichii'* *Streptococcus thermophilus*

Very Hard, Ripened, 12-16 Months

Parmesan	*Lactococcus lactis* *Lactobacillus bulgaricus* *Streptococcus cremoris* *Streptococcus thermophilus*
Romano	*Lactobacillus bulgaricus* *Streptococcus thermophilus*

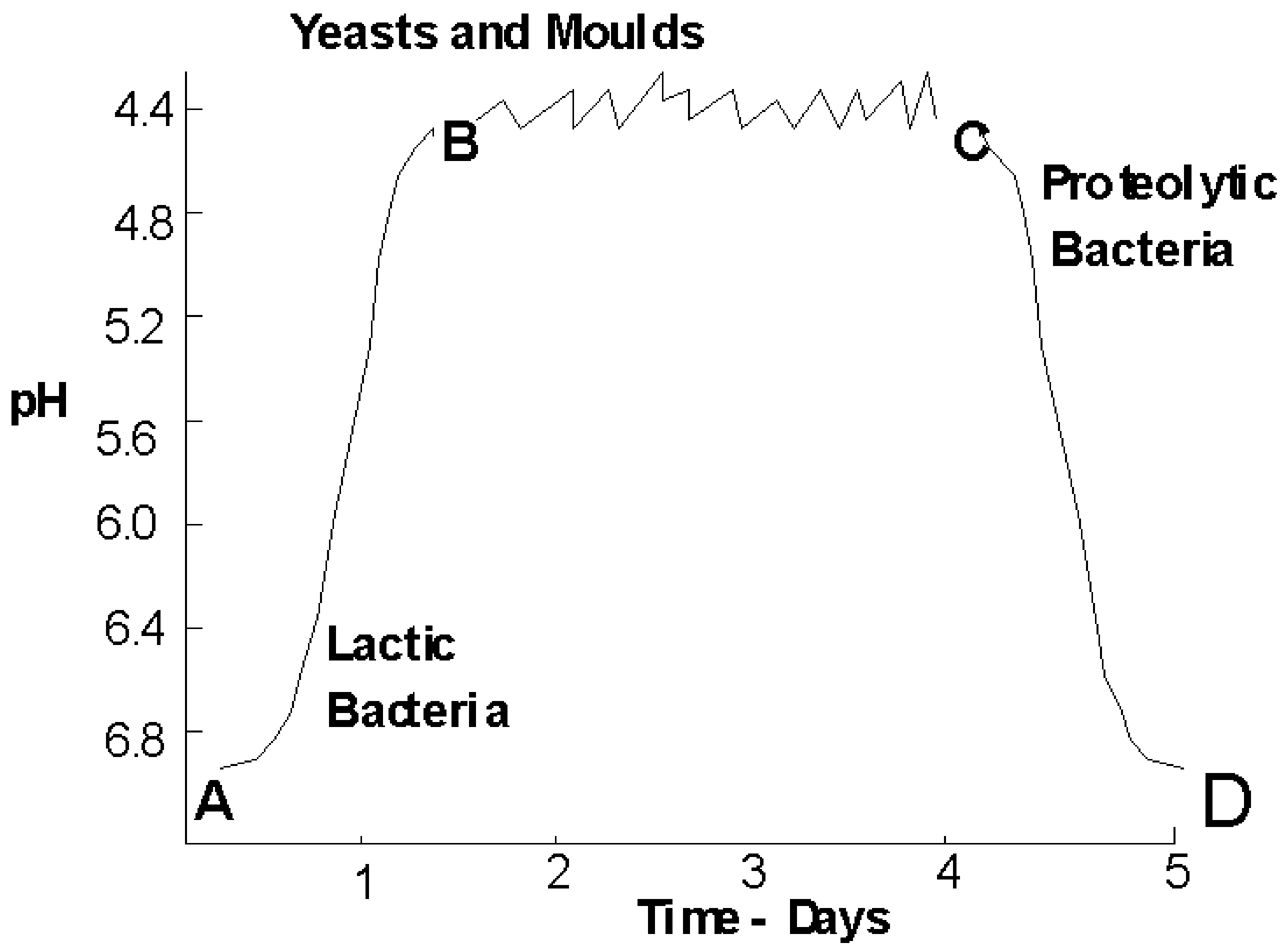
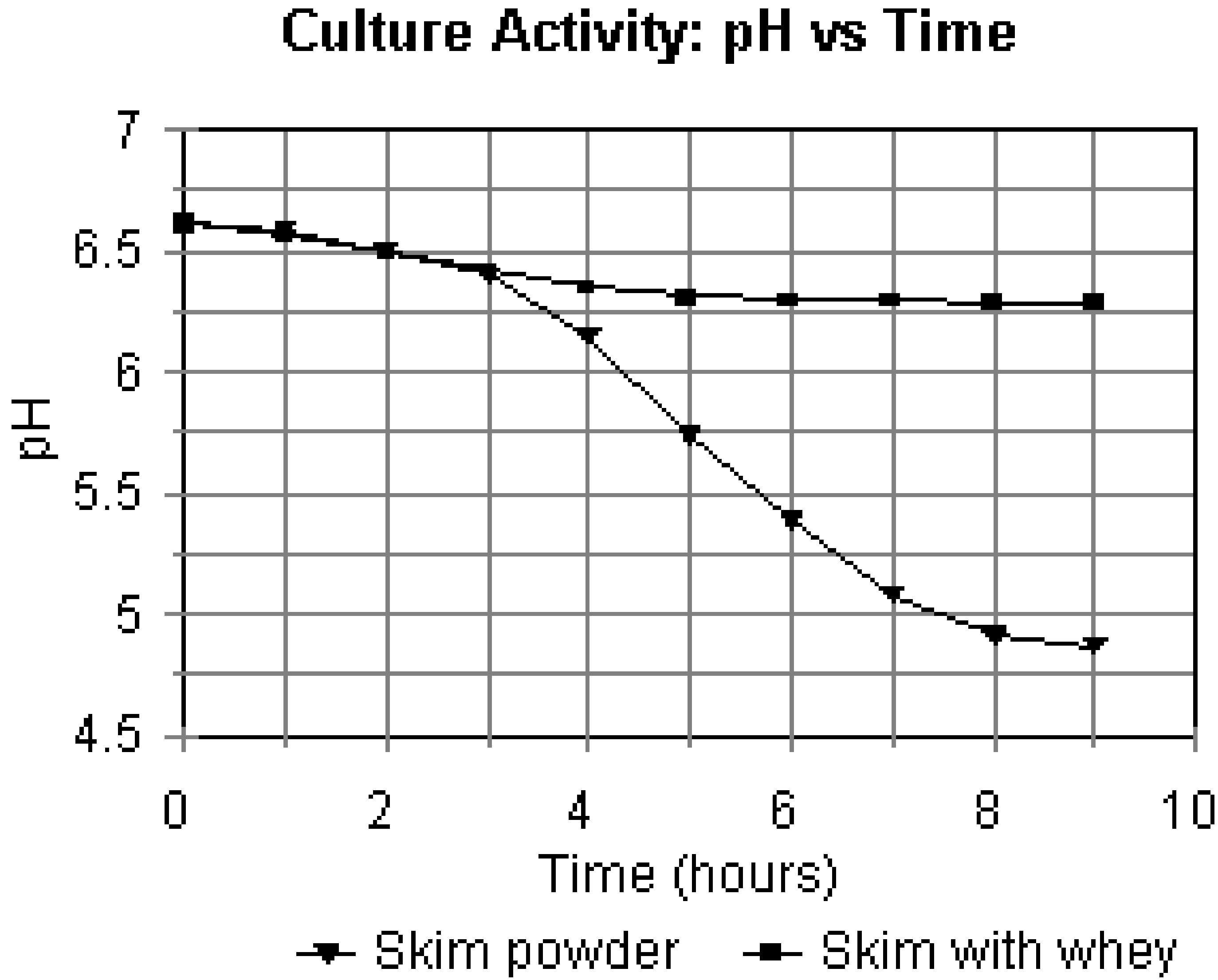
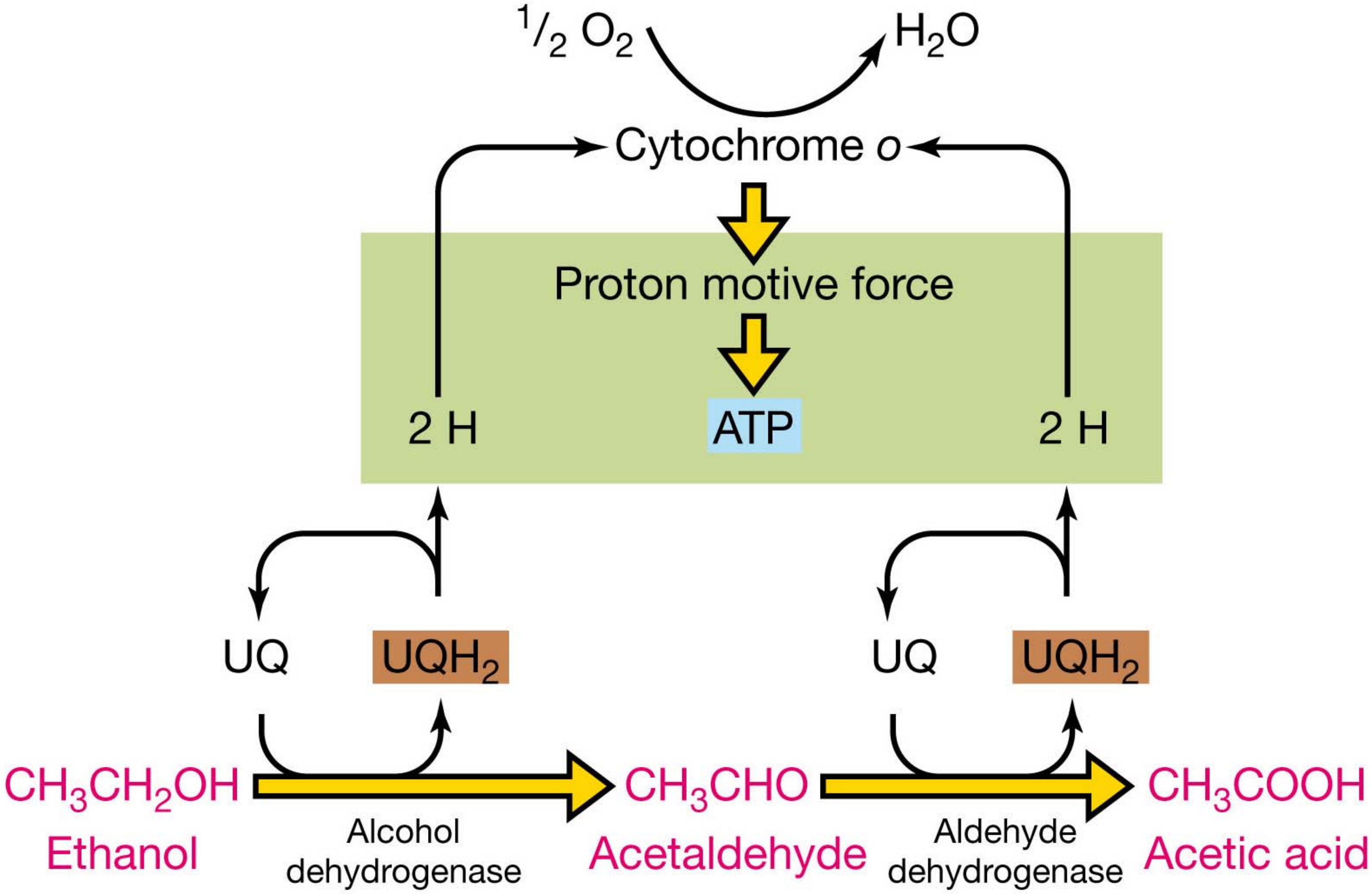


