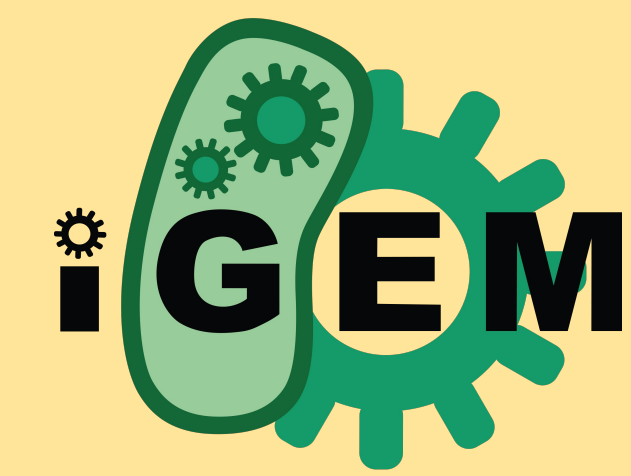




# BACMAN: IGEM 2018 TEAM IISER-KOLKATA

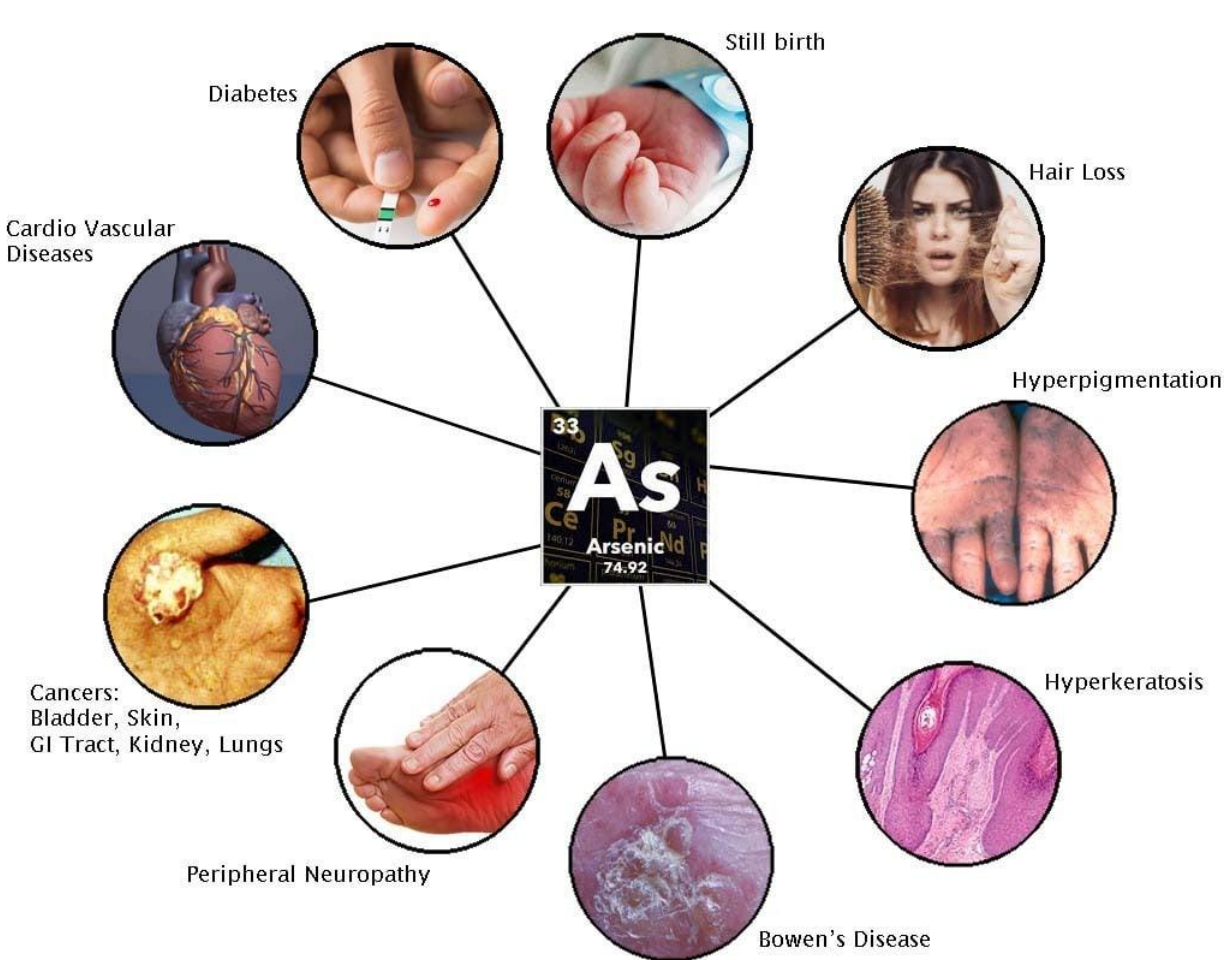
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Dr Partho Ray (Primary PI) Dr Arnab Gupta (Secondary PI) Mr Debabrata Sutradhar (Instructor)



