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CLOSTRIDIUM DIFFICILE **PCR RIBOTYPE SURVEILLANCE IN WALES**

2011

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SUMMARY

- 204 *C. difficile* samples from Health Boards in Wales were PCR ribotyped and tested for susceptibility to 9 antibiotics.
- A total of 33 PCR ribotypes were identified. PCR ribotype 027 was the most commonly isolated strain, accounting for 48% of the sample.
- 027 predominated in 5 of the 7 Health Boards. The proportion of samples that were 027 varied from 76% in Aneurin Bevan to 0% in Hywel Dda.
- The proportion of the sample that was PCR ribotype 027 has decreased slightly since the last survey. The proportions of PCR ribotypes 106 and 001 have decreased substantially since the original pilot PCR ribotyping survey in 2005.

1. INTRODUCTION

Because of increasing concerns regarding the incidence and severity of cases of *Clostridium difficile* across the UK, a *C. difficile* Task Group was set up in Wales by the Welsh Healthcare Associated Infection Sub-Group (WHAISG) of the Welsh Assembly Government. The task group made recommendations regarding changes to the surveillance of *C. difficile* in Wales, which were agreed by the WHAISG in May 2008. One of the changes was to develop a regular survey of the *C. difficile* PCR ribotypes that are causing disease in Wales, coupled with enhanced surveillance of the severity and outcome of disease. This would allow some understanding to be gained on the contribution different PCR ribotypes of *C. difficile* are currently making to the epidemiology of *C. difficile* in Wales.

A pilot snapshot PCR ribotyping survey took place in 2005. The first snapshot PCR ribotyping survey was carried out in 2008, which incorporated an enhanced surveillance questionnaire. The second snapshot survey took place in the winter of 2009/2010 (no additional surveillance information was collected). This report presents the ribotyping results of the snapshot survey that took place in 2011.

2. METHODS

Between February and April 2011, Health Boards in Wales were requested to submit consecutive stool samples positive for *C. difficile* toxins to the Anaerobe Reference Laboratory (ARL) in Cardiff. Health Boards submitted a pre-determined number of samples or all samples within an 8 week period, whichever was reached soonest. The number of samples requested was based on the numbers of cases reported in the mandatory *C. difficile* surveillance scheme in the first 9 months of 2010. A total of two hundred and fifty samples were requested.

At the ARL, the samples were cultured, PCR ribotyped and susceptibility tested against 9 antibiotics (metronidazole, vancomycin, erythromycin, moxifloxacin, imipenem, co-amoxiclavulanate, piperacillin/tazobactam, penicillin G and rifampicin) using the E test method (AB Biodisk, Solna, Sweden). PCR ribotyping results were returned to the originating laboratories and to WHAIP for analysis.

3. RESULTS

3.1 PCR Ribotyping

- 233 *C. difficile* samples were submitted from Health Boards in Wales. 10 samples were not processed because they were identified as duplicates submitted from the same laboratory. *C. difficile* was not identified from an additional 17 samples. One sample was excluded because it was from fistula fluid rather than a faeces sample.
- Of the 205 PCR ribotyped samples, 1 was identified as being from the same patient but submitted from 2 different Health Boards. The samples from this patient have remained in the data for each Health Board but one sample has been removed from the overall number for Wales ie 204 ribotyped samples.

Table 1. Number of *C. difficile* samples PCR ribotyped by Health Board for the PCR ribotyping survey in Wales, 2011

Health Board*	No of Samples
ABMU	34
Aneurin Bevan	46
Betsi Cadwaladr	51
Cardiff & Vale	42
Cwm Taf	10
Hywel Dda	18
Velindre Trust	4

*2 specimens were submitted from Powys Health Board but *C. difficile* was not isolated from either

- The specimen source was provided in 203/204 samples for Wales. 74% (150/203) of samples originated from patients in major acute hospitals within the Health Boards, 13% (27/203) from other hospitals in the Health Boards and 12% (25/203) were from patients in the community (including nursing/residential homes). One sample was submitted from a privately run dialysis unit.
- A lower proportion of samples were from the major acute hospitals within the Health Boards in 2011 compared to 2010 (2010 – 82%, 2011 – 74%). The proportion of samples from both other hospitals and community locations increased compared to 2010 (other hospitals: 2010 – 11%, 2011 – 13%; community: 2010 – 7%, 2011 – 12%).

- The proportion of each varied by Health Board (Table 2). The location of the patient when the sample was submitted does not necessarily reflect the location of acquisition of the *C. difficile*.

Table 2. Proportion* of Health Board *C. difficile* samples by source location for the PCR ribotyping survey in Wales, 2011

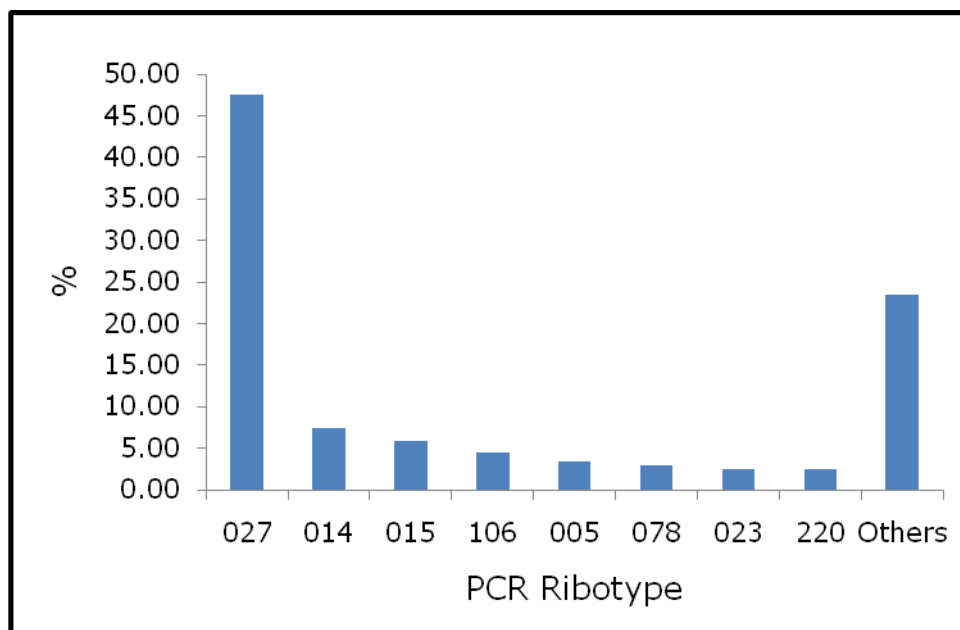
Health Board	% Major Acute Hospital	% Other Hospital	% Community	% Other/Unknown†
ABMU (N=34)	85	9	3	3
Aneurin Bevan (N=46)	61	20	20	0
Betsi Cadwaladr (N=51)	61	18	22	0
Cardiff & Vale (N=42)	83	12	2	2
Cwm Taf (N=10)	67	11	22	0
Hywel Dda (N=18)	94	0	6	0
Velindre NHS Trust (N=4)	100	0	0	0

