



LOVE FOOD  
love  
SCIENCE

**05: SIMPLE HOMEMADE ICE CREAM**

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## What you need:

- small zip seal bag
- large zip seal bag
- ½ cup milk
- 1 tablespoon caster sugar
- 6 tablespoons salt
- ice
- ½ teaspoon vanilla essence (optional)

## What to do:

Add the milk and caster sugar to the small zip seal bag (if you want to, you can add the vanilla essence for flavour) • Seal the bag afterwards • Fill the large bag with ice and add the salt • Add the small bag to the larger bag of salt and ice and seal it • Shake hard for five minutes. You may want to wear gloves for this part! • The longer you shake the bag, the better your ice cream will be so shake, shake, shake!

## What you may notice:

Ice cream! Nom nom nom!

## The science behind it all:

Ice cream is a strange one. Technically, it is considered a three phase emulsion because it is a solid, liquid, and a gas all at once. An emulsion is a mixture of two substances that don't mix so one substance becomes dispersed amongst another. Oil and water, being a perfect example. In ice cream, molecules of milk fat are suspended in a water-sugar-ice structure.

When you shake the bag, you are introducing little air bubbles into the ice cream mixture. These little air bubbles are incorporated into the ice cream and stabilise within

the structure. So, ice cream is also technically a foam – a gas dispersed amongst a liquid. Air makes up about half of ice cream's volume. Without it, you wouldn't be able to scoop ice cream – it would be a block of ice!

Finally, the liquid phase. Ice cream begins as a liquid, just as you began with your mixture. As it freezes, the pure water crystallises into ice. The remaining water mixes with the sugar, creating a sugar solution, which has a lower freezing point than pure water. As more pure water freezes, the concentration of the sugar

solution increases and the freezing point continues to lower. Even at the typical ice cream temperature of about  $-16^{\circ}\text{C}$ , only about 72% of the water is frozen. The rest exists as part of the sugar solution. This, along with the air content, allows ice cream to be scooped and eaten at freezing temperatures.

## Beyond the science:

The properties discussed above are essential in making ice cream. Without the addition of air and the liquid sugar solution, it wouldn't be possible to scoop ice cream. The final product results from all of the ingredients working together in perfect harmony.