## Abstract:

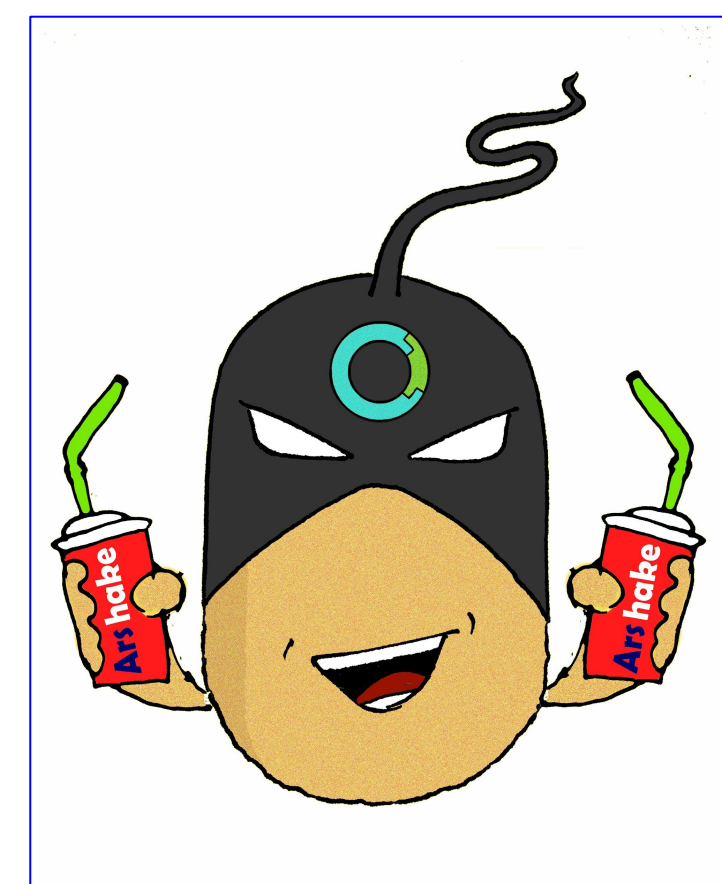
Arsenic contamination in groundwater is a major global problem particularly severe in West Bengal (India) and Bangladesh and has been the cause of the largest mass poisoning in history still ongoing today. Arsenic accumulation in tissues leads to chronic poisoning whose symptoms include dreadful skin lesions, neuropathy, cardiac issues and very high risk of cancer. All of the current technologies aim at purifying water before drinking so that ingestion of the toxic ion is lowered. However, rice and fish raised using contaminated water also take up large amounts of the ion which subsequently enter the food chain when ingested. No measures attempt to block or target this pathway of arsenic entry. Team IISER-Kolkata presents an unprecedented, novel, prevention based therapeutic approach to combat arsenicosis. We aim to design probiotic bacteria capable of sequestering arsenic ions at the physiological conditions in the human gut to shield the population from arsenic poisoning.

