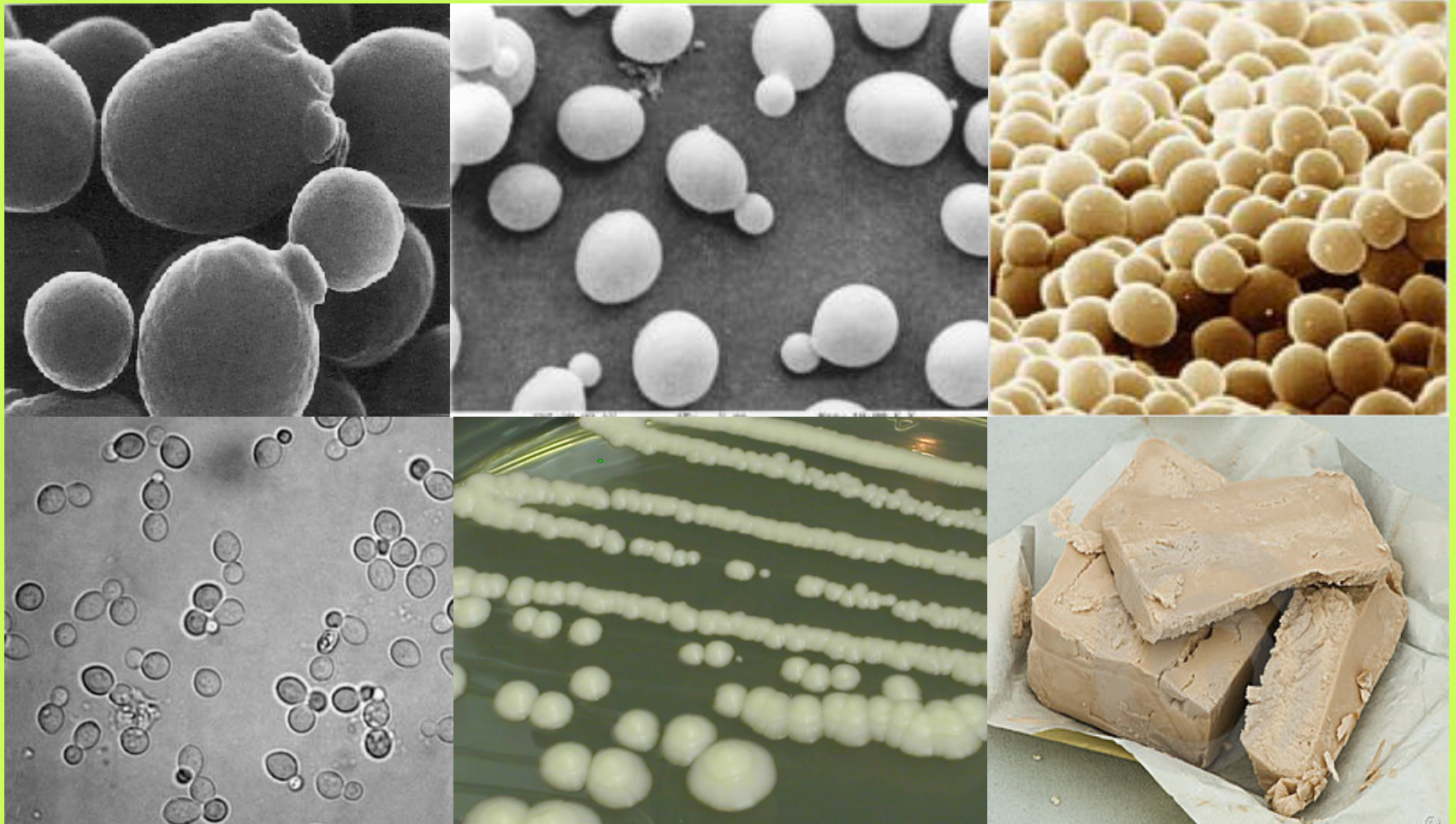


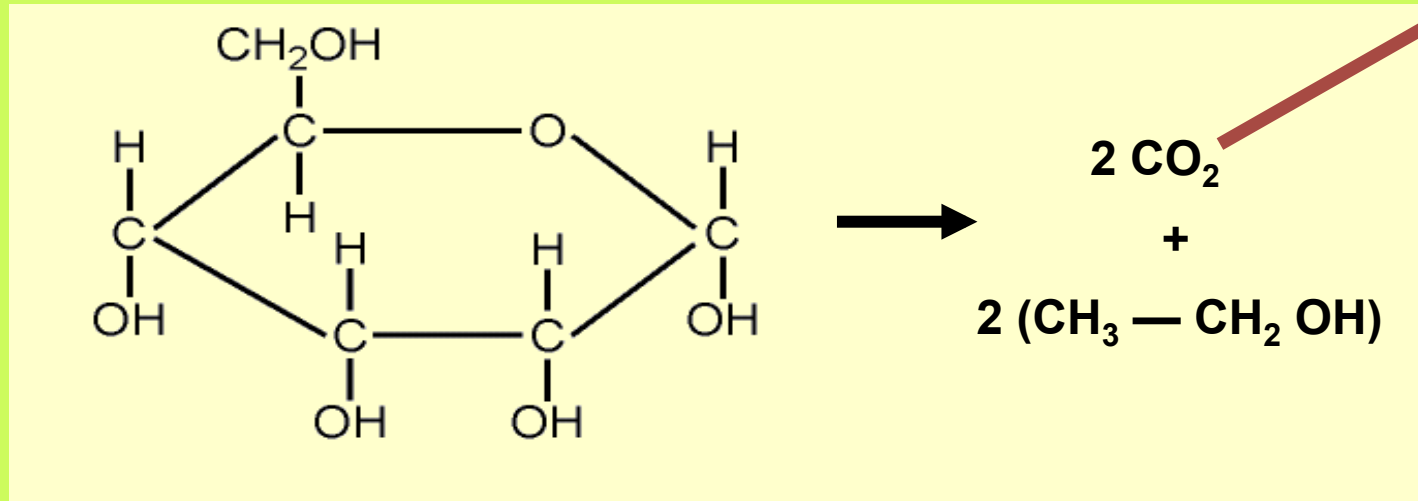
Tecnologia de Alimentos Fermentados

**Mestrado em
Engenharia Alimentar**

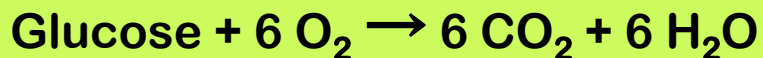
Leveduras



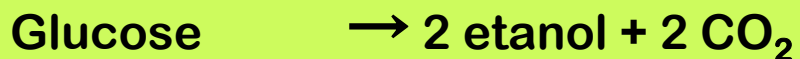
Fermentação Alcoólica



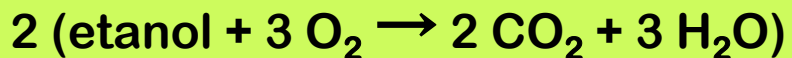
E a energia?



