

National Meticillin-Resistant *Staphylococcus aureus*
Reference Laboratory
Annual Report, 2009

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Accredited Medical Laboratory
Reference No: 2899

National MRSA Reference Laboratory

Annual Report 2009

Summary

The National MRSA Reference Laboratory (NMRSARL) supports efforts to prevent and control MRSA in Ireland by providing expertise to laboratories in the correct identification of bacteria, by tracking circulating strains as part of infection control, by detecting the emergence of new mechanisms of resistance to antibiotics, by screening for the presence of novel virulence factors or toxins, and by participation in research and development initiatives at home and abroad.

During 2009, there were 325 cases of bloodstream infection due to MRSA, compared with 407 and 467 in 2008 and 2007, respectively. By providing timely and complete surveillance data and by supporting microbiology laboratories throughout the country, the work of the NMRSARL has contributed to a decline in the proportion of *S. aureus* bloodstream infection due to MRSA. The proportion of *S. aureus* isolates recovered from blood cultures in Irish hospitals that participated in the European Antimicrobial Resistance Surveillance System (EARSS) exhibiting meticillin resistance has decreased during the past two years (from 42% in 2006 to 27.1% in 2009)¹. One particular strain type predominates among blood-stream isolates accounting for 85% of isolates (276/325) investigated².

Reassuringly in 2009, there were no reports of vancomycin-resistant MRSA as vancomycin remains the drug of choice for the treatment of many MRSA infections. PVL toxin, which

¹EARSS Report for Quarter 1 2010. <http://www.hpsc.ie/hpsc/A-Z/MicrobiologyAntimicrobialResistance/EuropeanAntimicrobialResistanceSurveillanceSystemEARSS/Referenc eandEducationalResourceMaterial/SaureusMRSA/LatestSaureusMRSAdata/File.3989.en.pdf> (Accessed 20/07/2010).

² This report.

*, The spelling 'meticillin' is used in place of 'methicillin' in accordance with International Pharmacopoeia guidelines.

often indicates the presence of community-acquired MRSA, was detected in 18% of isolates investigated. NMRSARL also assisted other laboratories on 28 occasions regarding laboratory aspects of MRSA and participated in the investigation of 19 outbreaks.

The NMRSARL continued its international collaborations including in the areas of optimising the characterisation or typing of different strains and it published and presented at local and international meetings.

Despite restrictions on staff and funding, NMRSARL intends to continue to meet the needs of its users in the future and also enhance the safety of patient care by on-going analysis of strains of MRSA. In addition, NMRSARL aims to enhance services by investigation of infection caused by meticillin-susceptible *S. aureus* (MSSA) as MSSA can cause the same serious illness as those caused by MRSA.

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*, The spelling 'meticillin' is used in place of 'methicillin' in accordance with International Pharmacopoeia guidelines.

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Background

The National Meticillin-resistant *Staphylococcus aureus* (MRSA) Reference Laboratory (NMRSARL) was officially opened on 23rd January, 2002. NMRSARL is located in St. James's Hospital (SJH) and works closely with the SJH Department of Microbiology, Central Pathology Laboratory. In 2009, funding for NMRSARL came from the Department of Health and Children (DoHC) through the Health Service Executive to SJH. Local administration is through SJH.

NMRSARL currently offers the following services to microbiology laboratory medical and scientific staff in hospitals in Ireland:

- confirmation of *S. aureus* identity and meticillin resistance
- epidemiological typing using
 - antibiogram-resistogram (AR) typing
 - biotyping
 - DNA macrorestriction analysis using pulsed field gel electrophoresis (PFGE)
- investigation of glycopeptide resistance
- detection of virulence factors {at present, restricted to the Panton-Valentine leucocidin (PVL), a virulence factor associated with CA-MRSA causing skin and soft tissue infection and investigated in NMRSARL for research purposes only}
- advice on treatment of patients with MRSA through its medical director
- advice on infection control through the infection control team of SJH
- advice on laboratory aspects of MRSA through the scientific staff of NMRSARL.

