

Microbiology and Infectious Disease

Dr Rosemary Ikram FRCPA Medlab South Ltd

Key Components of Community Microbiology Service

- Providing referrers with a complete diagnostic microbiology service.
- Advice on antimicrobial treatment.
- Advice on vaccinations.
- Laboratory notification of disease with relevance to public health.
- Surveillance – antimicrobial susceptibility.
 - unusual organisms.
 - data for National Surveillance programs.
- Infection Control expertise.

Complete Microbiology Diagnostic Service

- Information relating to collection and transport of samples.
- Supply equipment for the above.
- Laboratory testing microscopy, gram stain, culture/antigen tests/antibodies/NAAT (PCR).
- Antimicrobial susceptibility tests
 - routine.
 - specialised.
- Timely results and interpretation.

Microbiology Laboratory

- Quality Control
- Evaluation Methodology
- Expertise remains current for all staff.
- Research and Development.
- Education

Laboratory Diagnosis

- When to take a sample?
- When not to take a sample?
- How and what to take?
- Best practice guidelines for some syndromes eg UTI and diarrhoea.
- Some areas less clear and clinical practice variable (UK study showed 200% difference urines /800% difference wounds)

UTI

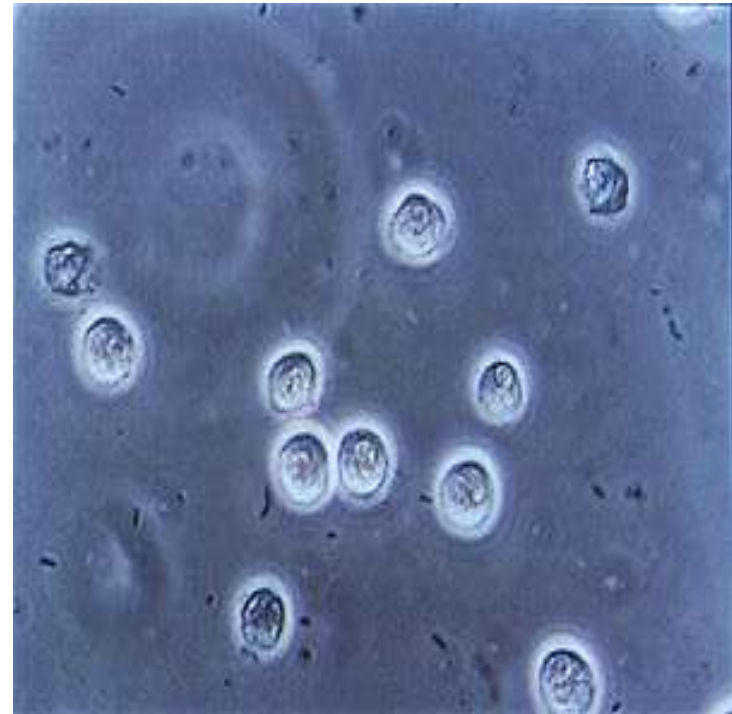
- Best Practice not to sample when uncomplicated in a woman – empiric treatment.
- When to sample ie complicated.
- Complicated UTI an infection of the upper or lower urinary tract in the presence of an anatomical or functional abnormality or presence of a urinary catheter.

UTI (cont.)

- Best Sample
- Bladder Puncture
- MSU
- Clean Catch
- Bag
- In Out Catheter
- Other Catheter

Microscopy

- Detects WBC, RBC, epithelial cells casts etc.



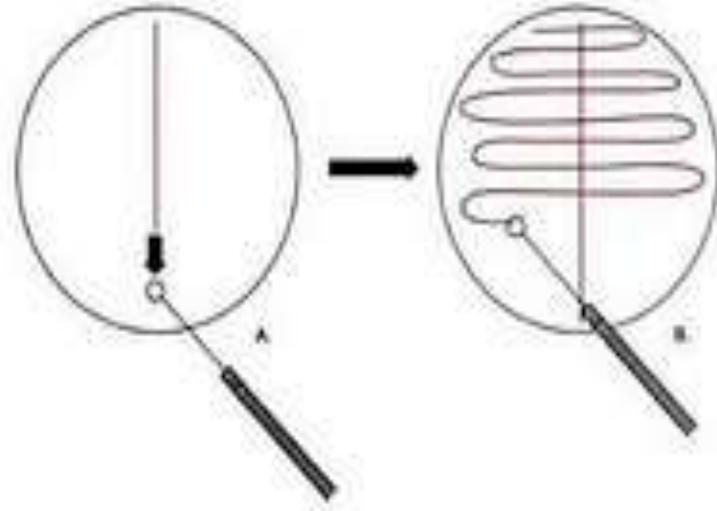
Urinalysis

- Automation vs manual
- Result interpretation.



