Healthcare-Associated Infections and Antimicrobial Resistance: 2009/10
## Contents

1. Foreword

2. Highlights

3. Mandatory surveillance of MRSA bacteraemia and *Clostridium difficile*  
   Trends in the epidemiology of MRSA bacteraemia  
   Trends in the epidemiology of *Clostridium difficile*

4. Trends in the epidemiology of MRSA bacteraemia

5. Trends in the epidemiology of *Clostridium difficile*

6. Formal engagement with stakeholders

7. Enhanced reporting and surveillance activities

8. Strengthening healthcare epidemiology

9. Research and development

10. *Clostridium difficile* Ribotyping Network

11. Translational research in partnership with industry

12. Surveillance of norovirus

13. Surveillance of surgical site infection

14. Antimicrobial resistance

15. Antiviral resistance

16. Carbapenem resistance in enterobacteriaceae

17. Decline in resistance following introduction of vaccine

18. Protection against airborne infection risk in intensive care units

19. e-Bug—a pan-European educational resource for schools

20. Infection control in care homes

21. Information for patients

22. Data sources

23. Other useful links
During 2009/10, we observed another sustained reduction in the number of people who fell ill with healthcare-associated infections (HCAIs). We commend the NHS, and others working in healthcare, for the continued decline in the number of infections caused by meticillin-resistant *Staphylococcus aureus* (MRSA) and *Clostridium difficile* (CDI).

The 35% drop in MRSA bloodstream infections reported in 2009/10, and the 29% fall in CDI, demonstrate that year-on-year reductions in HCAIs have been achieved through concerted efforts to improve the prevention and control of infection.

While the figures are encouraging, patients continue to contract HCAIs in hospitals, care homes and other community settings. The emphasis placed on preventing, and eliminating, these infections must be maintained so that people receive safe and effective care. To tackle HCAIs and the challenge posed by antimicrobial resistance (AMR), the Health Protection Agency (HPA) provides expert advice and support, enhanced surveillance and epidemiological reports and diagnostic and reference microbiology services. We work with the NHS and other partners to increase awareness of HCAIs by promoting good antibiotic stewardship and high standards of cleanliness. Where appropriate, we provide education and training.

**Dr Christine McCartney**
Executive Lead for the Health Protection Agency (HPA) Healthcare-Associated Infection (HCAI) and Antimicrobial Resistance (AMR) Programme
During the past year, we helped care home providers prepare for the Department of Health’s (DH) Code of Practice (Code) on the prevention and control of infections, which was introduced by the Health and Social Care Act 2008. This Code builds on the previous Code of Practice, which only applied to the NHS, by also including registered providers of independent healthcare and adult social care from October 2010. The Code will be used by the Care Quality Commission to judge whether these registered providers comply with the registration requirement for cleanliness and infection control.

Many infectious diseases can spread within care establishments, where large numbers of people, many of whom are susceptible to infection, share eating and living accommodation. Infection of care home residents can result in admissions to hospital. The HPA provided expert advice, including a series of road shows, to help care home providers deal with difficult infection prevention and control issues.

Other considerations for the year ahead are the new MRSA objective that requires NHS organisations to make further reductions in the number of MRSA cases and the forthcoming C. difficile objective.
Mandatory surveillance of MRSA bacteraemia and *Clostridium difficile*

**Trends in the epidemiology of MRSA bacteraemia**

Rates of MRSA bacteraemia continue to decline for both trust-apportioned infections, which are presumed to have been acquired in hospital, and those attributed to primary care organisations (PCO) because the infections may have been acquired outside hospital.

At the request of the DH, the HPA began publishing monthly online data for MRSA bacteraemia from May 2009. This followed epidemiological findings that highlighted the importance of distinguishing between trust-apportioned and other cases, including those detected from the community. Figure 1 shows the substantial decreases in both PCO and trust-apportioned rates.

