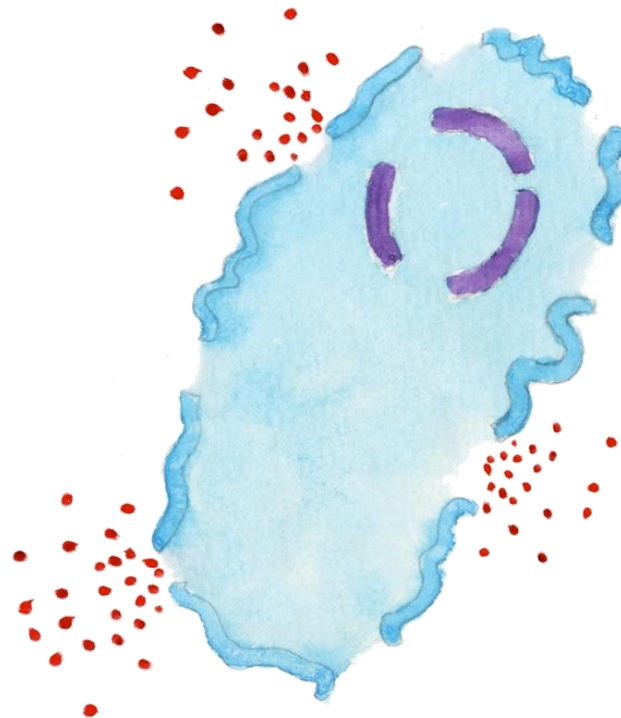


# Protein extraction from animal and plant source

BCH303 [Practical]

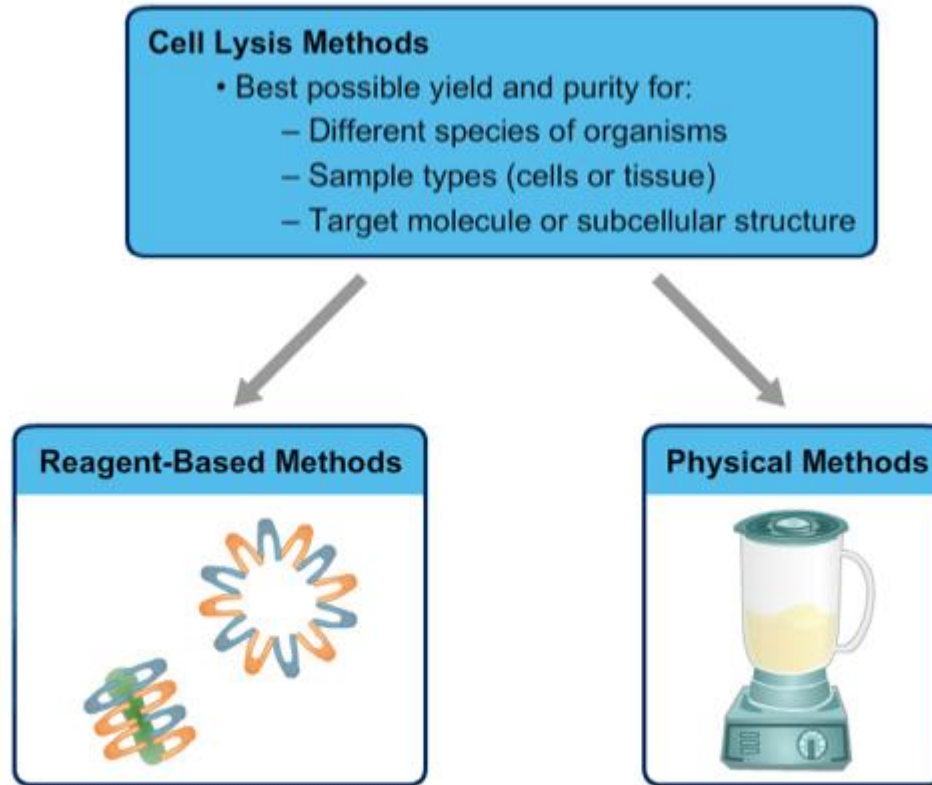
# Cell lysis and disruption:

- Cell lysis is the first step in cell fractionation, organelle isolation and **protein extraction and purification**.
- **Many techniques ???**



# Cell lysis and disruption methods:

- Mechanical and non-mechanical methods.