## Arsenic, the synonym of death:



Arsenic Intake	Mean Value
Daily intake through diet	164 µg/day
Daily intake through water and diet	349 µg/day
Total As dose through diet	3.37 µg/Kg/day
Total As through water and diet	6.93 µg/Kg/day

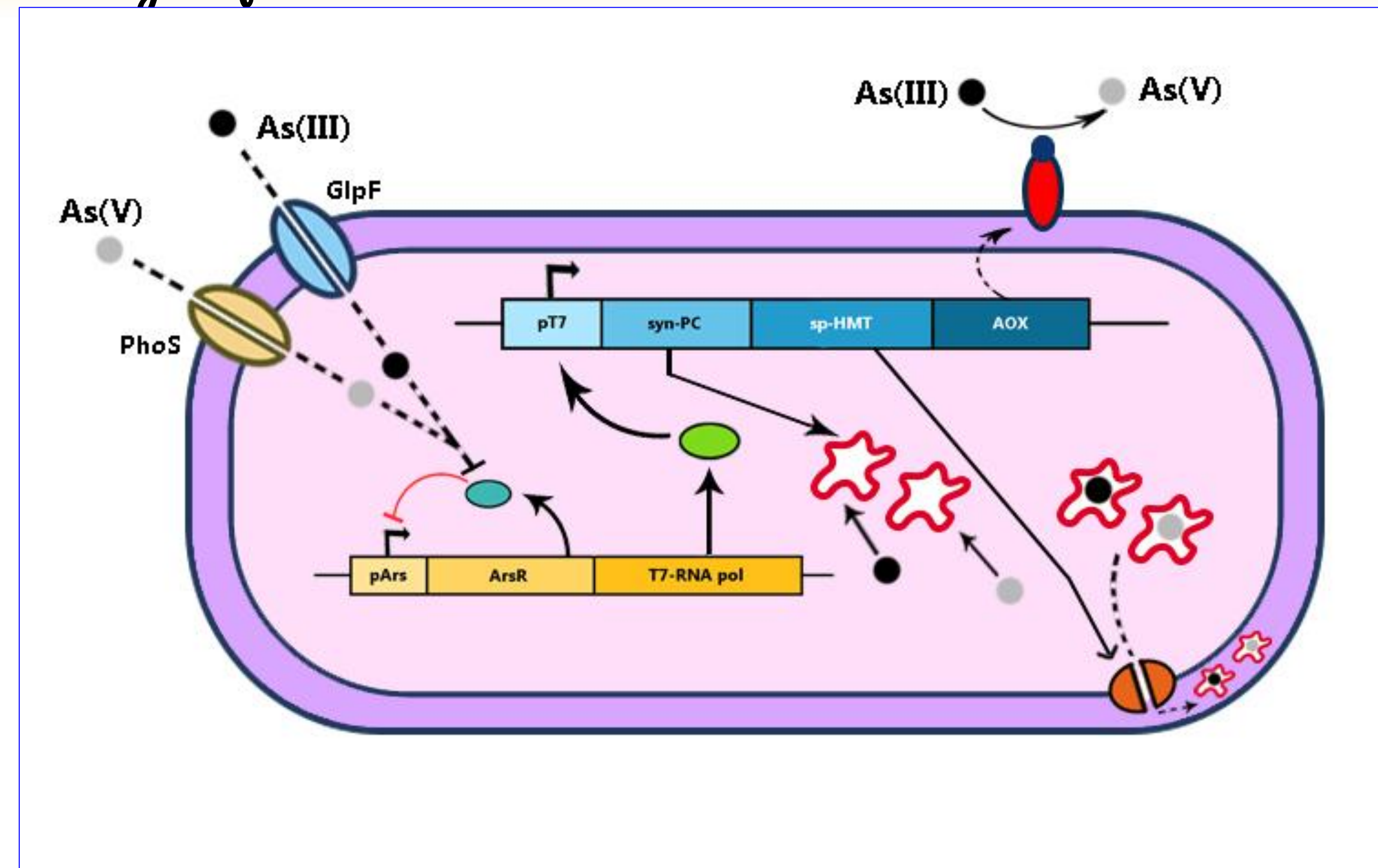
## BacMan:



A probiotic bacterial BatMan to protect the citizens of Gotham from Arsenic poisoning.