PCO-attributed rates of MRSA bacteraemia fell from 5.9 per 100,000 population in 2008/09 to 3.8 per 100,000 population in 2009/10 (Figure 1a), continuing a downward trend over time. An equally significant decrease was seen in the trust-apportioned rate, which fell from 4.2 per 100,000 bed days in 2008/09 to 2.6 per 100,000 bed days in 2009/10 (Figure 1b).

![Figure 1](image-url)
Trends in the epidemiology of Clostridium difficile

There continues to be a significant decline in the rate of C. difficile infection (CDI). Comparing all cases of C. difficile in the three years from 2007/08 to 2009/2010, the rate fell from 11.1 cases per 10,000 population to 5.1 per 10,000 population in 2009/10 (Figure 2a). Similarly, for cases apportioned to acute trusts, the rates decreased from 9.3 per 10,000 bed days in 2007/08 to 3.6 per 10,000 bed days in 2009/10 (Figure 2b), indicating that the NHS is continuing to make progress in reducing the number of cases.

The HPA collects these mandatory surveillance data on behalf of the Department of Health and publishes them on the HPA website (www.hpa.org.uk) in compliance with the UK Statistic Authority Code of Practice for Official Statistics.
Formal engagement with stakeholders

The HPA, in conjunction with the DH, carried out a formal review of the mandatory surveillance of MRSA bacteraemia and *C. difficile*. This included an online survey (July/August 2009) and a formal stakeholder meeting in November 2009. The goal of the engagement process was to gain stakeholder views on several components of the programme, including the IT system, the public reporting function, the epidemiology commentaries and the routine surveillance outputs from the HPA’s Local and Regional Services.

Stakeholders from a range of organisations took part, including NHS acute trusts; primary care organisations; strategic health authorities; the Care Quality Commission; patient representation organisations; the National Patient Safety Agency and the Independent Sector Healthcare Advisory Service.

Feedback from stakeholders has been fundamental in guiding a number of recent developments. At the start of 2010, we began to redesign the data capture system (DCS) in response to stakeholder needs. The new system will provide users with an enhanced reporting function, improved data entry processes and a more intuitive user-interface.

Enhanced reporting and surveillance activities

The agency’s surveillance outputs have been redesigned with changes to the format, content, and publication schedule. Following comments that quarterly data tables were not timely enough, the HPA published monthly data tables from November 2009. A new series of quarterly epidemiological commentaries covers topics related to the epidemiology of HCAIs, providing comments on, and interpretation of, the data.

The HPA is preparing the first publication of voluntary surveillance data on MRSA bacteraemia and *C. difficile* from independent sector (IS) healthcare organisations. IS organisations are playing an increasing role in treating NHS patients for elective procedures. Since 2008, several of these organisations have been reporting data on HCAIs to the HPA.
Strengthening healthcare epidemiology

A review of epidemiology in the HPA (October 2008) found that healthcare epidemiology needed to be strengthened to address the challenge of HCAIs in hospitals and the community. An operational group, reporting to the HCAI and AMR Programme Board, was established in 2009 to define the competencies for healthcare epidemiologists and then to provide specialist training, experience and skills relevant to healthcare epidemiology.

The group identified the need to foster a multi-disciplinary approach across the HPA with respect to healthcare epidemiology. At meetings for staff, there was overwhelming support for a long-term strategy of strengthening healthcare epidemiology in the HPA. The group has now developed competencies in the area of healthcare epidemiology and secondments for training are planned.

Research and development

Hospitals often do not have sufficient single room accommodation to isolate patients infected with resistant microorganisms. However, if temporary side room facilities were available, they could be used to accommodate such patients in a general ward. This could reduce the risk of an infection being transmitted to other patients.

As part of the DH HCAI Technology Innovation Programme, which aims to identify new technologies that can be used to combat HCAIs, the HPA’s Biosafety Investigation Unit were commissioned to evaluate a temporary side room (TSR).