Current PCR assays include detection of *mecA* (which encodes meticillin resistance) and *pvl* (encoding the Panton-Valentine leucocidin toxin).

Part of NMRSARL's current work is the routine monitoring of MRSA strains prevalent in Ireland. This is done by AR typing, biotyping and PFGE typing of blood culture MRSA isolates from Irish hospitals that participate in the European Antimicrobial Resistance Surveillance System (EARSS).

In addition, NMRSARL is involved in research, education and training.

Achievements in 2009

NMRSARL Laboratory Work

European Antimicrobial Resistance Surveillance System

Forty-two laboratories throughout Ireland submitted 325 blood-stream MRSA isolates to NMRSARL during 2009 for monitoring of epidemiological types and monitoring of resistance to clinically significant antimicrobials. This laboratory work is performed for the project European Antimicrobial Resistance Surveillance System (EARSS), a European initiative that, in Ireland, is operated through the Health Protection Surveillance Centre (HPSC).

All MRSA isolates are frozen, minimum inhibitory concentration (MIC) determinations of oxacillin and screening isolates for reduced susceptibility to vancomycin with the E-test™ macro-method are performed. In addition, NMRSARL provides HPSC with data on rates of resistance to other clinically useful antibiotics. Additional data generated from these isolates include agar screening for glycopeptide resistance and teicoplanin E-test™ macro-method determinations.

Fusidic Acid Resistance

Monitoring antimicrobial resistance in MRSA isolates investigated under the EARSS has shown that resistance to fusidic acid increased between 1999 and 2009. Resistance increased from <10% between 1999 and 2001 to 27% in 2006 and to 35% (113/325) in 2009.

This is a worrying development as fusidic acid remains a clinically useful antimicrobial for difficult to treat infections.

Mupirocin Resistance

Between January 2006 and December 2007, the proportion of MRSA isolates exhibiting high-level mupirocin resistance (MpR) increased to 2.9% compared with 1.4% between January 1999 and December 2006. During the later period of 2008 55% of MpR isolates (16/29) exhibited an unfamiliar AR pattern which included resistance to the aminoglycosides gentamicin, kanamycin and tobramycin but with PFG-01 patterns which are associated with the AR06 AR type while 14% (4/29) exhibited AR-PFG 06-01¹. In 2009, high-level mupirocin resistance was detected in 3.1% (10/325) of MRSA isolates from blood; 20% of these MpR isolates (2/10) exhibited the 'old' AR-PFG types 13-00 or 14-00 (or variants of these patterns) while 60% exhibited the 'unfamiliar' AR pattern

¹ Rossney A, O'Connell S. *EuroSurveillance* 2008; Apr 3;13(14). pii: 8084.
<http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=8084>. Accessed 13/07/2009.

with aminoglycoside resistance but with PFG-01 patterns associated with the AR06 AR type.

This work suggests that mupirocin resistance may be becoming established in the most common strain that is circulating in Irish hospitals. If this is the case, then it will undoubtedly have a major impact on the success of decolonisation, a major strategy in preventing spread. NMRSARL alerted microbiologists and infection control teams across the country of this potential development and guidance on use of mupirocin¹.

Glycopeptide Resistance

The glycopeptides, vancomycin and teicoplanin, remain the mainstay for the treatment of serious infection caused by MRSA. There has been increasing concern about the development of resistance to these agents over recent years and laboratory detection of resistance is complex. NMRSARL uses a vancomycin agar screen and an experimental teicoplanin agar screen for preliminary investigation of reduced susceptibility to glycopeptide². NMRSARL also tests all EARSS MRSA isolates by a commercial MIC system (E-test) for both vancomycin and teicoplanin resistance using a macro-method which screens for hetero-glycopeptide resistant *S. aureus* (hGISA). Isolates yielding positive results in the E-test macro-method are confirmed as hGISA by population analysis profile-area under the curve (PAP-AUC) ratio determination. As part of an evaluation of glycopeptide resistance detection strips staff completed PAP-AUC on isolates submitted to the NMRSARL since 1999. In total 347 isolates were tested (97 of which were completed in 2009). Of these 30.5% (106/347) were shown to be glycopeptide susceptible, 34.9% (121/347) exhibited reduced susceptibility to teicoplanin but not vancomycin, 28.2% (98/347) exhibited reduced susceptibility to vancomycin and teicoplanin and 6.3% (22/347) exhibited reduced susceptibility to vancomycin alone.

