Team 09

Selective HIV DNA Enrichment Using Magnetic Beads

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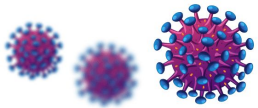
Need

Approximately **1.2 million Americans** are diagnosed with **HIV**

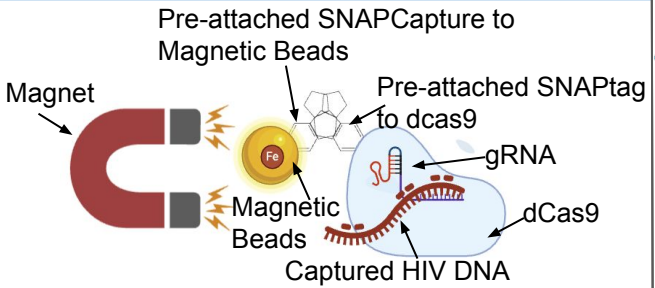
- Optimize HIV research protocols
- Decrease amount of time and resources needed to gather HIV DNA



Objective: Design a **non-toxic method** that increases target DNA through **selective enrichment** by **10x** within **2 hours**

Solution - Build

Magnetic beads are combined with dead Cas9 (dCas9). Target DNA grabbed by the Mag-dCas9 complex is removed from pool of DNA using a magnet.

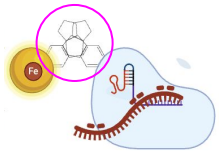


Testing Results

dCas9 and Magnetic Bead Complex: Test the SNAP attachment between mag beads and dCas9

Req: 50% binding efficiency

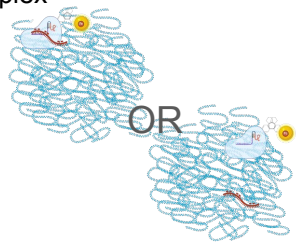
Result: 88%



DNA Grabbing: Find if DNA is grabbed by complex

Criteria: DNA concentration decreases

Result: Fail



Design Inputs - Requirements

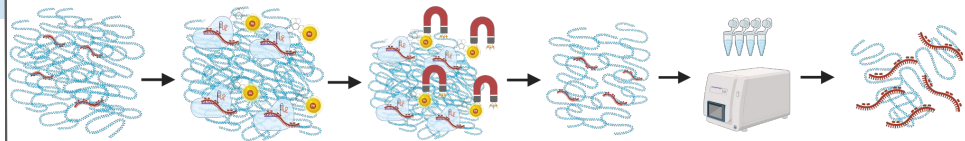
DNA Concentration: Increased ≥ 10-fold

Shelf Life: ≥ 2 days

Procedure Time: ≤ 2 hours

Modularity: Multiple gRNA inputs

Solution - Design



Human + HIV DNA

Previous + mag-dCas9 complex

Magnets grabbing complexes attached to target DNA

Grabbed DNA strands

Round of PCR

Amplified target DNA and some off-targets

Future Plans & Impact

Future Plans:

- Research methods to reduce procedure time
- Determine optimal concentrations for buffer, magnetic beads, dCas9, and gRNA
- Design new gRNA for corresponding target strands

Impact:

- Preliminary design set-up for future revisions
- Improve HIV sequencing efficacy and reduce the time and resources needed to amplify DNA