Figure 7.1 Natural Fermentation of Raw Milk

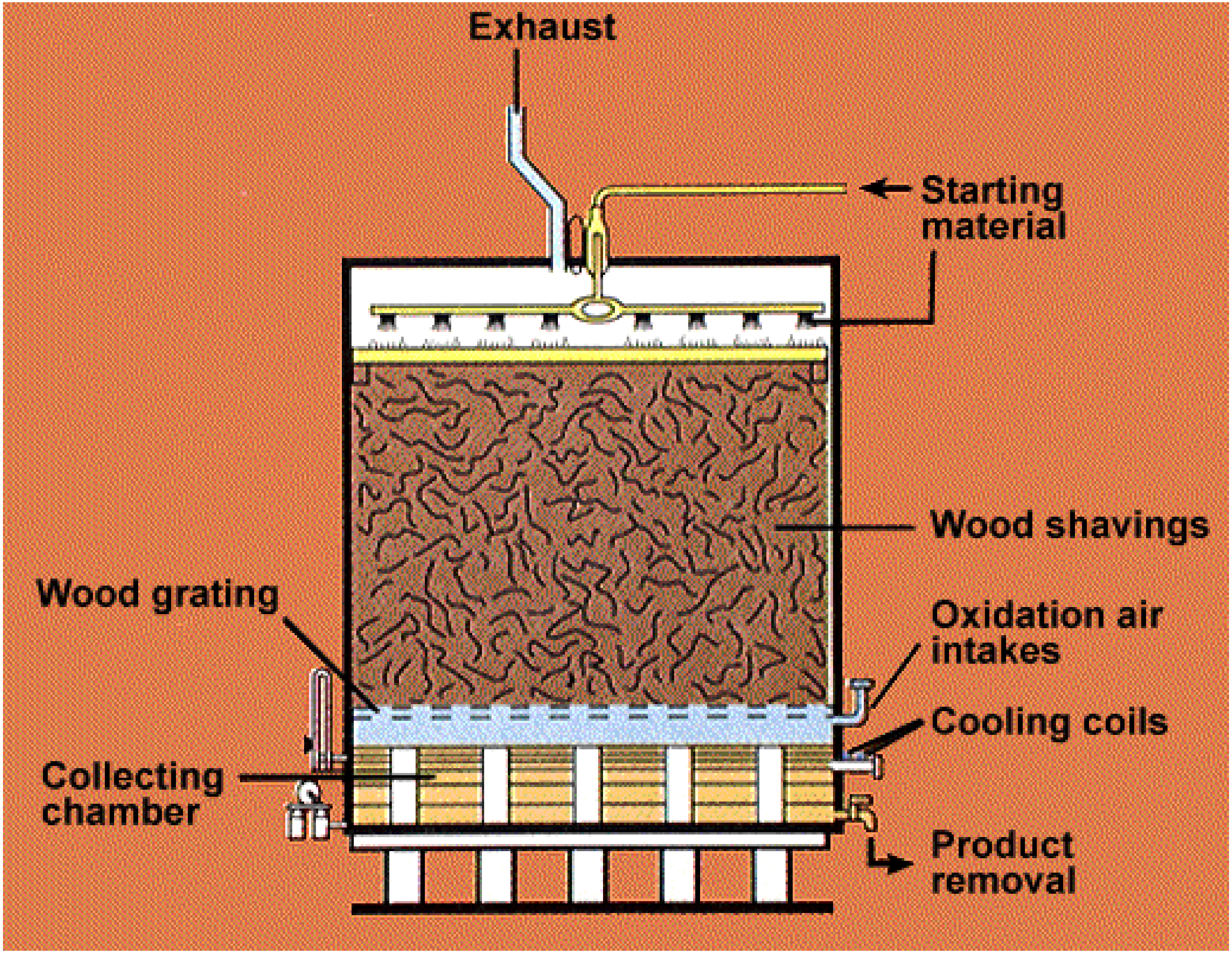


Culture Activity: pH vs Time
7
6.5
6
5.5
5
4.5
pH
0
2
4
6
8
10
Time (hours)
Skim powder
Skim with whey