**Aim:** To show proof of concept in *E. coli* and then Proceed to a probiotic species such as *Lactobacillus*.

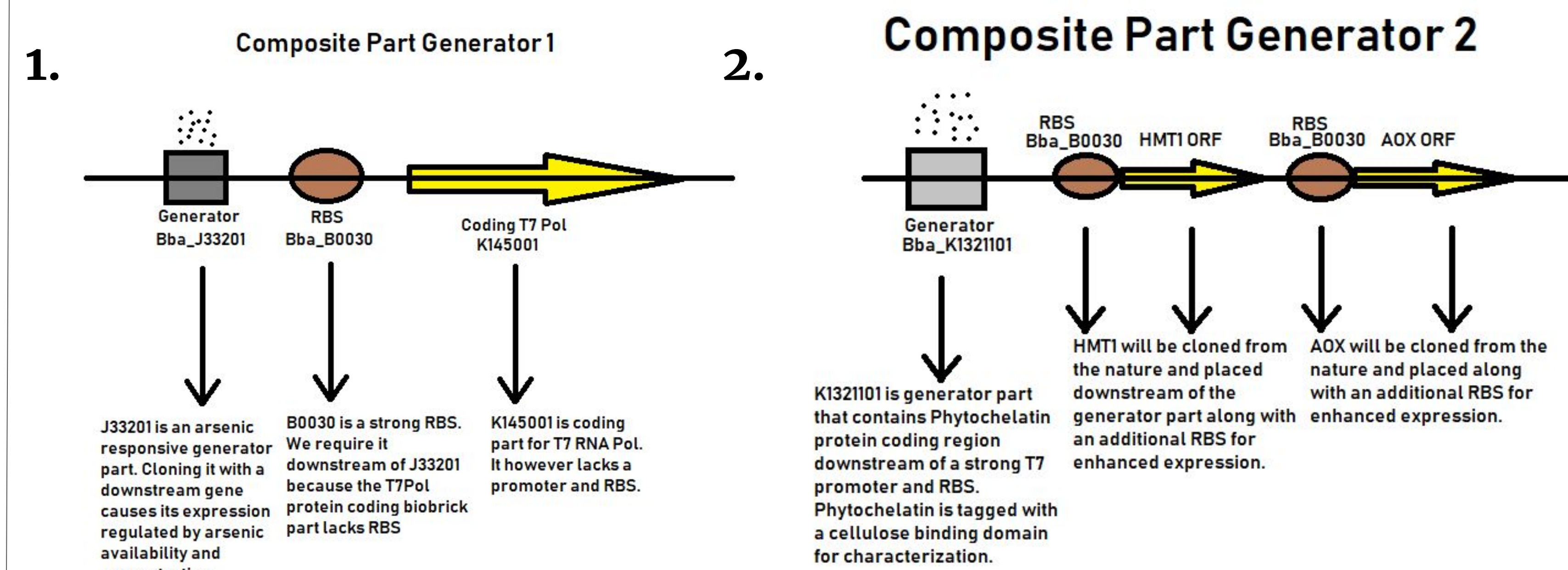
## Core Design of BacMan:



