Characterisation of bioaerosol bacterial communities in different size factions from urban, industrial and agricultural environments

Extensive research has been conducted in order to characterise bacterial communities present in land and water based environments, however characterising such communities present in bioaerosols has also become a very important area of environmental microbiology. This study aimed to focus on this area further in order to investigate bioaerosol bacterial communities in different size factions as a representation of the different penetration stages of the respiratory system.

Field sampling was carried out at three sites: urban (Colchester), industrial (composting facility) and agricultural (farm). This enabled me to learn how to use a six stage Anderson impactor in order to collect my samples and observe other cutting edge sampling equipment such as SIBS. Back in the lab I was then able to extract the DNA from my samples, amplify it by PCR and visualize the products using agarose gel electrophoresis. I was given the opportunity to carry out a Q-PCR reaction on the compost samples in order to quantify bacterial load and run one set of the compost PCR products on a DGGE gel to asses changes in bacterial diversity.

The PCR and electrophoresis of the compost samples produced the clearest bands of DNA on the agarose gel in comparison to the urban and agricultural samples. However it is possible that sampling needed to be carried out for longer at the urban and agricultural sites. The Q-PCR of the compost samples showed that there was some variation between the samples with more bacterial biomass collected during certain sampling cycles and stages of the Anderson impactor. The DGGE gel indicated that there were diverse bioaerosol bacterial communities present at the compost site with some communities only seen in certain stages of the Anderson impactor. This indicates that some bacterial species can penetrate deeper into the respiratory system than others.

Overall this project has given me the opportunity to extend by lab based skills and also experience science in the field. The results I obtained have provided me with follow up questions and ideas that I hope to implement in my final year project for example extended sampling times, DNA sequencing and different primer use. I have also had the chance to learn important research methods that I can use in my final year project. I would like to thank the Aerosol Society for awarding the bursary and the Biological Sciences department at the University of Essex for supporting me for the duration of the project.