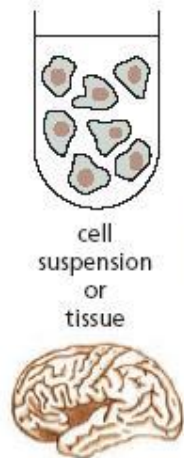
# Cell disruption by different mechanical and non-mechanical methods:

## BREAKING CELLS AND TISSUES

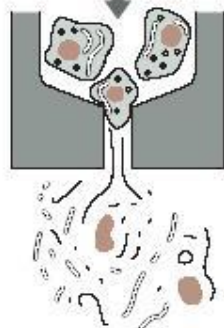
The first step in the purification of most proteins is to disrupt tissues and cells in a controlled fashion.

Using gentle mechanical procedures, called **homogenization**, the plasma membranes of cells can be ruptured so that the cell contents are released. Four commonly used procedures are shown here.

The resulting thick soup (called a **homogenate** or an **extract**) contains large and small molecules from the cytosol, such as enzymes, ribosomes, and metabolites, as well as all of the membrane-enclosed organelles.



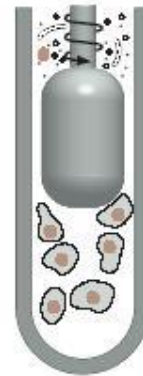
- 1 Break cells with high-frequency sound.



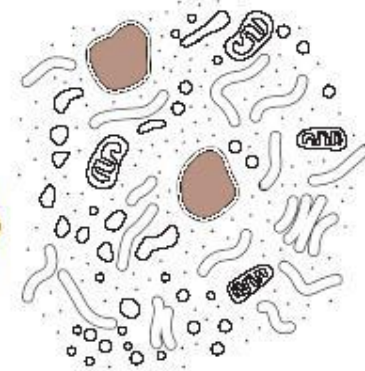
- 3 Force cells through a small hole using high pressure.



- 2 Use a mild detergent to make holes in the plasma membrane.



- 4 Shear cells between a close-fitting rotating plunger and the thick walls of a glass vessel.