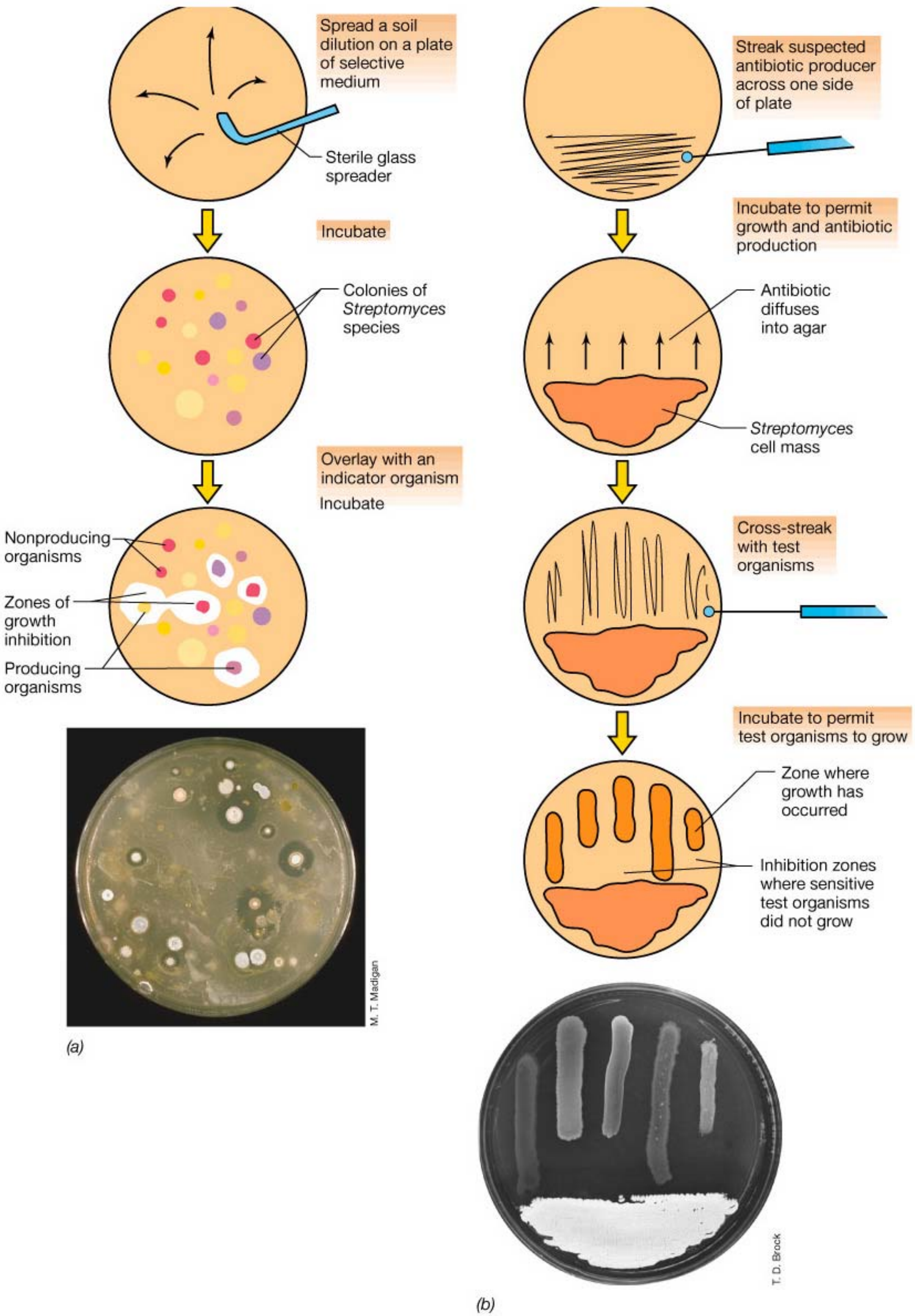
El Vinagre



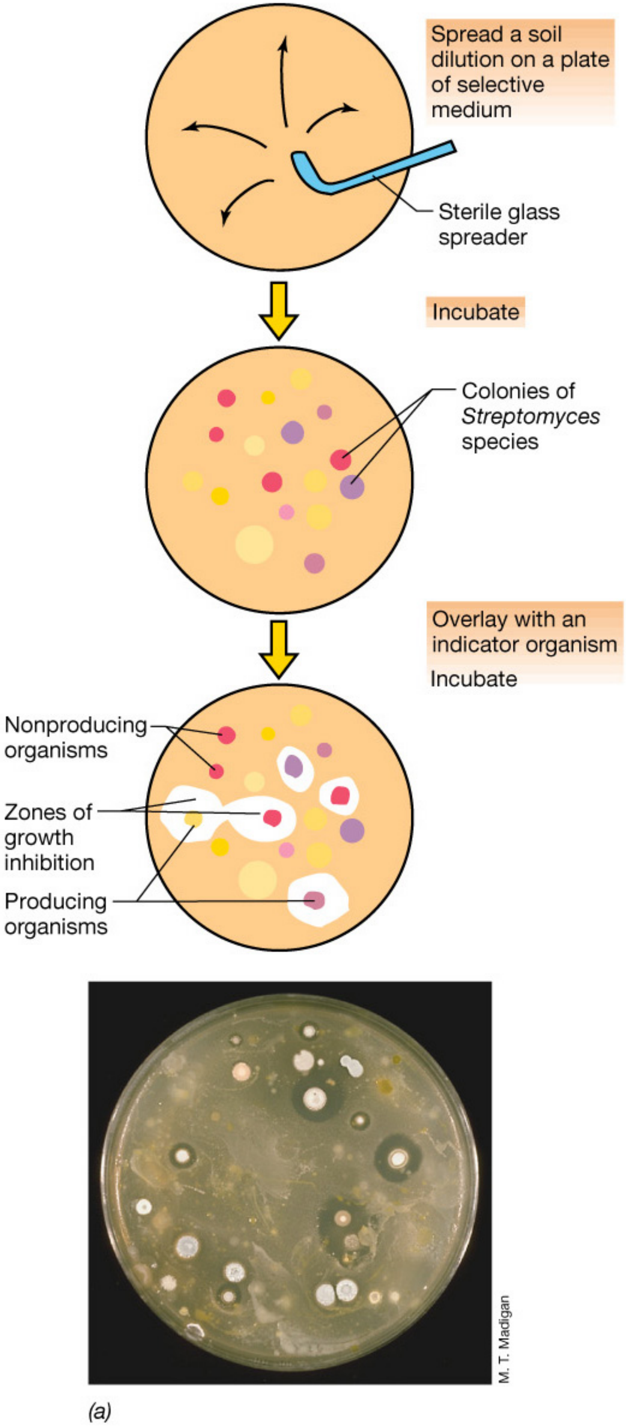
Oxidation of ethanol to acetic acid, the key process in the production of vinegar. UQ, ubiquinone.