Initial trials of a number of TSR prototypes were carried out by the DH in wards at University College London Hospital (UCLH) so that NHS staff and patients could comment on the design and efficacy. The TSR, which is made of plastic screens and ceiling, included integral hand wash stations, portable stand-alone toilets and high efficiency particulate air (HEPA) filters.

The HPA working with the DH, UCLH and the TSR designers (Renfrew Group International), carried out aerobiological testing of the TIU to assess the integral HEPA filters and directional air flows. The results of the aerobiological testing currently are being used to improve the efficacy of the TSR.

In a study funded by the Medical Research Council (MRC), the HPA, UCLH and the Royal Free Hospital are assessing the requirements for isolation in England. The final phase of the project, during 2010/11, will explore the feasibility of two interventions in four hospitals for a possible subsequent prospective study.

The HPA is also collaborating with UCLH and the Royal Free Hospital, in a DH/MRC Patient Safety funded project to evaluate the NPSA cleanyourhands campaign and the effectiveness of a feed back intervention study to improve hand hygiene compliance.
The *Clostridium difficile* Ribotyping Network (CDRN) for England and Northern Ireland provides ribotyping and enhanced DNA fingerprinting to identify cross-infection, reduce transmission, optimise management of outbreaks and determine the epidemiology of *C. difficile*. Since 2007, reports of *C. difficile* in England have continued to fall markedly.

During 2009/10, the CDRN processed 5,762 faecal samples from 199 healthcare facilities in England. This is around 23% more than the previous year (4,682 samples from 190 facilities). On average, 28.9 and 24.6 samples were submitted to CDRN by each participating hospital in 2009/10 and 2008/09 respectively. In 2009/10, about one out of every four or five *C. difficile* cases in England was examined by CDRN (versus one out of every eight or nine in 2008/09). Reasons for submission of samples to CDRN are summarised in Figure 3.

There were marked changes in ribotype prevalence compared with previous years. (Table 1). The downward trend in the prevalence of ribotype 027 continued. Ribotype 106 also declined markedly. These changes may reflect the success of control measures to reduce cross-infection in hospitals caused by epidemic strains or adjustments to antibiotic prescribing. With increased sample submission to CDRN, these trends may be expected to be accompanied by increases in the relative contribution of other ‘emergent’ *C. difficile* ribotypes to the overall disease burden.

![Figure 3: Reasons for sample submission to CDRN (2009/10)](image-url)
The top 10 most prevalent ribotypes (those with >2% prevalence in 2008/09) are shown in table 1.

In 2007/08, 2008/09, and 2009/10, 7.2%, 8.1% and 12.6%, respectively, of all isolates were designated as sporadic i.e. these were not one of the commonly recognised ribotypes.

The proportion of (toxin positive) faecal samples that were *C. difficile* culture-negative was 12.7%, which is very similar to that seen in 2008/09 (12.5%). This observation implies that there remains an issue with some faecal samples yielding false positive toxin results when tested locally. Guidance about the laboratory diagnosis of *C. difficile* infection is available on the HPA website.

Enhanced fingerprinting activity continued to increase. The Leeds CDRN Reference Laboratory carried out 27 multiple-locus variable-number tandem repeat (VNTR) analysis (MLVA) investigations in 2009/10. In 11 of these investigations, all tested isolates were indistinguishable or very highly related, suggesting possible cross-infection. In six investigations, all isolates were clearly distinguishable/not related. In the remainder, isolates consisted of both highly related and clearly distinguishable strains. The results emphasise that without such investigations assumptions about potential clustering of CDI cases may be mistaken.

HPA scientists, with their expertise in microbiology and molecular biology techniques, have formed partnerships with industry to research and develop new treatments for HCAIs. Improved therapeutics for the management of CDI are urgently required because patients can become unresponsive to the current frontline antibiotics, metronidazole and vancomycin.

