Healthscope

Management of an Infection Cluster in ICU

A Journey with *Serratia marcescen*

Beth Elias

The *Serratia marcescens* infection cluster in ICU

What is *Serratia marcescens* ?

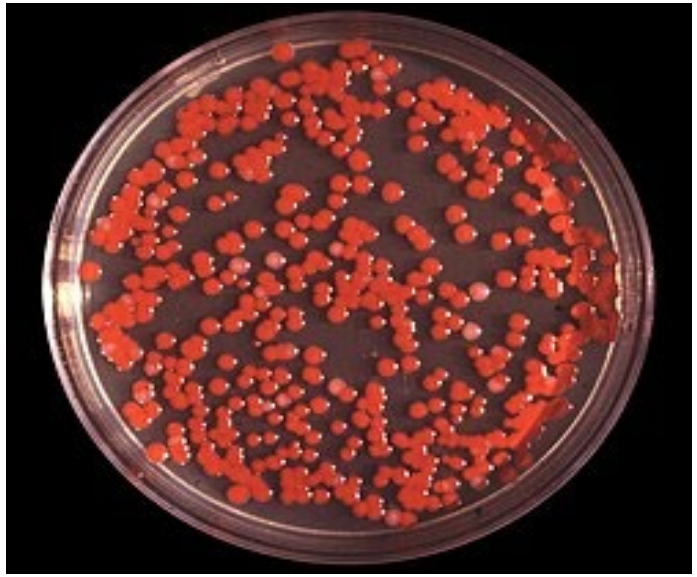
Serratia marcescens is a gram-negative bacillus of the Enterobacterales order.

Serratia m. occurs naturally in soil and water and produces a red pigment at room temperature.

It is associated with

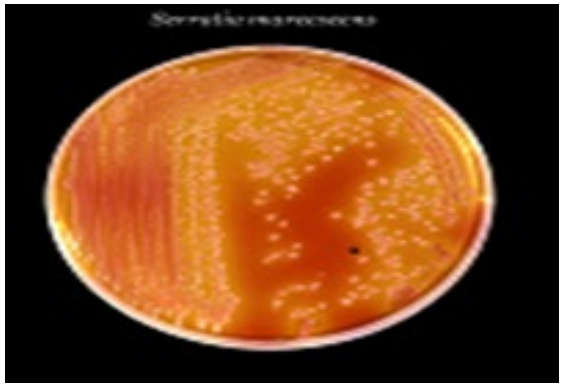
- Urinary and respiratory infections.
- Wound infections and others.

Serratia species may harbor multidrug resistance mechanisms that can complicate treatment decisions.



Serratia marcescens is an opportunistic pathogen.

- People whose resistance to infection is weakened and/or have a medical device (such as catheter, drain, and airway tube)
- *Serratia* is commonly found growing in bathrooms where it can form a pink-orange biofilm feeding on soap and shampoo residue

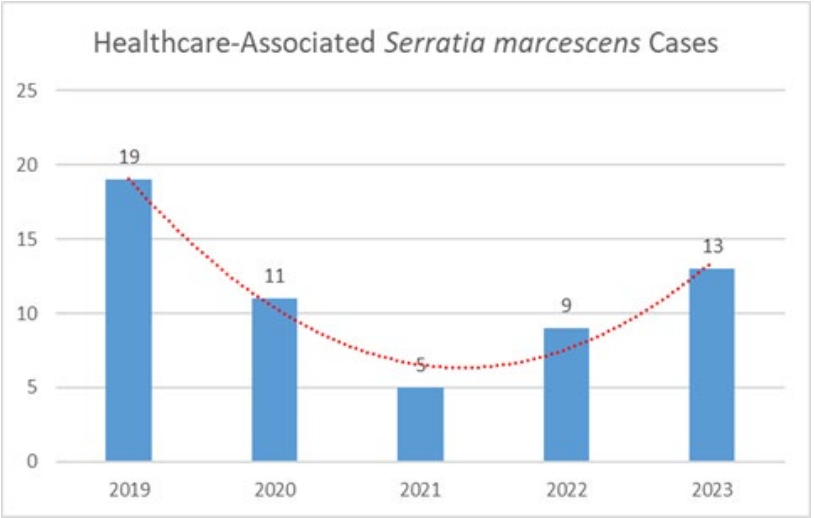


How did *Serratia m* get into ICU and contribute to some Healthcare Associated Infections (HCAI) ?

The infections were in sputum, some wounds and rarely but also blood cultures. Cases in ICU were primarily in cardiothoracic patients.

