

NAME

PORTFOLIO OF EVIDENCE

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Summary

I graduated from The University of XxxxxX in 1998, with a Bachelor of Science Degree with Honours in Medical Microbiology. This degree accentuated my enthusiasm for Microbiology. I was, therefore, delighted when I was selected to undertake the Scottish Grade A Clinical Scientist Training Scheme, approved by the Association of Clinical Microbiologists. My base throughout the training period was XXX Hospital, but carried out secondments to various laboratories where necessary. During my training I had the opportunity to undertake a Master of Science (MSc) course in Molecular Medical Microbiology at the University of Nottingham, where I graduated with Distinction. After completing the training scheme in October 2001, I was employed as a locum Grade B Clinical Scientist at XXX Hospital and Regional Virology Laboratory, XXX Hospital. This was a split contract for a period of 6 months. I was then the successful applicant for a permanent Grade B Clinical Microbiologist post at the Xxxx XXX Reference Laboratory, XXX Hospital, to which I moved, in February 2002.

SECTION A

GRADE A TRAINING SCHEME

The Xxxxxx Grade A Clinical Scientist Training Scheme is funded by the National Services Division (NSD) of the Scottish Executive, for a period of 3 years. During this time, I received training in all areas of clinical microbiology, and also in epidemiology, laboratory management, and computing, by participation in appropriate secondments. Each secondment was carried out under the supervision of a Grade C Clinical Scientist (or equivalent).

1 Bacteriology, Virology, Parasitology and Mycology Training

Laboratory training in bacteriology, virology, mycology and parasitology was comprehensively undergone. In Year 1 of the Training Scheme the majority of time was spent in the Microbiology Department at XXX Hospital. Year 3 was spent on secondments to various Reference Laboratories, mainly in Scotland. Appendix 1 details all of the secondments undertaken throughout my training, the supervisor responsible for me, and the reasons for the secondment.

1.1 Safety

During the first week of training I was made aware of current legislation (e.g. COSHH, RIDDOR), and recommendations for safe laboratory practice. An induction covering general aspects of laboratory safety (protective clothing, hazards, disposal of sharps & waste, out of hours safety, accidents etc) was given. Further training in disinfection and sterilisation procedures, the handling of specimens and organisms, safety cabinets and radiation was also given. Throughout my training the recommendations for safe laboratory practice were observed, and could be applied as appropriate.

1.2 Laboratory Practice

A wide range of techniques ranging from traditional methods right through to “up-to-date” molecular methods were learned in depth. For bacteriology and serology, this was achieved by carrying out benchwork in each of the sections, primarily at XXX Hospital – Urines, Pus/Swabs, Acute Specimens, Faeces, Respiratory, Blood Cultures,

Serology/Virology. For Virology (and further serology) I carried out benchwork in the following sections between the Regional Virus Laboratories in Edinburgh and Glasgow – Blood-borne Virus Section, Molecular Section, Serology, Tissue Culture. Secondments to the Scottish Diagnostic Parasitology Laboratory and the Specialist Mycology Laboratory were also undertaken.

In each of these disciplines I gained vast experience in understanding the appropriate specimens for each section and how to process them according to the clinical details given. By going on secondments to other microbiology laboratories, I could compare techniques employed, and learn about the range of methods and systems available for analysis, as well as their advantages/limitations etc. I was also given a thorough training in the interpretation of results from the vast range of methods used within each of the disciplines.

1.3 Clinical Experience

As my experience in the laboratory increased, I was encouraged to accompany the Consultant Microbiologist/Grade C Clinical Scientist on his daily ward rounds. During these visits clinical cases, treatment options and infection control issues were amongst the topics discussed. I also attended pre-clinic GUM/HIV meetings and Infection Control outbreak meetings throughout my training, allowing me to communicate with different people from different professions within medicine.

1.4 Further Training/Experience

The combination of laboratory benchwork, interpretation of results, clinical ward rounds and tutorials allowed me to gain a vast knowledge of the groups of organisms of clinical importance, and the pathogenicity associated with them. In addition to this I became familiar with the clinical aspects of infectious diseases, and also of infections associated with different groups of compromised patients.

To complement my visit to the Mycology Laboratory, I was privileged to attend the British Society of Medical Mycology Course in Diagnostic Medical Mycology. At this course I gained invaluable clinical and diagnostic knowledge related to the field, by attending a series of lectures and practical sessions.

To complement the training I received in microbiology, I wrote several essays on topics relevant to current clinical cases/topical subjects etc. A list of essay titles is given in Appendix 2.