Exhaust
Starting material
Wood shavings
Wood grating
Oxidation air intakes
Cooling coils
Collecting chamber
Product removal

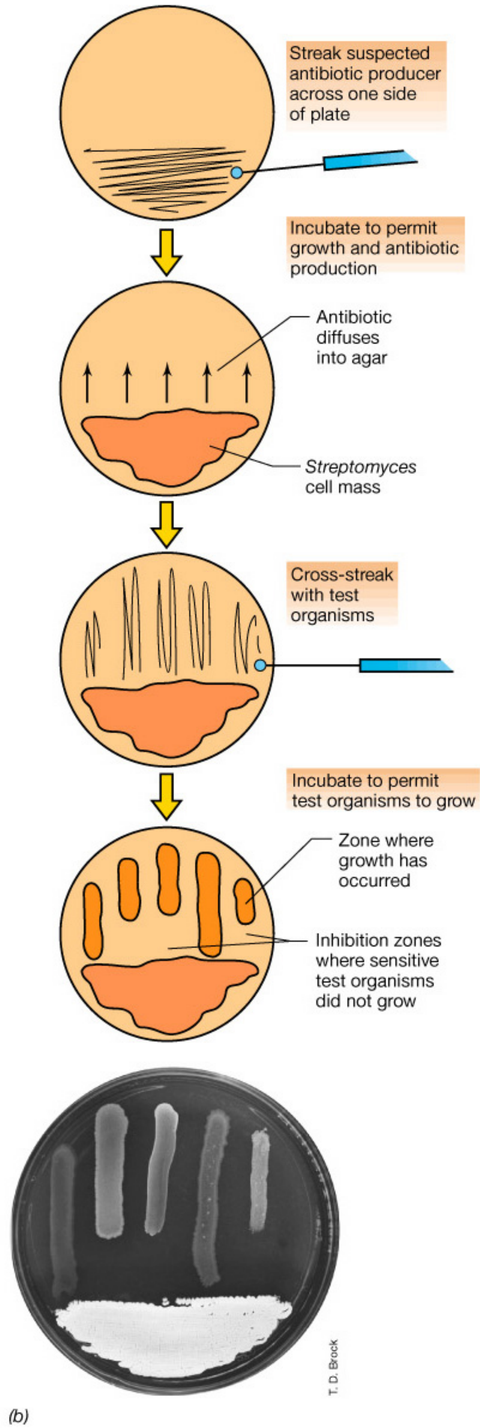
Los antibióticos



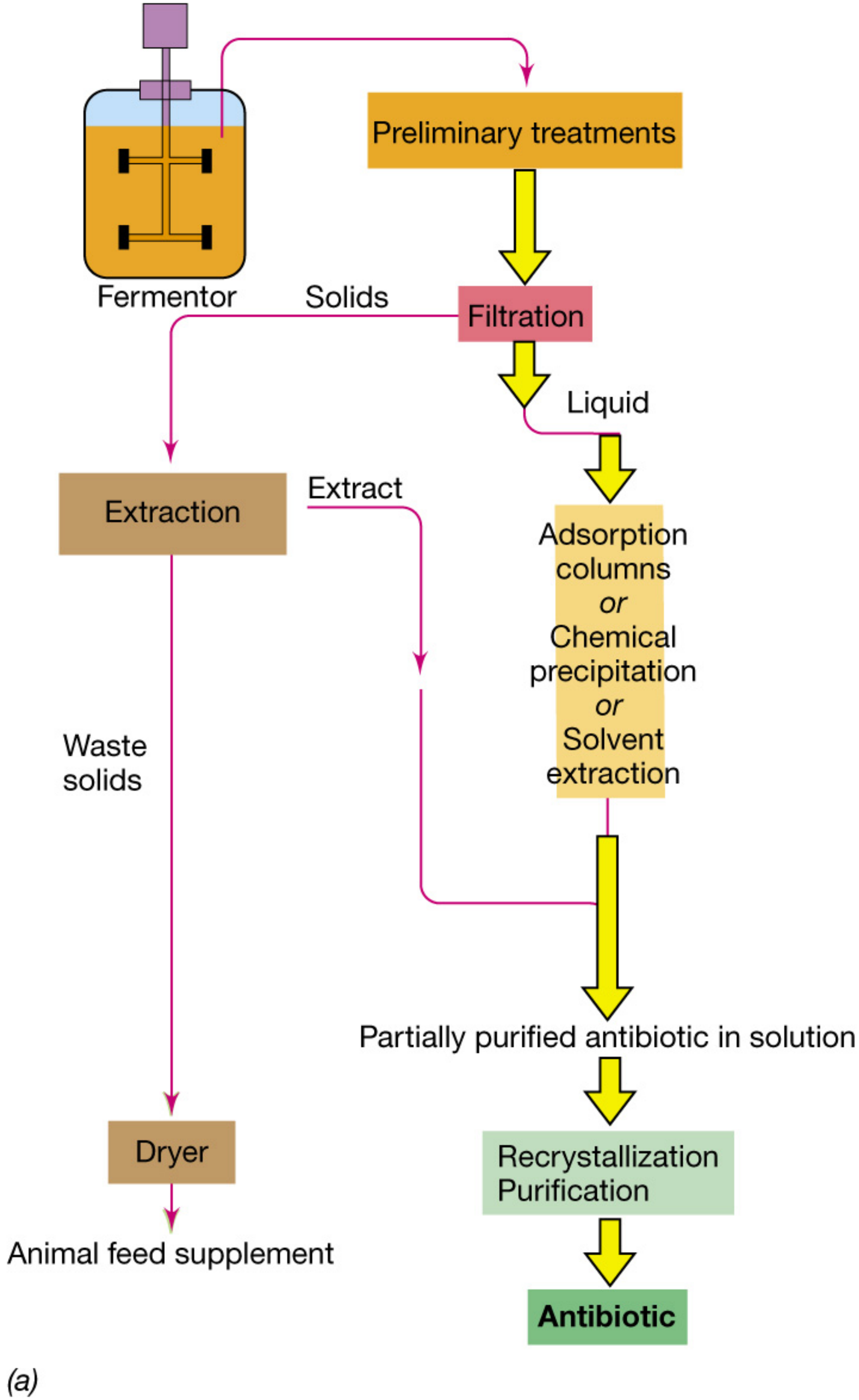
Isolation and screening of antibiotic producers. (a) Isolation using media selective for *Streptomyces* and identification of antibiotic producers using an indicator organism. In the photo, most of the colonies are of *Streptomyces* species, and some are producing antibiotics as shown by zones of growth inhibition of the indicator organism (*Staphylococcus aureus*) around some of the colonies. (b) Method of testing an organism for its antibiotic spectrum of activity. The producer (a *Streptomyces* species) was streaked across one-third of the plate, and the plate incubated. After good growth was obtained, the test bacteria were streaked perpendicular to the *Streptomyces* and the plate was further incubated. The failure of several organisms to grow near the mass growth of *Streptomyces* indicates that the *Streptomyces* produced an antibiotic active against these bacteria. Test organisms (left to right): *Escherichia coli*, *Bacillus subtilis*, *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Mycobacterium smegmatis*.