So we did environmental screening of the:

- Sinks and drains
- Ventilation machines in ICU and all tubing
- ECG leads
- By-pass machines in theatre
- Alcohol based hand gel dispensers
- Stethoscopes



Only the sink drains came back positive for *Serratia*.

This was our source !

EACH YEAR IT WAS THE SAME THING, ALWAYS THE SINK DRAIN.

THE PIPES WERE OLD AND WE ASSUMED HAD DEAD LEGS AND BIOFILMS.

ALL THE PLUMBING IN THE SINKS HAD BEEN CHANGED AND THE TRAPS CHANGED REGULARLY.

Sink drains in ICU were the risk factor as the source of this bacteria.

Australasian Health Facility Guidelines
Part D: Infection Prevention and Control Revision:
Date published:
16/04/2025

- Updated advice relating to hand hygiene facilities given to the use of alcohol-based hand rub (ABHR) as the preferred mode of hand hygiene in most clinical settings and i**ncreased knowledge relating to the risk of potential infection transmission from hand wash basins (HWB).**
- Revised recommendations relating to the optimal location of HWB in response to **emerging research associated with splashing from the sink and drain outlets.**

HAND BASIN DESIGN …

- Are to have curved sides, to minimise splashing; - do not include integrated plugs
- Alignment of the waterspout should ensure the water flow does not run directly into the drain aperture, thus avoiding aerosol splashback to the hands and face of the user. The waterspout will be positioned to ensure the water flow hits at the front of the basin, sink or trough.

The sink splash zone. ª 2023 The Healthcare Infection Society.

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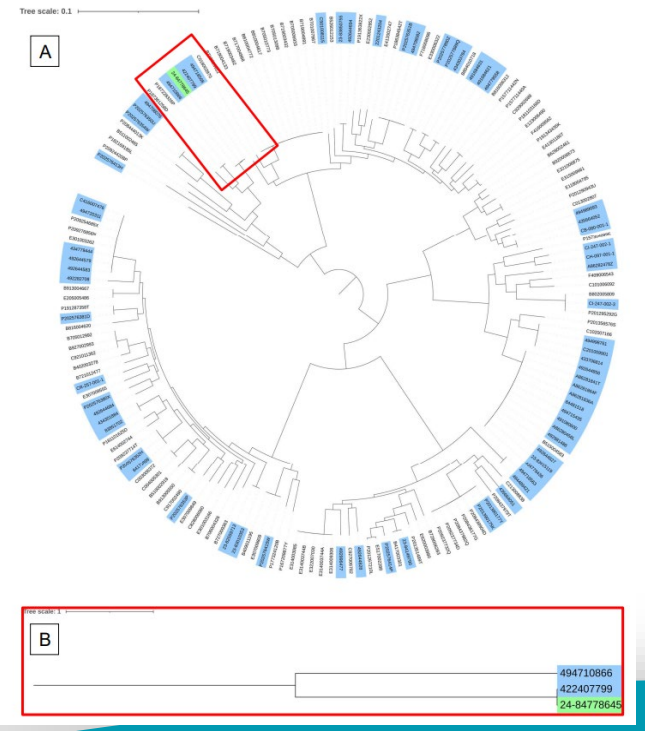
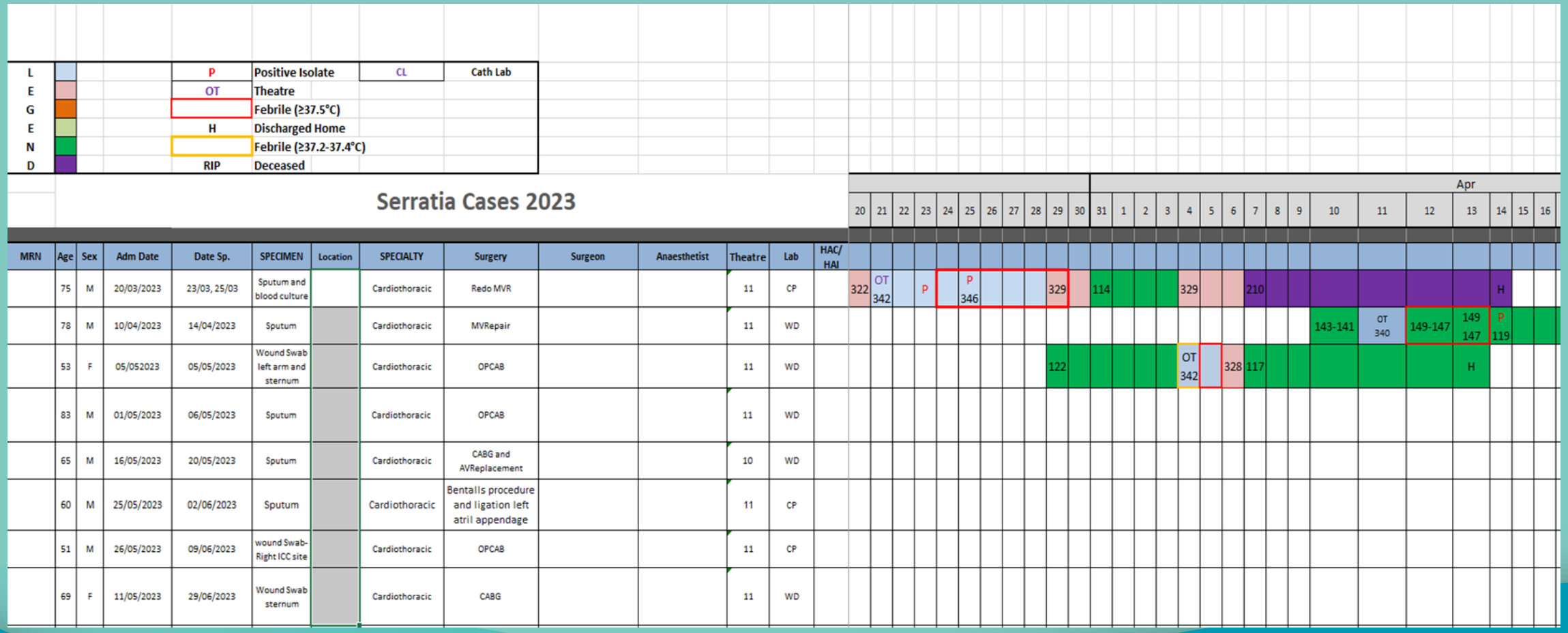
Where to start ?