I also gained further experience in laboratory methods by carrying out small projects (also detailed in Appendix 2). An evaluation of the prevalence of *Clostridium perfringens* in hospitalised patients' faeces, gave me experience of traditional microbiological methods, as well as a commercial reverse passive latex agglutination kit. An evaluation of three commercial ELISA kits to detect *Varicella Zoster Virus* IgG, allowed me to gain further experience of serological techniques. As a result of this project, the working practices of the laboratory were altered. A further project allowed me to further experience molecular techniques – developing two PCR methods for the detection of Serogroup A *Neisseria meningitidis*. This project gave me experience of designing primers and optimising PCR conditions for a standard PCR, and also for a quantitative PCR. The results of this project have recently been accepted for publication by the *Journal of Clinical Microbiology*.

During these projects, and my general laboratory experience, problems (of minor and also more serious natures) were encountered, and I was therefore given the opportunity to gain experience in problem solving.

1.5 Secondments to Reference Laboratories

By visiting Reference Laboratories, a further in-depth knowledge was gained in particular organisms – *Legionella*, MRSA, *Meningococci*, *Pneumococci*, *Salmonella*, *E. coli* O157, *Toxoplasma*. During these secondments I gained experience of further techniques not employed by routine laboratories. More in depth clinical information was also sought in each of the areas. I also had the opportunity to visit the Reference Laboratories based at the Central Public Health Laboratory in London.

2 Epidemiology of Disease

Throughout my training, I became aware of the need to relate laboratory diagnosis of infection, with the possible spread of infection in a susceptible population. It was therefore essential that I became familiar with the principles of infection control. This

was done through a series of tutorials and ward rounds with both an Infection Control Nurse and the Infection Control Doctor. Here I learned the importance of correct patient management where nosocomial infections such as MRSA/*Clostridium difficile* are present. I also gained first hand experience of an outbreak of Norwalk-Like Virus in a Residential Home during my training, and was invited to attend the Infection Control Outbreak Meeting to discuss the measures, which should be taken to manage the situation.

I also became familiar with surveillance schemes which operate in Scotland, UK-wide and also European-wide, from my secondment to the Scottish Centre for Infection and Environmental Health (SCIEH), and also to a short secondment to CDSC (London). The collection, analysis and interpretation of data, by the use of computer software packages, was emphasised during a short project I carried out at SCIEH. As a follow-up to a highly publicised outbreak of infection among injecting drug abusers in Scotland, I carried out a comprehensive analysis of data, to determine the incidence and nature of all soft tissue infections among injecting drug abusers in Scotland.

3 Laboratory Management

I attended a Clinical Laboratory Management Course held in collaboration with Xxxx Xxxxx University, where important issues such as quality assurance, audit, finance, IT and clinical governance were discussed.

In addition to this course, during my training I assisted colleagues in preparation for CPA Accreditation at XXX Hospital, mainly by up-dating serology SOPs, and also general “house-keeping” activities. I became aware of the high standards required by the scheme.

Throughout my training I became aware of the importance of Quality Control (both internal and external), and the problems associated. I also visited the Quality Assurance Laboratory, PHLS, Colindale – the providers of the UK National External Quality Assessment Scheme (UK-NEQAS) for Microbiology, where I gained an insight into the preparation and dissemination of specimens for participants of the scheme, and also the collection and analysis of data received in return.

4 Computing

Throughout my training I learned the principles of the use of computer systems for the management of information relating to the processing of clinical specimens. I became competent with patient detail/specimen entry, entry of results, and searching for complete/incomplete results on the system employed at XXX Hospital (LMX, provided by Bayer). I was given brief overviews of the computer systems employed by other laboratories whilst on secondments. I also became competent with the use of computers for word-processing, databases, spreadsheets and presentations. Experience of epidemiological packages (SPSS 10.0 for Windows) for data analysis, and automated laboratory systems for diagnosis (Axsym, VITEC, Sysmex) was also gained.

5 Master of Science Course

In the second year of my training I carried out an MSc in Molecular Medical Microbiology at the University of Nottingham. This course was structured to include the following taught modules: Bacterial pathogenesis and infections; Viral pathogenesis and infections; Applied molecular microbiology and Prevention and treatment of infection. In addition to the taught modules, a practical module – Microbial and Molecular Techniques – was undertaken. This course enhanced my knowledge about micro-organisms which cause human infection, the clinical picture associated and the mechanisms of disease pathogenesis. Studied in depth were the vast range methods available for diagnosis of infection, with an emphasis on the role of molecular biology in the development of new diagnostic strategies. Also highlighted by the course were treatment options available for the wide range of bacteria, viruses, fungi and parasites causing human infection.