*Please note because of rounding totals may not add up to 100%.

†One specimen was submitted from ABMU with no source provided and one specimen was submitted from Cardiff & Vale from a privately run dialysis unit.

- A total of 33 PCR ribotypes were identified. PCR ribotype 027 was the most commonly isolated strain, accounting for 48% (97/204) of the sample (Figure 1).

Figure 1. Percentage distribution of PCR ribotypes of *C. difficile* in the PCR ribotyping survey in Wales, 2011



NB "Others" encompasses 25 PCR ribotypes with <5 samples each (N=48).

- PCR ribotype 027 predominated in the samples from major acute hospitals, other hospitals and GPs (Table 3). There has been a decrease in the proportion of 027 in specimens from major acute hospitals (2010 – 51%, 2011 – 45%) and other hospitals (2010 – 63%, 2011 – 59%) and an increase in the proportion of 027 from community locations (2010 - 25%, 2011 – 52%) compared to the 2010 survey.

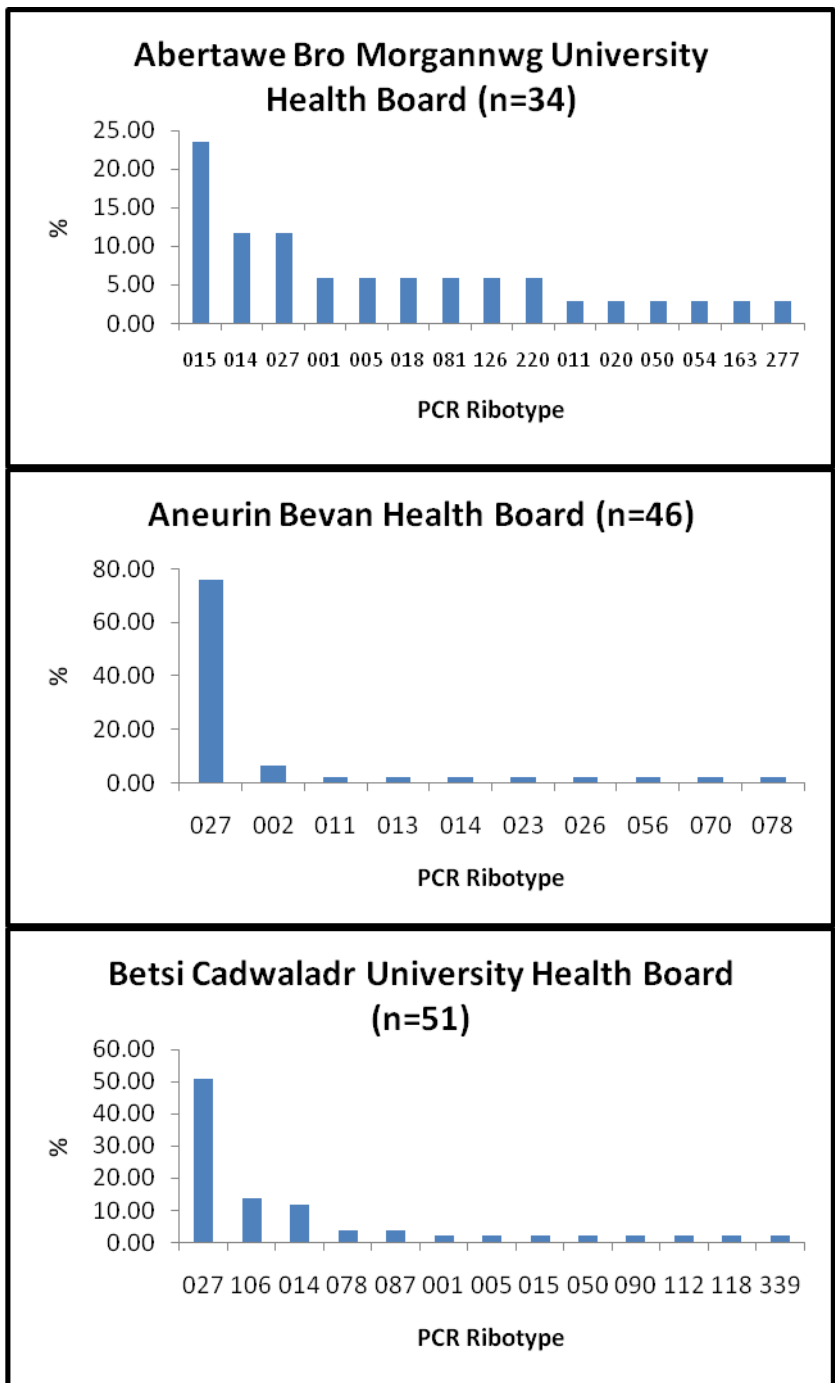
Table 3. Percentage distribution of the common *C. difficile* PCR ribotypes by location of patient in the PCR ribotyping survey in Wales, 2011

