SPOILED MILK?

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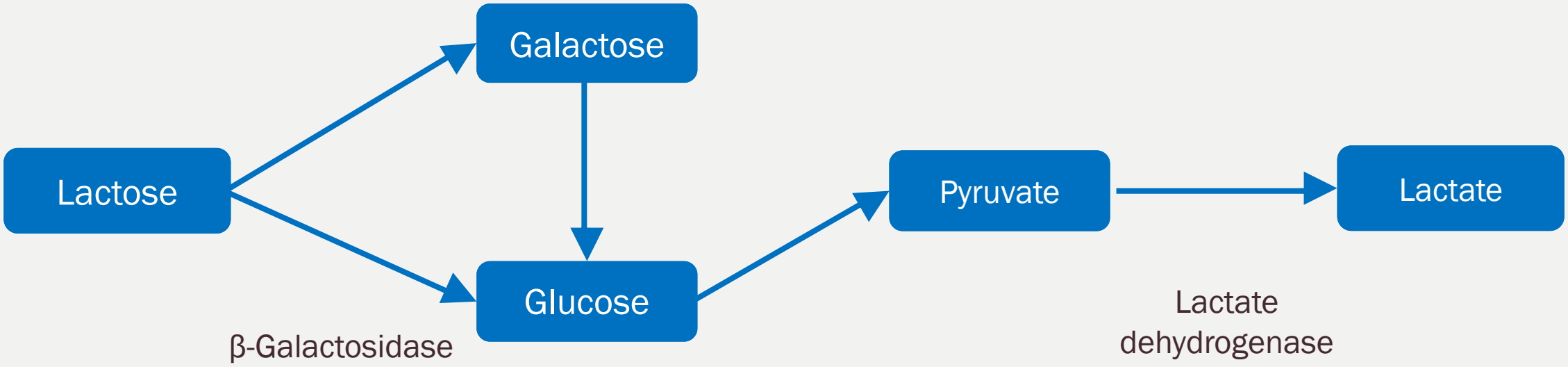
Introduction

- A sensor that tells when milk starts to spoil.
- The most common spoilage of fluid milk products is souring caused by lactic acid bacteria that can survive pasteurization.
- Helps prevent people wasting good milk that has gone past the expiration date
- Let's people know their milk is going bad and should be used quickly

