Role of Undergraduate Biochemistry Education in Protein Function Assignment
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Hypothesis: Undergraduate students can characterize proteins of unknown function as the central theme of their regular biochemistry laboratory course.

In silico Characterization

The SBEVS team has identified >57 "good hits" with the ProMOL plugin for PyMOL. A typical alignment is shown in Figure 2. Promising results are further explored with BLAST, Pfam and Dalil to discover superfamilies and families. This is an iterative process. For example, if a BLAST search yields a promising alignment with a database in the PDB, a suitable template is created and the alignment is tested with ProMOL/PyMOL.

Narrowing the Field

In Vitro Characterization

Selecting a Protein. If the combined alignments suggest promising substrates directly, they are pursued. For cases where no clear substrate preference is obvious, we are developing computational methods with Autodesk to help narrow the list of potential substrates.

The process of protein selection continues with a thorough study of related enzymes in the literature:

- Are the assays simple with readily detectable products?
- Do we have the necessary instrumentation?

Next the candidate substrates must be evaluated:

- Are the substrates available for purchase?
- Are they stable?
- Is the price reasonable?

If the answer to all of these questions is yes, the plasmid is ordered, typically from the plasmid repository at DNAsu (https://dnasu.org/DNASu). The next panel is a mapping of our process onto a typical undergraduate biochemistry lab course.