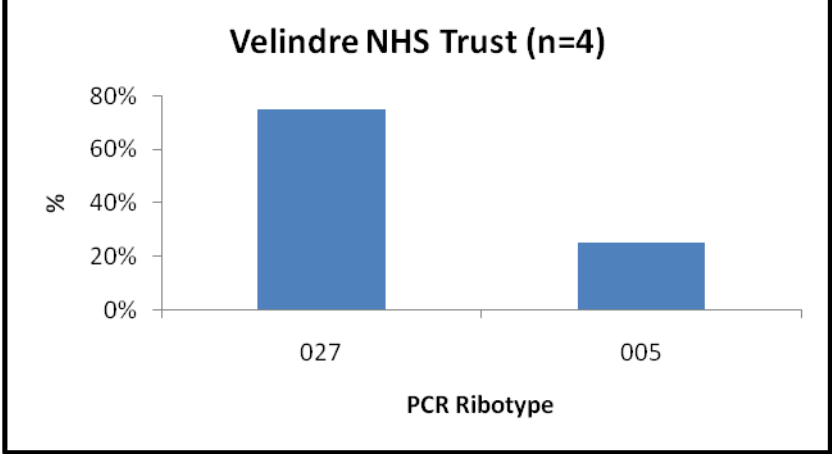
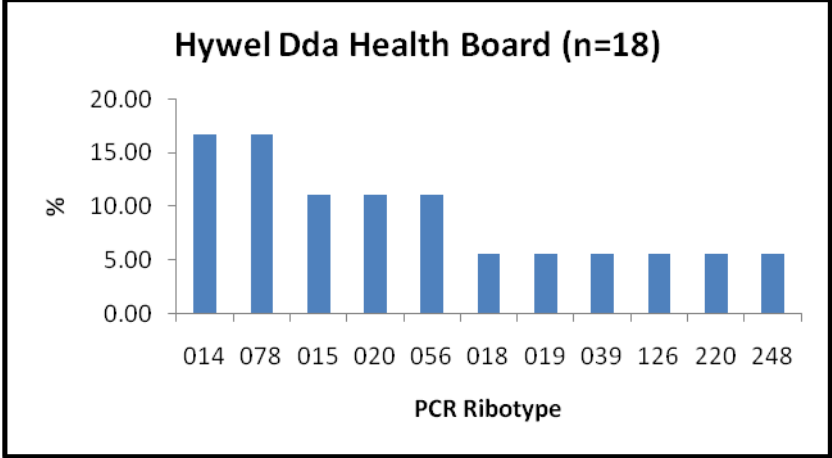
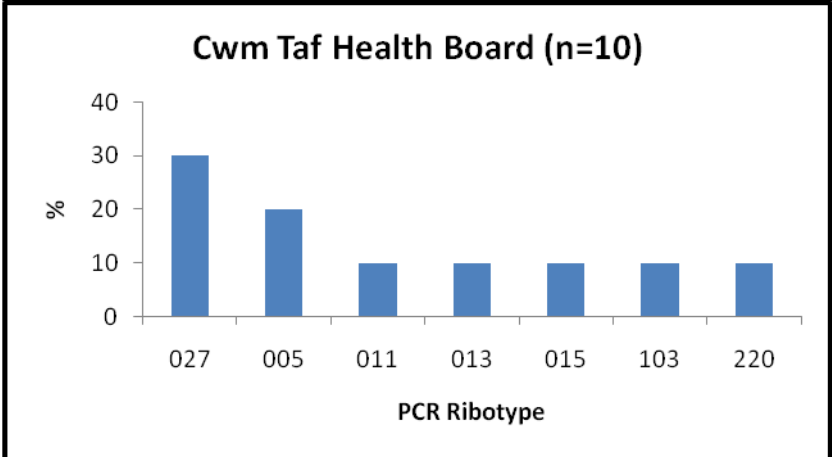
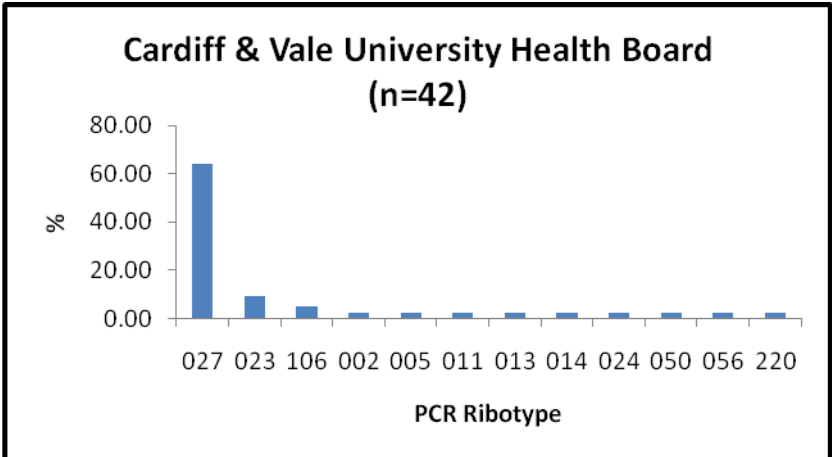
PCR Ribotype	Major Acute Hospital (n=150)	Other Hospital (n=27)	Community (n=25)
027	45%	59%	52%
014	7%	11%	4%
015	5%	7%	8%
106	4%	4%	8%
005	5%	0	0
078	3%	0	4%
023	2%	4%	4%
220	3%	0	4%
others	27%	15%	16%

Please note because of rounding totals may not add up to 100%.

- Results were not uniform across Health Boards (Figure 2). PCR ribotype 027 was reported from all Health Boards except Hywel Dda. It was the most common PCR ribotype in 5 of the 7 Health Boards. The proportion of the sample that was 027 varied, with the highest proportion in Aneurin Bevan Health Board (76%) and the lowest (other than Hywel Dda) in ABMU Health Board (12%).

Figure 2. Percentage distribution of PCR ribotypes of *C. difficile* by Health Board in the PCR ribotyping survey in Wales, 2011





- PCR ribotype 014 was the second most common ribotype overall, but only constituted 7% of the sample. It was reported from 5 Health Boards.
- PCR ribotype 015 was the third most common ribotype overall. It was reported from 4 Health Boards, but two thirds (8/12) of samples were from ABMU Health Board.
- There has been a small decrease in the frequency of PCR ribotype 027 since the last survey. The previously common ribotypes of 106 and 001 have decreased substantially over time. (Figure 3).
- Changes in distribution of PCR ribotypes have not been uniform across Wales. The changes in the frequencies of PCR ribotypes 027, 106 and 001 by current Health Board areas are provided in Figure 4.

