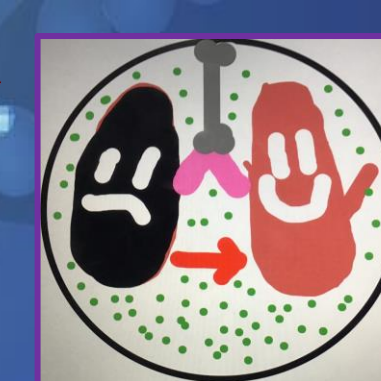


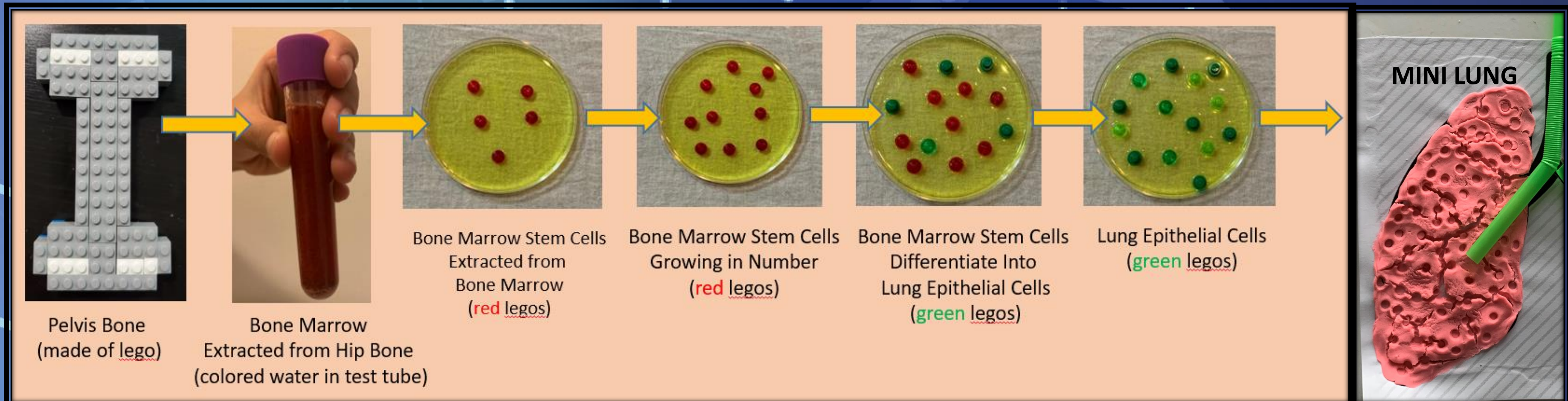
# STEM CELL LUNG TRANSPLANT



YOUNG LUNG RESEARCH INSTITUTE

**ABSTRACT:** The 2020 Covid-19 pandemic may cause increase of lung diseases globally, especially in patients with respiratory problems, thereby increasing need for lung transplants. Finding matching donors may become difficult. The need for growing 'healthy lungs' is important. For patients with damaged lungs and needing transplant, we have developed a method to grow healthy human lungs from patient's own bone marrow stem cells. We added a supporting biodegradable artificial micro-pump (BAmP) during transplant to support patient's respiration until new lungs can function independently.

