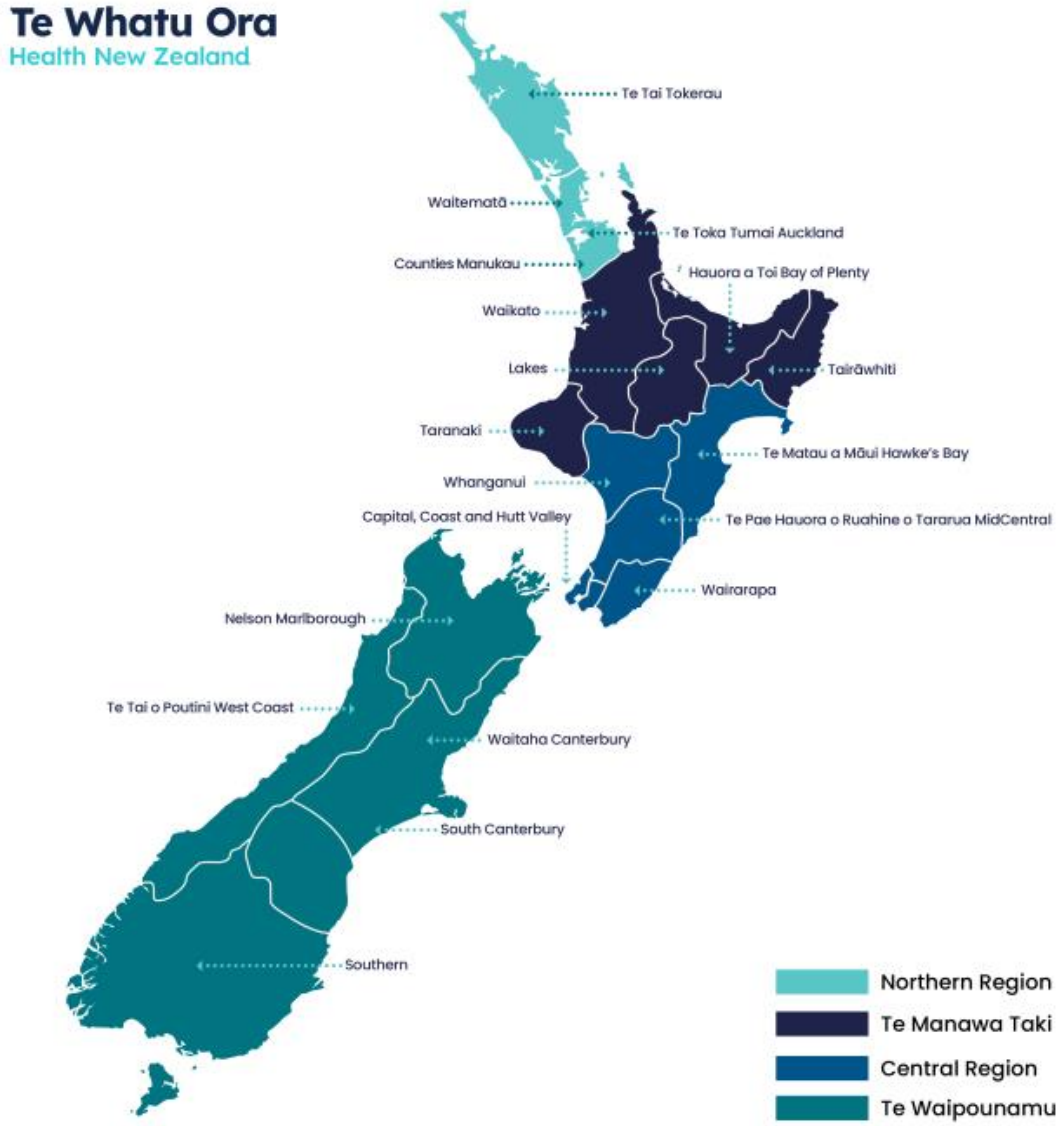
Te Ratonga Ārai Mate
Infection Prevention and Control Service

Enrolled Nurse Section
NEW ZEALAND NURSES ORGANISATION

Enrolled Nurses Making a Difference

MDRO Management

Toni Sherriff CNS & Rebecca Henderson RN
IPC Service – Waitaha & Te Tai o Poutini