- May 2023 there were 5 cases of *Serratia* infections, wound and sputum then 3 more in June.
- Discussion with WA Health for advice.
- We set up a *Serratia* Working Party group to organize plans to manage this cluster.
- All patients' pathology results were sent to PathWest for Whole Genomic Sequencing, which showed some of the 2023 samples were related
  to samples sent in 2021.



Set up *Serratia* Gantt Chart



L		P	Positive Isolate	CL	Cath Lab
E		OT	Theatre		
G			Febrile (≥37.5°C)		
E		H	Discharged Home		
N			Febrile (≥37.2-37.4°C)		
D		RIP	Deceased		

Serratia Cases 2023

MRN	Age	Sex	Adm Date	Date Sp.	SPECIMEN	Location	SPECIALTY	Surgery	Surgeon	Anaesthetist	Theatre	Lab	HAC/ HAI
	75	M	20/03/2023	23/03, 25/03	Sputum and blood culture		Cardiothoracic	Redo MVR			11	CP	
	78	M	10/04/2023	14/04/2023	Sputum		Cardiothoracic	MVRepair			11	WD	
	53	F	05/052023	05/05/2023	Wound Swab left arm and sternum		Cardiothoracic	OPCAB			11	WD	
	83	M	01/05/2023	06/05/2023	Sputum		Cardiothoracic	OPCAB			11	WD	
	65	M	16/05/2023	20/05/2023	Sputum		Cardiothoracic	CABG and AVReplacement			10	WD	
	60	M	25/05/2023	02/06/2023	Sputum		Cardiothoracic	Bentalls procedure and ligation left atril appendage			11	CP	
	51	M	26/05/2023	09/06/2023	wound Swab-Right ICC site		Cardiothoracic	OPCAB			11	CP	
	69	F	11/05/2023	29/06/2023	Wound Swab sternum		Cardiothoracic	CABG			11	WD	

Had an informal discussion with microbiologist for advice on management

- Beds were to be greater than a meter from all sinks.
- Sinks are cleaned with a chlorine based cleaner.
- All the plumbing was changed for new, 22/05/2023.
- All shared items cleaned with universal disinfection wipes.
- Tested the incoming water for *Serratia.* Not in the incoming water.
- Staff were educated on Serratia.
- Staff who washed their hands with water were then using ABHG;
- Improved mouth care for all patients in ICU.

What next?

Screening all cardiothoracic patients coming into ICU for *Serratia*. Were patients already colonised?