Linezolid, Quinupristin/dalfopristin, Daptomycin and Tigecycline Susceptibility Testing

Monitoring of these newer agents for treatment of MRSA infection is important as resistance detection is rare and difficult with not all laboratories having the capability to perform appropriate tests. All EARSS MRSA isolates are tested against linezolid and in 2009, all were susceptible. During 2009, 100 MRSA isolates (from the EARSS study) were tested for susceptibility to quinopristin/dalfopristin, daptomycin and tigecycline by E-test MIC determination. In addition, these isolates were tested against quinopristin/dalfopristin and tigecycline by disk diffusion. All isolates were susceptible to quinopristin/dalfopristin, daptomycin and tigecycline with MICs $\leq 1\text{mg/L}$ ³.

¹ Rossney A, O'Connell B. *EuroSurveillance* 2008; Apr 3;13(14). pii: 8084.

² Fitzgibbon MM, Rossney AS, O'Connell B. *J Clin Microbiol* 2007; 45: 3263-9.

³ Clinical and Laboratory Standards Institute. CLSI Documents M7-A8; M2-A10; M100-S19; 2009.

Molecular Epidemiological Typing

PFGE

During 2009, all EARSS MRSA isolates were typed by PFGE. As reported previously, in NMRSARL, PFGE patterns are assigned a five-digit PFGE type (PFT) number which are grouped into apparently-related groups of PFTs according to the criteria of Tenover *et al.*^{1,2}. AR typing and PFGE typing results are combined to yield AR-PFG types. The continuing predominance of AR-PFG 06-01 isolates (which are susceptible to most antimicrobials on the AR typing panel) is resulting in AR typing becoming less useful and PFGE typing being required more extensively. PFGE patterns of AR-PFG 06-01 isolates have tended to be relatively homogeneous. When Irish laboratories first participated in EARSS in 1999, just seven PFGE patterns were detected among the AR-PFG 06-01 isolates investigated. However with the development of the PFGE method used the number of patterns recognised has significantly increased to over 180 PFTs. Since 2001 two patterns (PFTs 01018 and 01039) have predominated. This trend continued in 2009, with 53.7% (155/289) of isolates exhibiting one of three closely-related patterns (PFT 01018, 01039 and 01042 which occurred at frequencies of 23.2%, 19.4% and 11.1%, respectively).

spa Typing

As previously mentioned AR typing and PFGE are becoming less useful in the typing of MRSA isolates in Ireland³. In 2006 and 2007, NMRSARL investigated 84 MRSA and 85 methicillin-susceptible *S. aureus* (MSSA) isolates by *spa* typing while coordinating Ireland's participation in a European study to determine the ability of *spa* typing to provide data on the clones of *S. aureus* circulating in Europe⁴. Since then the NMRSARL has continued using this typing method in order to obtain additional information about MRSA in Ireland.

In 2009 33 PVL-positive isolates and 55 other MRSA isolates were investigated (Figure 1 Panel A and B respectively). Among PVL-positive isolates (Figure 1, Panel A), the predominant *spa* type was t008 (associated with ST8) with t044, t051, t019 and t437 also exhibited by greater than one isolate. Eleven *spa* types were exhibited by only one isolate. Isolates represented in Figure 1 Panel B were investigated because they exhibited unfamiliar AR or PFGE patterns or represented isolates of special interest. In 2009 the most frequently occurring *spa* type in this group was t032 (38.2%) associated with ST22. t064 was exhibited by 7.3% (4/55) of isolates while t022, t037 and t727 were

¹ Tenover, FC, Arbeit RD, Goering RV *et al.* *J Clin Microbiol* 1995; 33: 2233-9.

