BIOBRICK GROUP PROJECT

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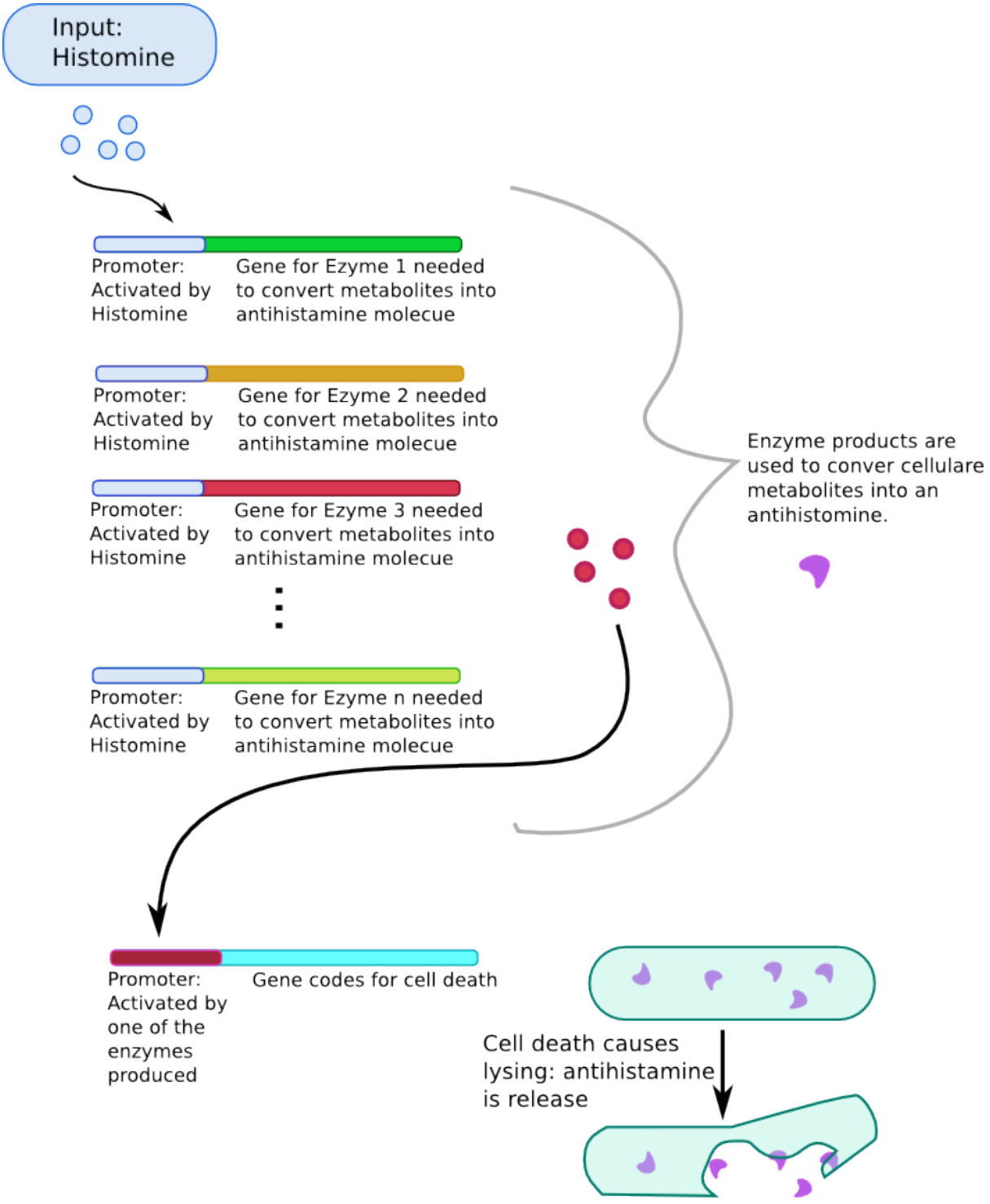
1) Inflammation Down Regulation : Less detailed #1



When foreign substances (antigens) enter the body, the immune system reacts by creating an inflammatory response. The basophilis (WBC) become mast cells and degranulate releasing histamines. Histamines increase vascular permeability and recruit more white blood cells to the inflammation site. In order to down regulate the inflammation, it is necessary to use anti-histamines. So, we proposed coming up with a biobrick that used histamine as the input which then activated a promoter. The promotor is tied to numerous genes which code for enzymes that can convert cellular metabolites into an antihistamine drug. We could also include a death gene which is activated by on of the enzymes (the system would be designed so that this is not an enzyme naturally found in E.coli so that cell death is not spontaneous. The cell would then lyse and release the drug into the environment.

2) AND gate

We came up with a biobrick that uses an AND gate. The AND gate has two inputs and depending on the presences of the inputs then the reporter protein will be expressed. The reporter protein can be, for example: green fluorescent protein (GFP) or produce a biofilm.