Δ H = - 2 807 kJ mol⁻¹



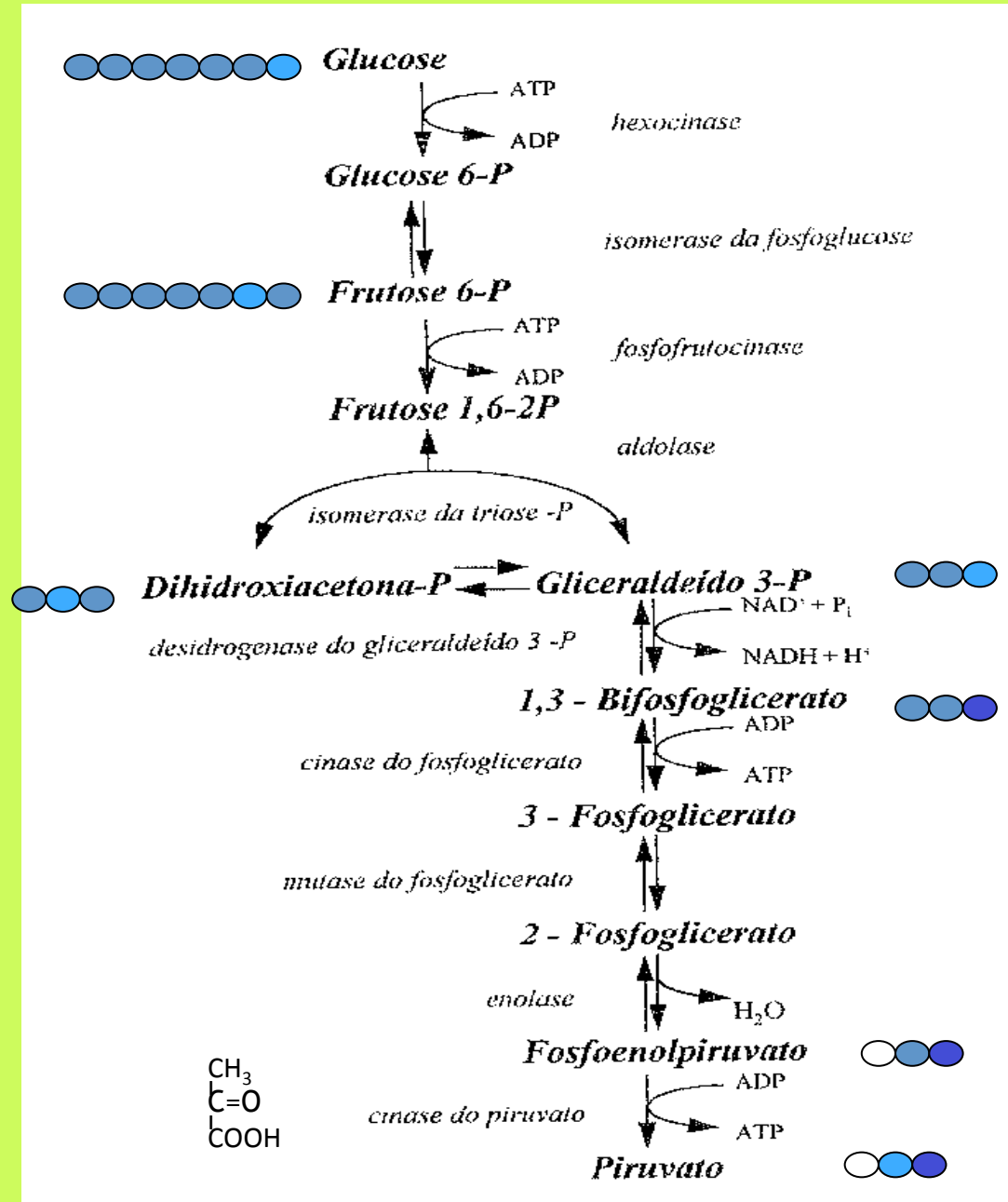
Δ H = - 102 kJ mol⁻¹



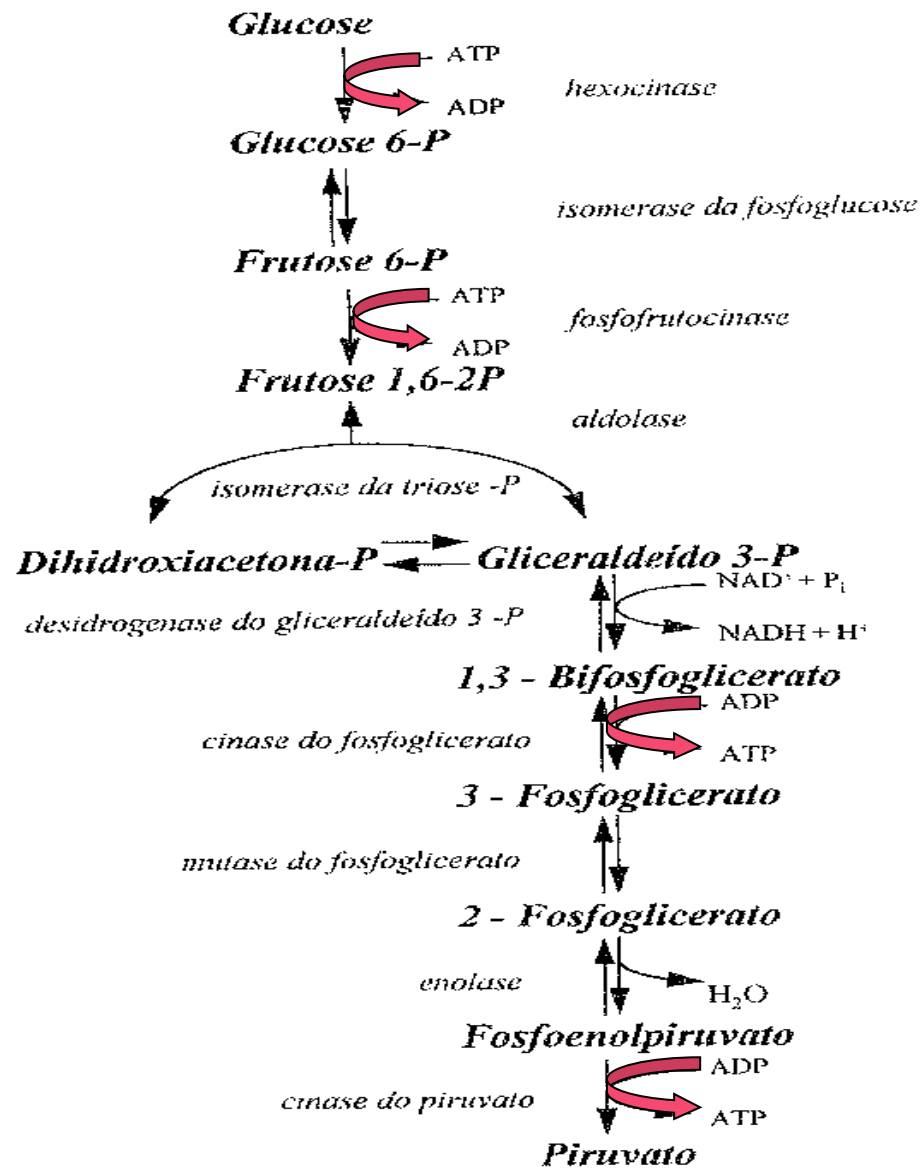
Δ H = - 2 705 kJ mol⁻¹

**Densidade mosto 1.100
vinho .990**

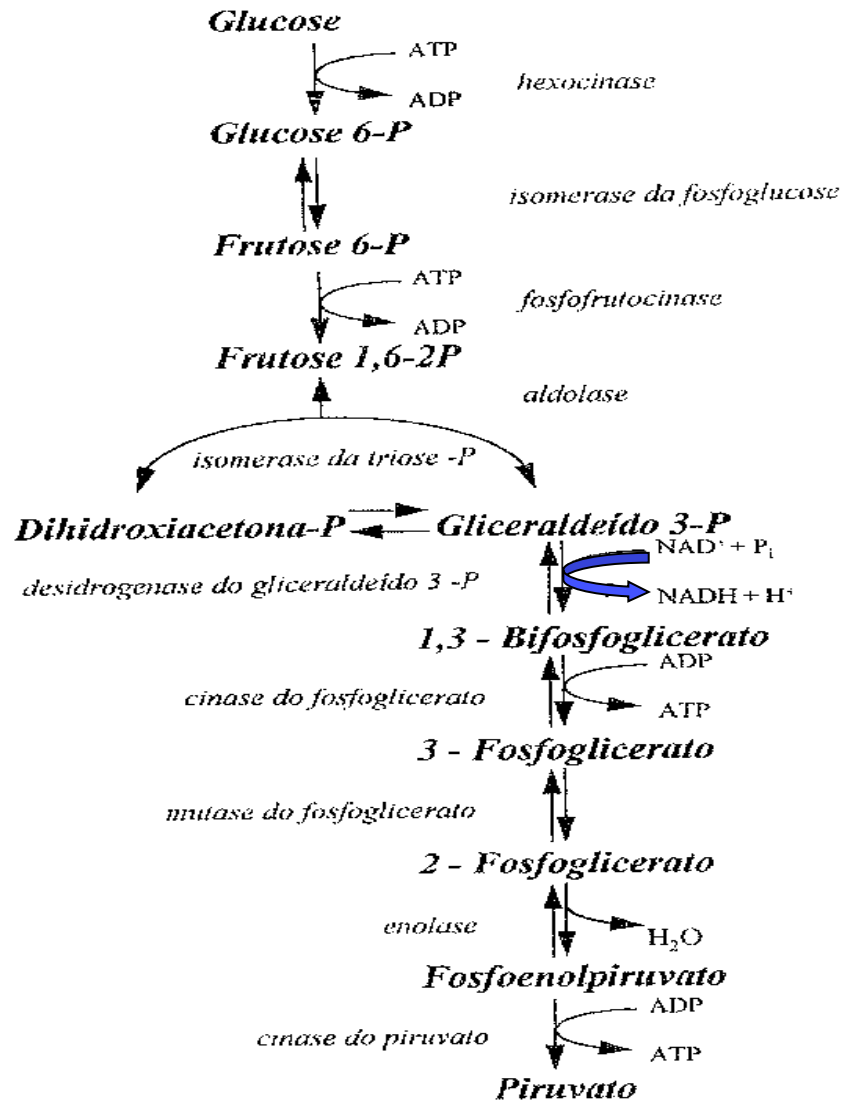
Glicólise



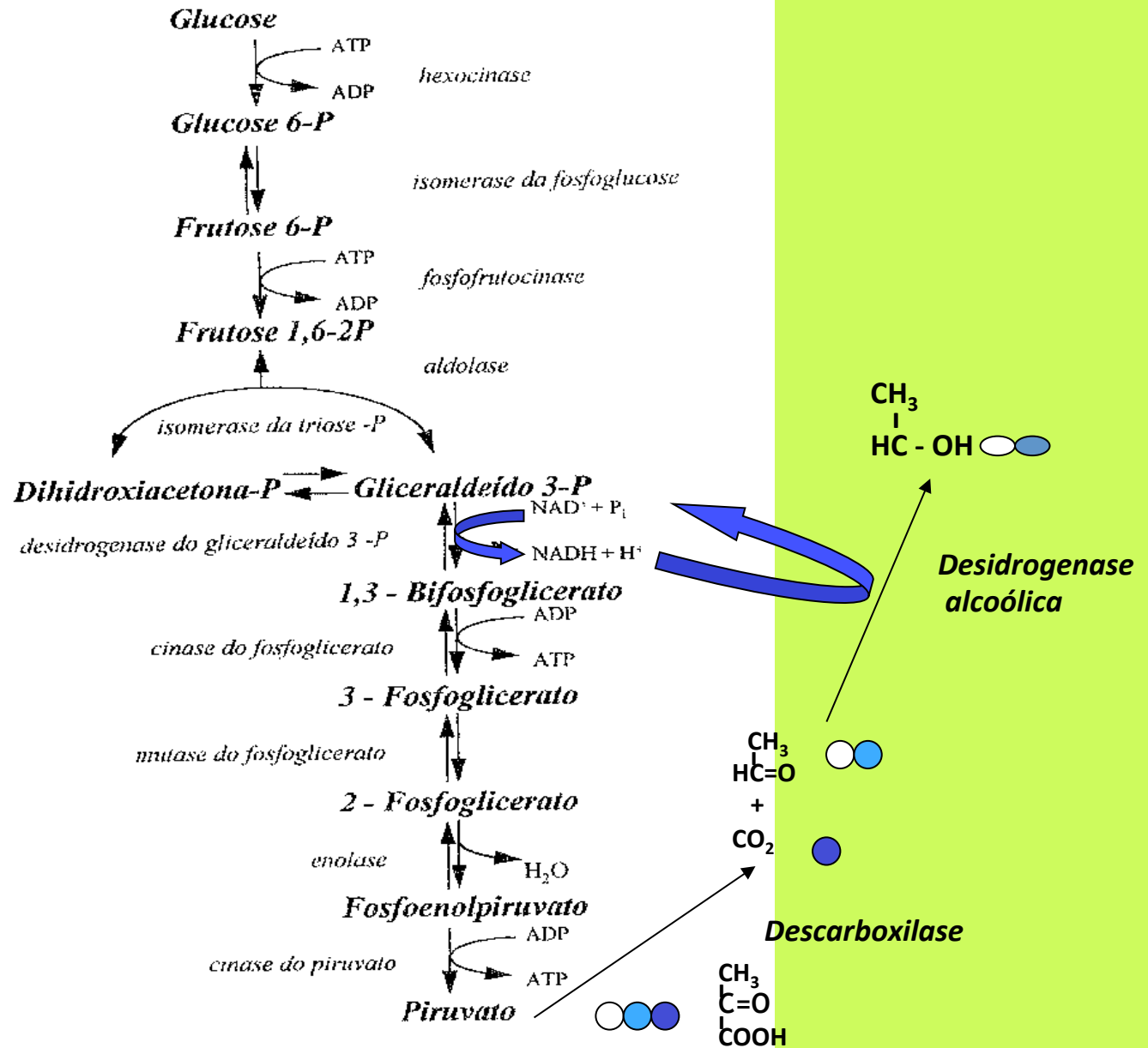
Glicólise