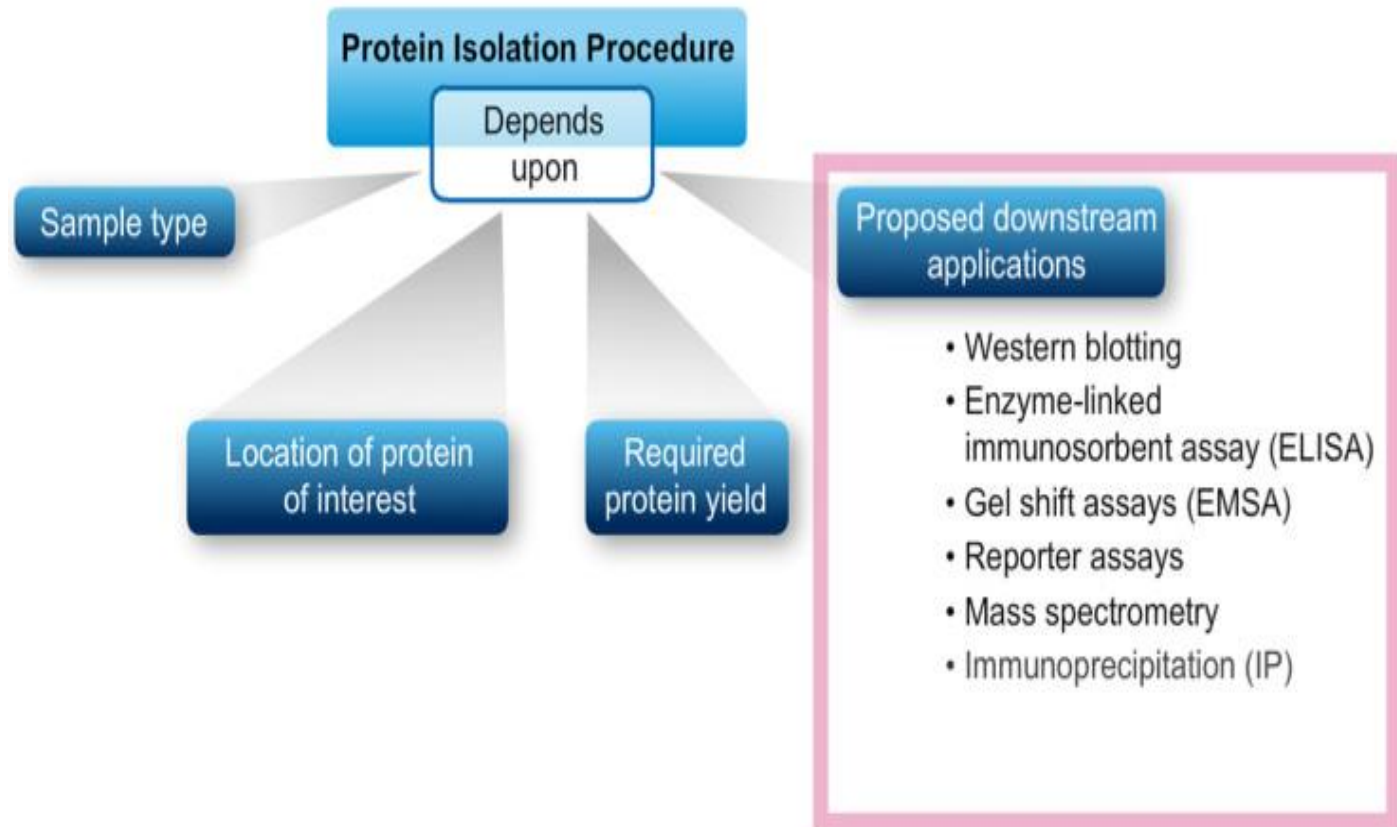


When carefully conducted, homogenization leaves most of the membrane-enclosed organelles intact.

# Protein extraction/isolation:

- There is no universal protocol for protein sample preparation. (WHY?)
- **Factors affecting:**
  - Sample.
  - Structure of protein.
  - Location.
  - Yield.