### Table 1

The prevalence of the most common *C. difficile* ribotypes detected by CDRN

<table>
<thead>
<tr>
<th>Ribotype</th>
<th>2007/08 n (%)</th>
<th>2008/09 n (%)</th>
<th>2009/10 n (%)</th>
<th>Prevalence change [07/08 and 09/10] (%)</th>
<th>Prevalence change [08/09 and 09/10] (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>027</td>
<td>1152 (55.3)</td>
<td>1468 (36.1)</td>
<td>1107 (22.0)</td>
<td>-33.3</td>
<td>-14.1</td>
</tr>
<tr>
<td>106</td>
<td>270 (13.0)</td>
<td>517 (12.7)</td>
<td>368 (7.3)</td>
<td>-5.7</td>
<td>-5.4</td>
</tr>
<tr>
<td>001</td>
<td>181 (8.7)</td>
<td>297 (7.3)</td>
<td>373 (7.4)</td>
<td>-1.3</td>
<td>+0.1</td>
</tr>
<tr>
<td>002</td>
<td>57 (2.7)</td>
<td>231 (5.7)</td>
<td>303 (6.0)</td>
<td>+3.3</td>
<td>+0.3</td>
</tr>
<tr>
<td>014/020*</td>
<td>57 (2.8)</td>
<td>218 (5.4)</td>
<td>128 (2.5)</td>
<td>-0.3</td>
<td>-2.9</td>
</tr>
<tr>
<td>015</td>
<td>50 (2.4)</td>
<td>215 (5.3)</td>
<td>332 (6.6)</td>
<td>+4.2</td>
<td>+1.3</td>
</tr>
<tr>
<td>078</td>
<td>37 (1.8)</td>
<td>144 (3.5)</td>
<td>288 (5.7)</td>
<td>+3.9</td>
<td>+2.2</td>
</tr>
<tr>
<td>005</td>
<td>29 (1.4)</td>
<td>118 (2.9)</td>
<td>215 (4.3)</td>
<td>+2.9</td>
<td>+1.4</td>
</tr>
<tr>
<td>023</td>
<td>21 (1.0)</td>
<td>109 (2.7)</td>
<td>150 (3.0)</td>
<td>+2.0</td>
<td>+0.3</td>
</tr>
<tr>
<td>026</td>
<td>5 (0.2)</td>
<td>87 (2.1)</td>
<td>41 (0.8)</td>
<td>+0.6</td>
<td>-1.3</td>
</tr>
</tbody>
</table>

*Data for ribotypes 014 and 020 are combined.
Translational research in partnership with industry

*C. difficile* produces two large protein toxins (Toxins A and B) which are the principal virulence factors. They cause the characteristic symptoms of CDI by damaging the gut lining. Antibodies that neutralise the biological activities of these toxins offer opportunities for the development of both new therapeutics and improved diagnostics.

Scientists at the HPA’s Centre for Emergency Preparedness and Response, in collaboration with their industrial and academic partners, have developed a broad array of techniques, reagents and assay systems, which have enabled the production of high affinity antibodies to Toxins A and B. Using cell-based assay systems, these antibodies have been shown to neutralise specifically the cytotoxic actions of these toxins (Figure 4). Studies using in vivo models for CDI show that administration of a mixture of Toxin A/B antibodies provides near complete protection against infection. Protection was observed when testing against a range of isolates of *C. difficile* including ribotypes 027 and 078.

Studies are now at the stage where the agency, with its partners, can take the preparatory steps required to generate therapeutic antibodies of the quality required to undergo assessment in early stage clinical trials.

New technologies to measure the efficacy of decontamination processes in controlling HCAIs have been developed. These aim to provide an evidence base to inform policy and to underpin the development and evaluation of new interventions. The technologies include assessing the efficacy of automated washer disinfectors and cleaning chemistries, particularly focused on cleaning of surgical instruments. The thermostable adenylate kinase (tAK) technology has been used in laboratories and in sterilising departments of hospitals. It is being developed further, with DH funding, in collaboration with commercial partners.