Our IPC Service

- **Te Tai o Poutini & Waitaha (Transalpine)**
- **Clinical Advisory Services**
  - Ashburton and Rural Health
  - Medical / Surgical Services
  - Older Person's Health & Rehab
  - SMHS
  - Te Tai o Poutini
  - Women's and Children's Health
- **Sub-speciality fields**
  - Built environment
  - Education
  - Environment Management
  - Reprocessing of Medical Devices
  - Surveillance

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Toni Sherriff
Kaimahi Mātanga Nēhi CNS

Kia ora, my name is Toni

I was born in Timaru and raised in Christchurch

My ancestors are of English descent

I acknowledge the indigenous people of this area

I acknowledge the important landmarks of this area

Rebecca Henderson
Nēhi RN

Ko Panguru te maunga e rū nei taku ngākau

Ko Manganui-o-wai te awa o taku kāinga tupu

Ko Hokianga te haukāinga

Ko West Eyreton te kāinga ināianei

E mihi ana ki ngā tohu o nehe, o Ngāi Tūāhuriri e noho nei au

Ko Rīpeka tōku ingoa

Nō reira, tēnā koutou katoa

Panguru is the mountain that speaks to my heart

Mangonui is the river of my homeland

My families true home is the Hokianga

West Eyreton is my home now

My name is Rebecca

Thus, my acknowledgement to you all

Overview

1. MRDO prevalence
2. MRDO colonisation vs infection
3. Standard precautions
4. Transmission based precautions
5. Antimicrobial stewardship
6. Case studies

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Learning Objectives

At the end of this session, you will be able to:

- State risk factors for MDRO transmission (patient, placement, pathogen)
- Describe key IPC considerations for MDRO Management in healthcare facilities (identify, contain, remove)
- Analyse case studies addressing MDRO acquisition

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MDRO

WHAT DOES THIS STAND FOR?

WHAT DOES IT MEAN?

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Abbreviations

MDRO - Multidrug Resistant Organism

MRSA - Methicillin Resistant *Staphylococcus aureus*

CPE - Carbapenemase-producing *Enterobacterales (*CRE / CPO)

VRE - Vancomycin-resistant *Enterococcus*

****ESBL** - Extended Spectrum beta-lactamase

**This is not a MDRO but an enzyme. Different pathogens can produce this enzyme as a resistance mechanism. This enzyme hydrolyses beta lactam antibiotics rendering them ineffective against the pathogen.

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What is a Multidrug Resistant Organism?

MDROs are organism that are resistant to one or more classes of antibiotic agents.

MDROs will be difficult to treat since antibiotics won't work to treat them.

People at risk are:

Older adults, immunocompromised, chronic illnesses	People with open wounds or have tubes and drains in their body	Multiple antibiotic treatments

Antimicrobial Resistance

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The Problem

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Australian seagulls carry antibiotic-resistant superbugs

10 July 2019 Share

Source: https://www.bbc.com/news/world-australia-48916923
Accessed on 15.07.2019

NEW ZEALAND

Spike in drug-resistant infections forces National Burns Centre at Middlemore to limit admissions

6 Feb, 2018 6:39pm 2 minutes to read

Middlemore Hospital's National Burns Centre has had three infections of the drug-resistant organism since December. Photo / Google Maps

NZ Herald

Source: https://www.nzherald.co.nz/nz/news/article.cfm?c_id=1&objectid=11989168
Accessed on 02.07.2019

Super-gonorrhoea is here – that means the antibiotic crisis is too

Jeremy Knox

Highly drug-resistant bugs are no longer a future problem. After decades of complacency, urgency is needed

▲ Antibiotics have been a vital part of modern medicine for more than 70 years. Photograph: Graham Turner/The Guardian

The UK has achieved an unenviable world first with news that a British man has been diagnosed with a strain of gonorrhoea so far resistant to all antibiotics normally used to treat the disease.

Source: https://www.theguardian.com/commentisfree/2018/mar/30/super-gonorrhoea-antibiotic-crisis-drug-resistant-bugs
Accessed on 15.07.2019

World Health Organization

12 multi-drug resistant gram negative bacteria currently posing serious threat to public health globally.