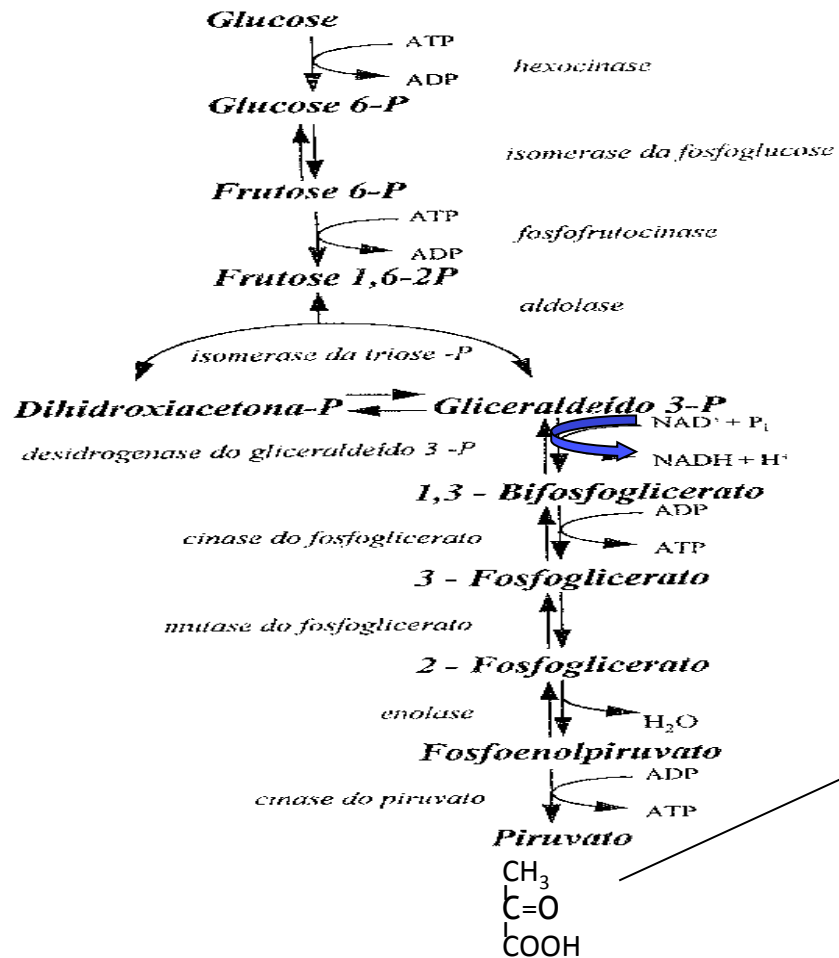
Glicólise



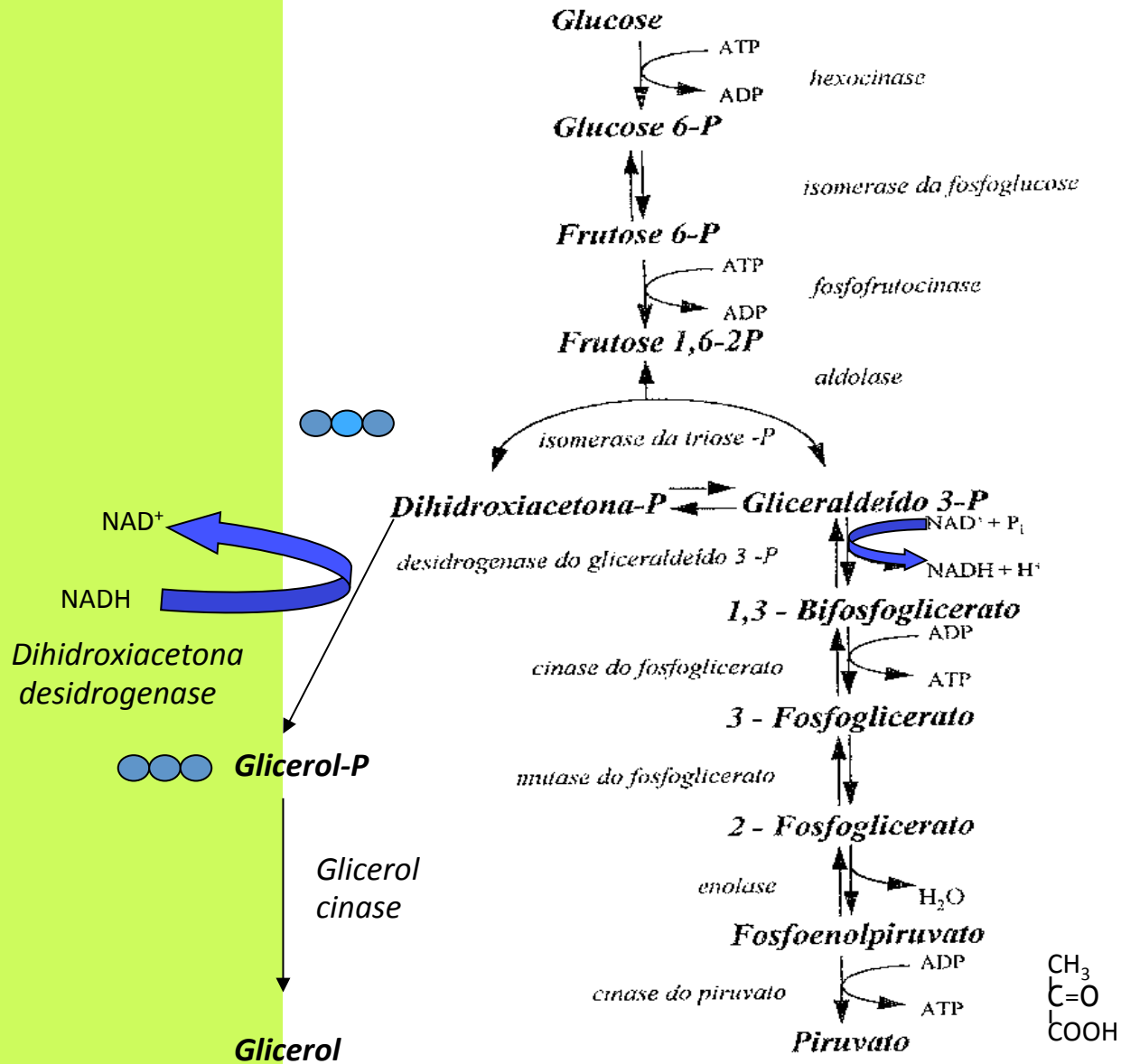
Fermentação Alcoólica



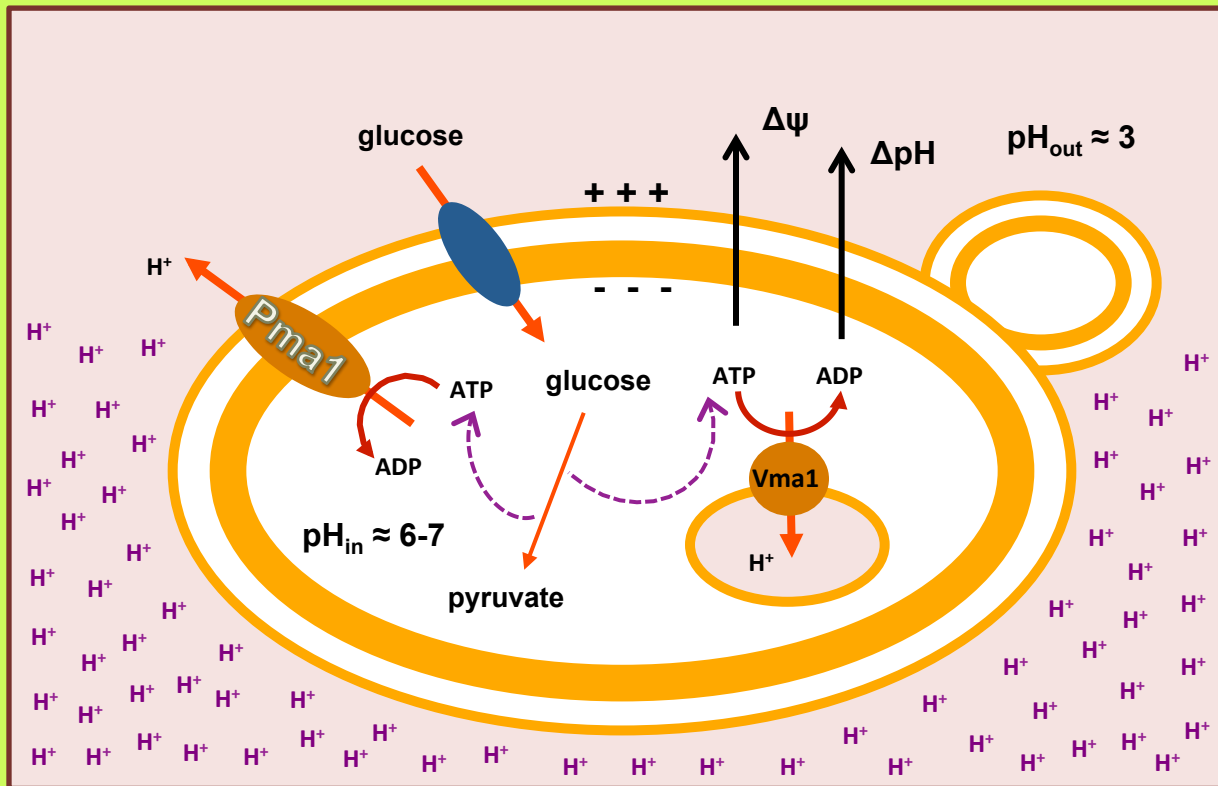
Fermentação Alcoólica



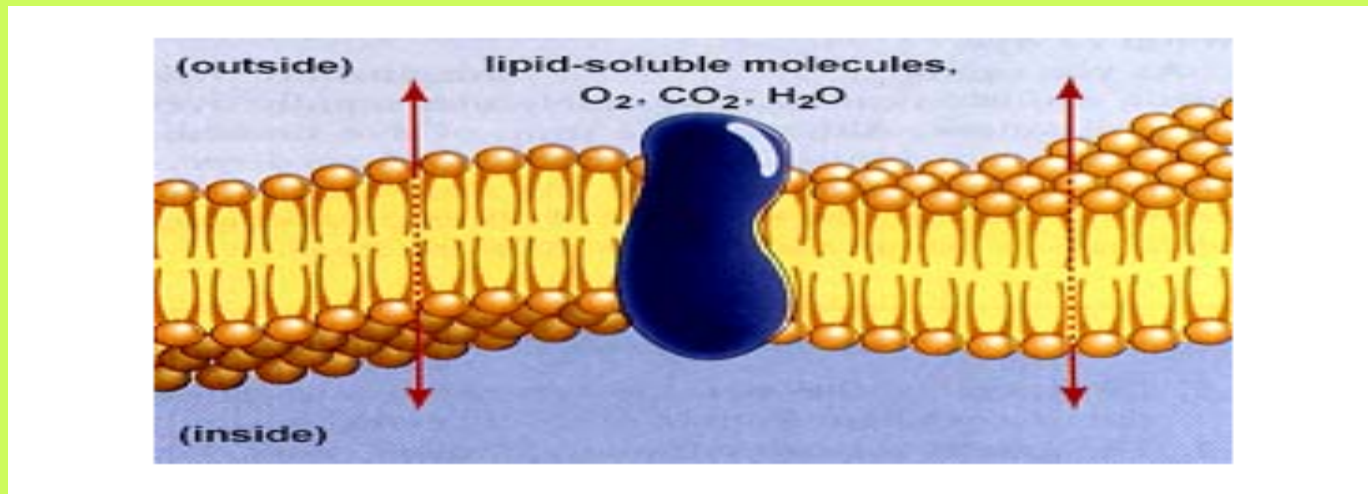
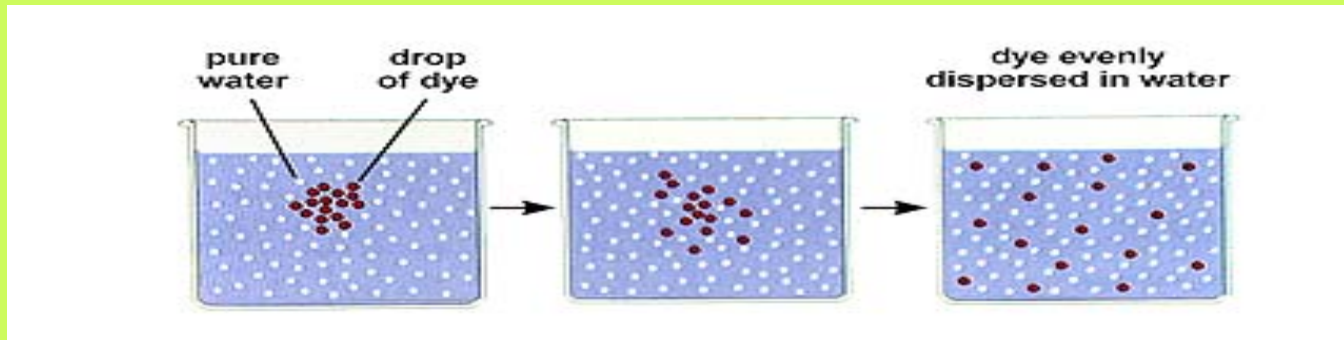
Fermentação Alcoólica