Culture

- Measured volume urine using a quantitative loop.



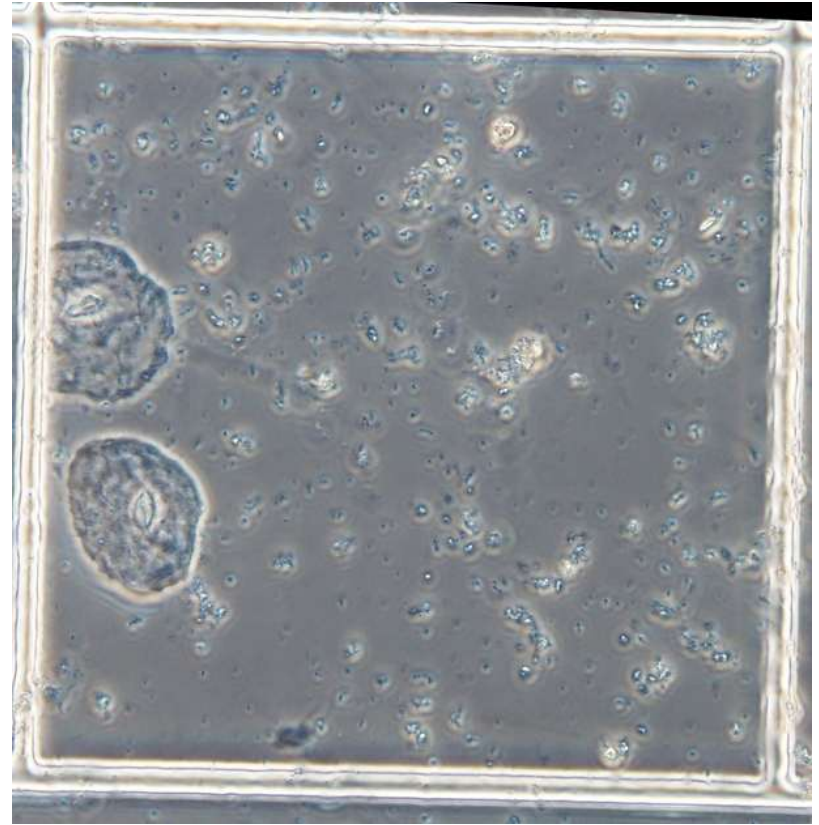
Positive

- If using 0.001ml loop number of colonies on plate number put on data base reported as $n \times 10^6$ / litre.



Contaminated Sample

- Microscopy = epithelial cells.
- $>100 \times 10^6$ / litre mixed growth.

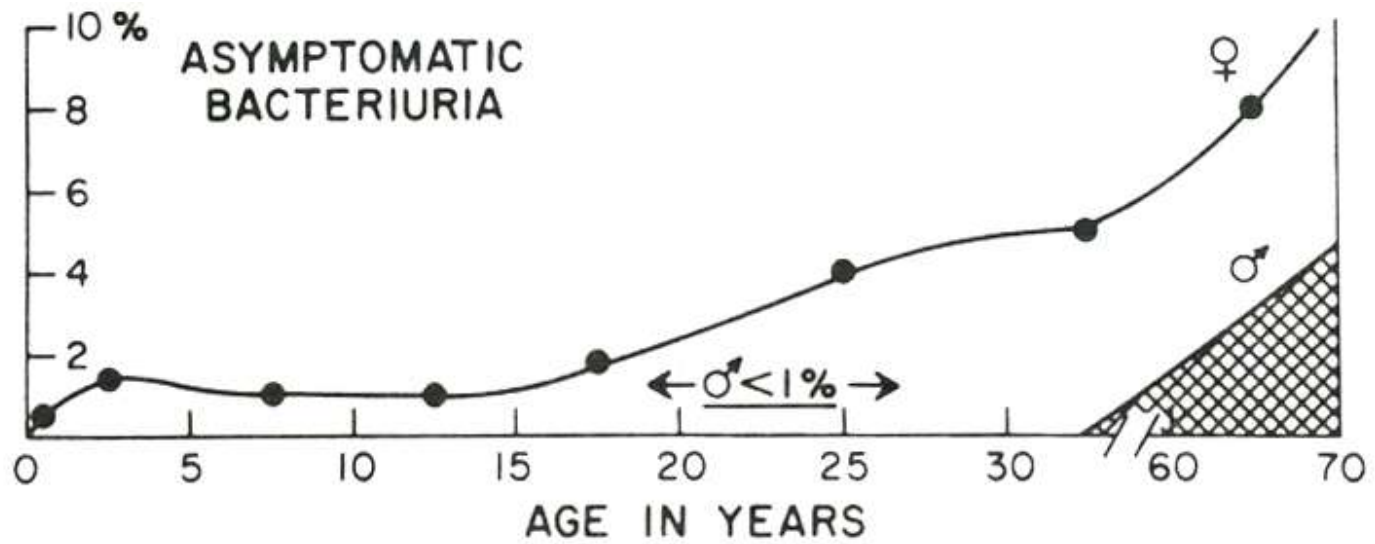


Susceptibility Testing

- Routine is the commonest (panels same).
- Protocols to pick up multidrug resistant organisms (MDROs) eg MRSA, ESBL producing *E. coli* etc.