Priority 1: CRITICAL

- Acinetobacter baumannii, carbapenem-resistant
- Pseudomonas aeruginosa, carbapenem-resistant
- Enterobacteriaceae, carbapenem-resistant, ESBL-producing

Source: https://www.who.int/medicines/publications/WHO-PPL-Short_Summary_25Feb-ET_NM_WHO.pdf

Colonisation VS Infection

Colonisation - bacteria is present on the body but is **not** causing illness

Infection - bacteria in or on the body and **is** causing illness.

Resistance to antibiotics limits some of the antibiotics that can be used to treat the infection!

MDRO Case Management Principles

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Bundled IPC Interventions

IDENTIFY

- Admission Risk assessment
- Surveillance (Active case finding and Contact tracing)
- MDRO screening

CONTAIN

- Standard Precautions
- Transmission-based Precautions
- Room Placement
- Laundry and Waste Management

REMOVE

- Hand hygiene
- Cleaning and disinfection of the environment
- Terminal cleaning on discharge

Identify

UNKNOWN MDRO Status

- Admitted for >24 hours and/or had an invasive procedure in an overseas hospital in the last 12 months
- Has travelled within the Indian sub-continent or SE Asia in the last 12 months
- Has been in contact with a known CPE case
- Admitted/transfer from long term care facility

KNOWN MDRO Status

- Positive MRSA, ESBL, VRE, CPE do not require to be rescreened.
- Risk assess each case for patient placement and isolation precautions.

Transmission Risk Factors:

- Diarrhoea
- Faecal or urinary incontinence
- Uncontained wounds
- On long-term antibiotics

Contain

Standard Precautions are the **minimum** infection prevention practices that apply to all patient care, regardless of suspected or confirmed infection status of the patient, in any setting where health care is delivered:

- ✓ hand hygiene
- ✓ use of personal protective equipment (e.g., gloves, masks, eyewear)
- ✓ respiratory hygiene / cough etiquette
- ✓ sharps safety (engineering and work practice controls)
- ✓ aseptic technique i.e. safe injection practices
- ✓ reprocessing of reusable instruments and equipment
- ✓ routine environmental cleaning
- ✓ laundry and waste management

Contain

- **Transmission-based precautions** are the **second tier** of basic infection prevention and control.
- Health care workers must use them when using standard precautions alone is not sufficient to prevent the spread of an infectious agent.
- The principal routes of transmission are through **direct or indirect contact**, via **infectious aerosols** – either large droplets or smaller airborne particles – or vector-borne.

Remove

Effective **Hand Hygiene**, as per the 5 Moments principles and even after wearing gloves, is one of the simplest and most effective ways to reduce the transmission of potential pathogens on the hands and decrease the incidence of preventable healthcare-associated infections, leading to a reduction in morbidity and mortality (HQSC; NICE; WHO).

A simple act of cleaning hands can prevent the spread of microorganisms, including those that are resistant to antibiotics (CDC).

Remove

Table 1: Pathogen Surface Survival Time

Organisms	Survival Time	Infectious dose
MRSA	7 days to >7 months	4 cfu
Acinetobacter	3 days to >5 months	250 cfu
VRE	5 days to >4 months	$<10^3$ cfu
Escherichia coli	2 hours to 16 months	$10^2 – 10^6$ cfu
Klebsiella	2 hours to >30 months	10^2 cfu
Clostridiodes difficile	>5 months	5 spores
Norovirus	8 hours to 7 days	<20 virions

Source: Kramer, BMC Infect Dis, 2006; Wagenvoort, JHI 2000; Chiang, Crit Care Med 2009; Lawley et al, Appl Environ Micro 2010, Larson, Lancet 1978; Kjerulf et al, APMIS 1998

Cleaning and Disinfection Protocols:

- Frequent cleaning of high touch points and dedicated patient equipment e.g. 4-hourly / after use.
- Effective decontamination of the Environmental Services requires adequate surface contact time and concentration of disinfectant agent.
- Twice daily cleaning of patient room and floor covering with 1000ppm hypochlorite solution.
- Terminal cleaning of room on discharge or end of stay.

