IIT Delhi’s
Vision

“Develop system utilizing recombinant bacteria to detect the levels of elicitor and producing and releasing required amount of peptidal drug into continuous stream”
E. coli
Flow system?

E. coli

Key Elements

Extracellular protein??
$\alpha$-hemolysin system
Flow system?

Key Elements

E. coli

α-hemolysin system
**Schematic Vision**

- Semi-permeable membrane
- Immobilized bacterial system

**Flow System/Vein**

Bypass
Continuous Flow Schematic

E. coli

Key Elements

α-hemolysin system
Part 1 – Engineering *E. coli* to produce and secrete the Peptidal drug
Part 2 – Designing and optimizing a suitable flow system

- Immobilized cells
- Peristaltic pump
- Feed Tank
- 1
- 2
- 3
- Sample collection and testing
1. Perfusion Reactor

- Media in
- Immobilized cells
- Media + drug out
- Perfusion membrane
Part 2 – Designing and optimizing a suitable flow system

1. Feed Tank
2. Immobilized cells
3. Sample collection and testing
2. **Hollow Fiber Reactor**

Hollow fiber with immobilized cells

---

Media in

Hollow Fiber Reactor

Media + drug out
Part 2 – Designing and optimizing a suitable flow system

- Immobilized cells
- Feed Tank
- Peristaltic pump

Sample collection and testing
3. Dialysis Bag

Dialysis bag
Holding string
Media in
Media + drug out
Immobilized cells
What exactly does such an idea entail?
Putting theory into practice...

*If we waited until we could do something so well that we would not make a mistake, then we will wait forever* –
*from ‘Organic Chemistry’ by IL Finar*
hlyB and hlyD: - The trans membrane components
hlyA: - The evil toxin
hlyC: - The instigator

hlyA tag

yfp
α-hemolysin system

Transmembrane construct
• Chimeric PCR used to create protein fusion.
• PCR products digested and ligated in two steps with pLac and various RBS sequences.
STATUS

• Reporter construct for study of secretion characteristics submitted (BBa_K408000).

• Biobricks necessary for extracellular secretion of proteins created (not yet submitted).

• The flow system analysis is ready to proceed once the cellular machinery is assembled.
Future Directions

• Need to improve the efficiency of transcriptional control

• Study the possibility of controlling the expression of the trans membrane components for faster response time.

• Hope to combine this with a sensor apparatus to create a targeted device
EXPERIENCES
Acknowledgments

Our Mentors
• Dr. D. Sundar
• Dr. Atul Narang

Our Graduate Advisors
• Ms. Somya Mani
• Mr. Abhinav Grover

Special Thanks to Prof. Agneta-Richter Dahlfors and Dr. Peter Kjall from the Karolinska Institute, Sweden.

Our Sponsors
Indian Institute of Technology, Delhi
Thank you.....