Results

- Preliminary reports.
- Final reports.



IDSA Guideline

Asymptomatic Bacteriuria

- Treat pregnant women and preop patients who will have prosthetic devices implanted eg orthopaedics.
- Large amount antibiotic use related to treating asymptomatic bacteriuria. (Including patients with indwelling catheters)

Subjective

- “Microbiologists are people with culture and sensitivity”.
- “Garbage in equals garbage out”
- Quality control programs.
- Education.
- Keeping methodology up to date.

Demand Management

A microbiologist's dream?

- Laboratory and referrers work together to test appropriately with optimal samples.
- Would reduce number of samples.
- Improve results.

Introduction of a New Test

- Awareness of referrer's requirements.
- Education
- Sampling
- Information on interpretation of results.

Appearances of the mind are of 4 kinds.

Things are either:

- as they appear to be or**
- they neither are, nor appear to be or**
- they are and do not appear to be or**
- they are not but appear to be.**

Rightly to aim in all these cases is the wise man's task.

Epictetus 2nd century A.D

Why Evaluate PCR for NG?

- Technology now readily available.
- Results may offer improved sensitivity compared to culture.
- More sensitive tests should detect more cases and lead to reduction in cases.
- Sampling less invasive.

Could there be any problems?

- Culture is considered 100% specific.
- Referrer's need to change practice ie be able to discuss unexpected positive results with patients and collect samples differently.
- Cost and charging.

Epidemiology CDHB/SCDHB

Ciprofloxacin, penicillin and tetracycline resistance among *Neisseria gonorrhoeae*, during the 3 months, April to June 2008, and the previous 12 months, July 2007 to June 2008

District Health Board ^{1,2}	Ciprofloxacin				Penicillin				Tetracycline			
	Latest 3 months Apr – Jun 08		Latest 12 months Jul 07 – Jun 08		Latest 3 months Apr – June 08		Latest 12 months Jul 07 – Jun 08		Latest 3 months Apr – Jun 08		Latest 12 months Jul 07 – Jun 08	
	No. tested	% resistant	No. tested	% resistant	No. tested	% resistant (intermediate)	No. tested	% resistant (intermediate)	No. tested	% resistant	No. tested	% resistant
Auckland ³	274	12.0	1056	13.8	274	9.5 (80.7)	1057	10.2 (82.5)	60	48.3	266	47.4
Capital and Coast/Hutt ⁴	92	43.5	337	27.6	92	8.7 (81.5)	333	6.9 (81.7)	92	31.5	335	25.1
Canterbury ⁵	104	32.7	375	24.5	104	3.9 (78.9)	375	4.5 (81.1)	104	32.7	375	24.0
Total	470	88.2	1768	65.9	470	22.1 (241.1)	1765	21.6 (245.3)	256	112.5	976	96.5