**Figure 4**
Protective effect of antibodies on Vero cells

(A) Vero cells incubated with 0.5 ng/ml *C. difficile* Toxin B for 24 hours show typical cell rounding and detach from the matrix. (B) Cells incubated with 0.5 ng/ml Toxin B in the presence of a 10,000-fold dilution of ovine anti-Toxin B are protected and appear normal.
Surveillance of norovirus

Norovirus is the most common cause of infectious intestinal disease in the UK. A recent study* suggests that around two million people are affected in England each year. There is evidence to suggest that norovirus activity was significantly higher this season (2009/10) compared with last season (Figure 5).

The number of laboratory reports during 2009/2010 increased by 59% with 12,521 reported cases to week 24 compared with 7,880 reported cases to the same week in the 2008/2009 season. The majority of laboratory reports were from the beginning of 2010, with 79% occurring after week 52 in 2009.

The Hospital Norovirus Outbreak Reporting scheme has now been running for just over one year. Infection prevention and control teams in hospitals enter data via a secure web-enabled database.

In the first year, January to December 2009, 77 trusts (71 acute and 6 non-acute) reported 831 outbreaks of norovirus. Eighty-two per cent of outbreaks resulted in some form of ward closure and 72% were laboratory confirmed. The number of reported outbreaks was higher in December and accounted for 32% of those reported during the year. The reported outbreaks affected 8,500 patients and 2,500 NHS staff. More than 10,000 bed days were lost. Norovirus reporting is voluntary so these figures are likely to underestimate the number of outbreaks.

Surveillance of surgical site infection

Surgical site infections (SSIs) are estimated to account for 15% of all HCAIs and are associated with considerable morbidity. The care provided before, during and after an operation is critical to minimising the risk of SSI. Sending data on rates of SSI back to surgical teams can facilitate reductions in rates of infection.

The HPA established the SSI Surveillance Service (SSISS) in 1997 to enable hospitals to compare their rates of SSI against a benchmark rate. Hospitals are able to choose from 14 categories of surgical procedures. Data are collected on each patient who has a procedure in the category under surveillance. SSIs that meet standard case definitions are identified through active follow-up during the postoperative stay or through readmission (Figure 6).

From October 2008 to September 2009, 256 hospitals (194 NHS and 62 independent sector) collected data on 112,238 surgical procedures. A total of 1,404 SSIs were detected, with 30% of the infections detected at readmission. The rate of SSI varied between categories, reflecting differences in likelihood of microbial contamination at the site of operation. Data on the causative organism was available for 1,332 infections. Of these SSIs, 31% indicated infection with *S. aureus*, of which 32% were meticillin resistant.

Due to increasingly short lengths of stay for some procedures, a study is being undertaken to evaluate different methods of post-discharge surveillance. A pilot study, involving community midwives and patient questionnaires, has also been carried out to investigate the feasibility of using post-discharge surveillance methods for the capture of data on SSI after caesarean section. Results from both studies are expected later in 2010.

![Figure 6](image-url)

Risk of SSI detected during inpatient stay and at readmission by surgical category: England, October 2008 to September 2009

*mandatory categories
Antimicrobial resistance

The HPA monitors antibiotic resistance in England, Wales, Northern Ireland, the Channel Islands and the Isle of Man. Health Protection Scotland, the Scottish counterpart of the HPA, undertakes surveillance in Scotland.

Antimicrobial resistance testing by laboratories provides information that could be crucial to the treatment of patients. To modernise testing, Vitek automated susceptibility and identification systems were installed in laboratories in Leeds, Birmingham, Central Manchester and Wythenshawe, Bristol, Cambridge, Southampton and London (Kings). In December 2009 and January 2010, all sites had software upgraded to enable the laboratories to report susceptibilities to the European Committee on Antimicrobial Susceptibility Testing (EUCAST) standards.