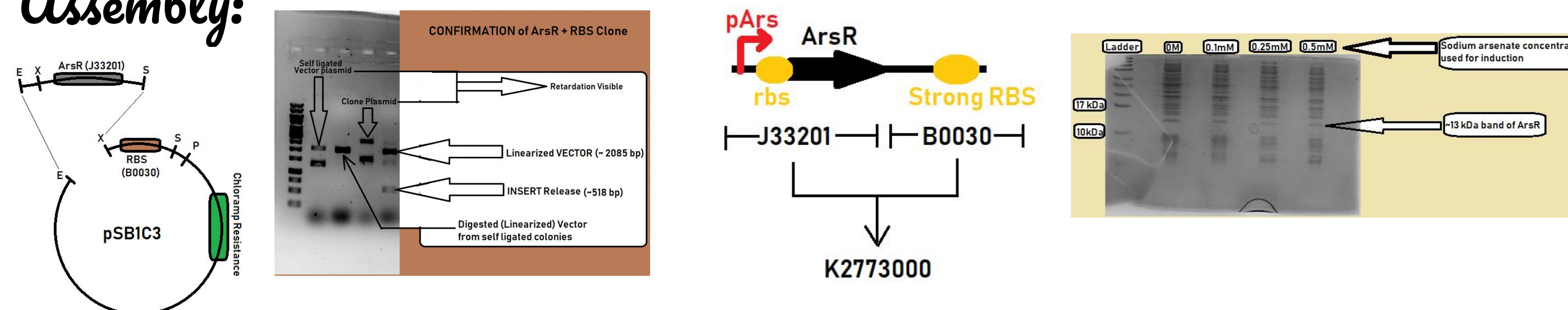
## Arsenic Entry:

As(V) and As(III) ions enter through phosphate transporters and glycoporins.

## Gene circuit has two operons:



## Assembly:



Part K2773000 is our contribution to the registry. The Part has been confirmed by sequencing. Full proof characterization of the part is still on going but Preliminary Data suggests that the part will work.