² Rossney AS, Lawrence MJ, Morgan PM *et al.* *Eur J Clin Microbiol Infect Dis* 2006; 25: 79-89.

³ This report.

⁴ Grundmann H. *et al.*, *PLoS Medicine* 7(1): e1000215. doi:10.1371/journal.pmed.1000215

each exhibited by 5.5% (3/55) of isolates. All other *spa* types were exhibited by only one isolate.

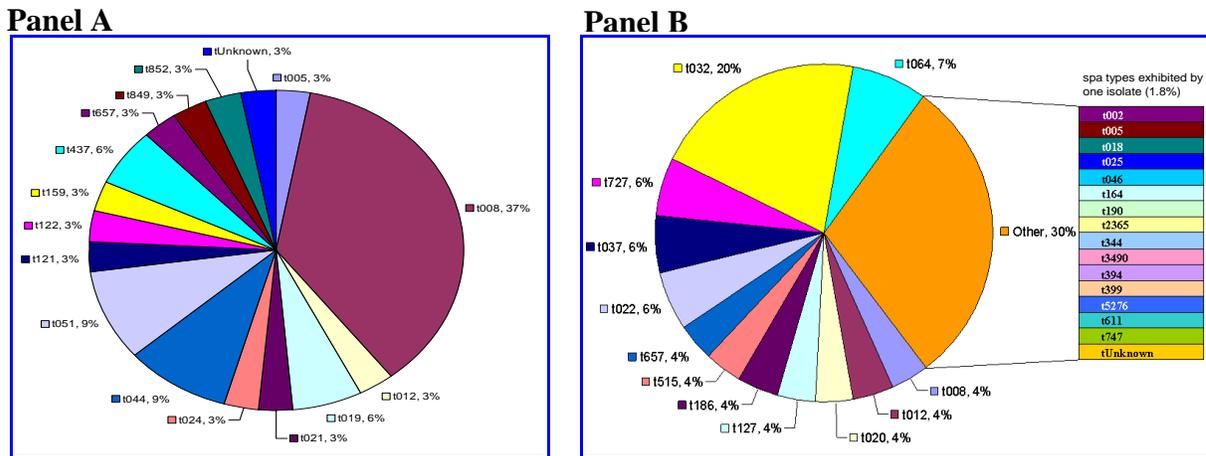


Figure 1. *spa* types from PVL positive (Panel A) and PVL negative (Panel B) isolates investigated in 2009.

MLST and SCCmec Typing

In 2002, the International Union of Microbiological Societies Subcommittee on Typing of Staphylococci agreed that a nomenclature based on MLST and SCCmec typing should be used for international comparison of MRSA strains¹. In previous reports, we showed that the majority of MRSA isolates recovered in Irish hospitals between 1971 and 2003 belonged to one of seven internationally spread MRSA clones (ST239, ST247, ST250, ST5, ST22, ST36 and ST8) and had SCCmec types I, Ia, II, III or IV but ST8 isolates showed an unexpected degree of diversity within the SCCmec element. The correlation between AR-PFG, MLST and SCCmec types is shown in Figure 2. Isolates with AR-PFG 06-01 exhibited MLST and SCCmec type ST22-MRSA-IV similar to UK EMRSA-15 while those with AR-PFG 07-02 were ST36-MRSA-II similar to UK EMRSA-16^{2,3}.

Monitoring the Epidemic Strains Prevalent in the Irish MRSA Population

In addition to data generated to support the EARSS programme in Ireland, NMRSARL investigates MRSA to monitor the epidemiological types of MRSA that are circulating in Irish hospitals. Isolates are typed by AR typing, biotyping and PFGE typing. Quarterly reports are issued to each participant laboratory detailing the overall AR type distribution among EARSS MRSA isolates. NMRSARL also provides separate reports for

¹ Cookson BD, Robinson DA, Monk AB *et al.* *J Clin Microbiol* 2007; 45: 1830-7.

