



# really small science

At Home



## Activity: Sludgy Egg-speriment

**Ages:** 7 and up – Adult supervision required.

In this activity, you will discover the properties of non-Newtonian fluids using cornflour and water.

Some of our engineers and scientists are interested in using cornflour and water as armour. They want you to make some different mixtures and test their ability to protect an egg when dropped from a height of 1 m.

### You will need:

- Cornflour
- Water
- 3 Eggs
- A kitchen scale
- A mixing bowl
- A spoon
- Zip-lock sandwich or freezer bags

This experiment can get a little messy so make sure you are doing this somewhere you can wipe clean afterwards!

### What to do:

Make up different 3 cornflour/water mixtures.

Amount of cornflour	Amount of water	What happened to the egg?
35 g	65 g	
45 g	55 g	
55 g	45 g	

- To make your mixtures, weigh out your desired amount of flour using the kitchen scales and place into a bowl. Weight out the amount of water you need and add this to the bowl with the flour. Mix it together gently with a spoon.
- One person can hold open the zip-lock plastic bag and the other person can carefully pour the mixture into it. Place an egg in the mixture and close the bag tightly. Then place that bag into another ziplock plastic bag and seal it (this is just in case the bag bursts!)
- Roll the egg gently in the sludge to coat it. Drop the bag with the egg in it from a height of 1 m.
- Look at the egg, has it survived intact, has it cracked or is it completely broken?
- Try the other mixtures and find which one best protects the egg.

### The Science:

We understand how liquid behaves and we understand how solids behave, but when you mix solids and liquids together it's much harder to understand.

When we mix the cornflour the particles of cornflour are spread through the water and when this mixture is runny – it is less concentrated and the mixture behaves just like water this is **Newtonian**. When we add more cornflour, the mixture becomes thicker until it becomes **non-Newtonian** fluid,

A non-Newtonian fluid means that applying stress changes its **viscosity** (how easily it flows). If you apply force to the mixture, it solidifies and feels solid, but if you apply gentle pressure – like running your fingers through it, it behaves like a liquid.

This is because cornflour particles are so tiny – smaller than a human hair. When they are mixed in water, cornflour particles repel each other, which helps them to flow. However, when the particles are squeezed together a force between the two surfaces *friction* slows them down and they behave like a solid.

Non-Newtonian fluids are good at absorbing shock and engineers think they could be used as armour!

## **ReallySmallScience:**

ReallySmallScience is a group of researchers from the Department of Chemical and Process Engineering at the University of Strathclyde. Our aim is to bring chemical engineering research to people of all ages through fun, hands-on science activities.

At Strathclyde, researchers in Chemical and Process Engineering study the science of sludge through material science and rheology (which is the study of how materials flow). Our researchers are very interested in non-Newtonian liquids and their applications as shock absorbing materials.

You can find out more about us at our website:

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