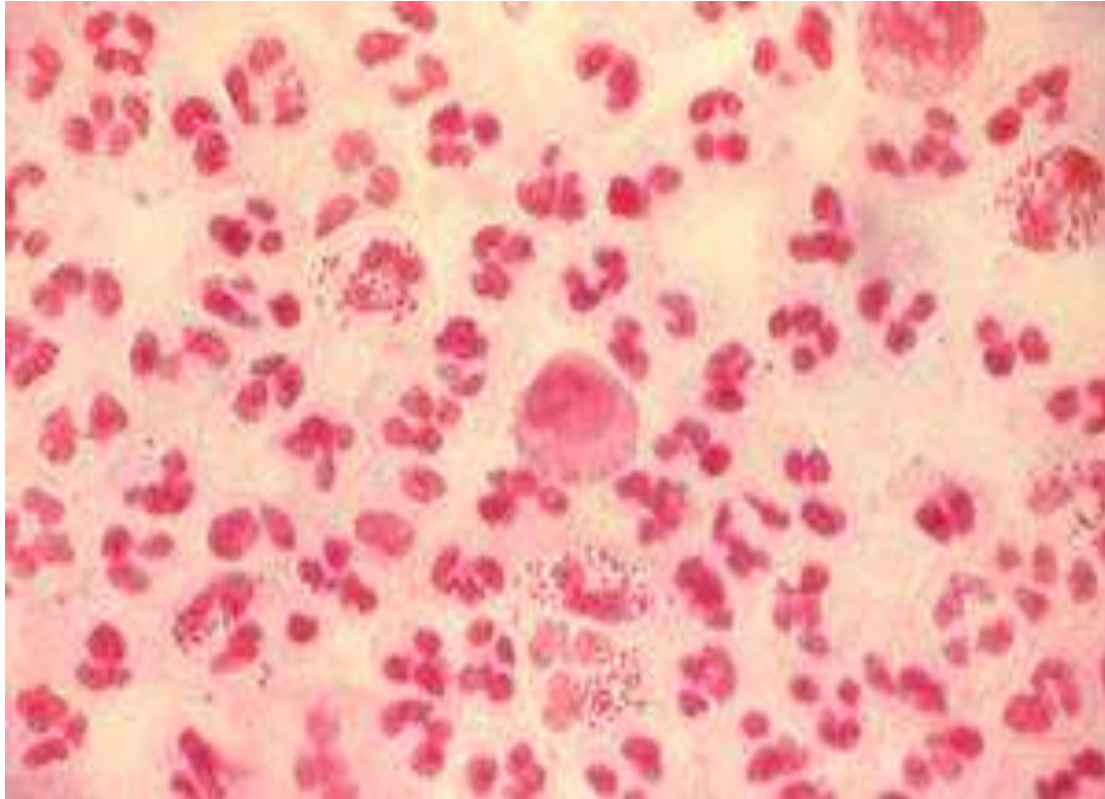
Notes:

- 1 The patient's place of residence, if known, was used to assign cases to a DHB, otherwise the location of the laboratory was used. For laboratories that do a lot of out-of-area work, place of residence data was available and used.
- 2 No data for Whanganui or Wairarapa District Health Boards.
- 3 The three Auckland District Health Boards (Waitemata, Auckland and Counties Manukau) are combined.
- 4 The two Wellington District Health Boards (Capital and Coast, and Hutt) are combined.
- 5 The two Canterbury District Health Boards (Canterbury and South Canterbury) are combined.

Epidemiology MSM

- More cases gonorrhoea reported in men than women.
- May be because easier to diagnose in men as well as the higher no. cases in MSM.
- Rates increasing in MSM result of behavioral disinhibition with improvements in treatment HIV.
- Commonly infected sites urethra, pharynx, rectum.
- 64% infections not urethral.

Gram Stain



Antibiotic Susceptibility

- Currently ceftriaxone empiric treatment of choice.
- Ciprofloxacin local rate susceptibility at MLS for 2009 for 167 isolates 47 ciprofloxacin R ie 28%.

Evaluation Roche 4800 NG Assay

- Why do we need a full local evaluation?
- This is a new test with very little published data.
- Roche Amplicor specificity was a problem.
- Prevalence gonorrhoea in areas served by MLS was not known.
- Ascertain the performance of this assay in our population.

Using Test Results (Total 10,602)

- 90 PCR +ve
- 15 highest no. of false +ve.
- Sensitivity 100%
- Specificity 99.8%
- PPV ~90%
- NPV 100%
- Prevalence = 0.85% , Canterbury 44/5710 = 0.77%

Establishing diagnoses = Imperfect process

- Result is a probability rather than a certainty.
- Important to understand relationship between the properties of diagnostic tests and the information they yield in various clinical situations.

Strategies Employed to Clarify Test Results

- Perform another test = confirmatory test.
- Re test.

CDC Meeting Testing for NG/CT (JAN 2009)

- NAAT are recommended for detection of reproductive tract infections caused by *C.trachomatis* and *N.gonorrhoeae*.
- Optimal specimen types for nucleic acid amplification tests are first catch urine from men and vaginal swabs from women.
- NAAT tests are recommended for the detection of rectal and oropharyngeal infections caused by NG/CT. These specimen types are not cleared by FDA.
- Routine repeat testing is not recommended.

Testing and Surveillance for Antibiotic Resistance

- Worrying international trends in antibiotic resistance.
- The increase world wide is outstripping the development of new antimicrobial agents.
- In USA group lobbying for increased funding to develop new agents (IDSA “10 by 20”). Previously most MDROs occurred in hospital now often these are community strains – makes control more difficult.

New Zealand

- Surveillance is performed by ESR.
- MRSA, ESBL producing Enterobacteriaceae, *Neisseria gonorrhoeae*, invasive *Streptococcus pneumoniae*, VRE and TB.
- NZ data always dominated by Auckland. Local surveillance required in other areas because problems may be different.