# Protein extraction/isolation method:



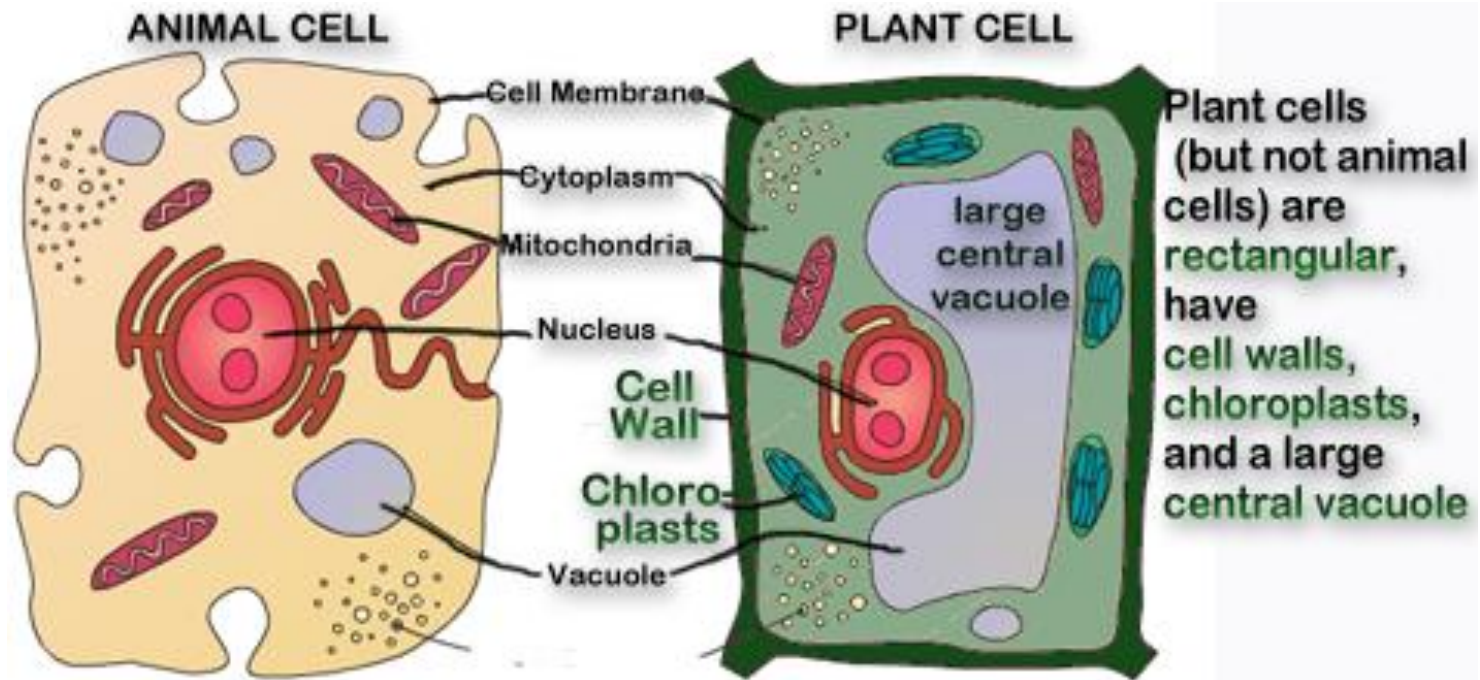
# Practical part

# Principle:

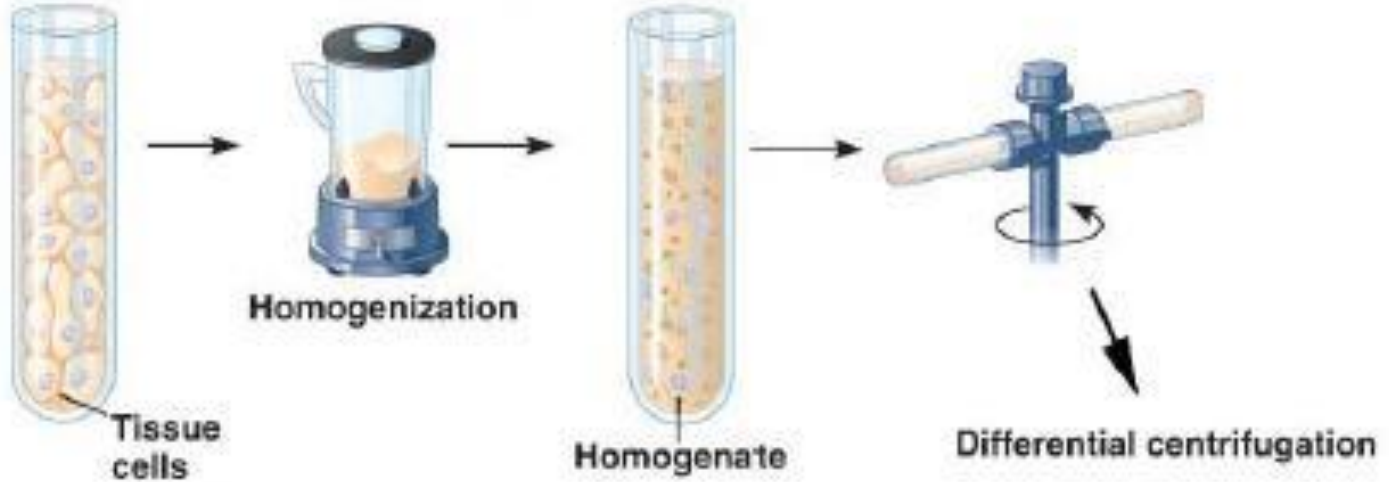
- The initial step of any purification procedure must, of course, be to disrupt the starting tissue to release proteins from within the cell.
- Depend on the cell type.
- Animal and plant cell ?
- Cell disrupting will be achieved using both mechanical and non-mechanical methods
- **After extraction, protein concentration determination is a routine requirement during protein purification, which can be achieved by different method (next lab).**



# Animal cell vs Plant cell:



# Shear forces using blenders:



# Experiment 1 : Protease inhibitor extraction from plant source

## **Aim:**

- To prepare crude extract from plant source.

## **Method:**

1. Weight 12 g of the sample and place it in the blender with 50 ml of the extraction buffer (phosphate buffer 0.1 M, pH 7.0)
2. Incubate the homogenate at room temperature on a rotary shaker for 30 min at 150 rpm.
3. Filter the slurry through cheesecloth and then transfer to centrifuge tube.
4. Centrifuge the filtrate at 10,000 rpm for 15 min at 4 °C for the removal of any cell debris that remained in the preparation.
5. Measure the volume of the supernatant.

# Experiment 2 : Lactate dehydrogenase extraction from animal source

## **Aim:**

- To prepare crude extract from animal source.

## **Method:**

1. Cut ~15 g of muscle tissue from the tissue source. Record the exact weight of tissue used.
2. Cut the tissue into small pieces. Discard the connective tissue and fat.
3. Add 75 ml of cold extraction buffer (0.1 M Tris-HCl, pH 7.4) in a blender with the sample.
4. Transfer the homogenized tissue/buffer mixture into centrifuge tubes.
5. Centrifuge your homogenate for 15 minutes at 3000 xg.
6. Measure the volume of the supernatant.

# Howe Work:

- **There are different mechanical methods (other than using blenders) for cell disruption. Search for one method and describe it briefly.**