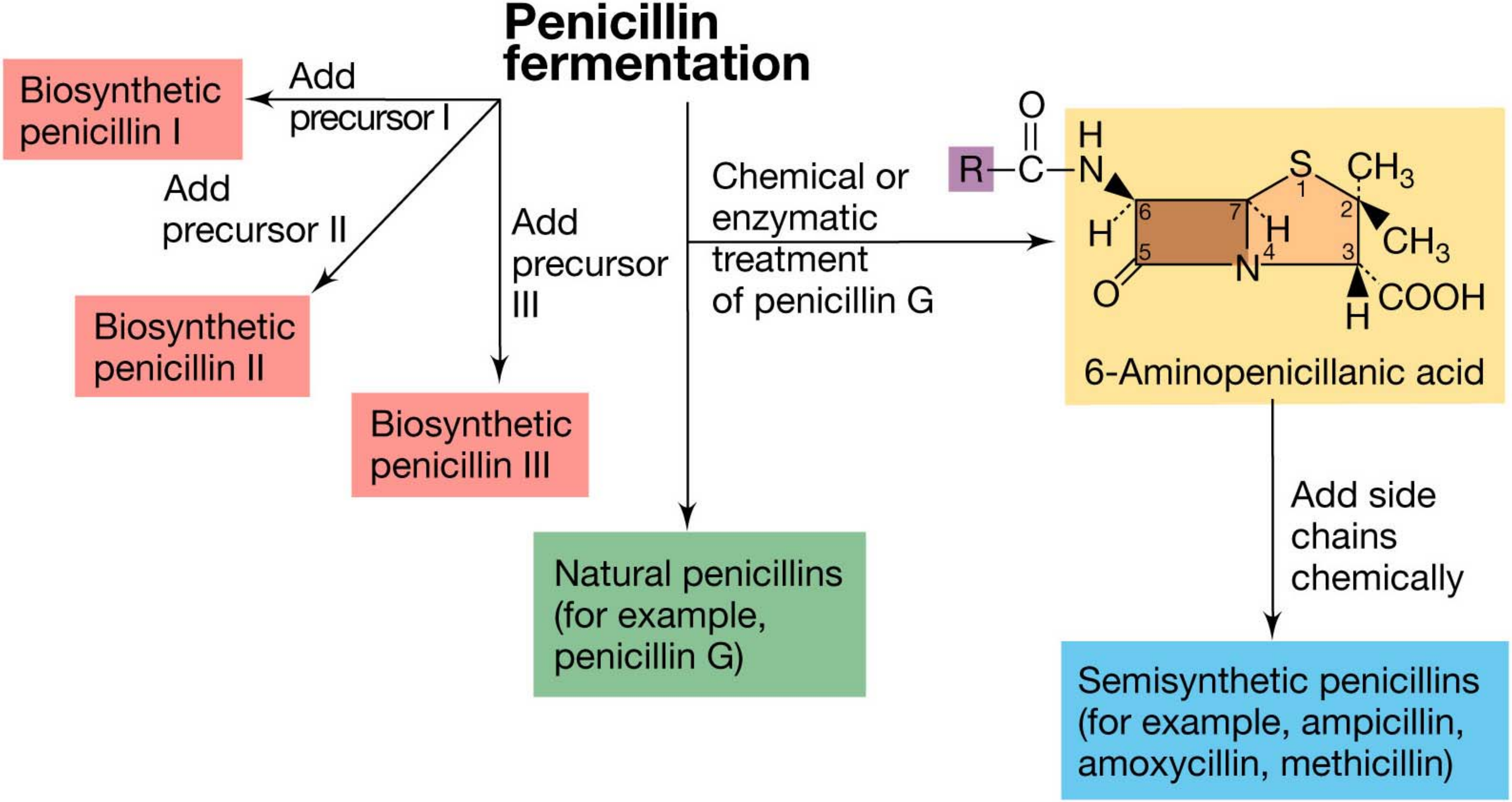
Isolation and screening of antibiotic producers. (a) Isolation using media selective for *Streptomyces* and identification of antibiotic producers using an indicator organism. In the photo, most of the colonies are of *Streptomyces* species, and some are producing antibiotics as shown by zones of growth inhibition of the indicator organism (*Staphylococcus aureus*) around some of the colonies.



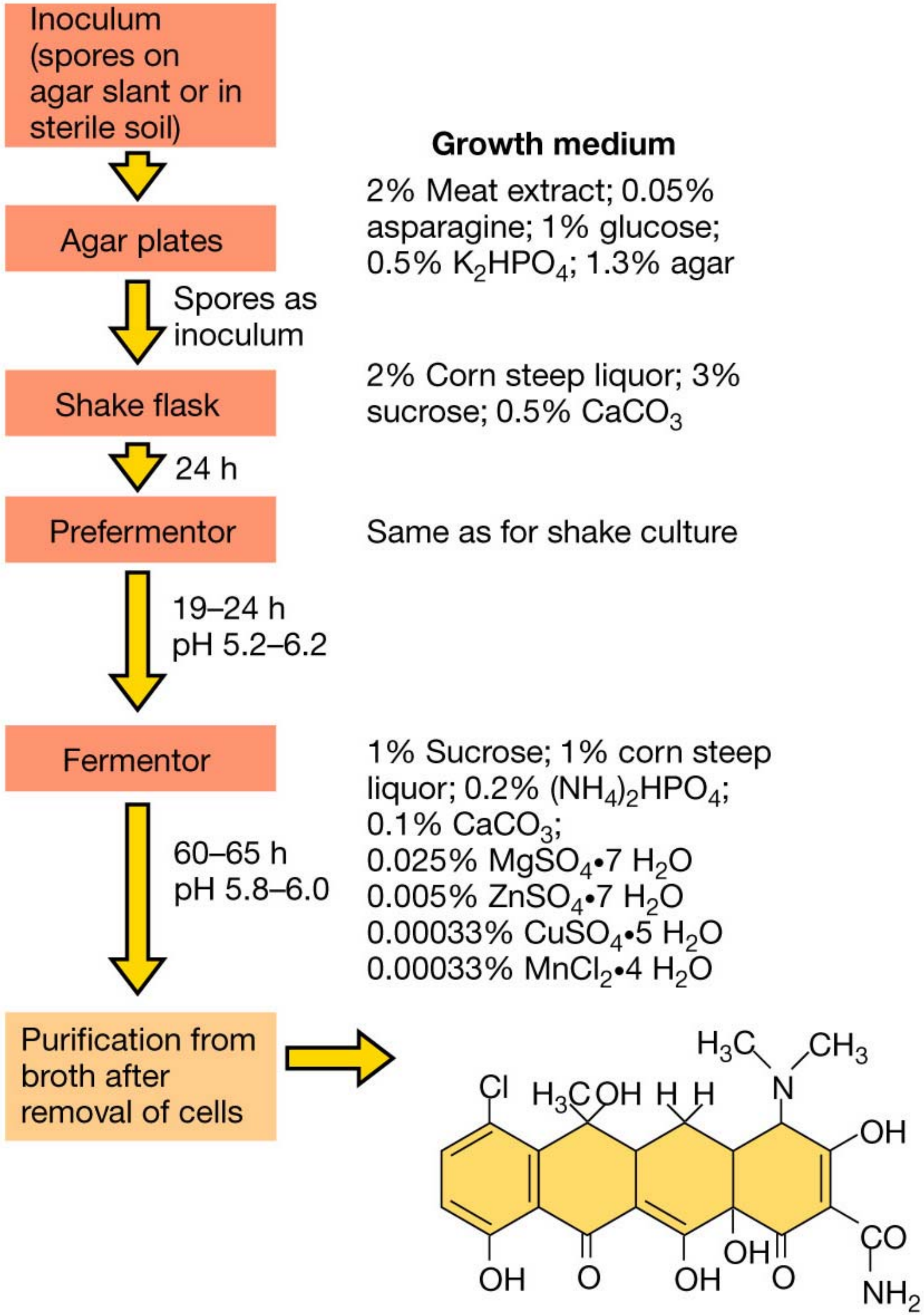
Isolation and screening of antibiotic producers. (b) Method of testing an organism for its antibiotic spectrum of activity. The producer (a *Streptomyces* species) was streaked across one-third of the plate, and the plate incubated. After good growth was obtained, the test bacteria were streaked perpendicular to the *Streptomyces* and the plate was further incubated. The failure of several organisms to grow near the mass growth of *Streptomyces* indicates that the *Streptomyces* produced an antibiotic active against these bacteria. Test organisms (left to right): *Escherichia coli*, *Bacillus subtilis*, *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Mycobacterium smegmatis*.