Figure 1. Annual/annualised incidence of ESBL-producing Enterobacteriaceae, 2000-2009

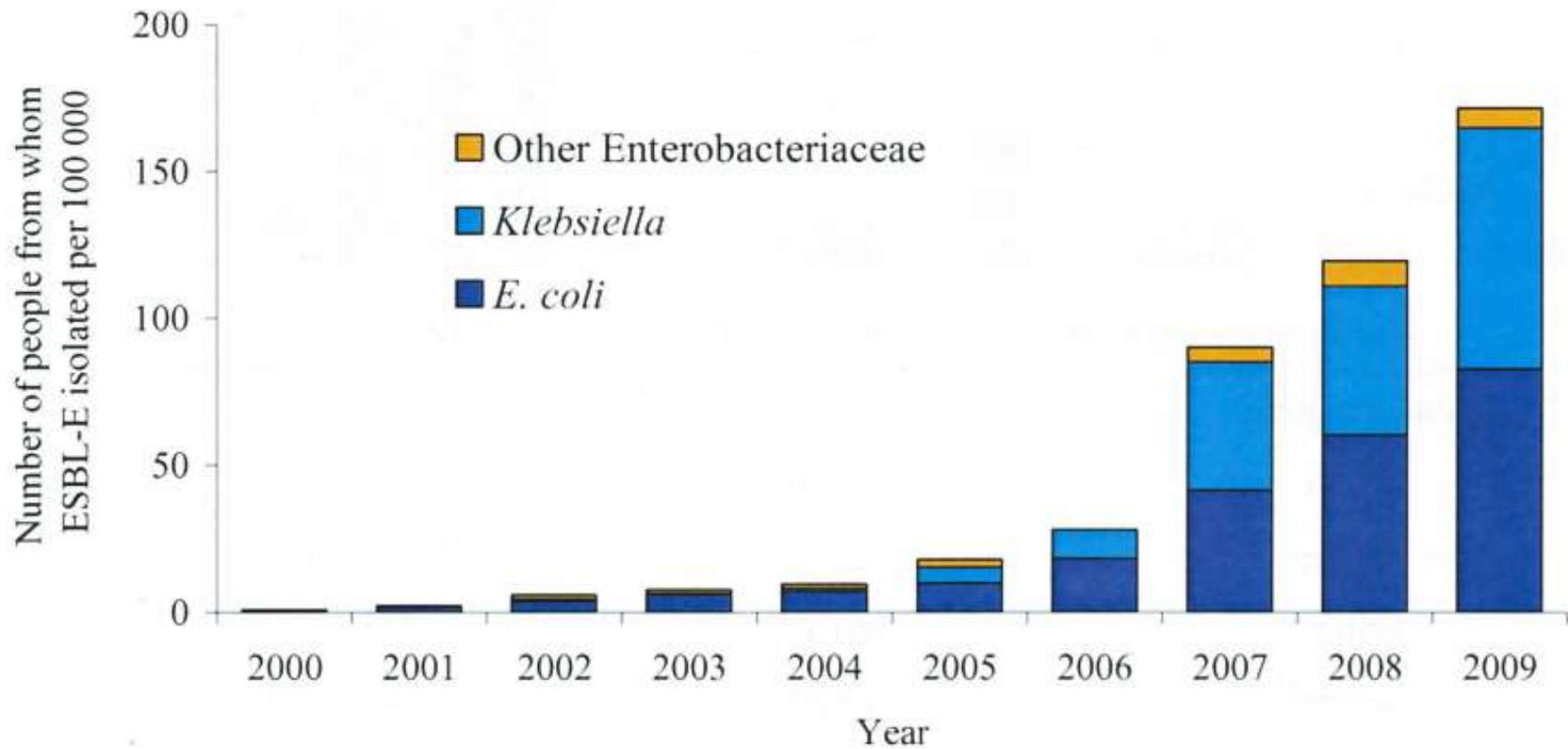
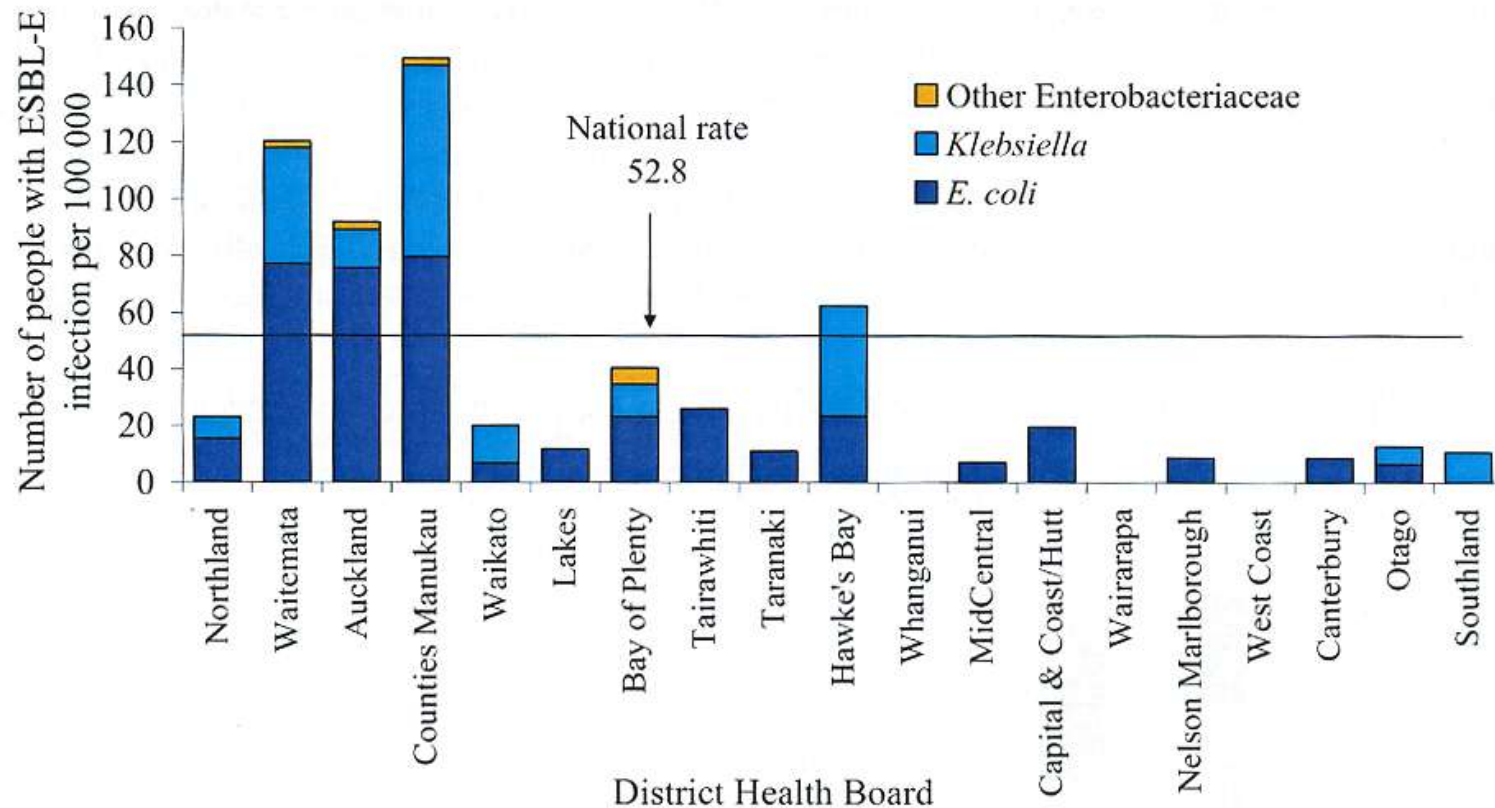


