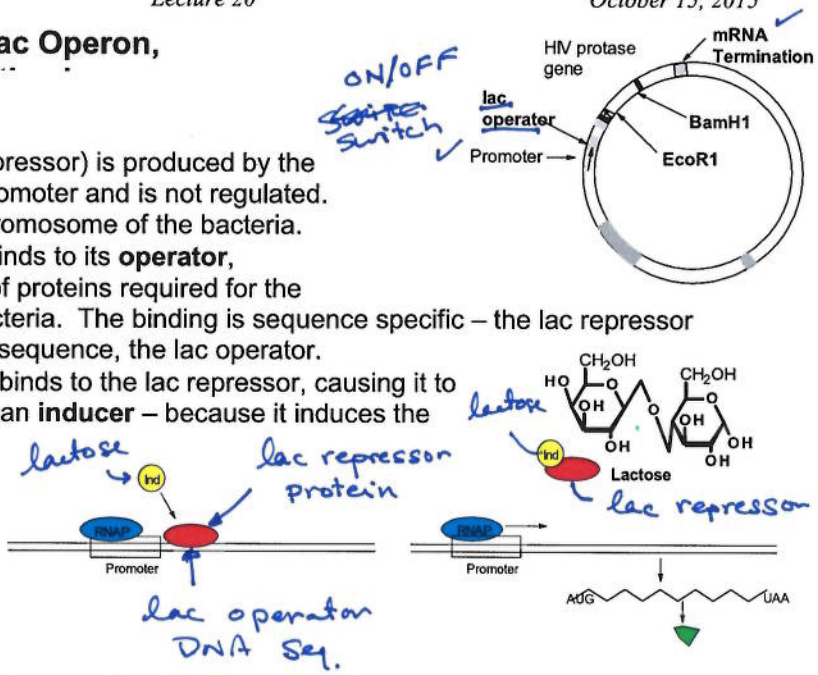


Lecture 20: Regulation by lac Operon,

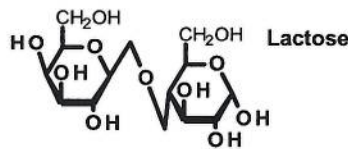
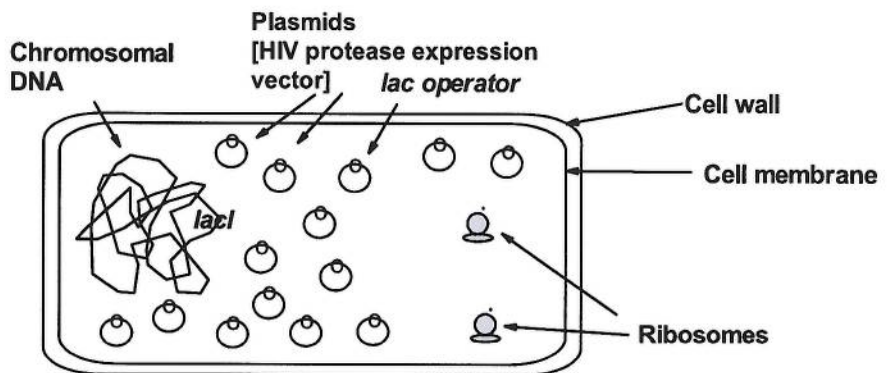
Regulation of the Lac operon

- **Repressor protein** (lac repressor) is produced by the lac I gene, it has its own promoter and is not regulated. The lac I gene is on the chromosome of the bacteria.
- The lac repressor protein binds to its **operator**, preventing the production of proteins required for the usage of lactose by the bacteria. The binding is sequence specific – the lac repressor recognizes a specific DNA sequence, the lac operator.
- When lactose is present, it binds to the lac repressor, causing it to leave the DNA. Lactose is an **inducer** – because it induces the production of enzymes.
- Enzymes for the usage of lactose are then produced by the cell and lactose is used as a source of energy.



Controlled Expression of HIV protease using the Lac operon Machinery.

1. The continuous expression of high levels of almost any protein is toxic to the bacteria.
 - Protein is toxic
 - Cell dies making so much of the protein
2. IPTG, an analog of lactose, also binds to and causes the lac repressor to leave the operator sequence on the DNA.
3. mRNA coding for HIV protease is then made by RNA polymerase, this is used by the ribosome to make the enzyme.
4. Typically, a large number of cells are grown up, and then IPTG is added, production of mRNA starts, and then HIV protease is made.



lactose analog inducer

mRNA $\xrightarrow{\text{start mRNA start}}$ HIV Protease \rightarrow

TTGACA TTTATGCTTCCGGCTCGTATAATGTGTGTGAGCGGATAACAATTCACACAGGAAACAGCTATG... Met... RNA pol