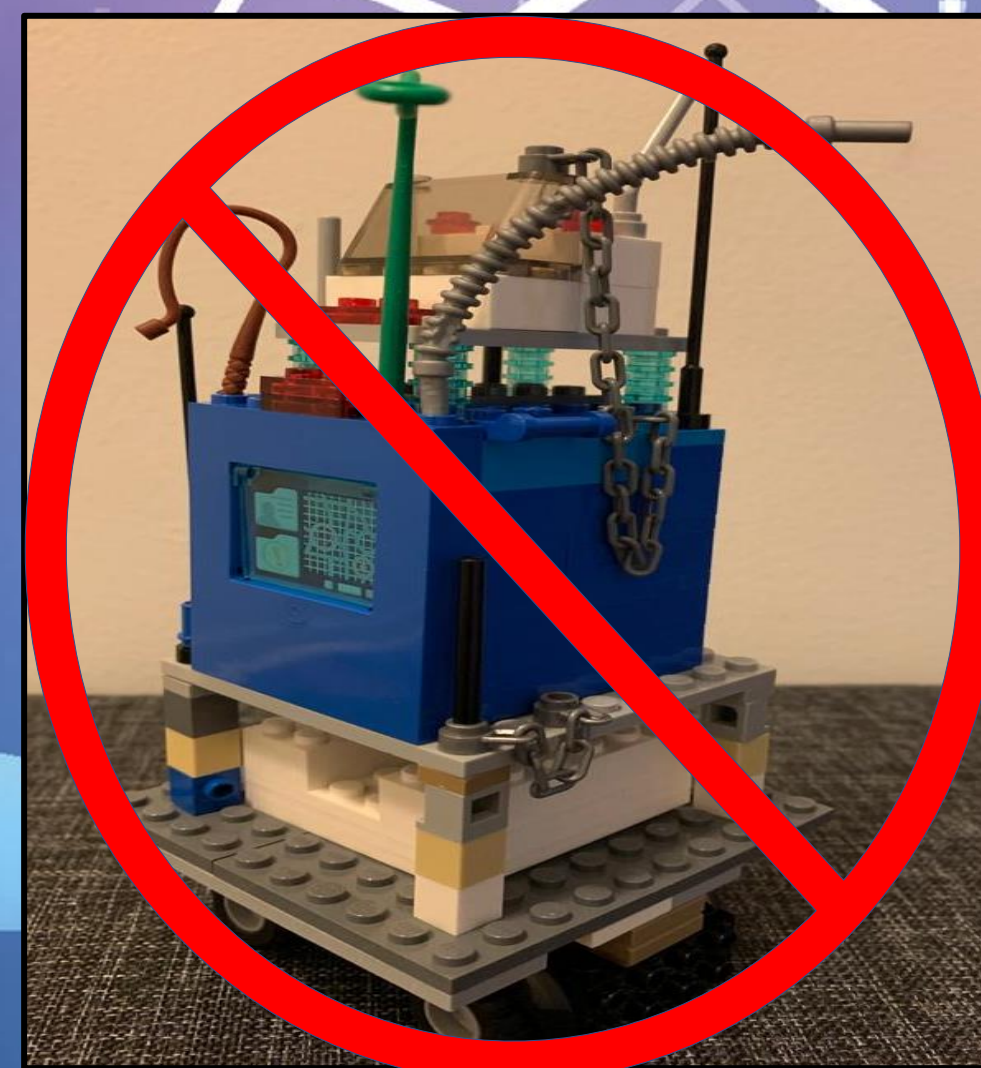
## Process for Growing 'Mini Lungs' from Bone Marrow Stem cells [demonstration using Lego model]



## Why Use Bone Marrow Stem Cells for Lung Transplant ?

- ❖ Get healthy lungs faster
- ❖ No waiting for a matching donor
- ❖ No chances of lung rejection
- ❖ Single surgery for double lungs transplant
- ❖ BAmP helps to breathe freely
- ❖ No more inconvenient & expensive Extra-Corporeal Membrane Oxygenation (ECMO)

## NO MORE ECMO



- The bone marrow stem cells (BMSC) present in bone marrow are used to grow mini lungs in humans, .
- The BMSCs can differentiate into epithelial cells of human lungs in cell culture.
- The lung epithelial cells from the BMSCs are grown on a bio-scaffold in the incubator into "mini lungs".
- This "mini lung" is transplanted inside the body of the patient which grows to adult lungs and helps the patient to breathe easily.

## 1 good lung and 1 bad lung

If we transplant only one bad lung, the other good lung will support breathing in the patient when the "mini lung" is growing into the adult lung inside the patient. BAmP not required.