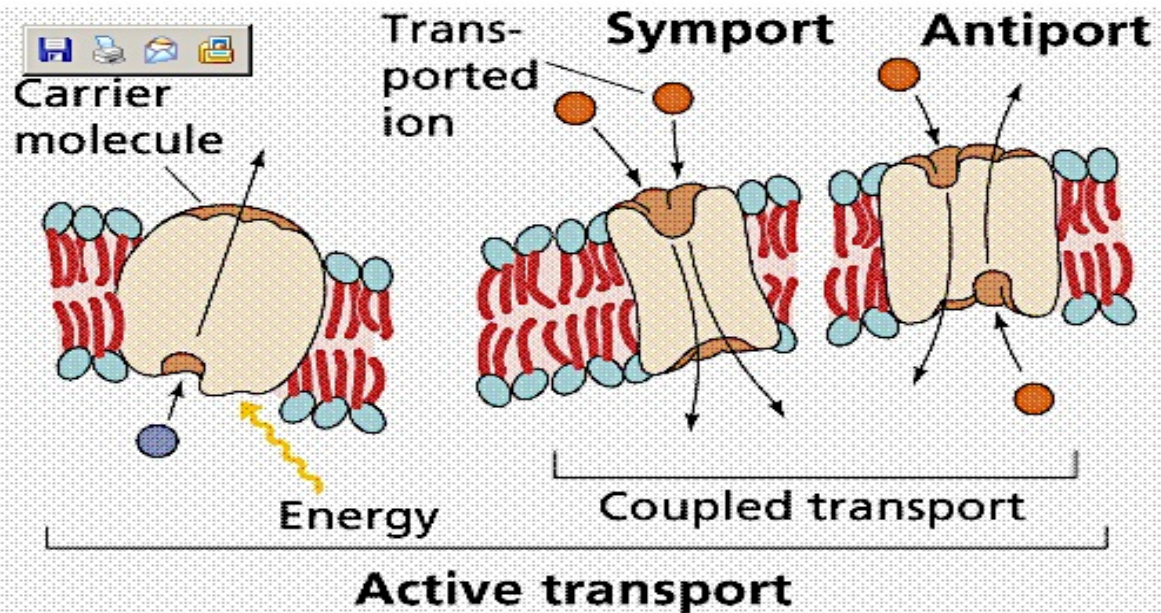
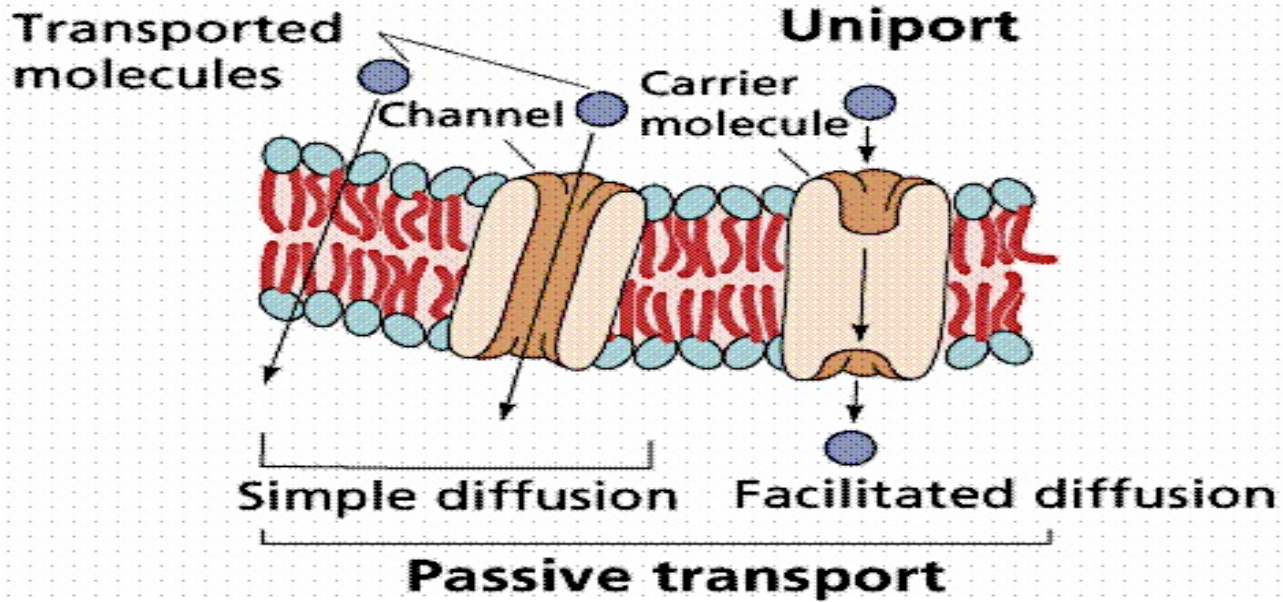
Levedura



DIFUSÕES

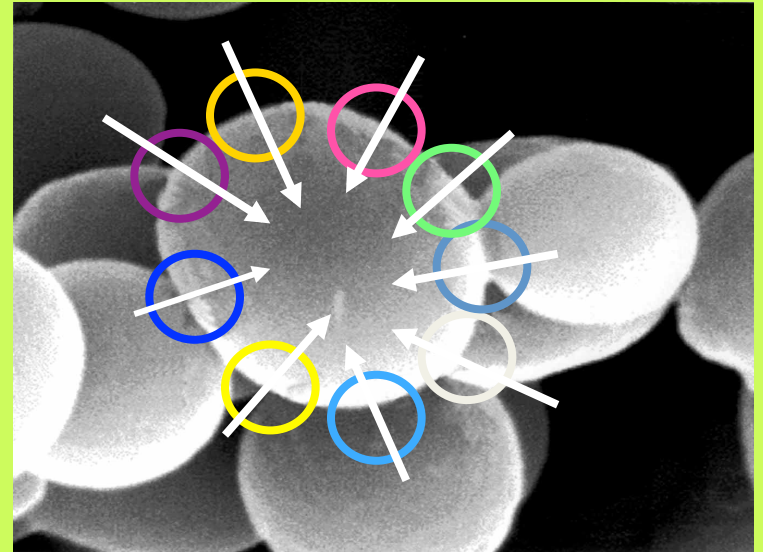


TRANSPORTE MEDIADO



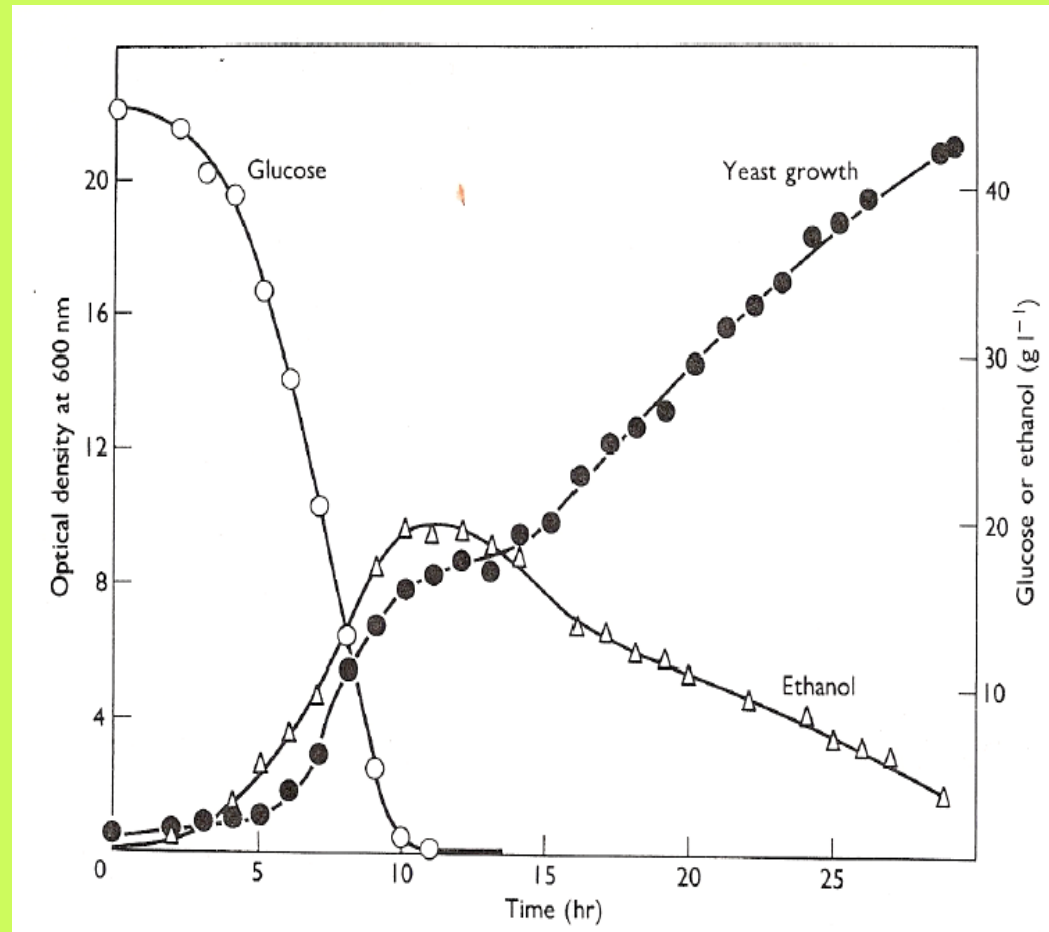
Fermentação Alcoólica

Que mecanismos conferem a grande capacidade de fermentar açúcares à levedura?



- Pelo menos 17 genes diferentes codificam proteínas transportadoras de hexoses

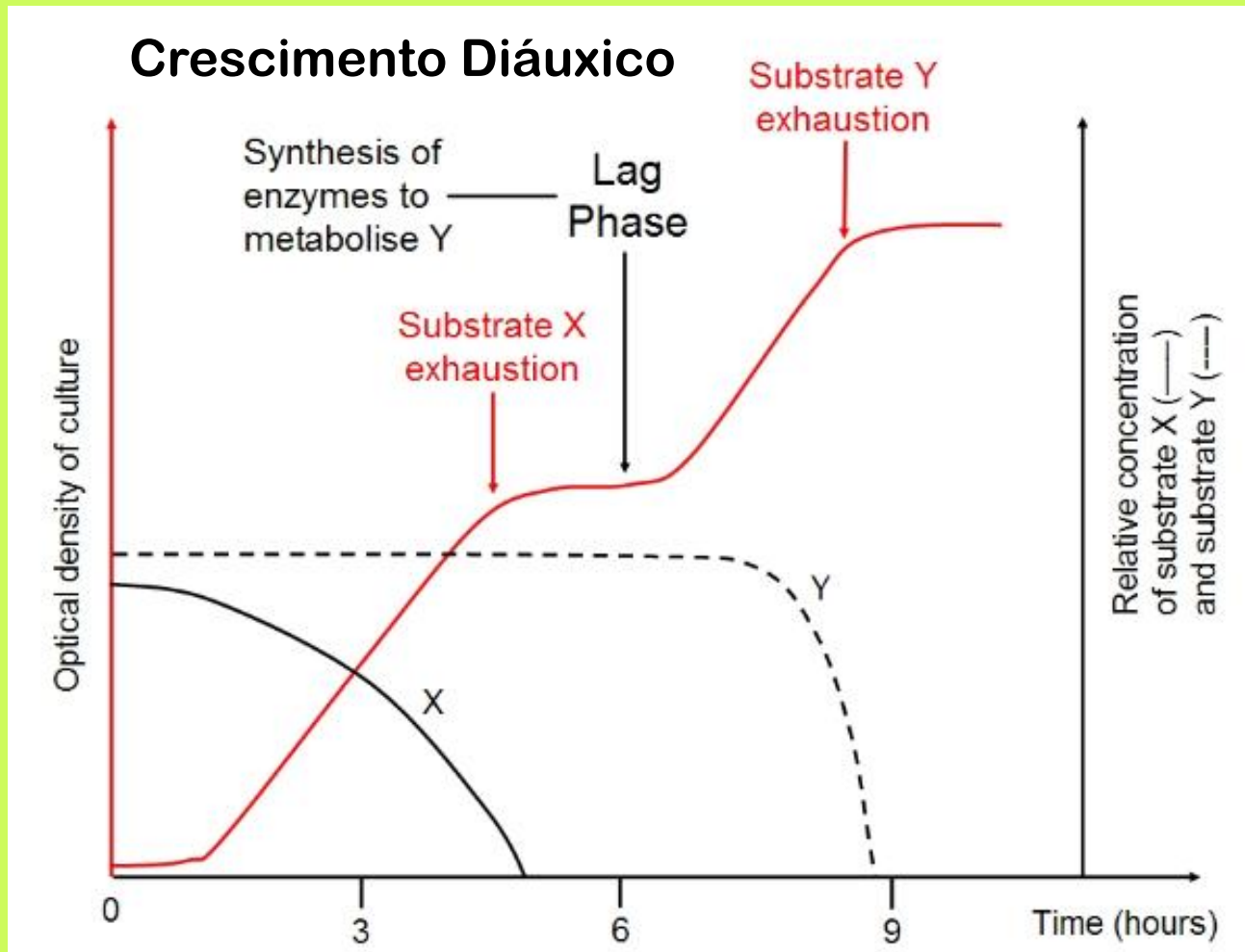
Fermentação Alcoólica (efeito de Crabtree)