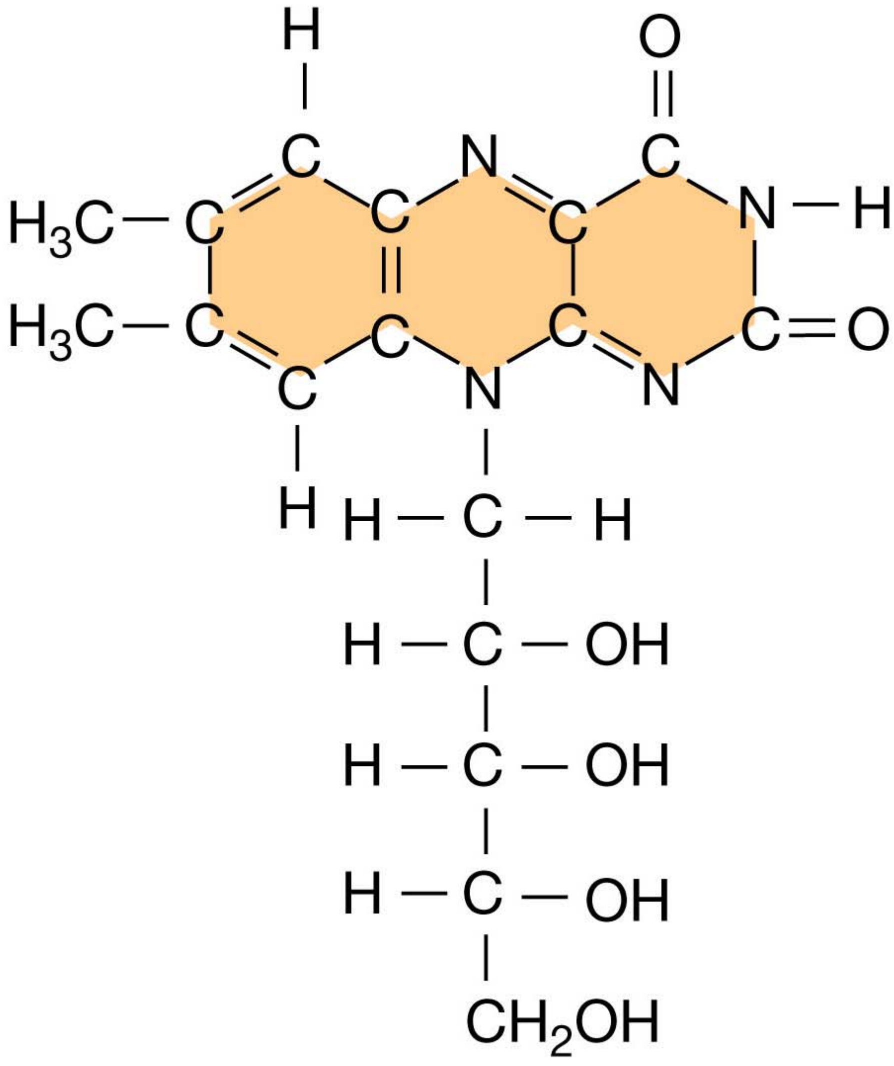
Purification of an antibiotic. (a) Overall process of extraction and purification.



Industrial production of penicillins. The β-lactam ring is shown in dark brown. The normal fermentation leads to the natural penicillins. If specific precursors are added during the fermentation, various biosynthetic penicillins are formed. Semisynthetic penicillins are produced by chemically adding a specific side chain to the 6-aminopenicillanic acid nucleus on the "R" group shown in purple. Semisynthetic penicillins have the greatest clinical usefulness because they are typically active against gram-negative bacteria and can be administered orally.

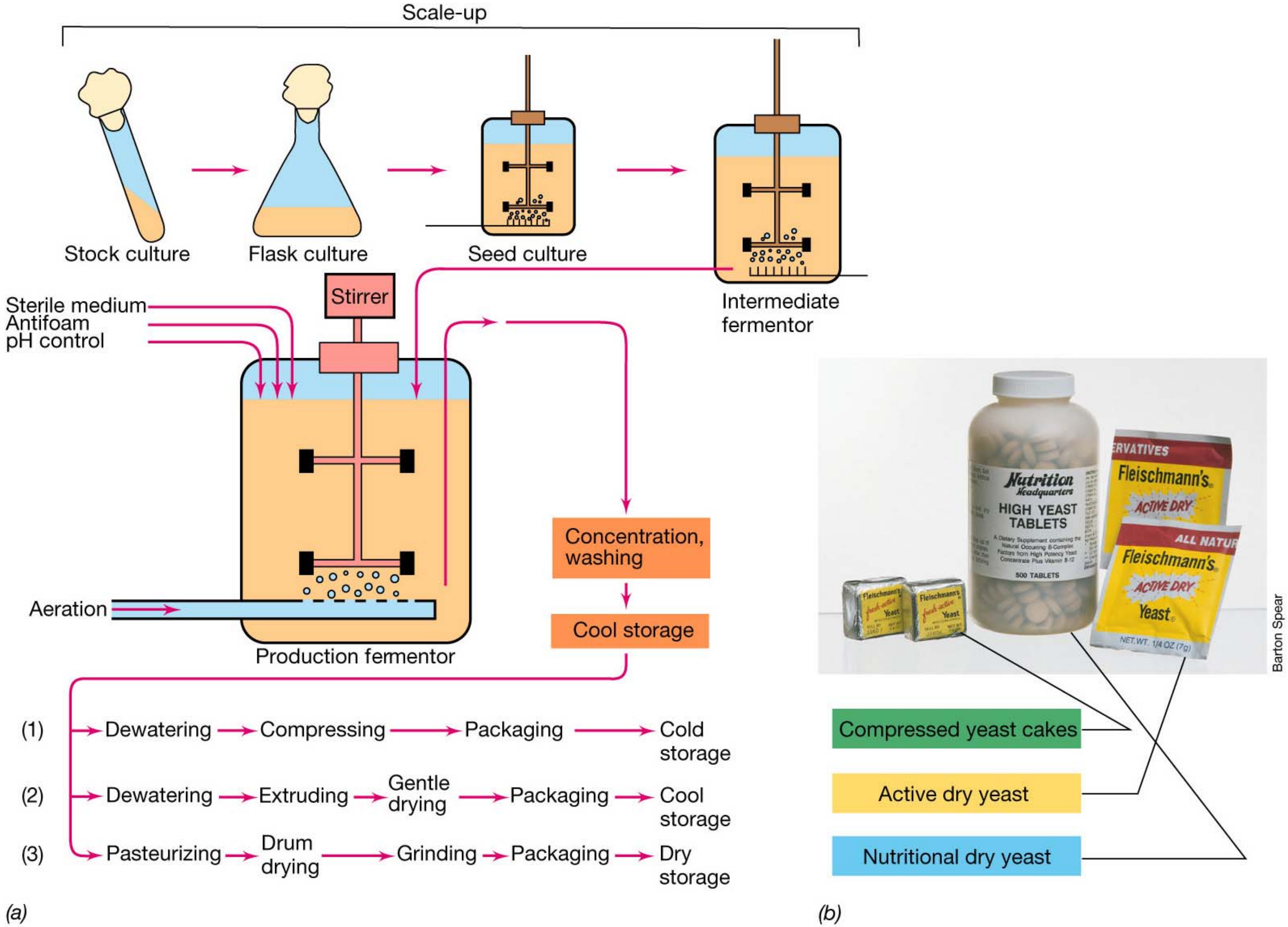


Production scheme for chlortetracycline with *Streptomyces aureofaciens*. The structure of chlortetracycline is shown on the bottom right. Growth temperature, 28° C throughout.



(b)

Vitamins produced by microorganisms on an industrial scale. (b) Riboflavin (vitamin B2; Section 5.11 and Figure 5.15).



Industrial production of yeast cells. (a) Stages in production. Antifoaming agents are added to the fermentor to prevent aeration and stirring from creating excessive foam on the surface of the medium.