Figure 3. Annualised incidence of ESBL-producing Enterobacteriaceae infections by district health board, 2009



Data for the Capital & Coast and Hutt District Health Boards (DHBs) is combined as 'Capital & Coast/Hutt', and data for the Canterbury and South Canterbury DHBs is combined as 'Canterbury'.

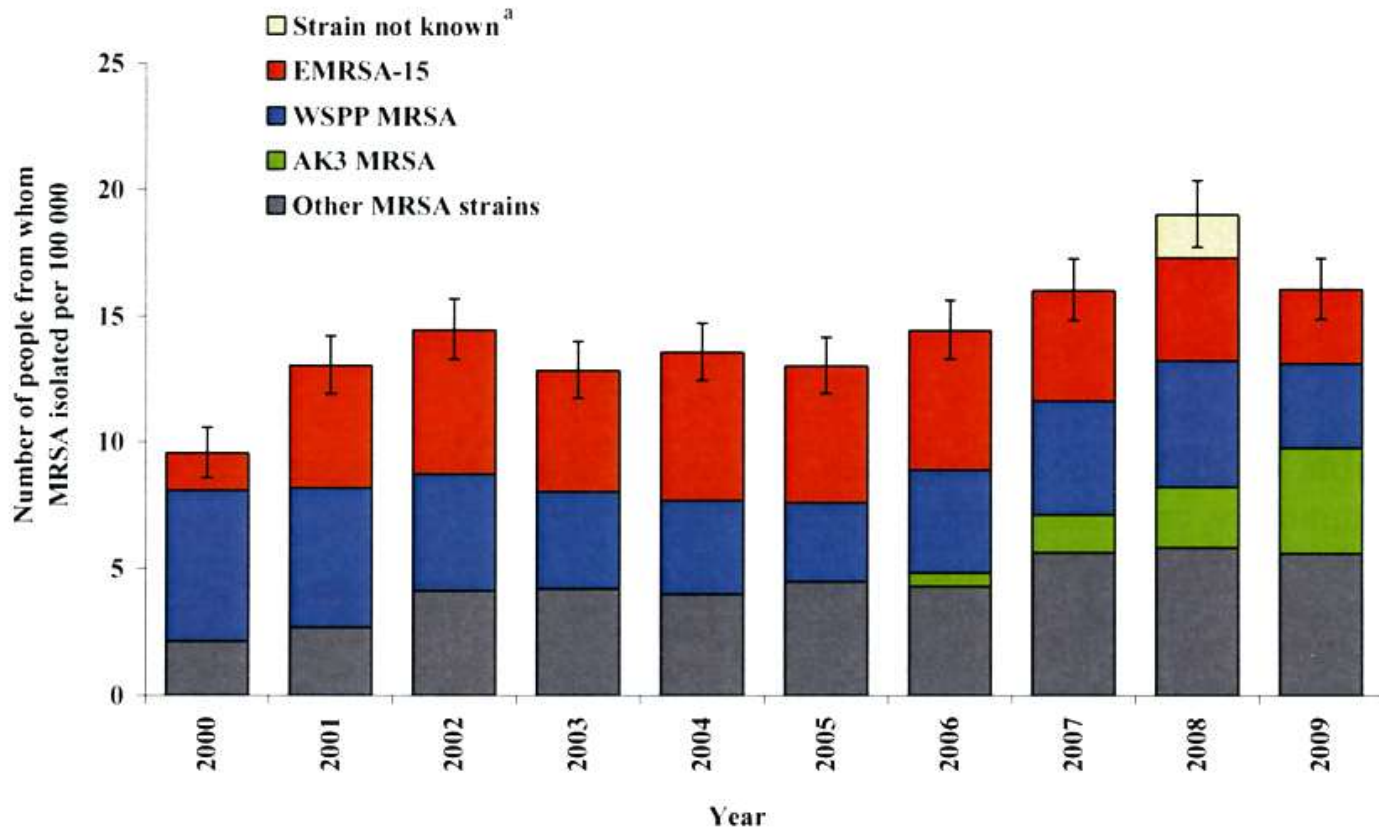


Figure 1. MRSA point-prevalence rates, 2000-2009, showing 95% confidence intervals.

^a The category ‘Strain not known’ for 2008 represents the number of people identified with MRSA by Middlemore Hospital laboratory which did not refer the isolates to ESR for strain identification.