## Ars Operon and its Deletion:

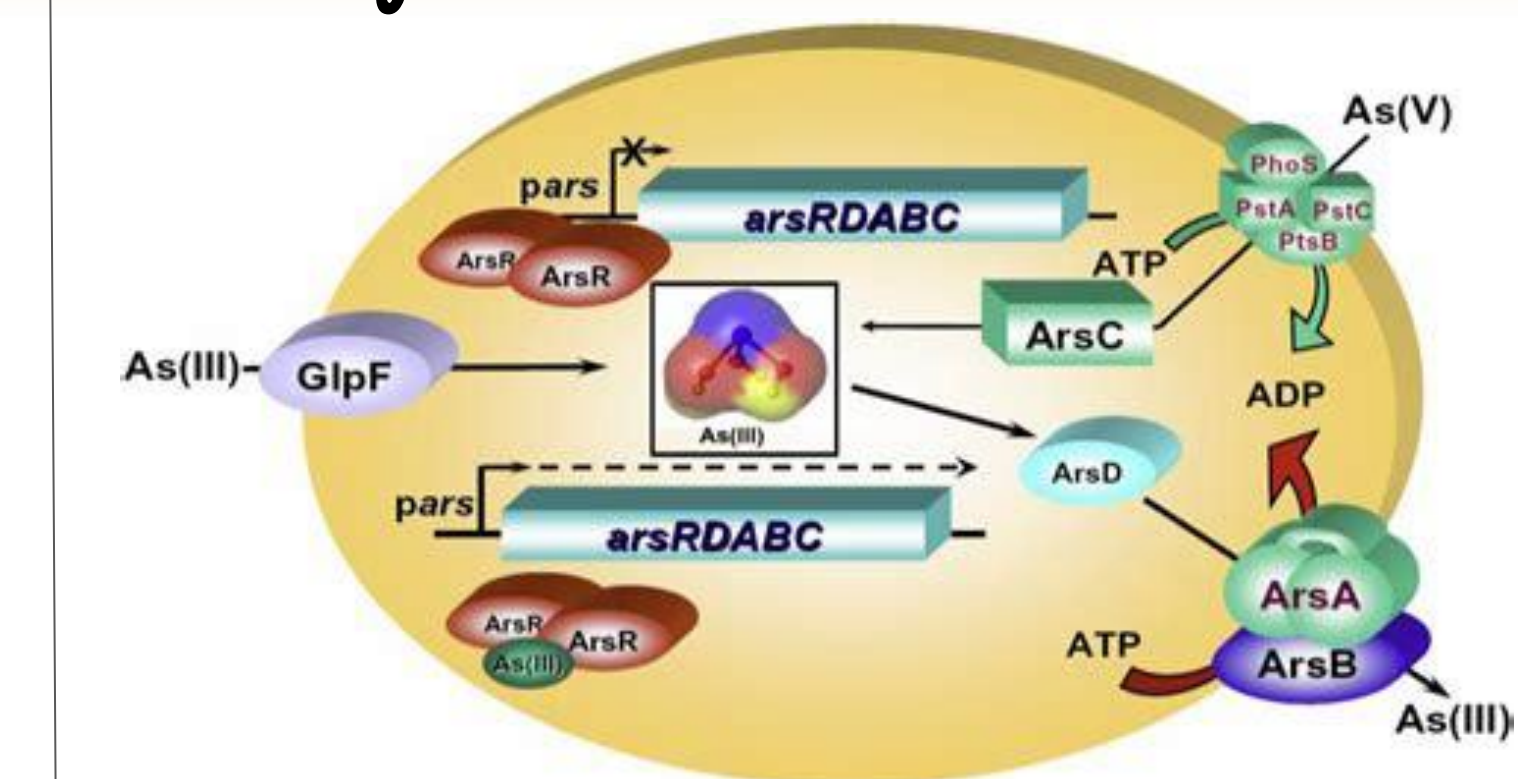
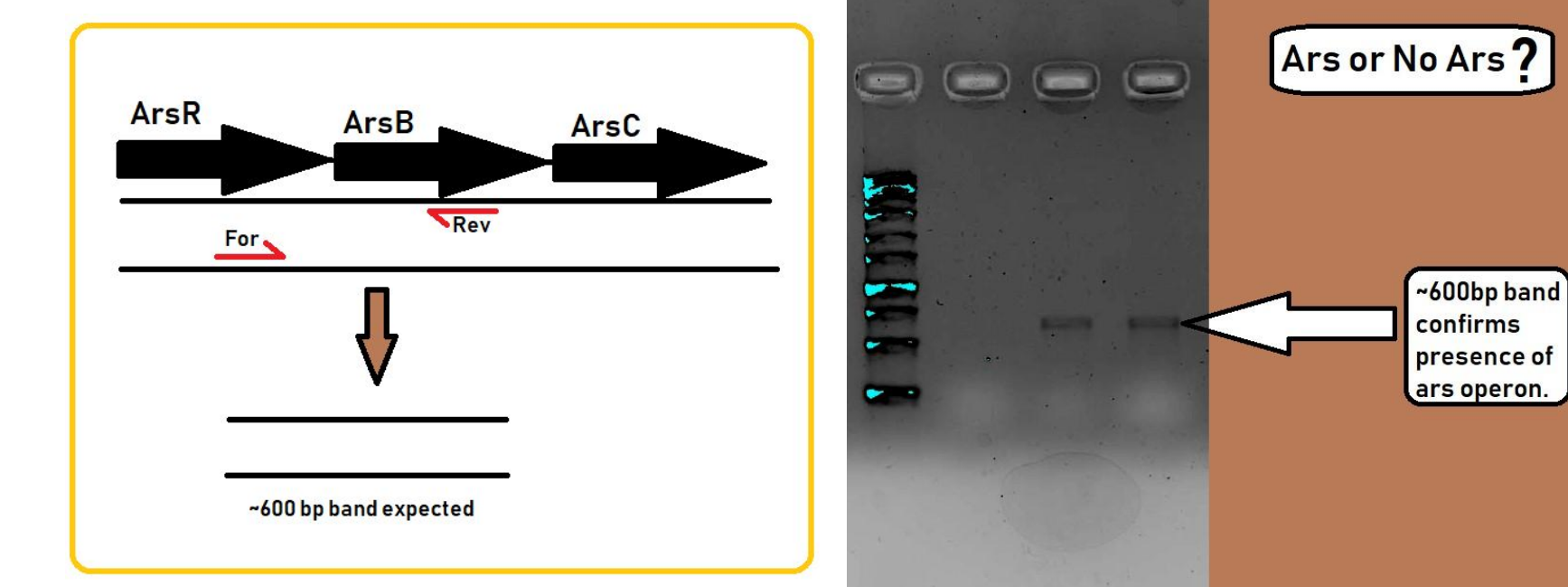