Antimicrobial Resistance

Predicted to have disastrous impacts on humans, plants, food and the environment within one generation if this global crisis is not averted

Control will be reliant on

- surveillance
- bundled IPC interventions….and judicious use of antibiotics

Source: Members of the Ad Hoc Interagency Coordination Group (IACG) On Antimicrobial Resistance. (April 2019). **No Time to Wait: Securing the future from drug-resistant infections. Report to the Secretary General Of The UN.** WHO: Geneva. Available at: https://www.who.int/antimicrobial-resistance/interagency-coordination-group/final-report/en/. Accessed on 15.07.2019

MRSA vs ESBL vs CPE vs CRAB Antibiotic Resistance

MRSA

(Import Date 04-Dec-2019 14:16)

Organism status Final

Heavy growth

Note:

Heavy growth

- Aminoglycoside
  - Gentamicin: Susceptible
- Aminopenicillin
  - Norfloxacin: Susceptible
- Anti-Mycobacterial
  - Rifampicin: Susceptible
- Anti-bacterial
  - Chloramphenicol: Susceptible
- Combination
  - Co-trimoxazole: Susceptible
  - Methi/Flucloxacillin: Resistant
  - Quinupristin+dalfopristin: Susceptible
- Fluoroquinolone
  - Ciprofloxacin: Susceptible
  - Moxifloxacin: Susceptible
- Glycopeptide
  - Teicoplanin: Susceptible
  - Vancomycin: Susceptible
- Lincosamide
  - Clindamycin: Susceptible
- Macrolide
  - Erythromycin: Susceptible
- Other
  - Daptomycin: Susceptible
  - Fosfomycin/ Trometamol: Susceptible
  - Fusidic acid: Susceptible
  - Linezolid: Susceptible
  - High level Mupirocin: Susceptible
- Penicillin
  - Penicillin: Resistant
- Second Generation
  - Cefoxitin: Resistant
- Tetracycline
  - Doxycycline: Susceptible

ESBL

(Import Date 10-Dec-2020 13:39)

Organism status Final

Note:

*isolated ****EXTENDED SPECTRUM B-LACTAMASE (ESBL) PRODUCTION DETECTED**** For clinical management please contact the Department of Infectious Diseases/ Clinical Microbiology at Canterbury Health Laboratories. No carbapenemase producing Enterobacteriaceae isolated.*

- Aminoglycoside
  - Gentamicin: Susceptible
  - Amikacin: Susceptible
  - Tobramycin: Susceptible
- Aminopenicillin
  - Amoxycillin: Resistant
- Carbapenem
  - Ertapenem: Susceptible
  - Imipenem: Susceptible
  - Meropenem: Susceptible
- Combination
  - Co-trimoxazole: Susceptible
  - Tazobactam/piperacillin: Susceptible
- Fluoroquinolone
  - Ciprofloxacin: Resistant
- Glycylcycline
  - Tigecycline: Susceptible
- Monobactam
  - Aztreonam: Resistant
- Other
  - Fosfomycin/ Trometamol: Susceptible
- Penicillin
  - Mecillinam: Susceptible
- Second Generation
  - Cefuroxime (IM/IV): Resistant
  - Cefoxitin: Susceptible
- Third Generation
  - Ceftriaxone: Resistant
  - Cefepime: Resistant
  - Ceftazidime: Resistant

CPE/CRE

(Import Date 10-Jan-2020 07:30)

Organism status Final

2 - 10 x 10(6)/L

Note:

*2 - 10 x 10(6)/L ****METALLO-BETALACTAMASE PRODUCER **** This isolate produces a Metallo-betalactamase enzyme (carbapenemase) that confers resistance to carbapenems. Please consult the Microl for treatment options Enzyme type NDM*