Figure 3. Changes in the percentage distribution of *C. difficile* PCR ribotypes 027, 106 and 001 in the PCR ribotyping surveys in Wales, 2005, 2008, 2010 and 2011

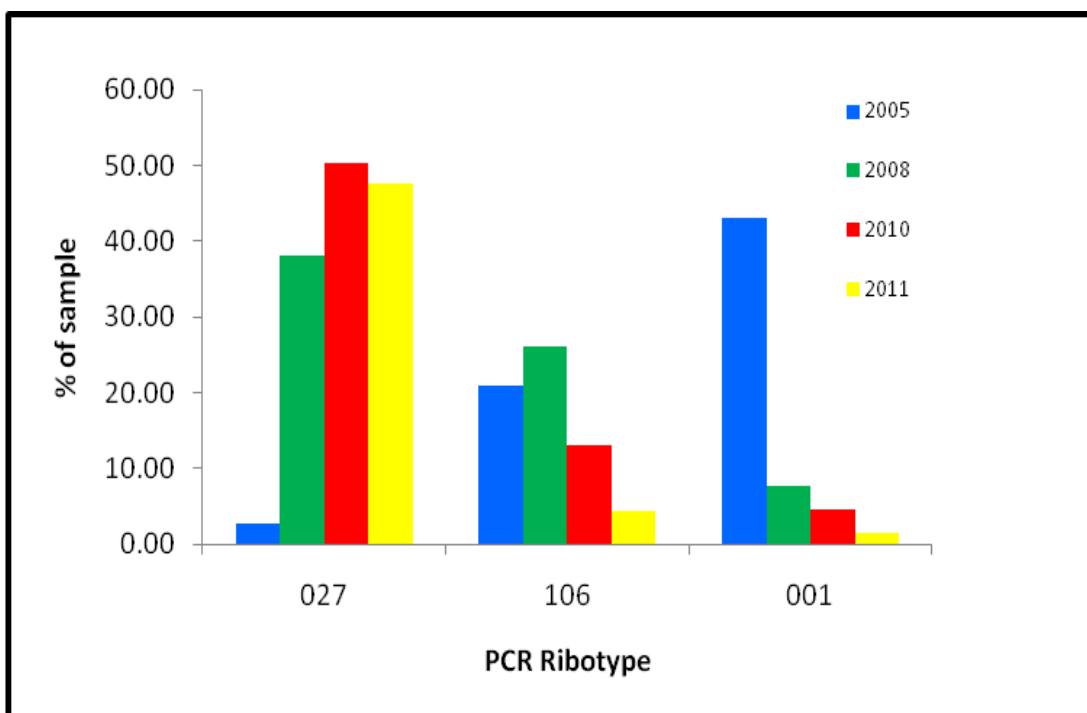
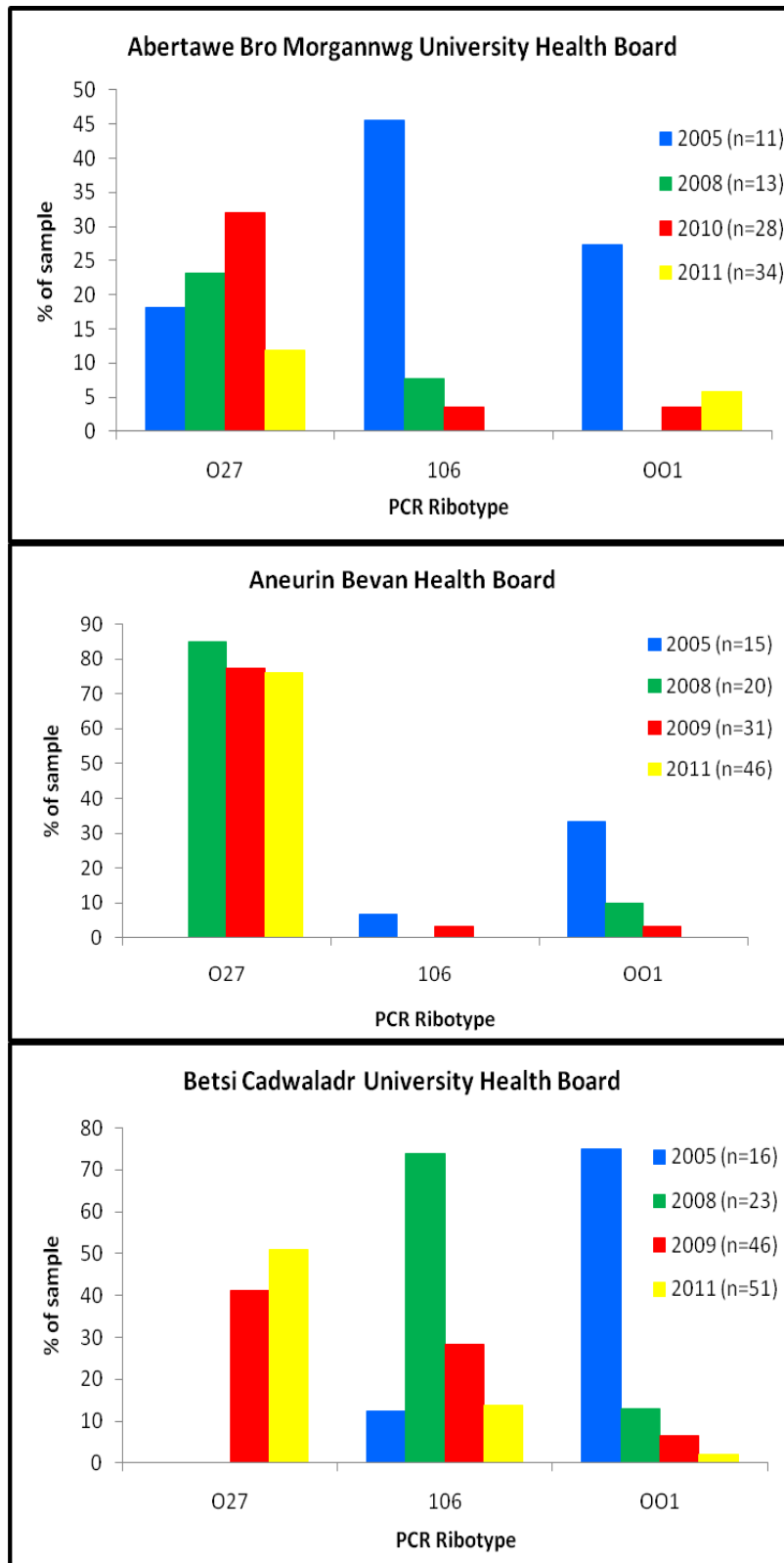
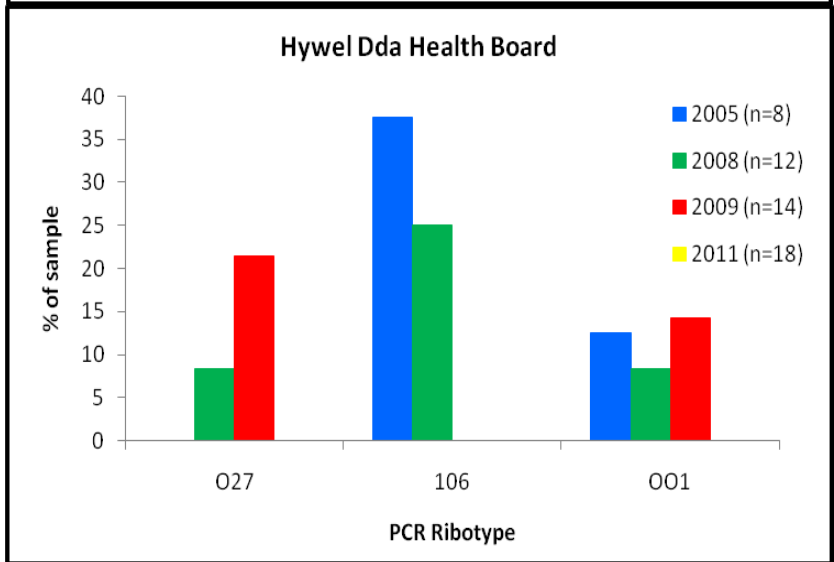
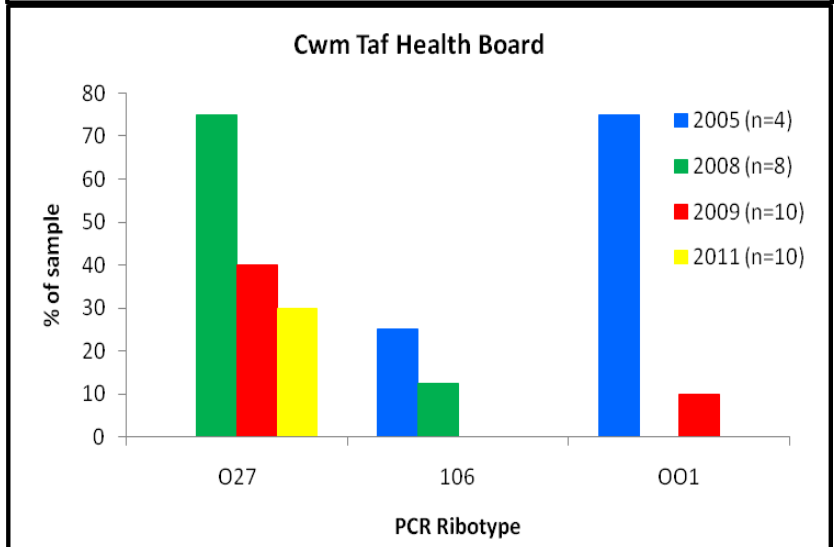
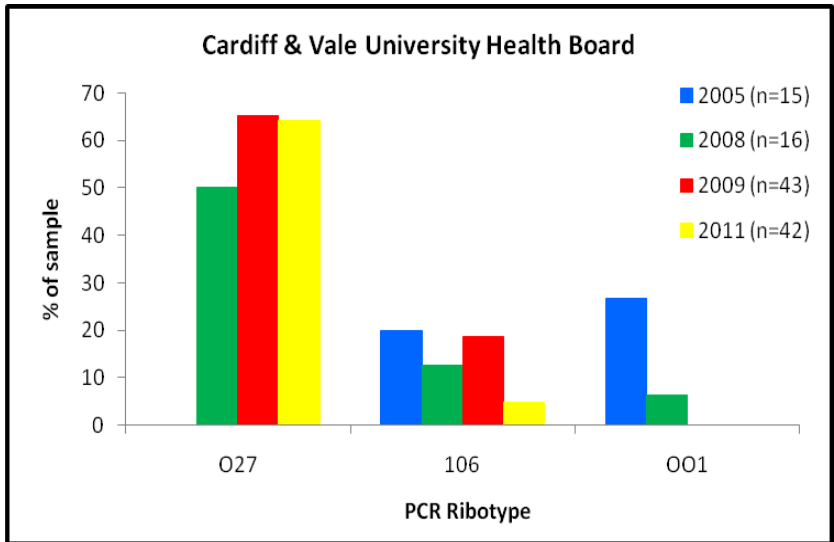


