

Emily Abraham

Date of Birth: 30th December 1992. Nationality: British

School of Chemistry, Biomedical Sciences Research Complex, University of St Andrews, Fife, KY169ST

E-mail: ea53@st-andrews.ac.uk

I am a PhD student with a background in **molecular biology/ synthetic biology**. My research in the Goss laboratory focuses on the manipulation of the biosynthetic gene clusters of natural products that have important medicinal properties. I am using a combination of genome mining and molecular biology approaches to try identify and heterologously express novel compounds, and to improve the bioactivities of known antibiotics by refactoring the antibiotic gene cluster and by creating analogues of the antibiotic.

Employment Record

PhD Studentship, University of St Andrews, Supervisor Professor Rebecca Goss

September 2015– present

Laboratory Assistant, One Scientific Ltd

March 2014 – May 2015

Research Assistant, University of Bristol, Professor Keith Edwards

July 2013 – September 2013

Education

PhD Studentship in Discovering and Developing New Antibiotics from Marine Microbes, School of Chemistry, University of St Andrews, Supervisor Professor Rebecca Goss.

September 2015– present

MSci Biology, University Bristol (First Class)

My master's year project was under the supervision of Dr Colin Lazarus. My research was based on the investigation of the biosynthetic pathway of statins and the heterologous expression of these pathways in the host *Aspergillus oryzae*.

Research Summary:

In my PhD I am using a combination of genomic, synthetic biology, and metabolomic approaches to antibiotic discovery and manipulation. My research involves the study of a series of promising marine and terrestrial microbes. I am analyzing their genomic sequences *in silico*, this allows for sequence motifs that potentially encode biosynthetic pathways to structurally interesting natural products to be selected. I am then heterologously expressing these gene genetically tractable hosts. New compounds are identified using LC-MS/MS, whereby I am utilizing molecular networking and information gained from genomic sequence analysis for dereplication purposes.

In complement to these studies, I am also cloning the genes encoding a known and potent antibiotic from a marine microbe into a heterologous host. This work will provide a platform for the fermentation, isolation and full structural characterisation of the new antibiotic molecules

Finally, I am manipulating biosynthetic pathways using our lab's Genochemetics approach, where gene insertion enables selective chemical modification. The manipulation of these biosynthetic pathways will allow analogues of antibiotics to be created and for structure activity relationships to be investigated.

Skills and Knowledge

- Molecular cloning techniques including Gibson Assembly, Gateway® Cloning and genomic library generation
- PCR, primer design, plasmid design and preparation
- Genetic transformation techniques including electroporation, protoplast transformation and intergeneric conjugation
- Gene cluster assembly
- Microbiological culturing: *E. coli*, many different strains of actinomycetes, fungi
- *in silico* analysis of gene clusters
- Liquid Chromatography Mass Spectrometry: including untargeted metabolomic network analysis

Awards:

Awarded an Early Career Research Exchange Scholarship from the Scottish Universities Life Sciences Alliance.

This has allowed me to spend time at Wageningen University with Dr Marnix Medema where I have developed skills utilising MS/MS fragmentation based molecular networking. This is very useful for analysing large LC-MS/MS data sets.

Awarded the Royal Society of Chemistry: Analytical Division Prize for the best early career researcher oral presentation

Scottish Metabolomics Meeting- 2/3 November 2017

Oral Presentations:

April 2016, University of St Andrews, Department of Chemistry, Organic Seminars

'Toward discovery and development of new antibiotics from marine microbes'

January 2017, University of St Andrews, Department of Chemistry, Organic Seminars

'Mining, moving and manipulating gene clusters'

September 2017, The European Marine Biological Research Infrastructure Cluster Project Meeting, University of Algarve, Faro, Portugal

Microbial pipeline: from environment to active compounds

November 2017, Scottish Metabolomics Meeting, City of Glasgow College

Combined Metabolomic and Genomic Approaches to Antibiotic Discovery: **Awarded best oral presentation**

Poster Presentations:

September 2017, The European Marine Biological Research Infrastructure Cluster Project Meeting, University of Algarve, Faro, Portugal

Genome-Led Pipeline of Antibiotic Discovery

November, 2017, Postgraduate Symposium, University of St Andrews, Department of Chemistry

Microbial pipeline: from environment to active compounds

January, 2018, Natural Product Discovery and Development in the Genomic Era Conference, Clearwater, Florida

Genome-Led Pipeline of Antibiotic Discovery

Publications:

Bluegenics: Bioactive Natural Products of Medicinal Relevance and Approaches to their Diversification. Joe Zarins Tutt, Emily Abraham and Rebecca J. M. Goss (Springer Book series: submitted)

Chemical Biology of Natural Products: The Generation of New to Nature Natural Products Through Synthesis and Biosynthesis: Blending Synthetic Biology with Synthetic Chemistry. Christopher Bailey, Emily Abraham and Rebecca J. M. Goss (Book chapter: Editors book editors, David J. Gordon M. Cragg and Paul Grothaus.)