**Goal: Extend lifetime of possible processes**

Is extending lifetime useful? Has it been done before? Is there an immediate need for this?

* Read this: <https://pubmed.ncbi.nlm.nih.gov/24326247/>
* <https://www.sciencedirect.com/science/article/pii/S0300908413004367?via%3Dihub>
* Lasts up to 10 hrs for CFPS

Will people use this ?

* Have to make efficient later on

Cell free vs encapsulated?

TxTl vs PURE?

Is ATP the limiting factor for protein production?

<https://pubs.acs.org/doi/full/10.1021/acssynbio.5b00296>

yes according to this paper noireoux

‘This metabolism, based on a phosphate donor and a carbon source,[(43)](javascript:void(0);) extends the kinetics of TX-TL by activating the glycolysis pathway and by recycling inorganic phosphate, a reaction byproduct that inhibits expression. Cell-free protein synthesis yields are increased by a factor of 2 to 3 on average, depending on the expressed’

* Plasmid with GFP, detect fluor via biotek
* Exp 1: (neg control) See how long experiment lasts with regular conditions
  + Collect data every 4 hours ? (Possible??), will biotek hurt things?? (aliquot a portion)
* Exp 2: give more ATP at beginning / add ATP intermittently / add PURE enzyme things to get rid of Pi
* If significantly more protein production (possibly positive), if not – something else limiting
* Any way to detect ATP ??

Can ATP Synthase be membrane bound in desired orientation?

* Express or purify and integrate?
* How does it happen naturally?
* Reconstitution:
  + Here: <https://febs.onlinelibrary.wiley.com/doi/full/10.1016/S0014-5793%2899%2901060-1>

Is a proton pump necessary?

* Study H+ in the membrane
* Study atp synthase

Can proton pump be membrane bound in desired orientation?