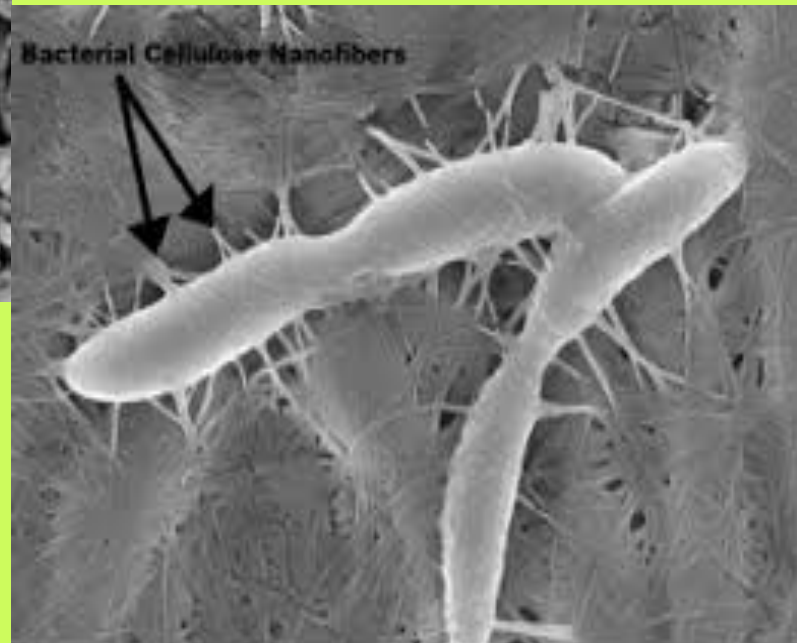
Fermentam na presença de O₂ se a concentração de glucose for elevada

Fermentação Alcoólica

(Crescimento Diáuxico: glucose+maltose)



Bactérias Acéticas



Bactérias Acéticas

- Gram (+) ou var
- Catalase pos. e oxidase negativas
- Aeróbias obrigatórias
- Temperatura optima de crescimento 25-30°C

- *Gluconobacter e Acetobacter*

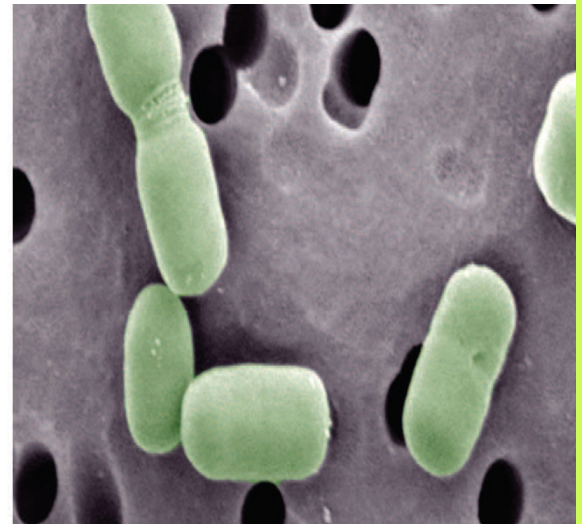
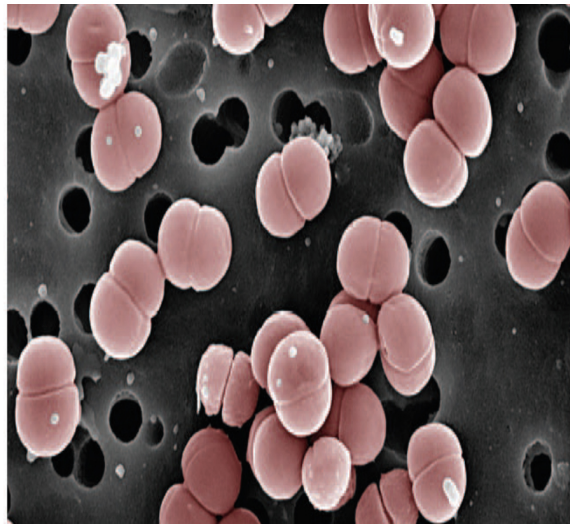
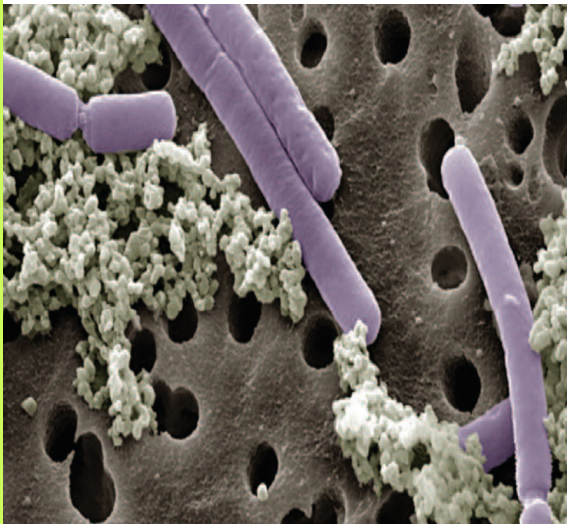
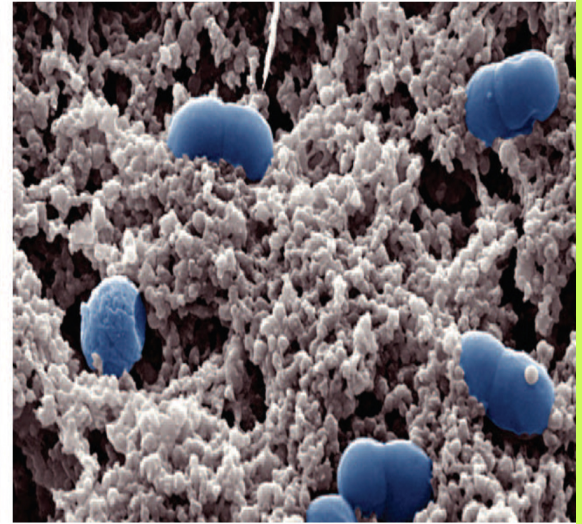
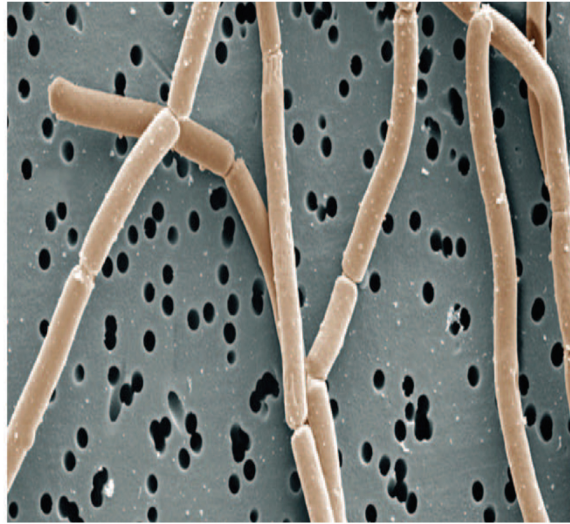
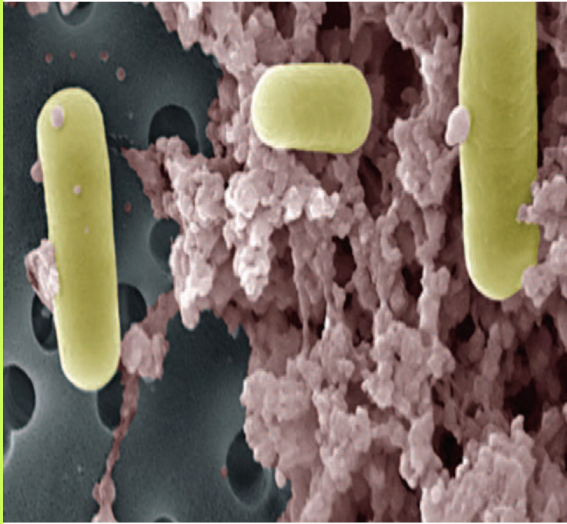


- Oxidam o etanol a ácido acético
- Importantes na produção de vinagre e kombucha
- Importantes na fermentação do cacao

Oxidação do etanol

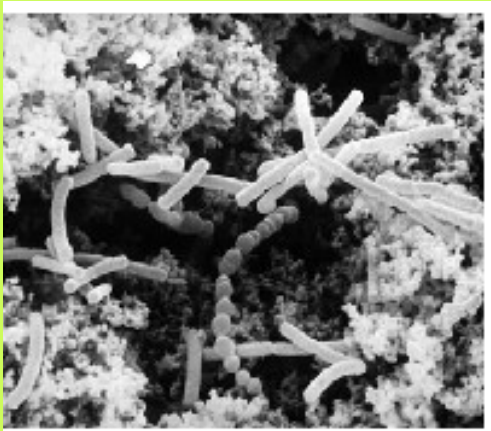
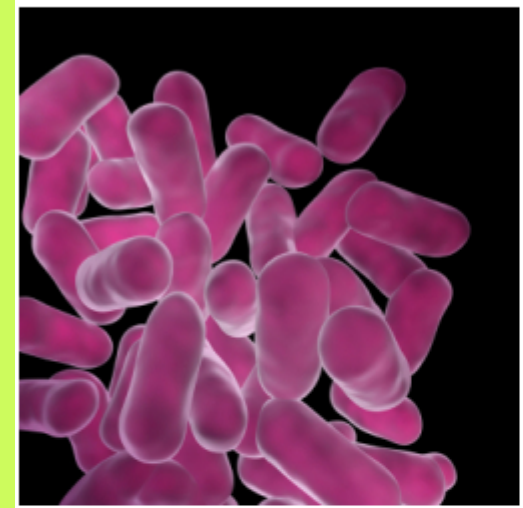
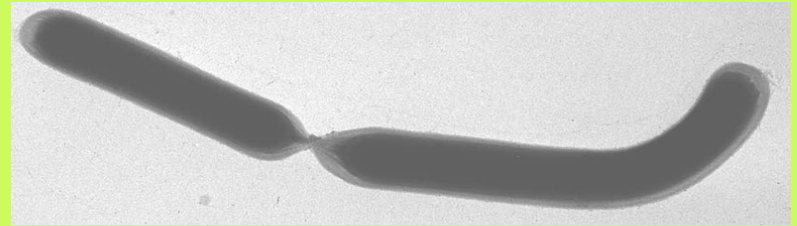


Bactérias Lácticas



Bactérias Lácticas

- Gram +
- Bastonetes ou cocos
- Fermentativas
- Catalase –
- Mesófilas
- pH óptimo 4-5 (pH 3.2 e pH 9.6)
- Difíceis de cultivar (fastidious) – vitaminas e aa