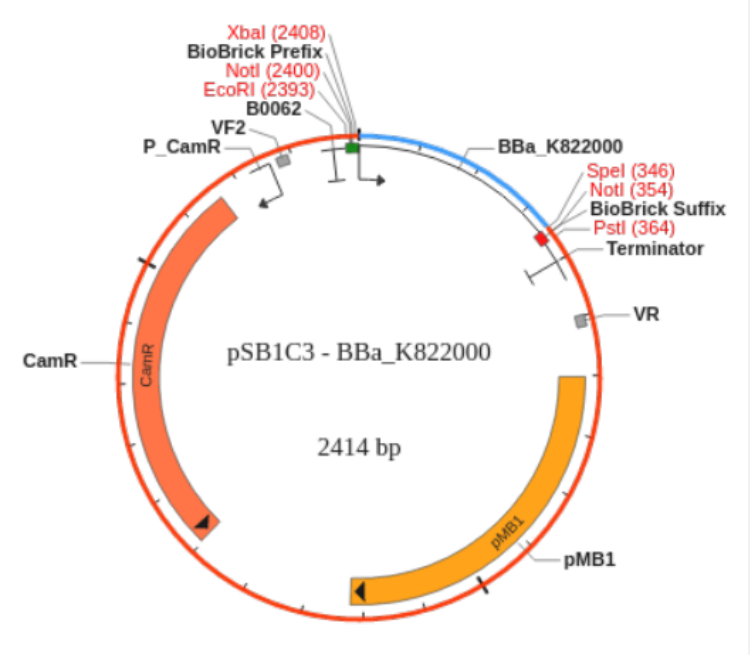
Decomposition of lactose to lactate

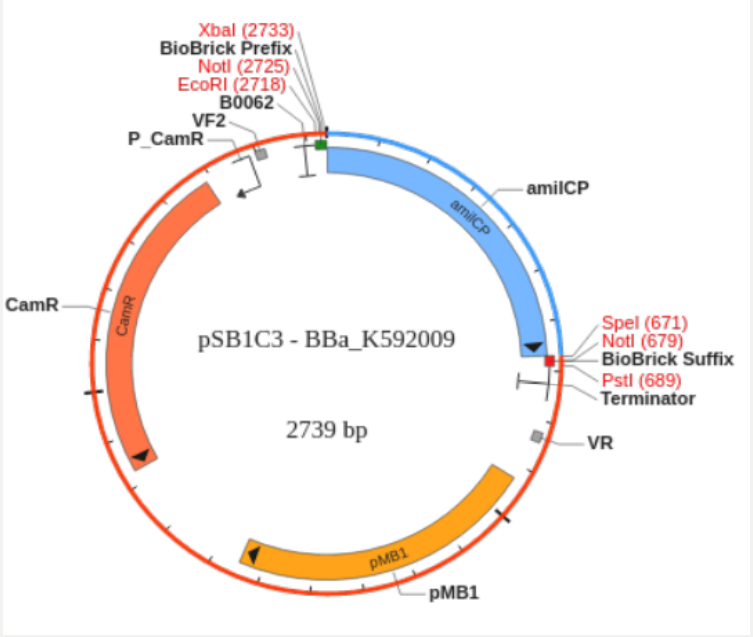
- Lactic acid bacteria secrete enzymes responsible for decomposition of lactose to glucose and galactose
- Pyruvate is fermented to lactic acid that cause the sour flavor of the spoilt milk
- Sourness causes destabilization of the emulsion → splitting

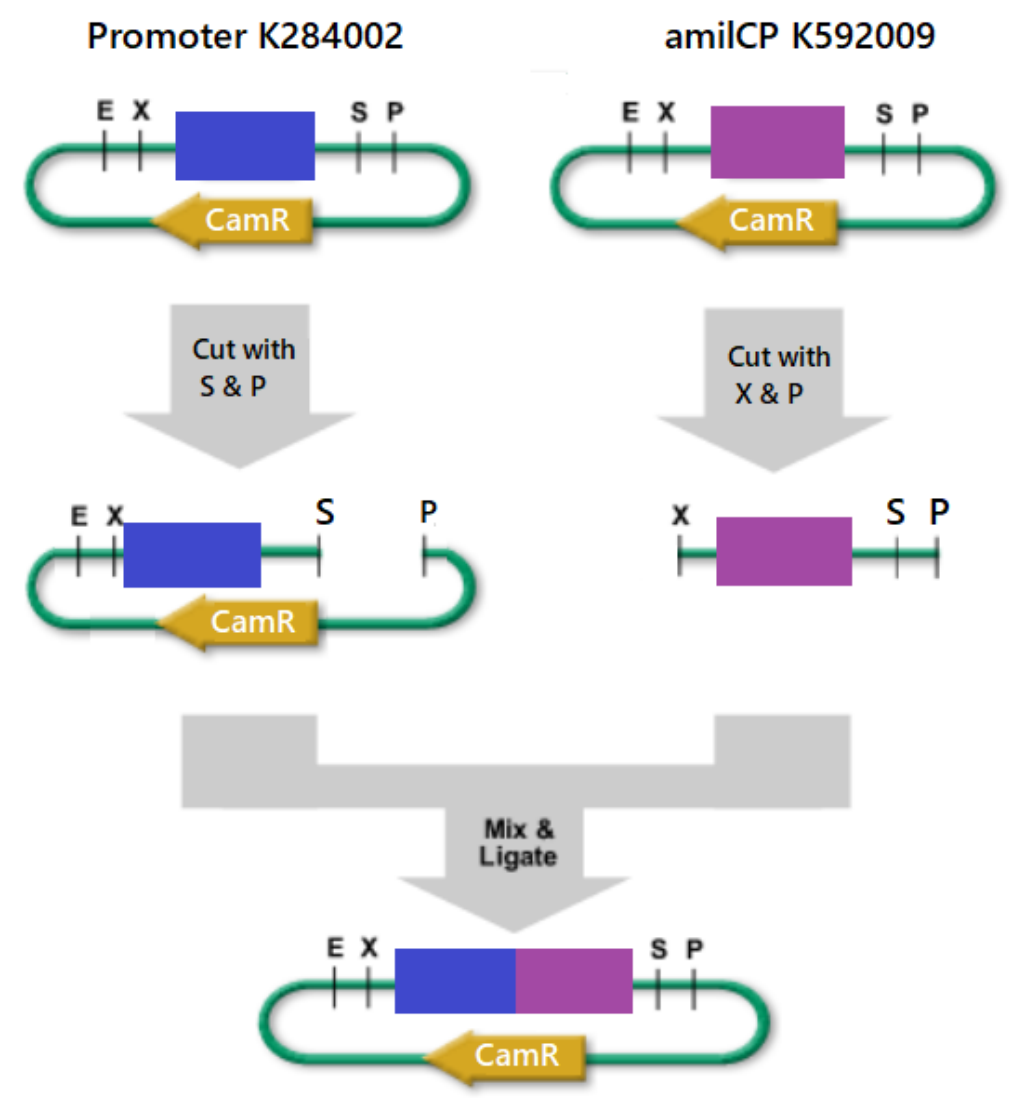


BioBricks Used

- **Chassis:** *Saccharomyces cerevisiae*
- **BBa_K284002**
  - From the yeast "*Kluyveromyces lactis*"
  - *JNE1* promoter
  - Induced by lactate
- **BBa_K592009**
  - From the coral "*Acropora millepora*"
  - *amilCP*, blue chromoprotein
  - Blue/purple color visible to the naked eye within 24 hours