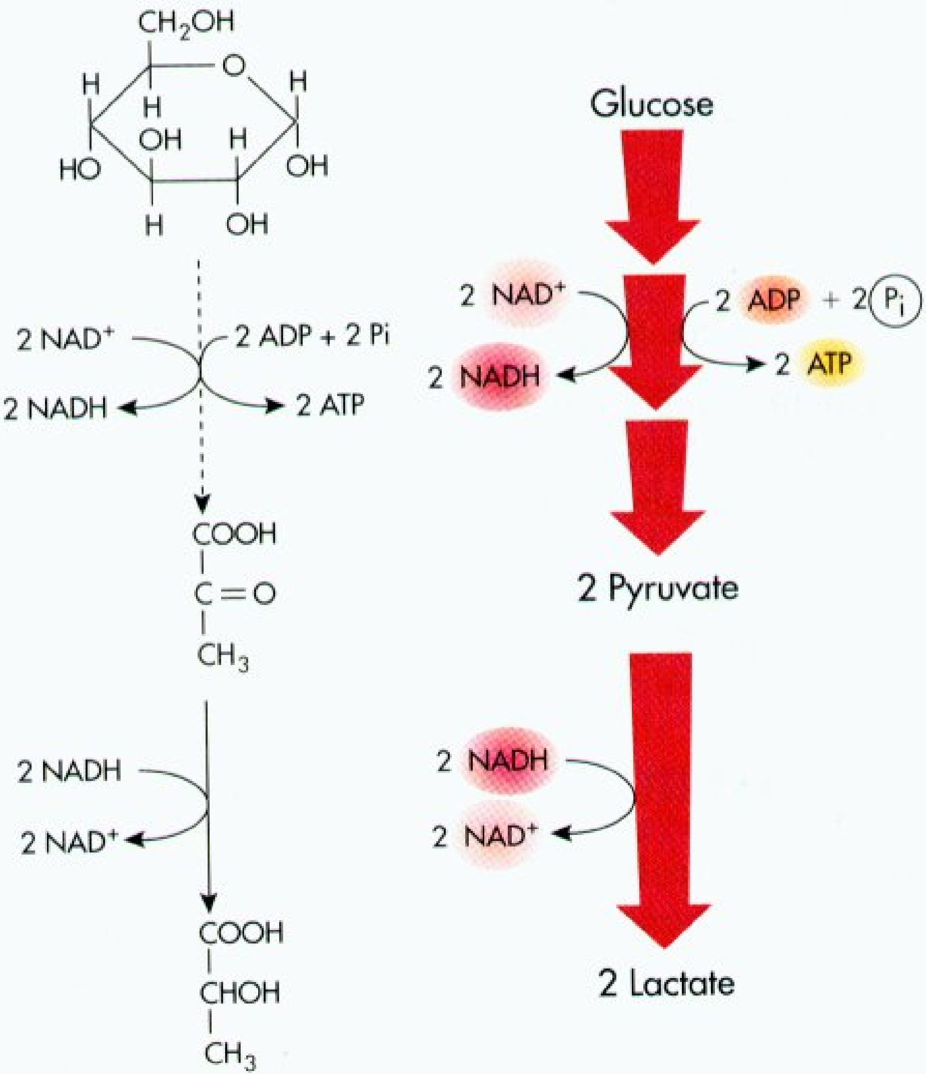


Fig. 4-13 Homolactic Acid Fermentation Pathway. The homolactic acid fermentation pathway results in the production of lactate (lactic acid).

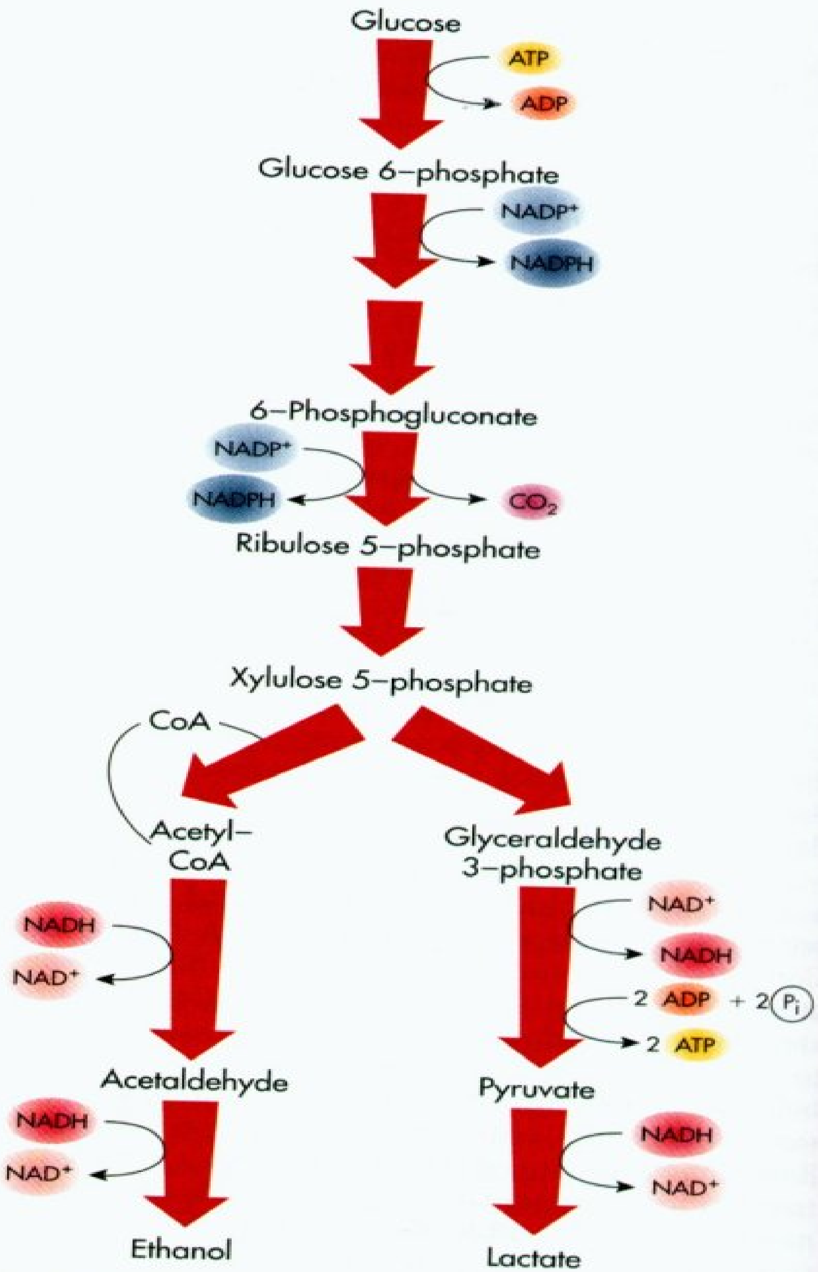
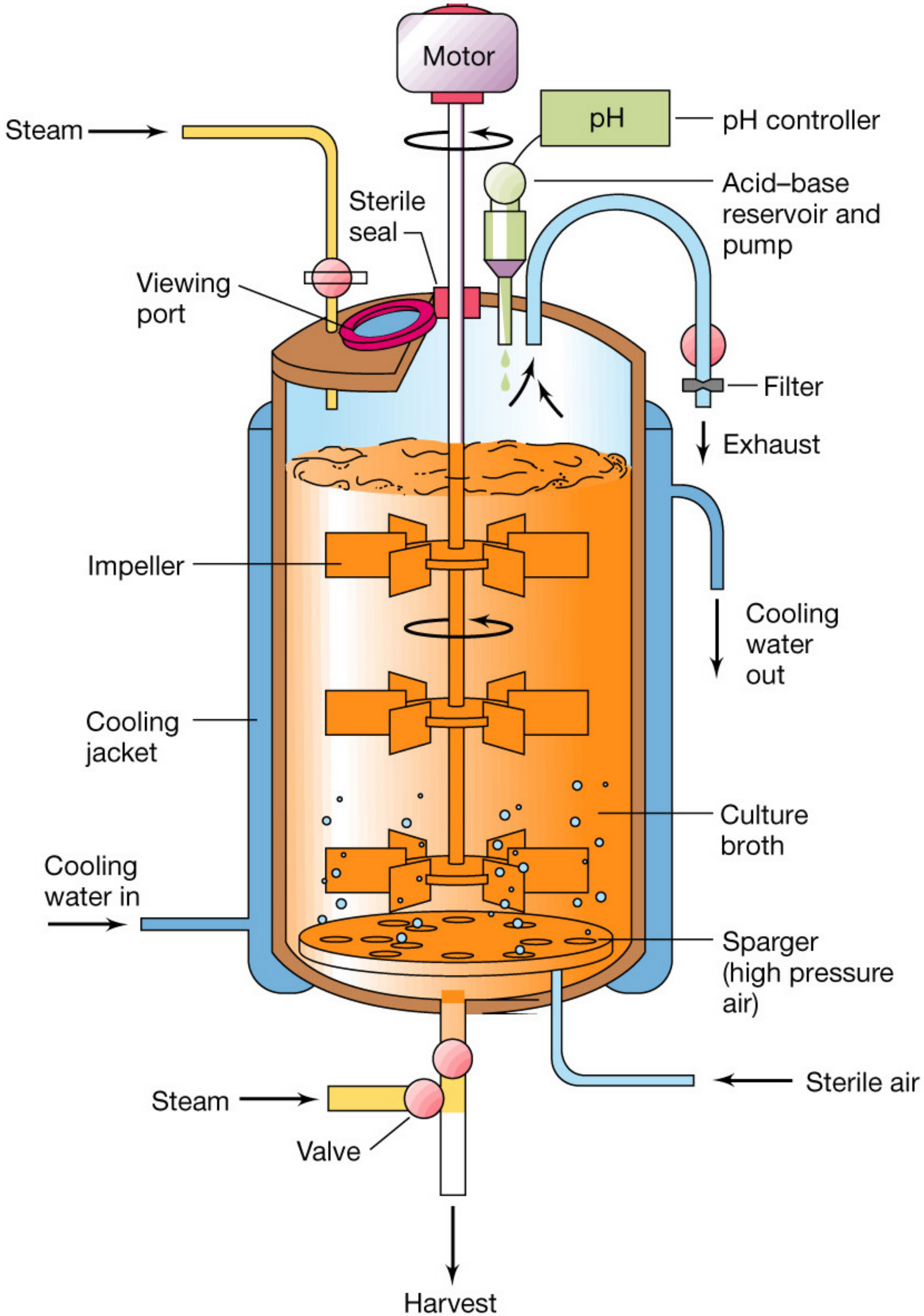