Fermentação homoláctica



Fermentação heteroláctica



LACTIC ACID BACTERIA

USES

MEDICINE

FOOD & FEED
INDUSTRIES

CHEMISTRY

PROBIOTICS

FUNCTIONAL INGREDIENTS

ENZYMES

STARTER CULTURES

VITAMINS

DAIRY FOODS

NON-DAIRY FOODS

EXOPOLYSACCHARIDES

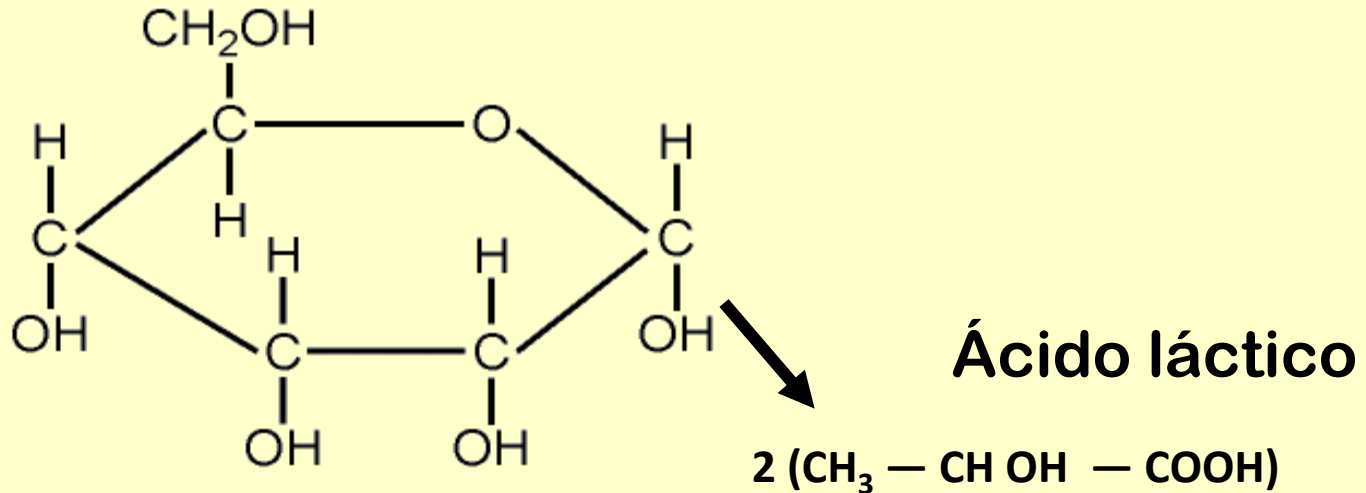
LOW-CALORIE SWEETENERS

ANTIMICROBIAL AGENTS

BIOPRESERVATIVES

MEDICINE SECTOR

Fermentação Láctica



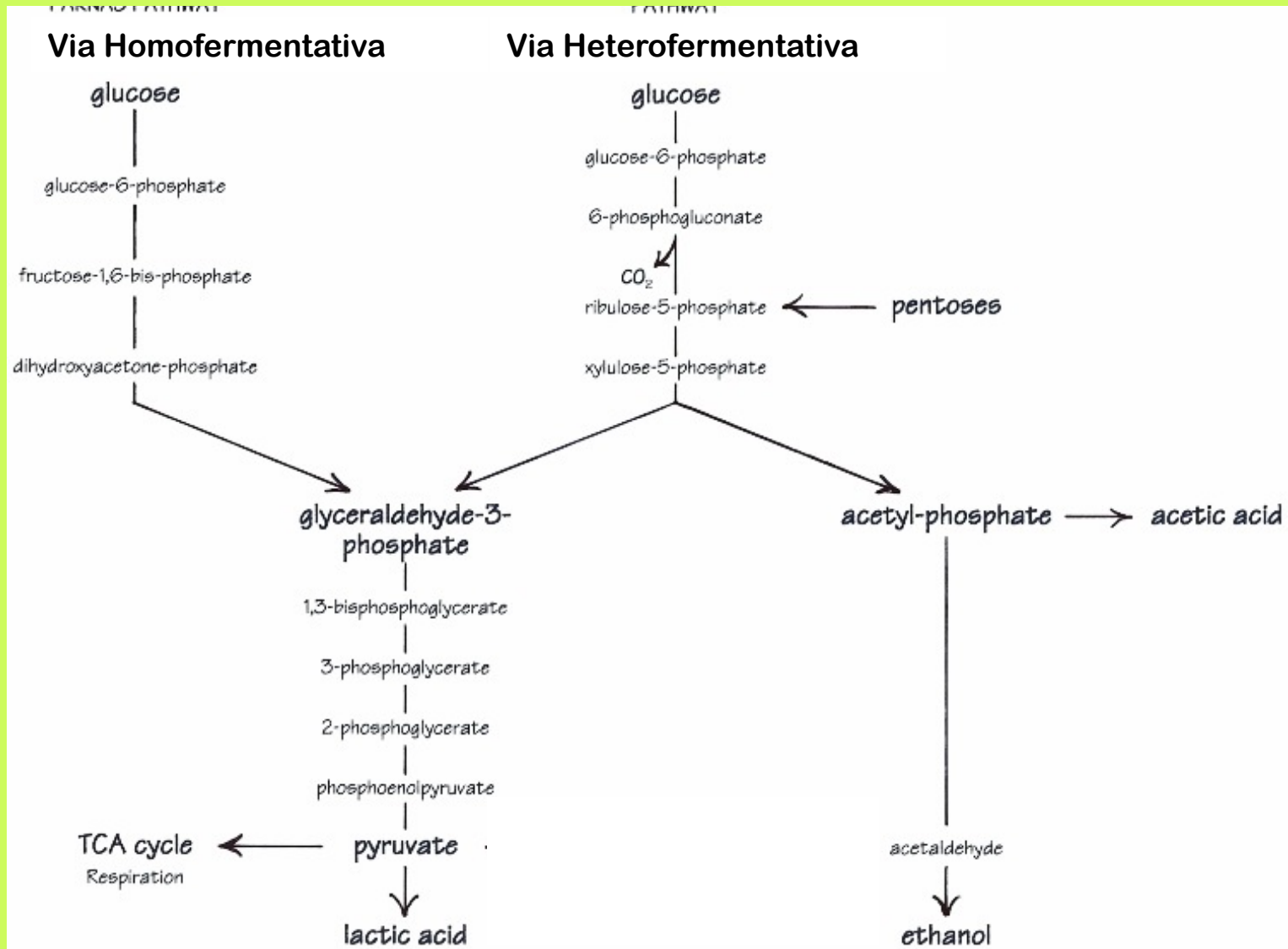
Mas às vezes também...