Assembly

- **The BioBrick Standard assembly RFC 10**

1. Wanted promoter

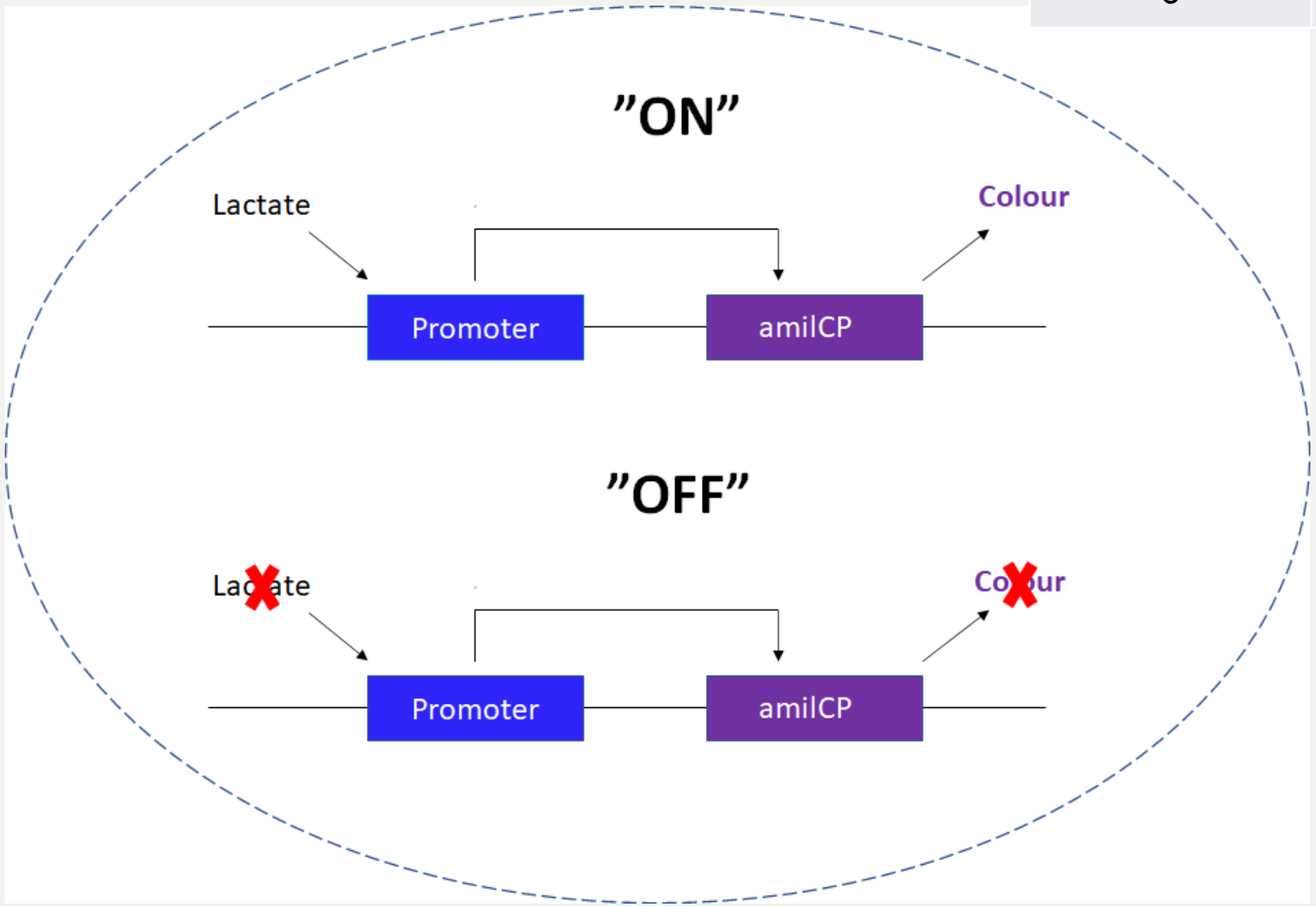
Cleavage with restriction enzymes SpeI and PstI

2. Wanted gene

Cleavage with XbaI and PstI

Sensor design

Lactate	amilCP
1	1
0	0



Implementation

Further development

- Semipermeable membrane pocket that passes only organic acids
- Other requirements for the formation of color besides lactate?
- Development of AND gate measuring lactate production and lactose depletion for higher sensitivity
- The chassis – Yeast vs. others
  - Consumers' perception on the safety of the chassis
- The promoter could be used in another host

THANK YOU!

Questions?