² Shore A, Rossney AS, Keane CT *et al.* *Antimicrob Agents & Chemother* 2005; 49: 2070-83.

³ Rossney AS, Lawrence MJ, Morgan PM *et al.* *Eur J Clin Microbiol Infect Dis* 2006; 25: 79-89.

each individual laboratory of that laboratory's AR typing results. These results provide essential background information on the MRSA population in each hospital against which potential outbreaks can be assessed.

Since 2004, NMRSARL has combined AR typing results with PFGE typing results to generate AR-PFG types¹. Figure 2 shows how the AR-PFG type distribution in participating hospitals changed between 1999 and 2009 and also includes data on multilocus sequence typing (MLST) and staphylococcal cassette chromosome (SCC)*mec* typing extrapolated from a study completed in 2004². Prevalence of one AR-PFG type 06-01 increased from 22% in 1999 to 84.9% in 2009. Unlike other strains of MRSA, AR-PFG 06-01 isolates are not multi-antibiotic-resistant and, as this strain becomes increasingly predominant, AR typing and PFGE typing are becoming less helpful. Other typing methods are required to distinguish among AR-PFG 06-01 isolates.

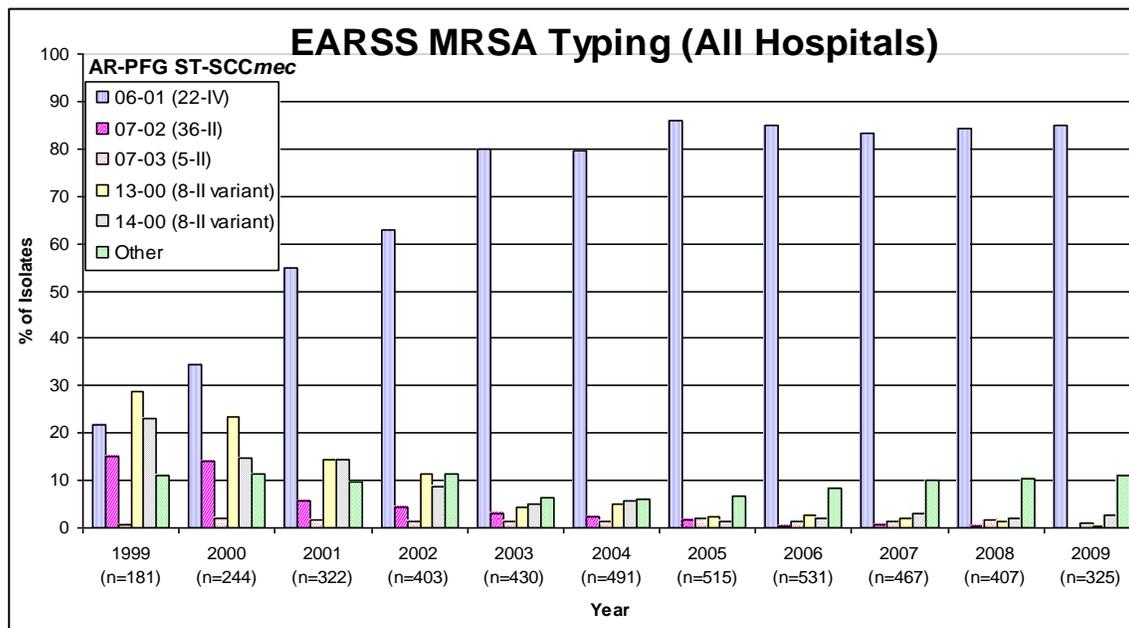


Figure 2. Epidemiological type distribution among MRSA isolates in Irish hospitals that participate in the European Antimicrobial Resistance Surveillance System (1999 to 2009).