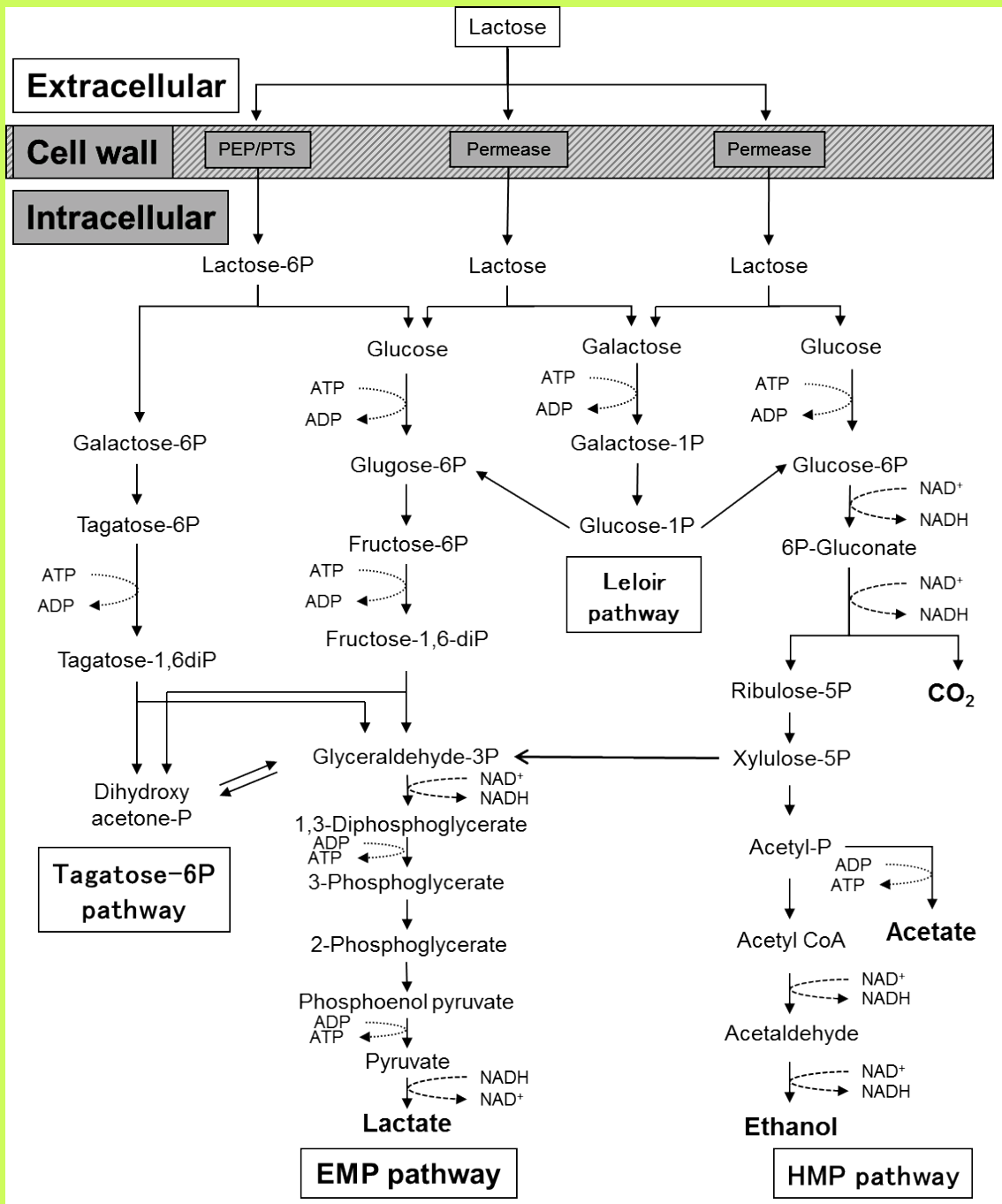
Ácido acético

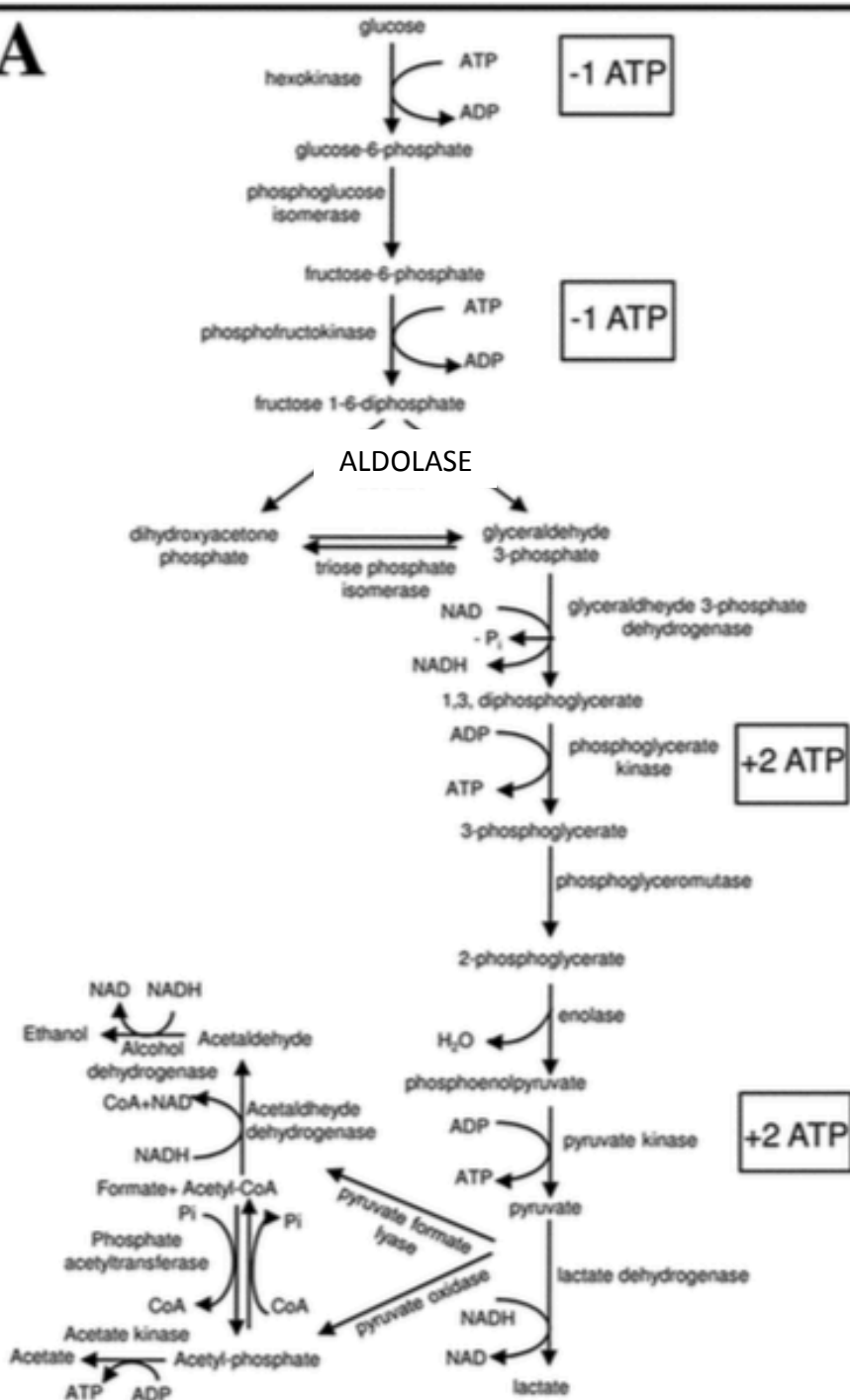
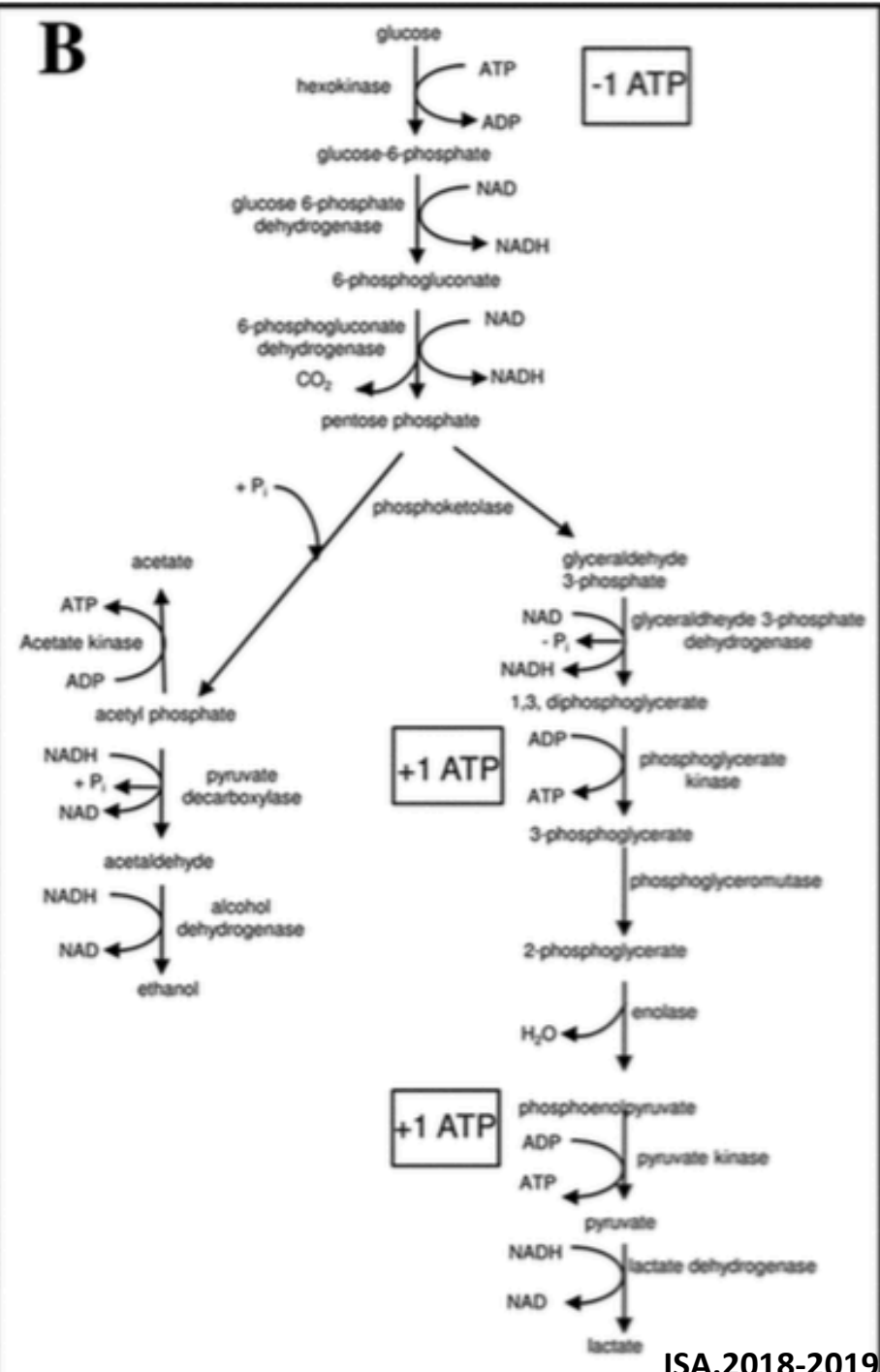
Etanol

