Challenge Title: Cell border force	**Duration:** 20 minutes but can be extended

Short Description:

Activity which introduces pupils to the role of cell membranes and familiarises them with the vocabulary relevant to this topic.

Venue: Classroom

Number of Participants: Up to 25	**Year Group:** Year 9

Resources:

- Pens
- Scissors
- Gluesticks
- Membrane builder worksheets and ID cards (included on PowerPoint)

Health and Safety guidance:

There are no specific health and safety issues with this activity

Challenge context:

The workshop aims to educate participants in the roles of cell membranes. This includes functions in transport, exchange and acting as a barrier. Membranes can be specialised for these functions depending on their composition.

Instructions:

Introduction

An introduction is given explaining the challenge context. The teacher draws an outline of a basic cell on the board and gets the pupils to label the parts (i.e. Nucleus, cytoplasm and membrane). This is followed by explaining the functions of each, emphasising the importance of the membrane acting as a barrier (Can use skin as an analogy). However, cells can let things cross the barrier in a controlled way, just like border control at an airport. The pupils are informed they will act this out.

First exercise – cell border control

The majority of students line up to form the lipid barrier. Other students are given the role of different molecules and it is up to students in the membrane to let them in or not. The molecules are introduced one after another. Water is not allowed to cross. Proteins have passports that allow them across or into the membrane. The virus has a fake passport so it can mimic proteins – emphasise that the membrane has no say because the virus tricks it. Transporters are illustrated by students in the membrane having to balance sodium and potassium ions on either side by exchanging them (Sodium must be transported out of the cell, potassium in). A signalling molecule on outside can pass a message across the membrane to the intracellular messenger. Allow around 5-8 mins. Can add things/leave out depending on numbers/time.

Second exercise – membrane builder

Students have a basic membrane sheet and one that has examples of receptors, channels, etc describing them. Pupils will build a membrane by cutting and pasting proteins onto the membrane. Tell them that they could build one that is specialised to have certain a function (e.g. – transport, signalling, structure). Cut and paste proteins onto the membrane. Allow around 10mins. At the end you can stick them up on the wall in one big line and highlight interesting features. This emphasizes how the membrane is one big structure with different domains.

Plenary *(Summary of what students have learnt)*

Students will learn that:

- Membranes keep out some molecules but allow others through.
- Proteins in the membrane perform functions such as transport.
- Membranes can be specialised to suit their function.

Further Reading

www.wisc-online.com - has an interactive membrane constructor with questions. A good online partner to this exercise that reinforces the learning objectives.

http://teach.genetics.utah.edu/content/begin/cells/print/BuildAMembrane.pdf - A membrane building exercise similar to the second part of the workshop but in 3D!