Fig. 4-14 Heterolactic Acid Fermentation Pathway. The heterolactic acid fermentation pathway results in the production of lactate (lactic acid), ethanol, and carbon dioxide.



Fermentors. (a) A small research fermentor. The volume is 5 liters. (b) Diagram of a fermentor, illustrating construction and facilities for aeration and process control. (c) Inside of an industrial fermentor, showing the impeller and internal heating and cooling coils. In a typical industrial fermentation, aeration and cooling are the key components for online monitoring and adjustment. Nutrient levels and pH are also closely monitored and adjustments made automatically when needed.

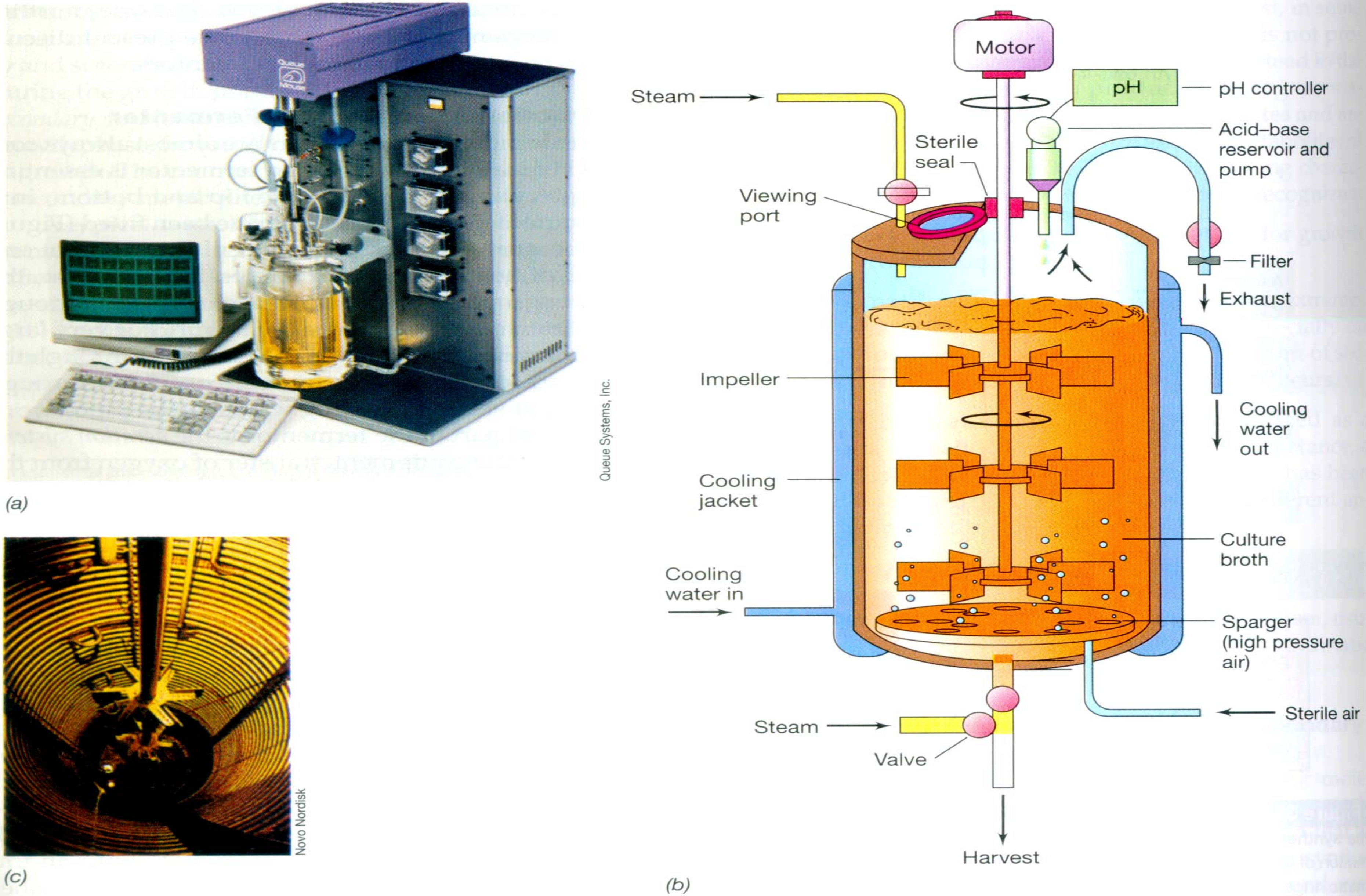


Figure 30.4 Fermentors. (a) A small research fermentor. The volume is 5 liters. (b) Diagram of a fermentor, illustrating construction and facilities for aeration and process control. (c) Inside of an industrial fermentor, showing the impeller and internal heating and cooling coils. In a typical industrial fermentation, aeration and cooling are the key components for online monitoring and adjustment. Nutrient levels and pH are also closely monitored and adjustments made automatically when needed.