Image Ref: Biosensors for Inorganic Arsenicals, Chen et. al.

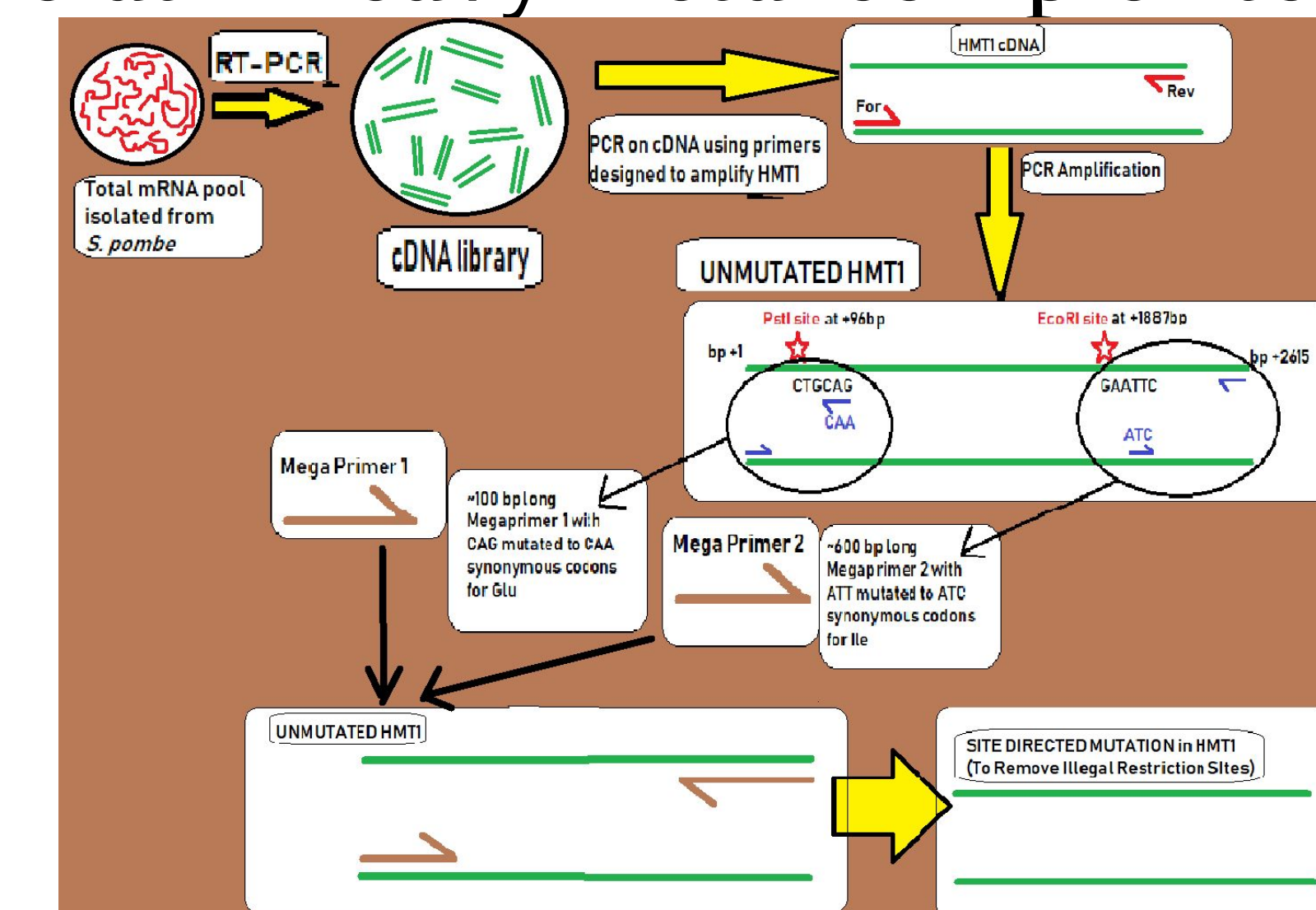
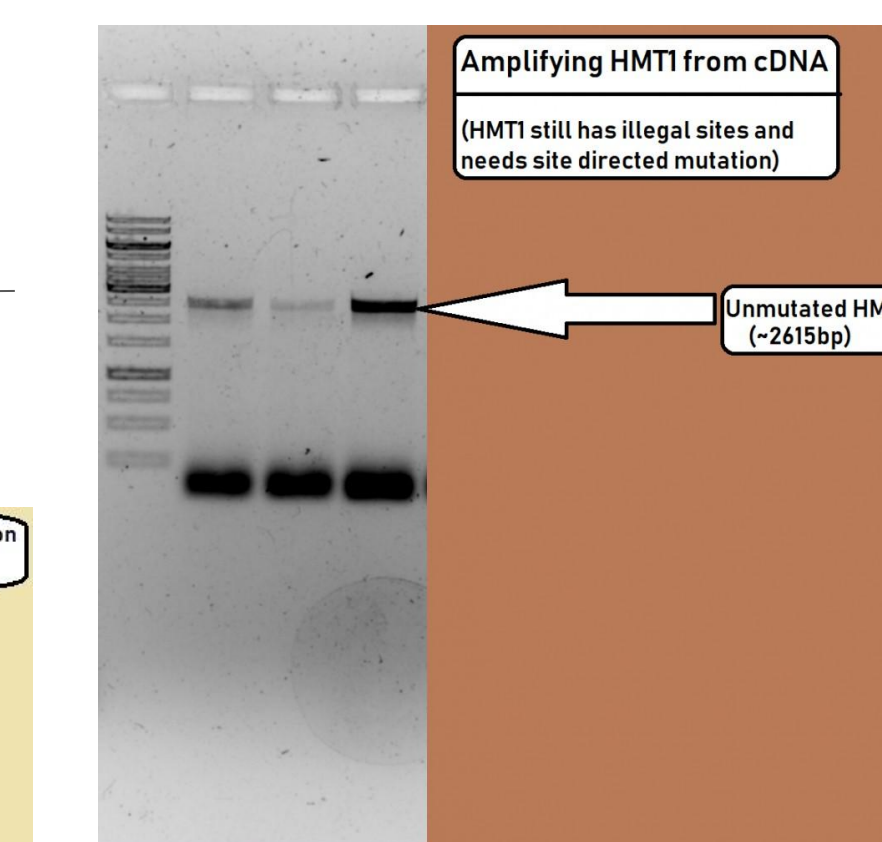
Therefore, verifying presence of the operon and deleting its genes is essential to meet the goal of making the bacteria able to keep the arsenic sequestered.



Hence, ars Operon exists and was planned to be deleted using phage recombination kit

## Story of HMT1:

Insight from mathematical model suggests need Of a protein that will shift equilibrium forward Rescuing the system after it reaches saturation of Chelating proteins. HMT1 expression in *E. coli* transports phytochelatin heavy metal complex to periplasmic space.



## References:

- Ortiz et. al., JBC, 1995
- Muller et. al., JoBact, 2003
- Carlin et. al., JoBact, 1995
- As Contam. in water & food chain, 2012 Sarkar and Guha Majumdar