A Research Methods module was included in the course, highlighting the skills necessary for the design of research investigations, the analysis of the findings and the critical evaluation of the work of others.

A Library Dissertation was carried out allowing me to further my ability to carry out critical evaluation of scientific literature, and write a review article.

A Research Project was carried out during the latter part of the course. I had the opportunity to carry out this part of the Course at the Xxxx Xxxxx Reference Laboratory in Xxxx. This gave me the opportunity to design and carry out a research project, but also become confident in the practice of molecular microbiology methods. The results of the project – A Phenotypic and Genotypic Characterisation of Coagulase-Negative Staphylococci from Orthopaedic Patients – was presented as a poster at ECCMID, Milan. The abstract of this project is presented in Appendix 3.

6 Additional Areas of Competency

During the third year of training I had the experience of “moving hospital”! XXX Hospital, was closed down, and all departments moved to the new Private Finance Initiative Hospital, XXX. It was during this lengthy process that I gained an insight into many of the aspects of this task, including laboratory design and organisation, and the detailed planning and logistics involved to ensure a smooth transition from one laboratory to another.

Throughout the entire period of the Training Scheme, I was encouraged by my supervisor to attend as many meetings/conferences as possible. A comprehensive list of meetings attended can be found in Appendix 4. The majority of meetings were local, and was given the opportunity to present work on several occasions. However, I was fortunate to obtain funding to attend the European Conference for Clinical Microbiology and Infectious Diseases (ECCMID) in Milan. It was at this meeting that I presented three posters of work that I had carried out. By presenting both oral and poster presentations, I gave gained experience in, and learned the importance of communication (Appendix 5).

After completion of the Grade A Training Scheme I sat an exit exam to ensure my training had been adequate. This was successfully passed in February 2002.

SECTION B

POST-TRAINING SCHEME / PRE-REGISTRATION TRAINING

November 2001 – February 2002

During this period I was employed as a locum Grade B (8-10) Clinical Scientist split between the Microbiology Department, XXX Hospital (3 days) and the Regional Virology Laboratory, XXX.

1 Locum Placement 1

As a locum I was expected to provide assistance, both technical and supervisory in routine benchwork in all sections of the department. This allowed me to further my knowledge gained during my training. I also had the opportunity to liaise with nursing staff and clinicians through routine enquiries via telephone, and to accompany Grade C Clinical Scientist/Consultant Microbiologist on ward rounds, again enhancing my overall knowledge of microbiology. I also had the opportunity to report results, and “sit-in” whilst the Grade C Clinical Scientist/Consultant Microbiologist was authorising reports to be issued. This further enhanced my knowledge of the importance of clinical pathogens, and the antibiotics which should/should not be used in varying scenarios.

During this period I introduced molecular techniques into the laboratory. I was initially responsible for costing the equipment and consumables required to carry out PCR. After the purchase of the necessary equipment, I designed a PCR to enable a more rapid detection of Group B Streptococci, than culture. After initially evaluating this method, I was responsible for training MLSO staff in this area. This gave me valuable supervisory and teaching experience. I also presented a basic overview of molecular techniques at a departmental seminar, giving me experience of presenting information to an audience with a mixed knowledge and range of skills.

As with my Grade A training I was encouraged to attend meetings, allowing continuing professional development in a wide variety of microbiological topics.

2 Locum Placement 2

During my time spent at the Regional Virus Laboratory, I was primarily responsible for carrying out a conventional PCR assay to detect the L1 Capsid gene of Human Papillomavirus (HPV). These products were subsequently hybridised to probe strips allowing visualisation of bands which can be interpreted as HPV types. I also had the opportunity to carry out Lightcycler PCR assays to detect a smaller region of the same gene.

I also had the opportunity to compare extraction methods between two automated extraction robots – the Qiagen Biorobot 9604 and the Roche MagnaPure.

By carrying out these simple projects I gained experience in two new areas of microbiology. During my training I had only observed Lightcycler PCR, so this gave me an ideal opportunity to learn, and carry out the practical work involved. I was also gained an insight into the interpretation of real-time/quantitative PCR.