AND gate (uses binary system; 1- present, 0-absent)

Input		Output
A	B	A and B
0	1	0
0	0	0
1	0	0
1	1	1

A high output results from the presence of both inputs to the AND gate and a low output results from neither of the inputs being present or only one input to the AND gate.

Example:

Iron and UV light irradiation→Fe and UV promoter →GFP generator

(parts: BBa_I765007, BBa_E0840)

3) And Gate with RNA aptamer

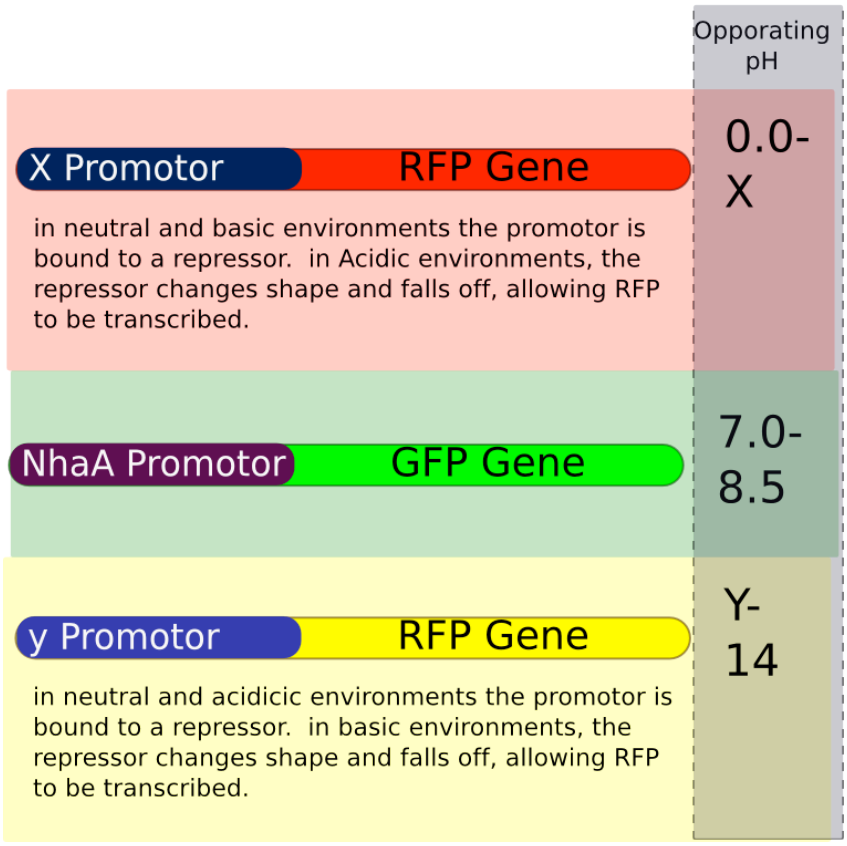
AND output behavior is same as in first And gate, but instead of using a promoter dependent on two molecules, we construct this AND by using a positive promoter with and activator (molecule A) and a aptamer sequence on the ribosome binding site of the mRNA such that it cannot bind to the ribosome and be translated into a protein until a ligand (molecule B) binds to the aptamer and changes its shape. In the case the only A is present, the mRNA will be transcribed but not translated. In the case that only B is present, nothing will happen.

4) We were just brainstorming more on the idea of coming up with a biobrick that can detect certain biomarker specific to a medical condition. For example, eosinophil cationic protein is a biomarker for airway inflammation. Airway inflammation is a red flag for certain respiratory diseases such as: bronchitis, chronic obstructive pulmonary disease, etc.

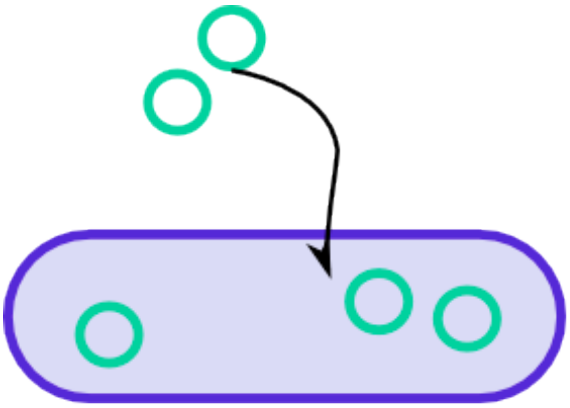
Biobrick: Eosinophic cationic protein (input)→promoter→reporter gene

pH sensor: (Biobrick #1)

For this biobrick, there are three different genes that are regulated by different promotors. The activators/ repressors are connected to pH. For example: in an acidic environment, the repressor for the yellow fluorescent protein will have denatured and YFP will be expressed.



Lithium Current sensor



Promotor activated by lithium Gene for electric membrane channels

Uses Suanella gene that code for the membrane channels that allow the bacteria to produce current by exporting electrons. The promoter is activated by lithium. The ideal is that the bacteria will detect the lithium and as the concentration of lithium goes up, so will the number of channels on the bacteria in the culture and effectively current should be a measure for amount of lithium,