Figure 4. Changes in the percentage distribution of *C. difficile* PCR ribotypes 027, 106 and 001 by current Health Board areas in the PCR ribotyping surveys in Wales, 2005, 2008, 2010 and 2011





3.2 Antimicrobial Susceptibility Results

- Summary results for the 9 antimicrobials tested are provided in Table 4. More detailed analysis of the minimum inhibitory concentration (MIC) results for metronidazole, vancomycin, moxifloxacin and erythromycin are provided in the Appendix.

Table 4. MICs of *C. difficile* isolates to 9 antimicrobials in the PCR ribotyping survey in Wales, 2011

Antimicrobial	MIC (mg/L)		
	Range	MIC50	MIC90
Metronidazole	0.03 – 4	0.19	0.5
Vancomycin	0.19 – 2	0.5	0.75
Erythromycin	0.047 - >256	>256	>256
Imipenem	1 - >32	>32	>32
Moxifloxacin	0.03 - >32	>32	>32
Co-amoxiclav	0.19 – 1.5	0.5	0.75
Benzylpenicillin	0.125 – 6	1.5	4
Piperacillin/tazobactam	1.5 – 16	6	8
Rifampicin	<0.002–0.002	<0.002	0.002

4. ACKNOWLEDGEMENTS

We would like to acknowledge the staff of the ARL, WHAIP, the microbiology laboratories and infection prevention and control teams in the Health Boards in Wales, for their contributions to this report.