- Aminoglycoside
  - Amikacin: Resistant
  - Gentamicin: Resistant
  - Tobramycin: Resistant
- Aminopenicillin
  - Amoxycillin: Resistant
  - Norfloxacin: Resistant
- Carbapenem
  - Ertapenem: Resistant
  - Imipenem: Resistant
  - Meropenem: Resistant
- Combination
  - Co-trimoxazole: Resistant
  - Tazobactam/piperacillin: Resistant
- Dihydrofolate reductase inhibitor
  - Trimethoprim: Resistant
- First Generation
  - Cephalexin (Oral): Resistant
- Fluoroquinolone
  - Ciprofloxacin: Resistant
- Glycylcycline
  - Tigecycline: Susceptible
- Monobactam
  - Aztreonam: Resistant
- Nitrofuran
  - Nitrofurantoin: Susceptible
- Other
  - Fosfomycin/ Trometamol: Susceptible
- Penicillin
  - Mecillinam: Resistant
- Second Generation
  - Cefoxitin: Resistant
  - Cefuroxime (IM/IV): Resistant
- Third Generation
  - Cefepime: Resistant
  - Ceftazidime: Resistant
  - Ceftriaxone: Resistant
- Amoxycillin/clavulanic acid: Resistant
- Ceftolozane-Tazobactam: Resistant
- Metallo B-lactamase positive: Resistant

CRAB

(Import Date 12-Mar-2017 09:07)

Organism status Final

51 - 100 x 10(6)/L

Note:

51 - 100 x 10(6)/L

- Aminoglycoside
  - Amikacin: Resistant
  - Gentamicin: Resistant
  - Tobramycin: Resistant
- Aminopenicillin
  - Amoxycillin: Resistant
- Carbapenem
  - Ertapenem: Resistant
  - Imipenem: Resistant
  - Meropenem: Resistant
- Combination
  - Amoxycillin/clavulanic acid: Resistant
  - Colistin/Polymyxin: Susceptible
  - Co-trimoxazole: Resistant
- Dihydrofolate reductase inhibitor
  - Trimethoprim: Resistant
- First Generation
  - Cefazolin: Resistant
- Fluoroquinolone
  - Ciprofloxacin: Resistant
- Monobactam
  - Aztreonam: Resistant
- Nitrofuran
  - Nitrofurantoin: Resistant
- Other
  - Fosfomycin/ Trometamol: Resistant
- Second Generation
  - Cefoxitin: Resistant
- Third Generation
  - Ceftriaxone: Resistant

Case Study 1

Mr AJ, 55 year old male, was referred by his GP for fever and ongoing haematuria to Urology Services at MMXX Hospital. A week prior to admission, he presented to his GP with dysuria, urinary frequency and intermittent haematuria. He was treated for a simple UTI (oral ABs) following urine microscopy, culture and sensitivity result.

The patient's urinary symptoms appeared to subside on oral ABs, but persistent fever and haematuria remained, leading to the GP referral for admission. Sepsis screening and interventions were commenced, which included blood cultures, midstream urine collection and IVABs. Routine MDRO risk assessment carried out by the RN on admission revealed that the patient had a minor surgery in an overseas hospital three months prior. Due to this, MDRO screening was undertaken. The MSU result came back positive with a Carbapenemase Producing *Klebsiella pneumoniae*, and same organism was identified from MDRO screening (faecal specimen).

Case Study 1

Questions:

1. Is this a case of colonisation or infection?
2. What is the most likely source of acquisition?
3. What transmission risk factors should be considered?
4. Should the patient be managed in transmission-based precautions?
5. If yes, what type of precautions should be implemented?

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Case Study 2

Mr A, 66 year old male, was transferred back to his Aged Residential Care facility post right below knee amputation (BKA) due to ischaemic ulceration of heel / midfoot. The patient had a medical history of end stage renal failure (ESRF), Type 2 Diabetes, ischaemic heart disease (IHD) and peripheral vascular disease. He was discharged on oral ABs for a further three days. His wound care plan included change of dressing twice weekly or as required. He was independent with his ADLs but required assistance on transferring.

After 4 weeks, Patient A became febrile (T – 38.5) and complained of pain on his right BKA stump wound. Some ooze and mild erythema were observed on patient's wound when reviewed by a nurse. Analgesics was administered and cooling cares given. Wound swab was performed, which came back MRSA positive.