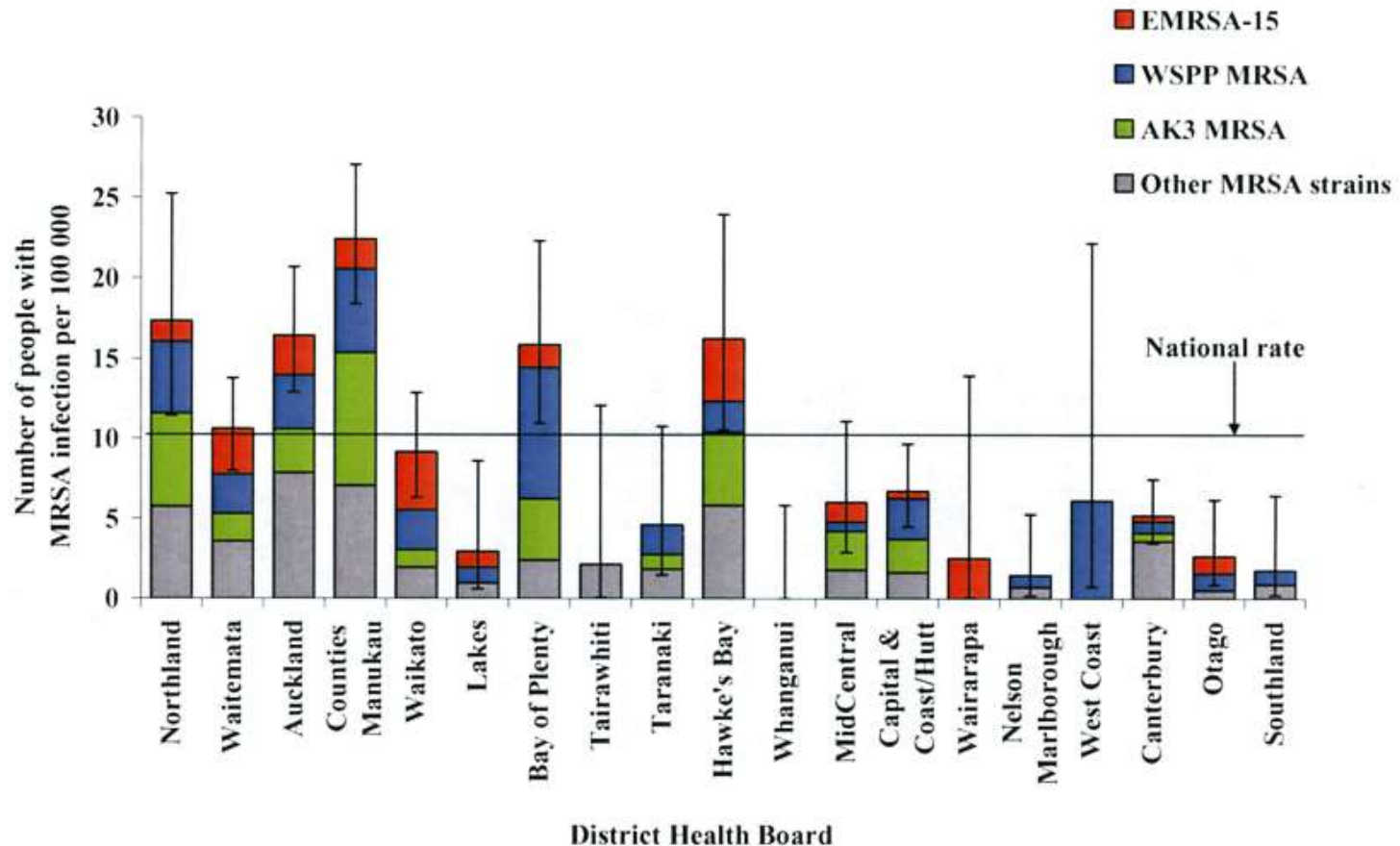


Figure 4. Point-prevalence rates of MRSA infections by district health board, 2009, showing 95% confidence intervals. Data for the Capital & Coast and Hutt District Health Boards (DHBs) is combined as 'Capital & Coast/Hutt', and data for the Canterbury and South Canterbury DHBs is combined as 'Canterbury'.

Geographical Differences

- Auckland ESBL producing coliforms VRE was a problem. Community and hospital strains MRSA.
- Christchurch MRSA not endemic in hospital. Community strain USA 300 is emergent – nationally the majority cases are from Christchurch. Raises the possibility of eradication – whose responsibility is this?

Background

- Lab monitors for antibiotic resistant organisms. Eg MRSA, extended spectrum beta lactamase producing gram negative bacilli ESBL)
- 2009 noted an increase of multiply resistant E.coli from both hospital and community patients.
- Some transmission in hospital but minimal and some patients admitted with it.

Susceptibility Profile Timaru E.coli

- Amoxicillin R
- Amoxy/clav variable.
- Trimethoprim R
- Gentamicin R
- Cotrimoxazole R
- Nitrofurantoin S
- Cephalosporins probably S

E.COLI ANTIMICROBIAL SUSCEPTIBILITY (% Susceptible)

	2007	2008	2009
Norfloxacin	95	92	87
Ciprofloxacin	89	84	82
Trimethoprim	83	78	77
Nitrofurantoin	97	96	96

MDRO

- Multidrug resistant organism is resistant to 3 or more classes of antimicrobial.
- In this case
quinolones/aminoglycoside/trimethoprim.

How does this happen?

- Most likely brought into the area.
- Spread because of wide use of antibiotics to which it is resistant – doesn't matter which one.
- Quinolones most closely linked to emergence of resistance.

How can we prevent further spread?

- Prevent in hospital transmission.
- Visit and discuss with 3 rest homes with known patients.
- Look at antimicrobial use strategy in Timaru community.

ANTIMICROBIAL USE AORAKI PHO

Antibacterials	Your PHO (per GP)	National (per GP)
Norfloxacin	42	30
Ciprofloxacin	25	15
Trimethoprim	49	27
Nitrofurantoin	18	11

Evidence is emerging that reduced use of quinolones leads to an immediate reduction in quinolone resistant bacteria.

- What can we do to try to achieve this?
- Lab can stop reporting quinolone sensitivities unless no alternatives.
- Can look at local guideline for use of quinolones.
- Continue to monitor use.
- Continue to monitor resistance.