5. APPENDIX

Antimicrobial Susceptibility Testing Results

Key results are presented as MIC distributions for selected antimicrobials. The MIC distributions for the Welsh isolates from the 2011 PCR ribotyping survey are compared with the EUCAST (European Committee on Antimicrobial Susceptibility Testing) distributions (of 2,550-4,500 isolates). Distributions are provided for all survey isolates, 027 isolates and non-027 isolates for comparison.

Where they have been established, the EUCAST breakpoint is displayed as a red line. Where there is no breakpoint, but an epidemiological cut-off has been defined, it is displayed as a black dotted line.

5.1. Metronidazole

The MICs of the *C. difficile* isolates to metronidazole are shown in Figures 5 and 6. Using the EUCAST breakpoint, there was a single resistant strain (0.5%) in the Welsh 2011 survey.

Figure 5. Population distribution of MICs of *C. difficile* to metronidazole in the PCR ribotyping survey in Wales, 2011

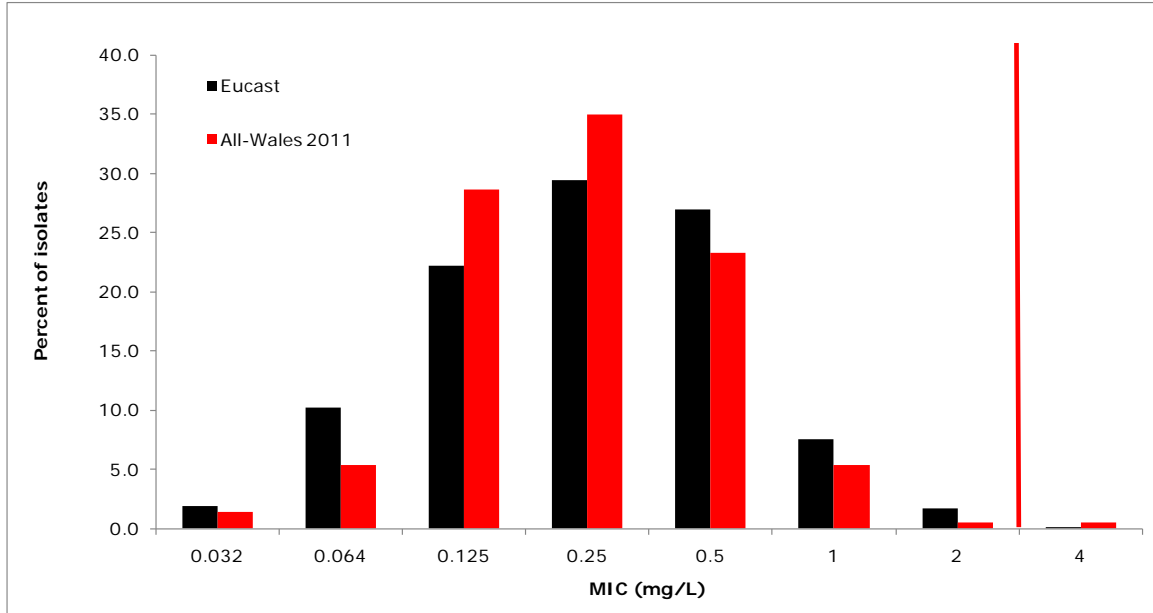
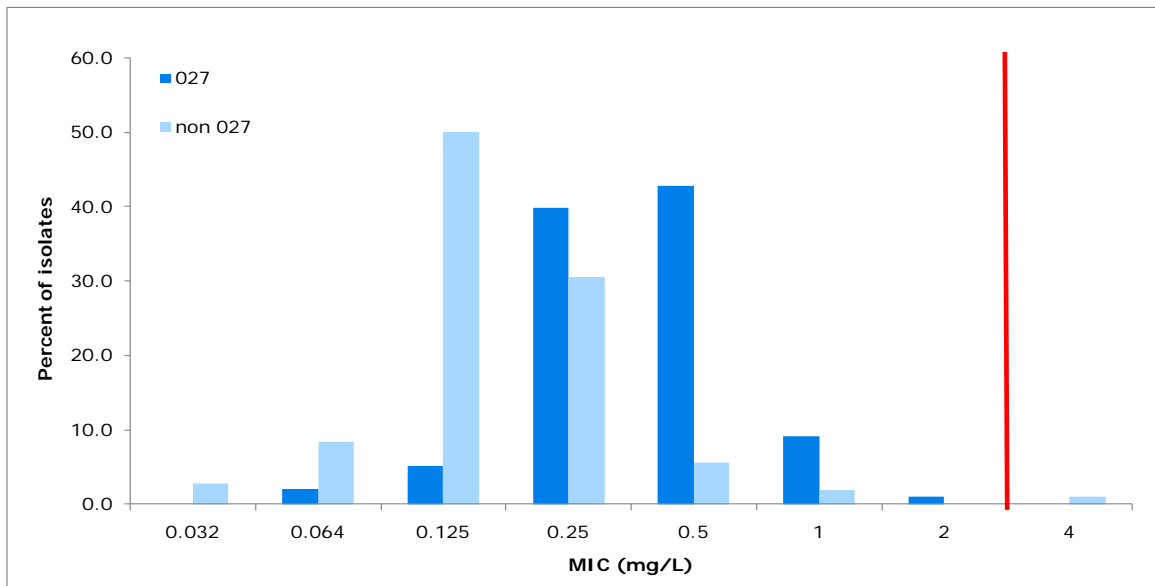


Figure 6. Population distribution of MICs of *C. difficile* to metronidazole by PCR ribotype in the PCR ribotyping survey in Wales, 2011



5.2 Vancomycin

The MICs of the *C. difficile* isolates to vancomycin are shown in Figures 7 and 8. Using the EUCAST breakpoint, there were no resistant strains in the Welsh 2011 survey.