The HPA uses a system called AmSurv to collect antimicrobial sensitivity data from both NHS and HPA Laboratory Information Management Systems. The surveillance data allows the agency, through its Regional Epidemiology Units, to monitor trends in resistance and to detect the emergence of exceptional resistance, which is investigated further at the Centre for Infections.

Half of all microbiology laboratories currently have the capability to provide data to AmSurv. To strengthen our capacity in healthcare epidemiology and to support the NHS in reducing the incidence and consequence of HCAI and AMR, funding has been made available to increase reporting capacity to 75% of laboratories by April 2011. We can seek to relate weight and type of antimicrobial usage to prevalence of resistance in order to produce reports on antibiotic-pathogen combinations. This should reduce inappropriate use of antimicrobials and reduce the impact of emerging resistance.

The HPA has a resistance alert system to inform microbiologists in the NHS about antibiotic resistance issues. Resistance alerts are circulated when new and emerging resistance problems are identified by HPA reference laboratories. The notices are used sparingly for matters of concern. For example, medical microbiologists would be alerted when a new resistance type that compromises critical antibiotics is encountered repeatedly and appears to be spreading.
Antiviral resistance

Until 2007, drug resistance to the anti-influenza neuraminidase inhibitor class of drugs (NIs: oseltamivir and zanamivir) was rare and limited to particular groups, such as immuno-compromised patients following treatment. Drug-resistant variants were reduced in viral fitness and transmissibility. Unexpectedly in 2007/08, oseltamivir-resistant seasonal H1N1 viruses were identified by the HPA and found to have emerged in Europe in the absence of significant drug pressure. The drug resistant seasonal influenza H1N1 strain spread globally and became the dominant circulating strain until early 2009.

With the emergence of the pandemic strain H1N1 in April 2009, a key concern was whether the pandemic virus would also become drug resistant. Surveillance for new, resistant mutations in the pandemic influenza strain H1N1 was a priority for the HPA and novel assays were designed and validated rapidly to ensure the agency was able to test for drug resistant viruses. The most important mutation associated with drug resistance in H1N1 influenza, either seasonal influenza or pandemic influenza, is at position 275 with an H to Y mutation. Detection assays for this particular mutation are gradually being introduced into regional laboratories.

Many thousands of patient samples were tested during the first and second wave of the 2009 pandemic. A total of 45 cases of oseltamivir resistance, all with an H275Y mutation, have been detected in the UK. The majority of these resistant viruses have been detected following treatment and have not resulted in person-to-person transmission. A high proportion (76%) of these cases have emerged in immuno-compromised patients (Figure 7).

Figure 7
Clinical summary of oseltamivir-resistant (H275Y mutation) cases of pandemic influenza A/H1N1 in 2009/10

PEP: Post exposure prophylaxis
Carbapenem resistance in enterobacteriaceae

Carbapenem resistance in enterobacteriaceae

Guidance on treatment of oseltamivir resistance, with particular reference to immuno-compromised patients, was updated in 2009 in response to patterns of resistance. A small contained outbreak of nosocomial transmission of an oseltamivir-resistant strain, within a haematology facility, was recognised through collaboration with the Public Health Microbiology Laboratory in Wales and the Centre for Infections. The requirement for assays to aid rapid detection of antiviral resistance has increased, in particular to assist with rapid clinical management. Further assays are being developed to enhance the overall capability of the molecular surveillance network in the UK to respond to the challenge of influenza surveillance.

Carbapenems are the most powerful penicillin-related antibiotics with the most comprehensive antibacterial activity. They are used in the treatment of infections caused by Gram-negative bacteria that are resistant to other agents, e.g. those with extended-spectrum β-lactamases (ESBLs). Since ESBLs have become more frequent in the last decade, especially in *Escherichia coli*, there is an increasing need to use carbapenems. Consequently, any resistance is of great concern.