AR-PFG, antibiogram-resistogram type and pulsed field gel electrophoresis group; ST-SCC*mec*, MLST sequence type and SCC*mec* type (SCC*mec* II variant, variants of SCC*mec* type II).

¹ Rossney AS, Lawrence MJ, Morgan PM *et al.* *Eur J Clin Microbiol Infect Dis* 2006; 25: 79-89.

² Shore A, Rossney AS, Keane CT *et al.* *Antimicrob Agents & Chemother* 2005; 49: 2070-83.

Detection of Virulence Factors

Panton-Valentine Leucocidin (PVL) Carriage in MRSA in Ireland

In a study investigating PVL in MRSA in Ireland, carriage of PVL was shown to be unreliable as a sole marker for CA-MRSA. Molecular characterization of PVL-positive MRSA isolates confirmed that all isolates carried SCC mec type IV but six genotypes (ST30, ST8, ST22, ST80, ST5 and ST154) were represented among these isolates. Epidemiological data showed that 36% of patients in Ireland from whom PVL-positive isolates were recovered were of non-Irish ethnic origin¹. In 2009, 222 isolates were tested for carriage of PVL of which 201 were from isolates recovered during 2009. These comprised 35 EARSS MRSA isolates (two were positive), 35 MSSA and 152 MRSA isolates. Fourteen percent of MSSA (5/35) and 22.4% of MRSA (34/152) were PVL-positive.

MRSA in Veterinary Medical Practice in Ireland

In 2009, NMRSARL continued its collaborative work with veterinary colleagues².

Requests from Diagnostic Laboratories

In NMRSARL, all requests are considered incidents. Incidents may be requests for information, requests to investigate isolates from potential outbreaks or requests to investigate some other problem with the isolate(s). During 2009, the routine epidemiological typing service was limited to institutions experiencing acute problems and AR typing and biotyping only were routinely offered. Recognition of the problems created by the increasing prevalence of AR06 isolates resulted in increasing numbers of isolates requiring PFGE typing. All isolates were screened for glycopeptide resistance by agar screening.

In 2009, NMRSARL processed:

- 325 isolates (from 310 patients) submitted under the EARSS scheme
- 28 requests for laboratory information regarding MRSA
- 159 requests for isolate investigation (on 353 isolates which included 19 outbreak investigation requests).

Workload figures for referral isolates and for isolates investigated under the EARSS project are detailed in the table below.

¹ Rossney AS, Shore AC, Morgan PM *et al. J Clin Microbiol* 2007; **45**: 2554-63.

² Abbott Y, Leggett B, Rossney AS *et al. Vet Rec* 2010; **166**:451-455

Numbers of incidents, putative outbreaks and isolates investigated during 2009

Year	Incidents	Isolates	Outbreaks	<i>pvl</i>	<i>mecA</i>	<i>spa</i>	PFGE	EARSS MRSA
1999	3	11	1	.....	.....	.....	.....	180
2000	9	65	2	.....	.....	.....	.....	245
2001	15	52	5	.....	.....	.....	.....	323
2002	64	117	12	.....	.....	.....	.....	426
2003	86	178	33	.....	.....	.....	.....	430
2004	92	170	21	35	.....	.....	.....	488
2005	164	336	30	97	46	.....	72*	507
2006	204	404	28	155	61	.....	679*	528
2007	189	390	21	185	85	45	636*	467
2008	209	432	20	241*	72	118	690*	407
2009	187	353	19	222	34	89	531*	325

*, all EARSS MRSA isolates ($n = 339$ in 2009) were investigated by PFGE and 35 were tested for *pvl*.
pvl, Panton-Valentine leucocidin toxin gene; *mecA*, gene encoding meticillin resistance; *spa*, staphylococcal protein A gene typing; PFGE, pulsed field gel electrophoresis.