In the same wing of the ARC facility, Mrs B, 92-year-old female, was known to be colonised with MRSA. She had urinary incontinence and required full assistance with her ADLs and had received wound cares on her left upper arm and left leg ulcer once weekly. Initial investigation identified that Mr A had been cared for by the same team of healthcare professionals (nurses, caregivers, etc) that had been looking after Mrs B. There was concern that MRSA transmission may have occurred.

Case Study 2

Questions:

1. State three risk factors for potential MRSA transmission in this situation.

2. What IPC measures should be considered in this scenario?

3. How would you confirm whether cross infection has actually occurred?

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Case Study 2

Mr A

Organisms:
☐ **MRSA**
(Import Date 22-Mar-2018 11:50)
Organism status Amended
Moderate growth
Note:
Moderate growth spa type t3949, Queensland clone MRSA strain.

- **Aminoglycoside**
  - Gentamicin: Susceptible
- **Aminopenicillin**
  - Norfloxacin: Susceptible
- **Anti-Mycobacterial**
  - Rifampicin: Susceptible
- **Anti-bacterial**
  - Chloramphenicol: Susceptible
- **Combination**
  - Methi/Flucloxacillin: Resistant
  - Co-trimoxazole: Susceptible
  - Quinupristin+dalfopristin: Susceptible
- **Fluoroquinolone**
  - Ciprofloxacin: Susceptible
  - Moxifloxacin: Susceptible
- **Glycopeptide**
  - Vancomycin: Susceptible
  - Teicoplanin: Susceptible
- **Lincosamide**
  - Clindamycin: Susceptible
- **Macrolide**
  - Erythromycin: Susceptible
- **Other**
  - Daptomycin: Susceptible
  - Fosfomycin/ Trometamol: Susceptible
  - Fusidic acid: Susceptible
  - High level Mupirocin: Susceptible
  - Linezolid: Susceptible
- **Penicillin**
  - Penicillin: Resistant
- **Second Generation**
  - Cefoxitin: Resistant
- **Tetracycline**
  - Doxycycline: Susceptible

Queensland clone MRSA strain [ST93, SCC*mec* type IV]:
Most common *spa* types: t202 and t3949
Typical antibiotic susceptibility pattern: Resistant to β-lactams only
Epidemiology: The Queensland clone is a community-associated strain of MRSA. It is the predominant community MRSA in Queensland and New South Wales, and has also spread throughout Australia. It is isolated sporadically from patients in New Zealand.

Mrs B

Organisms:
☐ **MRSA**
(Import Date 27-Jan-2014 13:15)
Organism status Amended
isolated
Note:
isolated Spa type=t008,USA300 Strain.

- **Aminoglycoside**
  - Gentamicin: Susceptible
- **Anti-Mycobacterial**
  - Rifampicin: Susceptible
- **Combination**
  - Methi/Flucloxacillin: Resistant
  - Co-trimoxazole: Susceptible
- **Fluoroquinolone**
  - Ciprofloxacin: Resistant
- **Glycopeptide**
  - Vancomycin: Susceptible
- **Lincosamide**
  - Clindamycin: Susceptible
- **Macrolide**
  - Erythromycin: Resistant
- **Other**
  - Fusidic acid: Susceptible
  - Mupirocin: Susceptible
- **Penicillin**
  - Penicillin: Resistant
- **Tetracycline**
  - Tetracycline: Susceptible

USA300 MRSA strain [ST8, SCC*mec* type IV]:
Most common *spa* type: t008
Typical antibiotic susceptibility pattern: Resistant to ciprofloxacin and/or erythromycin
Epidemiology: USA300 MRSA is a community-associated strain that is now widely disseminated in the United States. This strain is isolated from community and hospital patients throughout New Zealand.

Conclusion

- Antimicrobial Resistance is predicted to have disastrous impacts on humans, plants, food and the environment within one generation if this global crisis is not averted.
- The MDRO Risk Assessment Model considers: Patient, Pathogen and Placement.
- Bundled IPC interventions to minimise transmission risk are: Identify, Contain and Remove.
- MDRO Control will be reliant on active surveillance, bundled IPC interventions and judicious use of antibiotics.

Ka maru koe i tōku pūreke

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NGA MIHI NUI

(THANKS SO MUCH)

MDRO Bibliography List is available as separate file in Moodle.