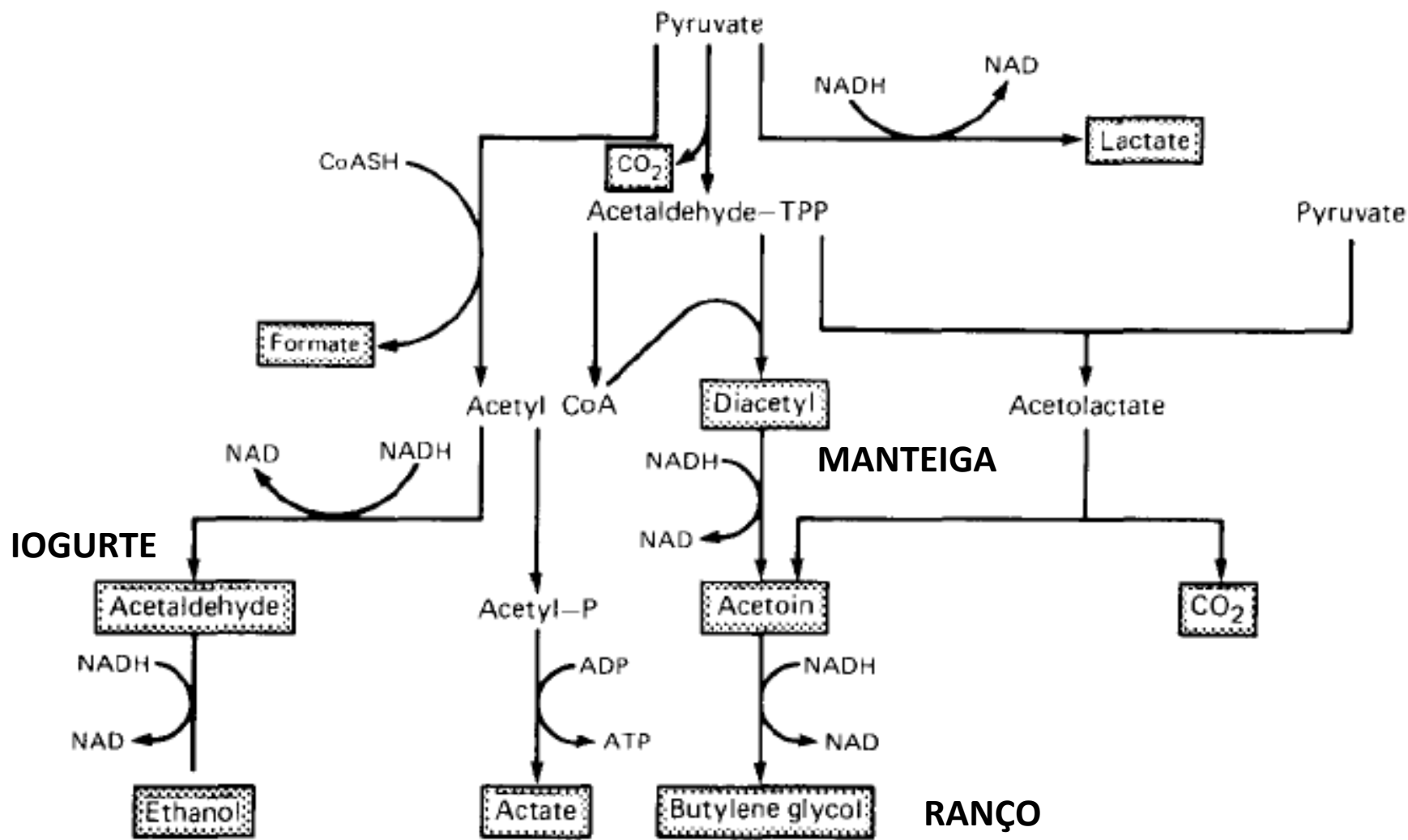
CO₂

Fermentação Láctica

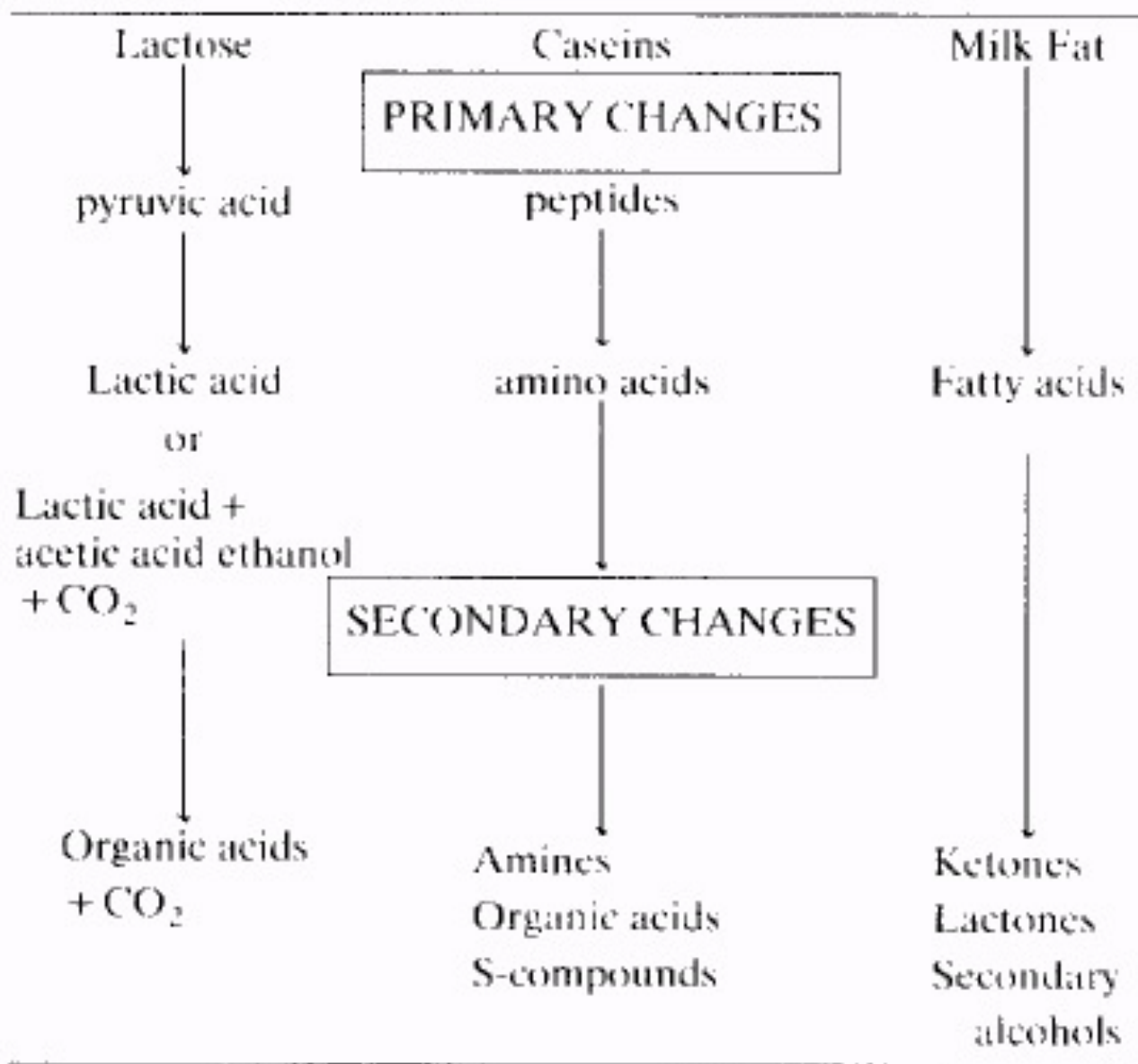




A**B**



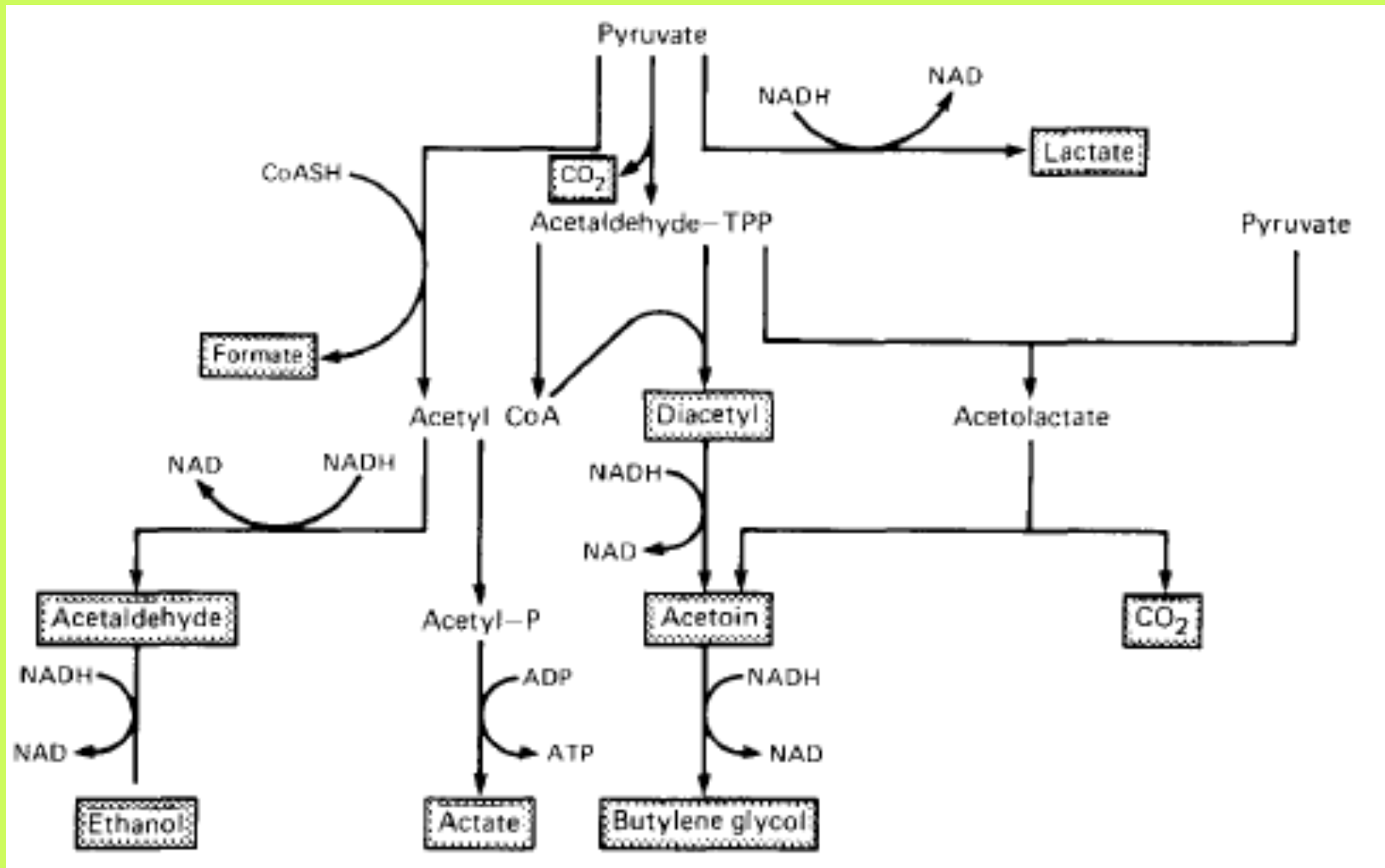
Major changes occurring during cheese ripening



Bactérias Lácticas

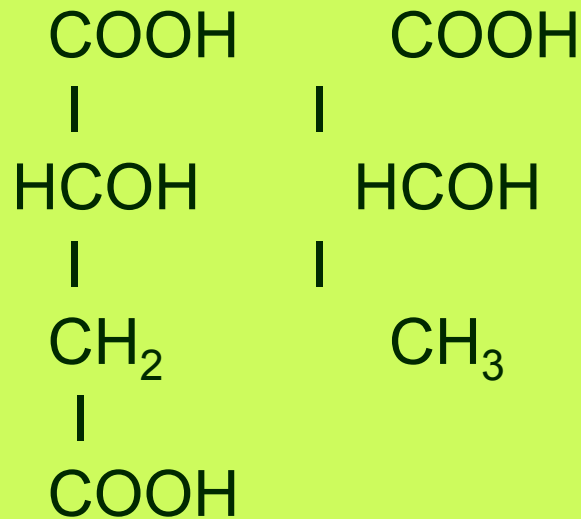
- Baixam o pH
- Produzem ácidos fracos
- Baixam o teor de açúcares
- Produzem H_2O_2
- Produzem diacetilo e acetaldeído
- Produzem bacteriocinas

Fermentação Láctica (flavors)

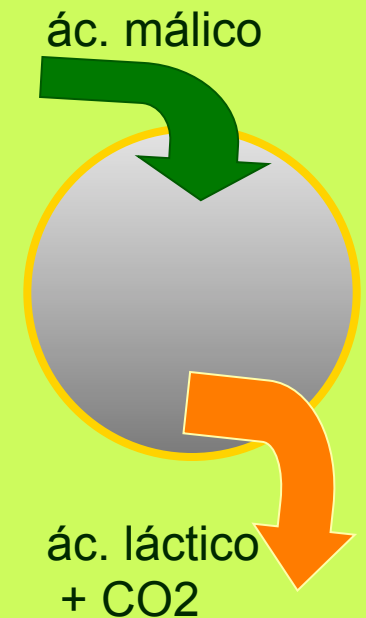


Vinho

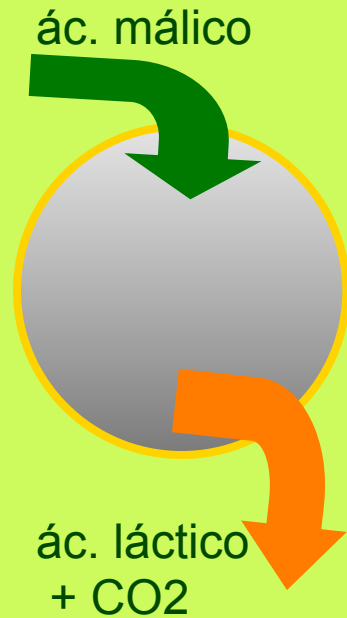
“Fermentação maloláctica”



Oenococcus oeni



Oenococcus oenii



Amacia o vinho (sobe o pH)

Estabiliza o vinho

(eliminação de açúcar residual)

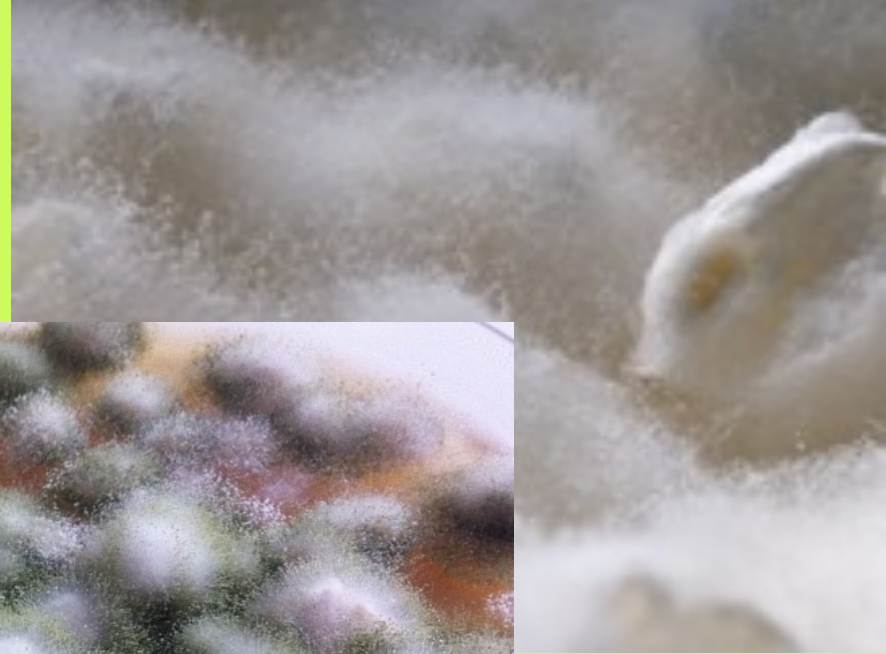
O “bouquet” ...

O “pico”



Fungos Filamentosos

(*Aspergillus oryzae* e *Aspergillus sojae*)



Fungos Filamentosos

(*Aspergillus oryzae* e *Aspergillus sojae*)

“Fermentação” = Mais valor nutricional

- Produzem amilases
- Produzem proteases
- Produzem lipases
- Produzem vitaminas



Fungos Filamentosos

(*Aspergillus oryzae* e *Aspergillus sojae*)

“Fermentação” = Maior digestibilidade

- Produzem amilases
- Produzem proteases
- Produzem lipases
- Produzem vitaminas

E ainda...

- Inibem compostos anti-nutricionais
- Consomem açúcares não fermentescíveis



Hidrólise do Amido (enzimas)