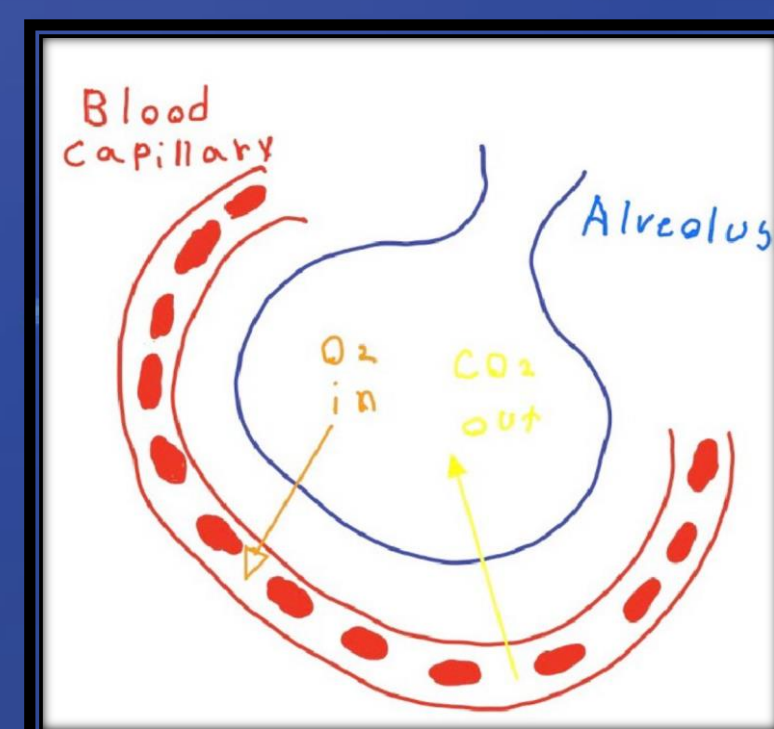
## Model of Prototype [playdough]



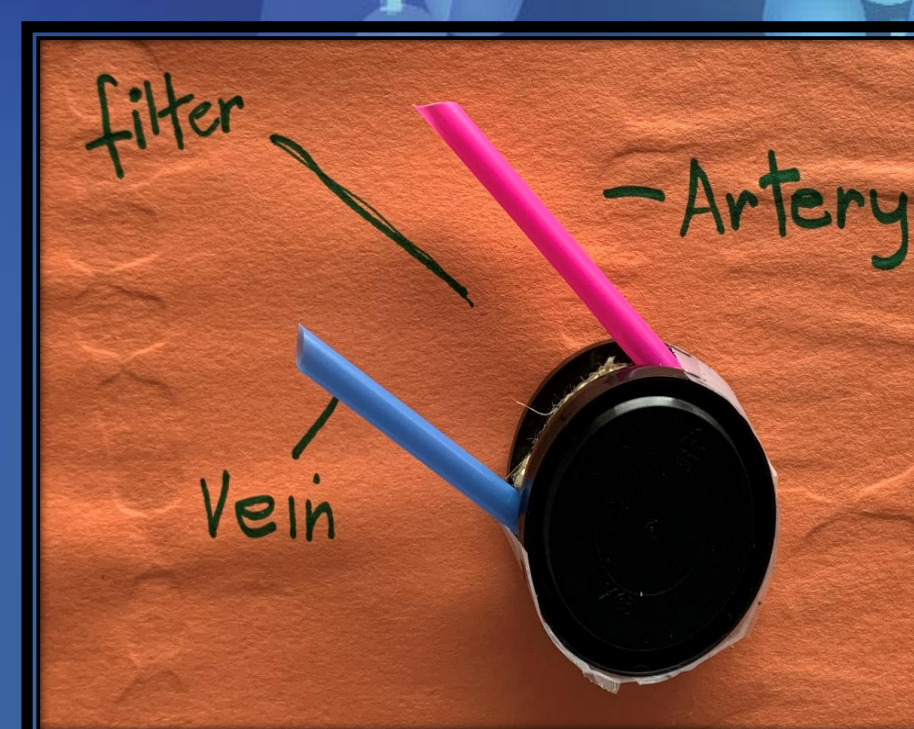
## Both bad lungs

If we transplant both bad lungs, then we need to insert a BAmP also during transplantation to help in respiration.