3 Current Employment

March 2002 – Present

After my 4 months' locum post, I was fortunate to be appointed a permanent Grade B (8-10) position at the Xxxx Xxxx Reference Laboratory. In this position I have 3 main roles, divided between:

- 1 – Reference Service
- 2 - Service Development
- 3 – Research

3.1 Reference Service

As part of the Reference Service provided, I contribute as necessary, to the routine phenotypic and genotypic based service functions of the laboratory. I have become competent in the day-to-day setting up and interpretation of the phenotypic typing of isolates.

I am responsible for the day-to-day running of the molecular assays carried out – mainly PCR and PFGE, and for supervising MLA/MLSOs who assist in this side of the service. I am also responsible for the preparation, and quality control of reagents

required for the molecular assays. It is in this role that I have gained further experience of molecular techniques, but is with every assay it is inevitable that problems will occur in the day-to-day running, and it is here that I have gained experience of troubleshooting, and problem solving. I am also responsible for the interpretation of molecular assays, along with the Senior Clinical Scientist.

The Laboratory has recently undergone CPA accreditation for the first time, so a large part of my time has been dedicated to preparation for this. I was responsible for the revision of original molecular SOPs, and writing SOPs for new assays being performed. I was also responsible for carrying out and writing the risk assessments for both the phenotypic and genotypic assays. This gave me a great insight into Health and Safety aspects of laboratories.

Preparation for CPA accreditation also gave me an insight into the importance of communication. Weekly meetings became necessary for everyone to update each other on their progress, and for suggestions to be made. I also learned the importance of planning and delegation of work.

At present I do not report/authorise results, but have observed MLSO 3/Consultant Microbiologist throughout this procedure. After State Registration has been granted, I will begin participating in this part of the service.

3.2 Research & Service Development

Part of my duty in this post is to carry out service development. Due to time constraints because of CPA accreditation, this has been slightly less than should be. I have introduced the use of plasmid typing into the routine service, to further differentiate between outbreak isolates of the same type/subtype. I have also been responsible for optimising the PCR assays. Many problems have been encountered with the PCR assays, as they have never been fully optimised or evaluated. I used a chessboarding method, to optimise primers, MgCl₂ concentration and *Taq* polymerase concentration. In addition to this, I have introduced another typing technique into the routine service, after initial development by a colleague – SCC mec typing. I have also introduced a further toxin assay into the routine service, to detect a novel toxin –

Panton Valentine Leukocidin, a toxin associated with community acquired MRSA causing boils etc and also necrotising pneumonia.

I am enrolling to begin studying for a PhD with the Open University. A proposal is being drafted at present, focusing on community acquired MRSA/MSSA isolates, known to have caused particular infections, and the virulence factors associated. It is also hoped that we can compare the virulence factors of community acquired isolates with hospital acquired MRSA isolates, to elucidate why Epidemic MRSA clones 15 and 16 are the ones which have spread most vibrantly.

3.3 Additional Areas of Competency

Part of the Reference Laboratory remit is “education and training”. Several students have visited the laboratory to carry out projects, requiring varying degrees of supervision. This has allowed me to gain experience in supervising research.

The Reference Laboratory has recently started to hold Research Meetings to encourage discussion regarding current research. I have been nominated to organise these meetings, and record the minutes. This has allowed me to gain important experience in the organisation of meetings.

I am an active member of the Association of Clinical Microbiologists. I am the Junior/Trainee Representative, responsible for liaising with current trainees, and reporting back to the Committee on a regular basis.

The Future

It is hoped that I will be registered to begin my PhD within the next two months, allowing me to enhance my scientific and research skills. I also hope to be able to keep up to date with general microbiology, allowing me the option of sitting the MRCPath examination in the future.

Appendix 1

Grade A Training Secondments

LIST OF SECONDMNETS AND DETAILS PROVIDED HERE

APPENDIX 2

Essays Written During Grade A Training

- Urinary Tract Infection
- Endocarditis
- *Bordetella pertussis*
- Infections of the Central Nervous System
- “Host factors have a significant influence on the outcome of infection. Discuss this statement with relevance to paediatric bacteriology”
- The pros and cons of the MMR Vaccine. Is there any evidence that this vaccine should not be given to children?
- Summary of the techniques used in conventional virology/serology

Mini-Projects Carried Out During Grade A Training

- Prevalence of *Clostridium perfringens* in hospital inpatient faeces.
- Evaluation of commercial *Helicobacter pylori* ELISA kit
- Development of two PCR methods for the detection of Serogroup A *Neisseria meningitidis*
- Comparison of three commercial Varicella Zoster Virus IgG ELISA kits.