Figure 7. Population distribution of MICs of *C. difficile* to vancomycin in the PCR ribotyping survey in Wales, 2011

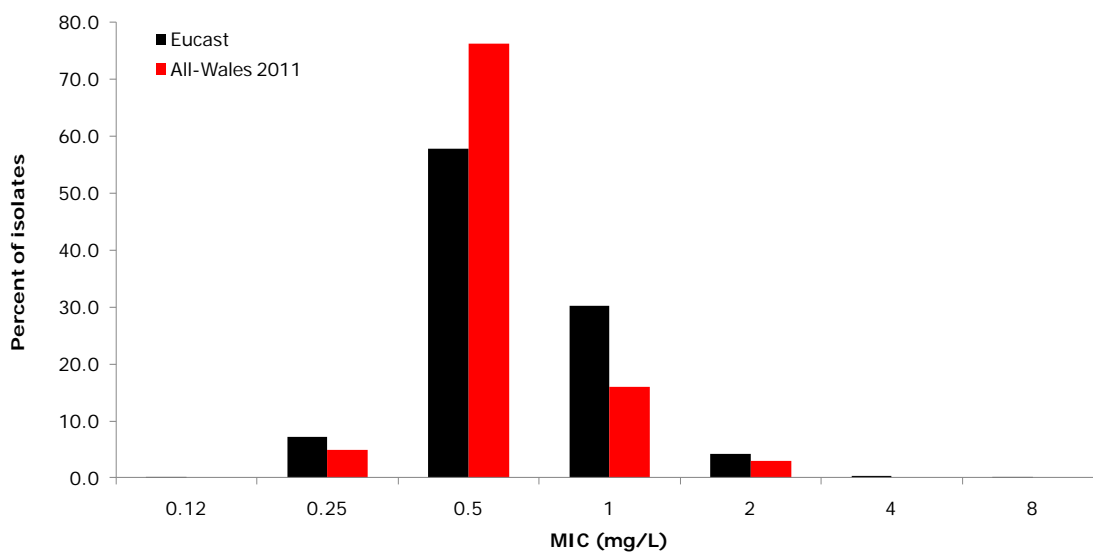
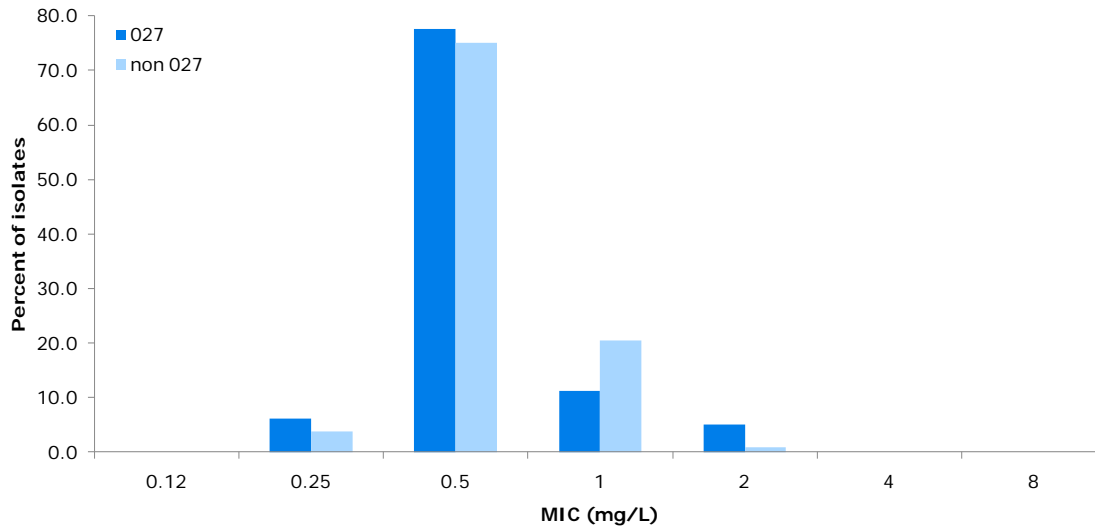


Figure 8. Population distribution of MICs of *C. difficile* to vancomycin by PCR ribotype in the PCR ribotyping survey in Wales, 2011



5.3 Moxifloxacin

The MICs of the *C. difficile* isolates to moxifloxacin are shown in Figures 9 and 10.

Figure 9. Population distribution of MICs of *C. difficile* to moxifloxacin in the PCR ribotyping survey in Wales, 2011