Carbapenemases (bacterial enzymes that destroy carbapenem) had been prevalent only in Acinetobacter, which rarely causes problems outside intensive care units. However, during 2008 and 2009, the reference laboratory began to receive growing numbers of carbapenemase-producing *Klebsiella* and *E. coli*. These are species that can cause infection in a wider range of patients than Acinetobacter. The total number of producers remains small, but the trend is upwards (Figure 8). Complacency is unwise because the producer strains are extremely multi-resistant and carbapenemases have spread in other countries creating significant treatment problems. For example, 40% of *Klebsiella* in Greece and 20% in Israel are resistant to carbapenems.

Strikingly, the UK carbapenemase types are diverse (Figure 8) but many of the patients have previously been hospitalised overseas. In effect, UK travellers seem to be ‘sampling’ resistance types that are more prevalent elsewhere. The most common carbapenemase in 2009 was NDM (New-Delhi Metallo-1), which is widespread in India and Pakistan, countries to which more than half the UK source patients
had travelled and where a third had been hospitalised. Similarly, many patients with VIM and KPC enzyme producers had prior hospitalisation in Greece, Cyprus and Israel—countries where these enzymes are circulating.

Not all carbapenemase producers are imported though. A *Klebsiella* strain with OXA-48 caused an outbreak at a London hospital.

The HPA combats carbapenemases in many ways. We identify producers, identify antibiotics that remain active, evaluate new drugs that may be future treatment options and provide infection prevention and control advice. The agency issued two national resistance alerts about this mode of resistance in 2009, one on the general problem and one specifically on NDM enzyme and the links to prior hospitalisation on the Indian-subcontinent.
Decline in resistance following introduction of vaccine

During the past decade, there has been minimal penicillin resistance (2–4%) in invasive pneumococci in England and Wales. By contrast, between 2000 and 2006, erythromycin resistance was seen in approximately 20–30% of invasive pneumococci from children aged from 2–24 months and 12–14% of older patients. Surveillance has shown that erythromycin resistance in pneumococci isolated from blood culture in the UK is strongly associated with serotype 14. Therefore, there was an expectation that a decrease in erythromycin resistance would follow the introduction of the pneumococcal heptavalent conjugate vaccine (PCV7), which contains the serotype 14 antigen (along with those of 4, 6B, 9V, 18C, 19F and 23F).

This vaccine was introduced into the UK routine childhood immunisation schedule in September 2006, with children receiving vaccine doses at two, four, and 13 months. As shown in Figure 9, following the introduction of PCV7 there was a significant reduction in erythromycin resistance in children aged from 2–24 months, from 24% in 2006 to 3% in 2009. Clearly, further surveillance will be required to assess future trends in resistance among pneumococci isolated from patients of varying age, and to monitor potential re-emergence of erythromycin resistance, possibly due to increased spread of pneumococcal serotypes currently not included in the vaccine.

Figure 9
Percentage of Streptococcus pneumoniae isolates resistant to erythromycin in children aged from 2–24 months (squares) and in older patients (triangles). Arrow indicates introduction of PCV7. Data for 2009 are from January–June only.
Protection against airborne infection risk in intensive care units

The HPA’s Biosafety Investigation Unit has been undertaking a national collaborative study in seven hospitals in England to determine whether patients in intensive care units (ICUs), undergoing various procedures, pose a risk to healthcare workers. A range of medical procedures, including various ventilation methods and bronchoscopy, undertaken in ICUs have been defined by the World Health Organization as having the capability to generate aerosols that could potentially pose a risk to those working closely with ICU patients.

Air samples were taken around the immediate vicinity of 26 patients with presumed H1N1 during 2009. These were analysed using quantitative PCR for the presence of H1N1 and other respiratory pathogens. This study will continue in the influenza season of 2010/11 and the results of the completed study will be published in 2011. The study will quantify the exposure risk to staff in ICUs for a wide range of procedures and will provide the evidence base for guidance on the requirements for use of respiratory protection in ICUs. The technical expertise and capacity built by the Biosafety Investigation Unit during this study have also been utilised in response to other outbreaks of HCAI.

e-Bug—a pan-European educational resource for schools

School children are learning about the importance of good hygiene and the prudent use of antibiotics as part of a European education project to help control antibiotic resistance.