APPENDIX 3

MSc Project Abstract

Coagulase-negative staphylococci (CNS), normal skin commensals are being increasingly recognised as the cause of infections. In particular, these organisms are associated with infections of foreign implants, such as orthopaedic prostheses. To date, there is limited data regarding the identification of CNS, the epidemiology of CNS in orthopaedic infections and the virulence factors involved in pathogenesis. This study compared both phenotypic (API Staph, ID 32 STAPH and an in-house method) and genotypic (species-specific PCR, 16S-23S spacer length polymorphism analysis and pulsed field gel electrophoresis) methods, in their ability to identify 30 previously identified reference CNS isolates, and 25 CNS isolated from patients with orthopaedic wound infections. Both phenotypic (slime production and expression of toxins/enzymes) and genotypic (toxin PCR and virulence gene PCR) virulence factors were also studied with regard to the orthopaedic wound isolates and random CNS isolates (thought to be commensals). CNS were identified with varying degrees of accuracy – species-specific (98.2%), 16S-23S spacer length polymorphism analysis (98.2%), API Staph (83.9%), ID 32 STAPH (71.4%) and in-house method (50%). By using the species patterns obtained from the reference isolates, the 16S-23S spacer length polymorphism analysis method was evaluated. Of the 27 isolates tested, 26 could be correctly identified using this method alone. Of the orthopaedic wound isolates, 52% were *S. epidermidis*, 32% *S. haemolyticus* and 4% each of *S. lugdunensis*, *S. schleiferi* and *S. warneri*.

From the virulence factor studies it became apparent that a significant number ($p < 0.05$) of orthopaedic wound isolates could adhere to surfaces and produce slime, whereas a significant number ($p < 0.05$) of random CNS isolates were unable to produce slime or adhere to surfaces. There was also a significant difference ($p < 0.05$) in the presence of the *icaAB* gene (involved in slime production) between the two groups of isolates. No toxin genes were found for enterotoxins A-E, exfoliative toxins A or B, or toxic shock syndrome toxin-1. However, there was a significant difference ($p < 0.05$) in the expression of β -haemolysin and esterase (Span 80) between the 2 groups of isolates. It was shown from this study that genetic methods are superior to phenotypic methods with regard to typing and virulence factors, since they are subject to less variation.

APPENDIX 4

Meetings Attended

- Scottish MRSA Reference Laboratory – Update March 1999
- Scottish Microbiology Association Various
- West of Scotland Clinical Microbiology Group Various
- Association of Clinical Microbiologists (Scottish Branch) Various
- ACM – Update Meeting Zoonotic infections January 2001
- Scottish Diagnostic Virology Group Various
- The Future of Antimicrobial Susceptibility (Oxoid)
- An Aid to the Challenges of Bacterial Resistance (BioMerieux)
- Society for General Microbiology Various
- The use of Chip Technology in Diagnosis (MWG Biotech)
- ACM Meeting – Applied Molecular Techniques October 2002
- MRSA in Scotland (SCIEH) October 2002
- ECCMID – Milan March 2002
- Lunchtime seminars at Xxxxxx Hospital, Xxxxxxx & Xxxxxxx Various

APPENDIX 5

Posters Presented

- A Comparison of Phenotypic and Genotypic Methods for the Identification of Coagulase Negative Staphylococci (Society for General Microbiology, Edinburgh)
- Development of Two PCR Methods for the Detection of Serogroup A *Neisseria meningitidis* (ECCMID, Milan, 2002)
- The Incidence of Soft Tissue Infections in Injecting Drug Abusers in Scotland (ECCMID, Milan, 2002)

Oral Presentations

- A Phenotypic and Genotypic Characterisation of Coagulase-Negative Staphylococci isolated from Orthopaedic Wounds (ACM)
- The Use of Molecular Techniques in a Medical Microbiology Laboratory (Wishaw Microbiology Department Seminar)
- The prevalence of Panton-Valentine Leukocidin among *Staphylococcus aureus* clones in Scotland (to be presented at ECCMID, Glasgow, May 2003)

Publications

XXXXXX XX,XXXXXX XX, XXXXX X, XXXXXX XX. Evaluation of a fluorescence-based PCR method for the identification of serogroup X xxxxxx. *Journal of Clinical Microbiology* (In Press).

APPENDIX 6

Certificates Enclosed:

University of XXXXXXXXXXXX BSc(Hons)

University of XXXXXXXXXXXX MSc

ACM Grade A Training