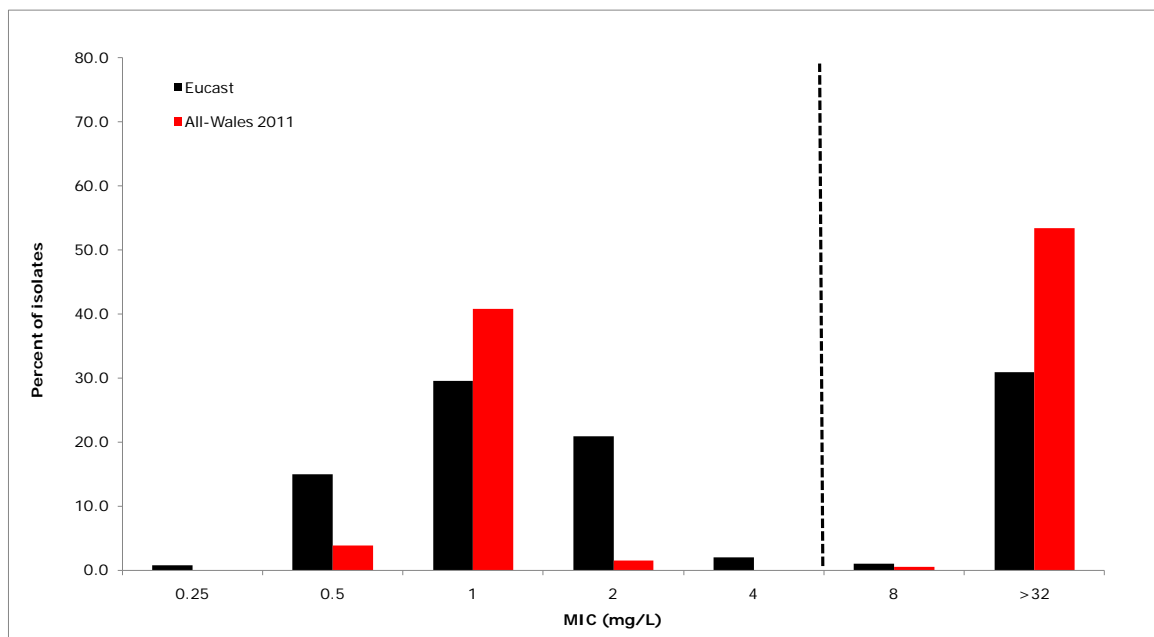
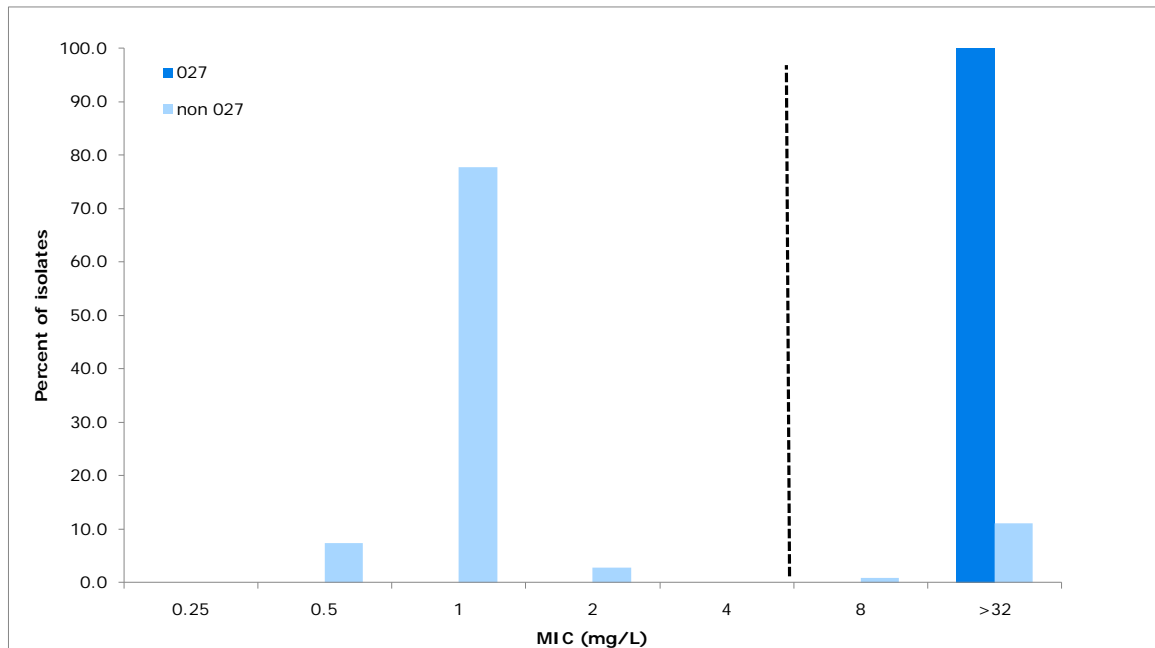


Figure 10. Population distribution of MICs of *C. difficile* to moxifloxacin by PCR ribotype in the PCR ribotyping survey in Wales, 2011



5.4 Erythromycin

The MICs of the *C. difficile* isolates to erythromycin are shown in Figures 11 and 12.

Figure 11. Population distribution of MICs of *C. difficile* to erythromycin in the PCR ribotyping survey in Wales, 2011

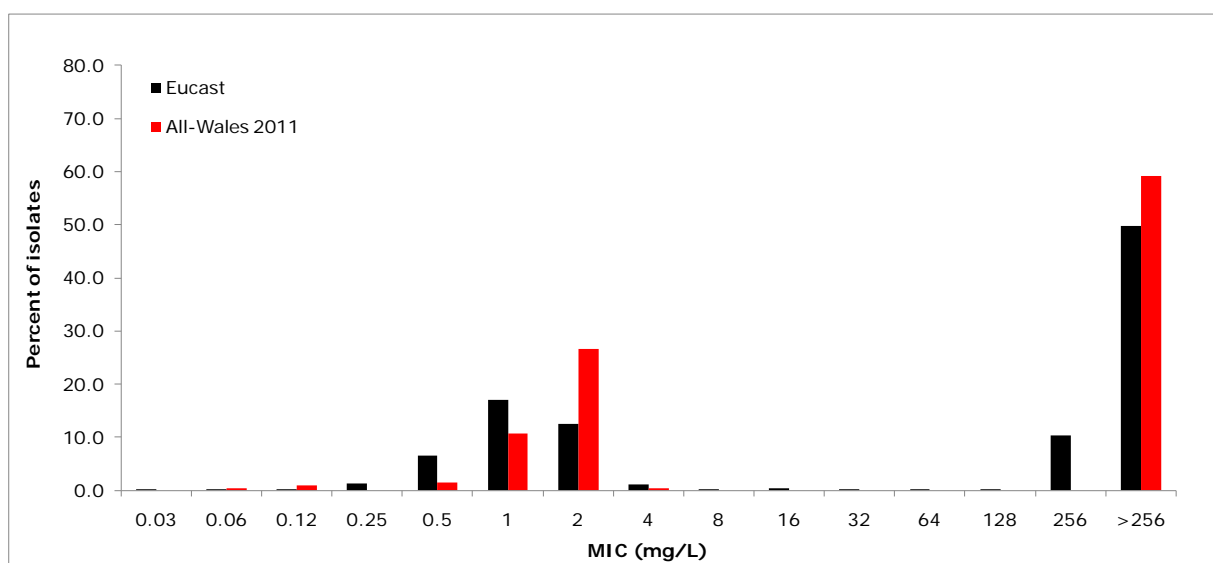


Figure 12. Population distribution of MICs of *C. difficile* to erythromycin by PCR ribotype in the PCR ribotyping survey in Wales, 2011

