# Activity: Antibacterial effects of honey

Honey is antibacterial and can prevent growth of most types of bacteria. This experiment compares the effect of different types of honey on bacteria growing on agar plates.

**The antibacterial properties of honey should be examined on non-pathogenic bacteria, such as *E. coli.***

## Background

Honey has several properties that help to kill bacteria. Honey has a high sugar content, which has an osmotic effect, drawing water from bacterial cells and dehydrating them. Honey produces small quantities of hydrogen peroxide, which kills many bacteria. It is also acidic, killing bacteria by denaturing their enzymes.

Read the article: [How honey heals wounds](https://www.sciencelearn.org.nz/resources/1702-how-honey-heals-wounds)

Mānuka honey also has an additional factor, called the Unique Mānuka Factor or UMF, which makes it particularly effective at killing bacteria.

## Aim

To compare the antibacterial effect of different honey types.

## Equipment

4 different honey samples
Antibacterial cream (for example, Savlon)
Squeezy pipette or eye-dropper
Agar plates
*E. coli* bacteria
Bunsen burner
Cork borer
Ruler
Incubator at 30ºC

*E coli* can be sourced from <http://www.esr.cri.nz/health-science/our-services/nz-culture-collection/>

Note that teachers should be aware of health and safety when undertaking this activity. It is recommended that they familiarize themselves with the Ministry of Education’s *Safety and Science* manual:

[www.nzase.org.nz/files/stanz-resources\_4\_1277119556.pdf](http://www.nzase.org.nz/files/stanz-resources_4_1277119556.pdf)

## Method

1. Inoculate the full surface of the agar plate with non-pathogenic bacteria. Protect the surface of the agar from other microbes by keeping the lid on the Petri dish as much as possible.
2. Sterilise the cork borer in the flame of the Bunsen burner, cool, then use to cut five wells in each agar plate (see diagram below):



1. Number the holes on the bottom of the plate and fill each of them with either a control solution, like antibacterial cream, or a honey sample using a clean pipette or eye-dropper.
2. Cover, seal with tape and place the dishes in an incubator (with the lid on top) at 30ºC for two days, or at 37ºC overnight.
3. Measure the diameter of the clear zone around the wells three times and take an average to allow for irregularities in the shape. Use the results from the rest of the class as repeats of your experiment.

## Results

### Diameter of the clear zone around each type of honey

|  |  |
| --- | --- |
| **Antibacterial****solution**  | **Diameter of the clear zone (mm)**  |
| **1**  | **2**  | **3**  | **Average**  |
|    |    |    |    |    |
|    |    |    |    |    |
|    |    |    |    |    |
|    |    |    |    |    |
|    |    |    |    |    |

## Conclusion

The larger the diameter of the clear zone, the more effective the honey is at killing bacteria.

* Rank the honeys in order from least to most antibacterial activity.

## Extra for experts

Design and carry out an experiment to discover how heating or diluting the honey can affect its ability to kill bacteria.

## Challenge

Honey is used for wound treatments all over the world. In countries where medical supplies are limited, it may be the only way to treat infected wounds. However, many of these countries do not have the right equipment to test the antibacterial effects of their local honeys as you have just done.

Your challenge is to design a simple method that people could use to test the antibacterial effect of honey, without using specialist laboratory equipment. **Hint**: Bacteria can grow rapidly in some foods such as milk, cheese or meat at room temperature.