The project, called e-Bug, was launched in 2009 by Dr David Heymann, Chairman of the HPA, at a meeting in London attended by 17 other collaborating countries. The aim is to teach children, from an early age, about the benefits that antibiotics can have when used wisely and the consequences of inappropriate use, such as the spread of antibiotic resistance in the community.

e-Bug resources include an education pack for schools on antibiotics and hygiene and a website (www.e-bug.eu) where children can read information and learn from the games. The resources have been sent to all junior and senior schools in England.

Examples of the subjects covered within e-Bug include: an introduction to the different types of micro-organisms and their shapes and sizes (bacteria, virus and fungi); the benefits of ‘good’ microbes including yeast and yoghurt-producing bacteria; illnesses that can result from bad microbes; the importance of antibiotics and other medicines to treat illness; how good hand hygiene can prevent microbes spreading from person to person and how microbes can be spread through coughs and sneezes.
In the UK, the project is led by the HPA Primary Care Unit in Gloucester. The other participating countries are Belgium, Czech Republic, Denmark, France, Greece, Italy, Poland, Portugal, Spain, Croatia, Finland, Hungary, Ireland, Latvia, Lithuania, Slovakia and Slovenia. These countries account for three quarters of the European population.

A European initiative co-ordinated by the European Centre for Disease Prevention and Control (ECDC) called the European Antibiotic Awareness Day (EAAD) takes place every year on the 18 November. Many of the associate countries, including the UK, use the day to promote e-Bug.
Infection control in care homes

The DVD produced by the HPA, called *Introduction to infection control in care homes*, continues to be popular. It can be seen online at [www.hpa.org.uk/carehomesdvd](http://www.hpa.org.uk/carehomesdvd) or requested from publications@hpa.org.uk.

The Department of Health funded 10 road shows across England which were developed with the HPA and the Infection Prevention Society to help the providers of adult social care homes meet new requirements for the prevention and control of infections. Each event was designed to give care home managers and their infection prevention and control leads information required for understanding and meeting the requirements of the “Health and Social Care Act 2008, Code of Practice for healthcare, including primary care and adult social care, on the prevention and control of infections and related guidance.”

Information for patients

The third edition of the MRSA leaflet (endorsed by the Royal College of Nursing and the Infection Prevention Society) and the second edition of the surgical wounds leaflet have been published in the past year. Printed copies are available free of charge from hcai.amrdivision@hpa.org.uk for the MRSA leaflet and from ssi@hpa.org.uk for the surgical wounds leaflet.
**Data sources**

Email: hcai@hpa.org.uk
Mandatory MRSA bacteraemia:
www.hpa.org.uk/web/HPAweb&Page&HPAwebAutoListName/Page/1191942169773

Mandatory *Clostridium difficile*:
www.hpa.org.uk/web/HPAweb&HPAwebStandard/HPAweb_C/1195733750761

CDRN:
www.hpa.org.uk/web/HPAweb&Page&HPAwebAutoListName/Page/1208417851521?p=1208417851521

Norovirus:
www.hpa.org.uk/web/HPAweb&Page&HPAwebAutoListName/Page/1191942172974?p=1191942172974

Surgical Site Infection Surveillance Service:

**Other useful links**

PVL Staphylococcus aureus
www.hpa.org.uk/web/HPAwebFile/HPAweb_C/1218699411960

*Clostridium difficile* infection: How to deal with the problem
www.hpa.org.uk/web/HPAwebFile/HPAweb_C/1232006607827

Antibiotic Resistance
www.hpa.org.uk/Topics/InfectiousDiseases/InfectionsAZ/AntimicrobialResistance

Download the care homes DVD
www.hpa.org.uk/carehomesdvd

e-Bug website
www.e-bug.eu