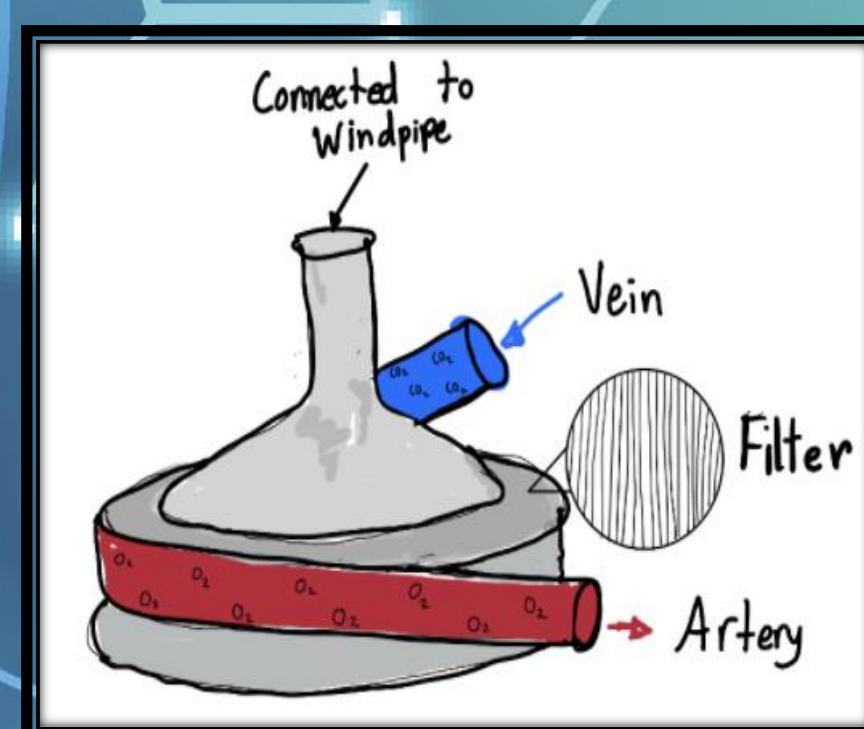
## BAmP Function



## BAmP Prototype



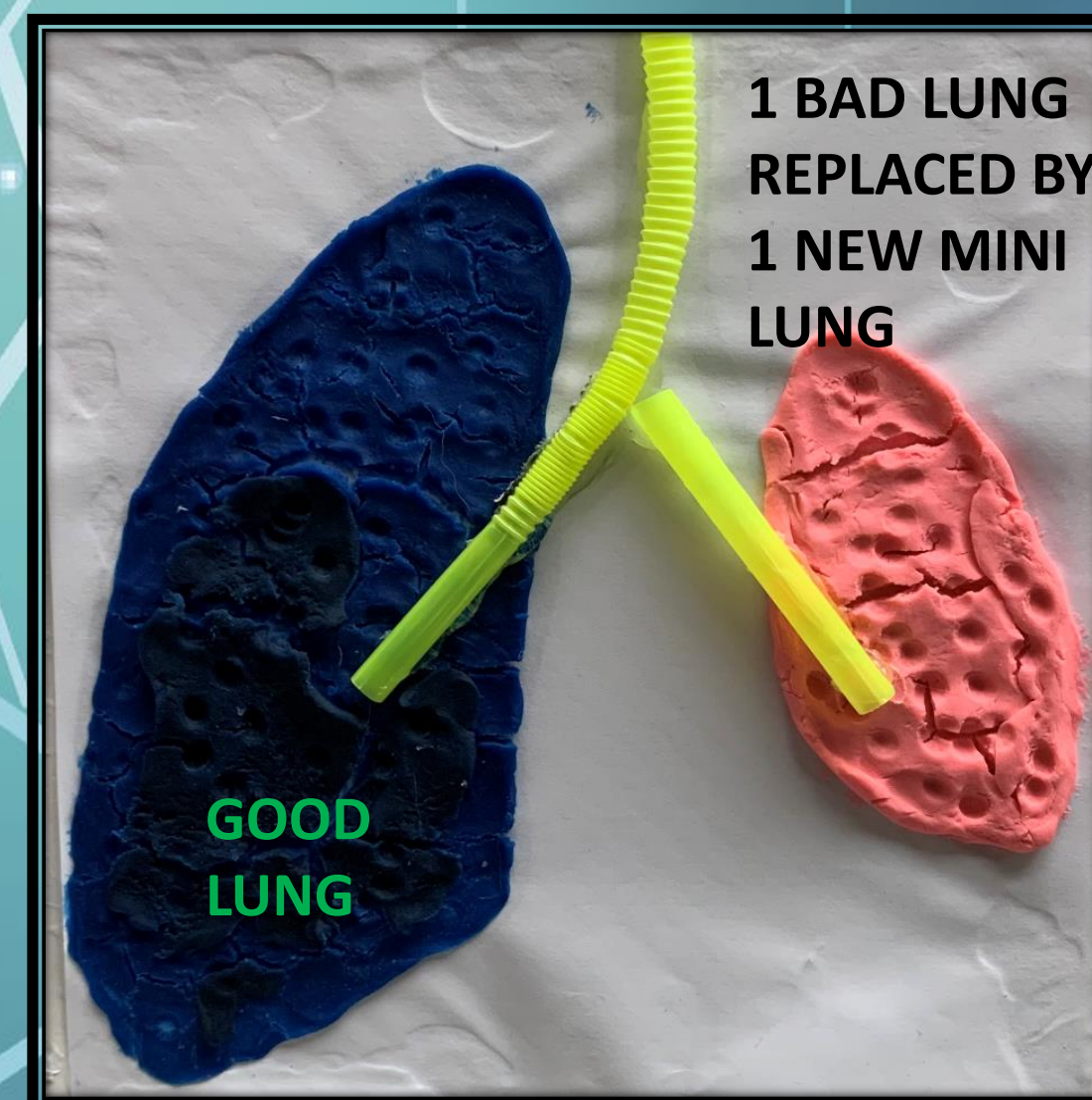
## BAmP Scientific Diagram



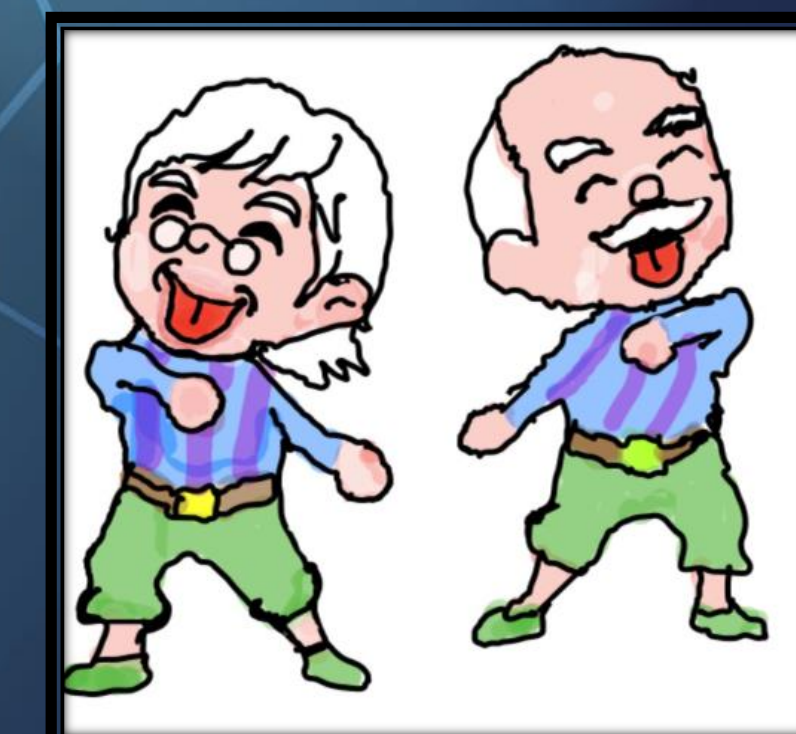
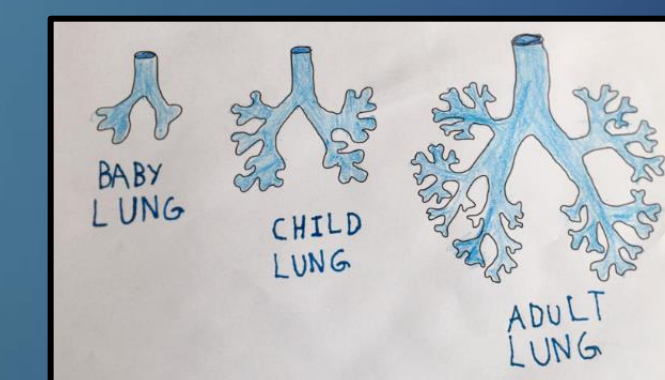
## Biodegradable artificial micropump (BAmP)

Tiny pump made of a biodegradable substance which can easily exchange oxygen and carbon dioxide from the blood just like real lungs. BAmP helps patients to breathe properly while the "mini lungs" are growing into adult lungs and can breathe independently. As the "mini lungs" grow, the BAmP will slowly degrade, shrink and be lost. No surgery is required to remove the BAmP.

1 BAD LUNG REPLACED BY 1 NEW MINI LUNG



Happy Breathing!



2 BAD LUNGS REPLACED BY 2 NEW MINI LUNGS & BAmP

