Biochemistry graduates to have results from their final year research projects on “The Antibacterial activity of Plant Extracts” submitted for publication.

Dilruba Meah and Aiysha Thompson have just finished their Biochemistry degrees whereas Rebecca Conniff-Jenkins and Emma Chileshe have completed degrees in Medical Biochemistry, all in SOTEAS; Aiysha gained a first and the others obtained 2:1s. They did their final year research projects in the laboratory of Dr Paula Row on “The Antibacterial activity of Plant Extracts”. Dr Dan Forman (not in the photograph) helped with the statistics.

**Introduction**

Bacterial infections are responsible for many deaths each year. The gut bacterium, *Clostridium difficile*, was mentioned in 5931 death certificates in the UK in 2008 whereas methicillin-resistant *Staphylococcus aureus* (MRSA) was mentioned in 1,230 death certificates [1]. New antibacterial treatments are urgently needed.

Shown on the right is a photograph of the bacterium, *Esherichia coli*, which was used in this project. The photograph was taken by Aiysha Thompson, using a light microscope.
Some herbs have been reported to have antibacterial activity. The compound thymol, extracted from thyme essential oil, was used as a battlefield antiseptic in the First World War, whereas tea tree oil was used in the Second World War [2]. Culinary herbs were probably originally used not for their flavour, but to prevent meat from going off before fridges were invented. On the left are some of the plants used in this study: wormwood, sage, lemon balm and Aloe vera.


**Disc Diffusion Assays**

Essential oils were tested for their antibacterial activity. *E. coli* bacteria were plated out as a lawn, and filter discs were placed on top, containing plant essential oils.

Presence of a “halo” shows that the oil inhibits the growth of the bacteria.

**Turbidometric Assays**

The effect of essential oils was examined on the growth of *E. coli* in liquid culture. When bacteria are grown in liquid medium, the medium starts off clear and ends up being cloudy, or “turbid”. Some essential oils stopped the bacterial culture from going cloudy, showing that they stopped bacterial growth. In the flasks shown on the right, peppermint oil has inhibited the growth of *E. coli*. 

*E. coli* cultures grown either in the absence of essential oil, with grapeseed oil, or with peppermint oil. (Photo: Dilruba Meah)
The cloudiness or turbidity of the bacterial culture can be measured at various times using a spectrophotometer (see below).

Spectrophotometer (Photo: Paula Row)

The graphs on the right show that grapeseed oil does not inhibit the growth of *E. coli* whereas rosemary essential oil causes a marked inhibition of *E. coli* growth, and peppermint oil blocks it completely.

Graphs of Turbidometric assays (Aiysha Thompson)

Making plant extracts with pestles and mortars. (Photo: Dilruba Meah)

**Plant Extracts**

Since many of the essential oils inhibited the growth of *E. coli*, extracts were made from herb plants corresponding to the essential oils using a variety of solvents. The results showed that extracts of mint, lemon balm and coriander (among others) inhibited the growth of *E. coli*.

**Conclusions**

The projects of Aiysha Thompson, Dilruba Meah, Rebecca Conniff-Jenkins and Emma Chileshe showed that several essential oils (including coriander, peppermint, pine, rosemary, tea tree and thyme oils) inhibited the growth of *Escherichia coli*. Several of the plant extracts had the same effect. Thus these oils and plants are worth investigating further as treatments for bacterial infections. The data is being submitted for publication to the Journal of Ethnopharmacology.

Dilruba was awarded the Ivor Isaac Prize in Botany and Microbiology for her project; she is going to do a PhD at Cardiff University on “Expanding the terpenome”. Aiysha is going to do a PhD in the ILS on the membrane trafficking of the Glucagon Like Peptide 1 (GLP-1) receptor and Emma has been accepted on a postgraduate course in dentistry in Hungary. Rebecca is currently applying for research assistant posts.

Good luck, all of you! Stay in touch!