Quality Management System

The National MRSA Reference Laboratory maintained CPA accreditation throughout 2009. As part of the quality management system staff completed a number of internal and external audits. Although there is no appropriate external quality assurance scheme which covers the work of the MRSA Reference Laboratory, staff in the laboratory have been working with Staphylococcal Reference Laboratories in Scotland, Copenhagen and London to develop an useful system. A review of the exercise in 2009 showed some weaknesses in the system and a revised system will be used in 2010 along with the inclusion of the German Reference Laboratory.

In 2009 a survey of all users was completed. It remains difficult to obtain a high response rate to these surveys however of those received one user considered the turnaround time as adequate while all other respondents thought the service was excellent (16) or good (4). Results of the user survey will be considered when planning for the development of the laboratory.

Resources

Staff

NMRSARL's current staffing level is one chief medical scientist (Dr. Angela Rossney), one staff grade medical scientist (Ms. Emma Gibbons), one molecular microbiologist (Dr. Pamela Morgan) and one medical laboratory aide (Ms. Aoife McConnon). A permanent

position for a clerical officer has been sanctioned by DoHC but remains vacant at present. During 2009, a medical scientist (Ms. Gráinne Brennan) was seconded to the NMRSARL from the diagnostic Microbiology Department in SJH on a temporary basis and was appointed in an acting senior medical scientist capacity. A temporary research assistant (Mr. Paul Grier) was financed by research funding. The role of Director is discharged in an honorary capacity by Dr. Brian O'Connell, Consultant Microbiologist, SJH.

Premises and Equipment

NMRSARL consists of three main laboratory areas, a Phenotyping Laboratory, a Genotyping Laboratory and a PCR Laboratory. Provision of a suitable computer system is a major requirement, both for monitoring isolates received and for detailed analytical work. The Central Pathology Laboratory in SJH has been involved in procuring a new computer system for a number of years and as part of this procurement, the special requirements of NMRSARL have been noted. However, all systems investigated to date would require extensive modification to accommodate NMRSARL's needs.

Finance

Funding of €305.2K was allocated for the year 2009. NMRSARL stayed within budget for the year.

Committees

NMRSARL staff members sit on the Irish EARSS Steering Committee and on the Royal College of Physicians of Ireland's Policy Group on HealthCare-Associated Infection.

Education

NMRSARL staff gave lectures to students on the joint Dublin Institute of Technology (DIT) / TCD MSc in Molecular Pathology course and to microbiology students in the Moyne Institute, TCD. Staff also made oral presentations at SJH Grand Rounds on 'MRSA in the Surgical Patient'.

Research

In on-going investigations, NMRSARL continues:

- 1) to monitor reduced susceptibility to glycopeptide using a new teicoplanin agar screen method, to investigate the role of teicoplanin PAP for confirmation of

- reduced susceptibility to glycopeptide¹ and to evaluate a new E-test hGISA/GISA resistance detection (GRD) strip
- 2) to monitor gentamicin-resistant MSSA (GentR MSSA) isolates recovered in SJH. A PVL-positive subset of these isolates with *spa* type t005 (associated with ST22) has been recognized in a number of European countries including Ireland
- In 2006 and 2007, NMRSARL coordinated Ireland's participation in a European study organized by the EARSS team investigating the value of *spa* typing to determine the clones of *S. aureus* circulating in Europe. Further work investigating the PFGE patterns of the MSSA isolates submitted for this project was undertaken in NMRSARL as project work for a student on the DIT / TCD MSc in Molecular Pathology course
 - The work described below has been undertaken in collaboration with Professor David Coleman and his team at the Dublin Dental School, TCD:
 - 1) On-going investigation of remnants of SCC*mec* found in GentR MSSA²
 - 2) Following a study investigating genotypes of the predominant strains of MRSA in Ireland, research is now focusing on MLST and SCC*mec* elements in infrequently-occurring, 'sporadic' and/or unusual MRSA isolates
 - 3) Investigation of MpR isolates exhibiting AR type AR06 and the 'unfamiliar' AR pattern with aminoglycoside resistance but with PFG 01 patterns associated with the AR06 AR type
 - 4) The role of a *S. aureus* DNA array to further characterize predominant strains of MRSA in Ireland.
 - Since 2005, NMRSARL has been collaborating with Professors Hilary Humphreys (RCSI/Beaumont) and David Coleman (TCD) in an MRSA Translation Research Project funded by the Health Research Board. In on-going collaborative work with Professor Richard Goering, Creighton University, Nebraska, USA, the value of *dru* typing for distinguishing among AR-PFG 06-01 MRSA isolates recovered in Beaumont Hospital during this project has been undertaken^{3,4}. Following an evaluation by NMRSARL of a rapid commercial real-time PCR technique (the Xpert MRSA assay, Cepheid) for detection of MRSA in screening specimens, the impact of the use of this system in clinical practice to reduce time from patient admission to isolation was assessed in Beaumont Hospital⁵.

