Announcements

Lab Quiz

Pre-lab Lecture
- Recap of BP components
- Signaling details of BP system
- Introduction to TinkerCell
- Today in Lab (M2D2)
Recap BP components

Fill in boxes with a partner...

light \[\rightarrow\] Input Sensing Device \[\rightarrow\] Output Generating Device \[\rightarrow\] color

\[\text{Omp}_R \quad \text{Omp}_{Ecoli} \quad \text{Omp}_{	ext{R}} \quad \text{binds here}\]

\[\text{pbpC} \quad \text{lac}^Z \quad \text{Kan}^R\]

\[\text{relay on native Omp}_{R}\]

\[\text{Amp}_{R} \quad \text{A lac}^Z\]

\[\text{Cph}_1 \quad \text{Env}_2\]

\[\text{apo-Cph}_1 + \text{PCB} = \text{holo-Cph}_1\]

\[\text{bound} / \text{functional}\]

\[\text{plasmids}\]
How is the signal processed?

1. Auto-phosphorylation
2. Phospho-transfer
3. Phosphatase
Chemistry of phospho-aa

Phosphohistidine vs Phosphotyrosine

1. Acid-labile
2. \( e^- \)-depleted form insignificant

\( \downarrow \)

\( \cdot \) unstable to nucleophilic attack

Slide from N. Kuldell
Chemistry of phosphorelay system

Slide from N. Kuldell
Thermodynamics of phosphorelay

What is a “high-energy” bond?

\[
\text{classic e.g. } \text{ATP} + H_2O \rightarrow \text{ADP} + P_i
\]

\[P\equiv O\text{ bond}\]

Typical $\Delta G^\circ$ of hydrolysis

-6.5 to -9.5 kcal/mol

-12 to -14 kcal/mol

Which one is phosphoester, which is phosphoramidate?

\[P\equiv O\]
\[P\equiv N\text{ (His)}\]

TinkerCell modeling program

• Two major utilities for biological systems

• Visualizing networks
  – GUI to combine enzymes, promoters, etc.

• Simulating and perturbing networks
  – ODE-based modeling
  – initial concentrations, rate constants, etc.

• Consider assumptions and reliability in modeling vs. experiments
Today in Lab: M2D2

- Observe/take pics of solid media from last time
- Prepare bacterial photograph
- Test liquid cultures from last time
  - β-gal assay (lyse cells, etc.)
  - Expected results: \([\beta\text{-gal}]_{\text{light}} < [\beta\text{-gal}]_{\text{dark}}\)
- TinkerCell
  - Draw network
  - Simulate changes to \(k\)'s, etc. (or next time)
- Atissa will give talk about talks @ 4 pm