¹ Fitzgibbon MM, Rossney AS, O'Connell B. *J Clin Microbiol* 2007; 45: 3263-9.

² Shore AC, Rossney AS, O'Connell B *et al. Antimicrob Agents Chemother* 2008; 52: 4407-19.

³ Rossney AS, Goering RV. 17th ECCMID, Munich, Germany, 31 March–03 April 2007.

⁴ Shore AC, Kinnevey P, Rossney AS *et al.* 13th ISSSI; Cairns, Australia, 2008. 7–10th September 2008.

⁵ Dolan A, Creamer E, Sherlock O *et al.* 19th ECCMID Helsinki, Finland. 2009 16–19th May 2009.

International Collaboration

NMRSARL is a member of the Harmony Group {an international group set up to standardize ('harmonise') PFGE methods}. One staff member (Dr. Angela Rossney) is the Irish representative on the International Union of Microbiological Societies Subcommittee on Typing of Staphylococci. Dr Angela Rossney is also a member of the European Society of Clinical Microbiology and Infectious Diseases Study Group on Epidemiological Markers. Between June 2005 and May 2007, NMRSARL participated in a UK / Irish study of MRSA bacteraemia in paediatric patients¹. NMRSARL participated in the EARSS *spa* typing project and Dr. Angela Rossney acted as the Irish National Study Coordinator². Collaborative work with Professor Richard Goering, Creighton University, Nebraska, USA proved fruitful in providing a potentially discriminatory method for distinguishing among AR-PFG 06-01 MRSA. Discussions with staff from the Scottish, Danish and UK Reference Laboratories to organize an external quality assessment (EQA) programme between the four centres continue. The first experimental EQA distribution took place in September 2007 with a subsequent distribution in 2009 and another planned for 2010.

Collaboration with Other Irish Reference Laboratories

NMRSARL maintains contact with colleagues in other Irish Reference Laboratories such as the Meningococcal Reference Laboratory.

Objectives for 2010

As part of the Quality Management System the management of the NMRSARL have set objectives for 2010. These objectives involve all staff and are reviewed throughout the year. Along with quality issues these objectives cover areas relating to Staff Training and Education, Health and Safety, Waste Management and Service Development.

The NMRSARL recognises the increased demand from our users for the investigation of MSSA isolates both for the detection of *pvI* and for epidemiological typing. With this in mind NMRSARL aims to increase the availability of these services to our users in the future. In 2010, staff in the NMRSARL aim to develop real-time PCR assays for the detection of PVL, *mecA* and *nuc* for use with both MRSA and MSSA isolates. Using knowledge obtained during participation in a European project for the typing of MSSA isolates the NMRSARL intends to engage in the typing of MSSA isolates on a national level.

¹ Goodall CM, Johnson AP, Sharland M *et al.* *Archives of Diseases in Childhood* 2009 In press.

² Hajo Grundmann *et al.*, *PLoS Medicine* 7(1): e1000215. doi:10.1371/journal.pmed.1000215.

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