In one year over 178 patients were screened going into ICU and then out of ICU.

Still getting some *Serratia* infections.

Back to the drawing board.

Something needed to be done!

After a discussion with IPPSU ….
we contacted Tim from Clinell

Peracetic Acid
Drain Disinfectant

Peracetic acid, is a oxidizing agent used as a disinfectant, sanitizer, and bleaching agent.

Peracetic acid is effective against various microorganisms, including bacteria, fungi, and viruses, and is often used in food processing, healthcare, and industrial settings.

Peracetic acid works by disrupting cellular proteins and enzymes in microorganisms leading to their destruction.

Most certainly worth a try.

The *Serratia* Working Party took the recommendation to Infection Prevention and Control Committee.

Then to the Clinical Governance Committee where it was also endorsed.

In discussion with WHS **a SOP was** developed based on the guideline from the TGA.

SAFETY DATA SHEET
Clinell Drain Disinfectant

Issue Date: 14th February 2023 Version Number: 3

SECTION 1: Identification of the substance/mixture and company/undertaking

Product Identifier
Product Name Clinell Drain Disinfectant

Relevant identified uses of the substance or mixture and uses advised against
Identified Use Drain disinfectant

Details of the supplier of the safety data sheet
Australian distributor GAMA Healthcare Australia Pty. Ltd.
Suite 1, 33-37 Duerdin Street
Notting Hill
Victoria 3168
Australia
Tel: +61 3 9769 6600
Email: info@gamahealthcare.com.au

Manufacturer GAMA Healthcare Ltd
The Maylands Building
Maylands Avenue, Hemel Hempstead Industrial Estate
Hemel Hempstead
Hertfordshire
HP2 7TG
Tel: +44 (0) 207 993 0030

Emergency telephone number
Tel: +61 3 9769 6600
Monday – Thursday, 9-5pm; Friday, 9-4pm (excluding UK bank holidays)

SECTION 2: Hazards identification

Classification of the substance or mixture

Classified as hazardous by the criteria of Safe Work Australia.

Classification according to Globally Harmonised System of Classification and Labelling of Chemicals (GHS).

Oxidising solid (category 3)
Acute toxicity, oral (category 4)
Skin irritation (category 2)
Eye damage (category 1)

Label Elements

healthcare

SAFETY DATA SHEET
Clinell Drain Disinfectant

Issue Date: 14th February 2023 Version Number: 3

Signal word: DANGER

Hazard statements:
H272: May intensify fire; oxidiser
H302: Harmful if swallowed
H315: Causes skin irritation
H318: Causes serious eye damage

Precautionary statements
P210: Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P280: Wear protective gloves and eye protection.
P305/351/338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do so.
P501: Dispose of contents in accordance with local/national regulations.

Other hazards (once activated)

Once added to water, this product produces peracetic acid.

Human Health
Once added to water this product generates substances which are corrosive. Contact with eyes may cause serious damage. The generated chemicals are harmful if swallowed and may be corrosive to skin.

It is advisable to wear eye protection and gloves when using this product.

Chemical Hazards
Peracetic acid is an oxidising agent and may promote combustion of flammable materials.

SECTION 3: Composition/information on ingredients

SOP

DEPARTMENT: Housekeeping / Maintenance / Infection Prevention and Control

SAFE OPERATING PROCEDURE	
Description of Task:	Chemical use
Equipment:	**Clinell Drain Disinfectant** **Intended Use:** Destroy the protective bacterial biofilms building up throughout the drains of hospital sinks and showers. Formulation prevents bacterial biofilms from recovering for at least four days.
Identified risks:	Inhalation, Eye Splash, Contamination.
Safety Controls/PPE:	Gloves, Goggles, Aprons, Safety Footwear, Masks
Supervision:	Nil required. (once trained)
Training/Competency Requirements:	Demonstration and training to cleaning staff, by Housekeeping Manager an IPC manager.
Relevant Legislation/Standard	• Oxidising solid (category 2) • Acute toxicity, oral (category 4) • Skin irritation (category 2) • Eye damage (category 1)
Procedure owner:	**Infection Prevention and Control**

Sequential Steps/Stages for Procedure:

Wear appropriate PPE according to local policy, Gloves, Goggles, Aprons, Safety Footwear, Masks.
Turn on the tap for 30 seconds
Pour the entire contents of the sachet into the running water near the drain. Turn off the tap immediately.
Wait for at least *15 mins.* DO NOT USE THE SINK DURING THIS TIME.
Turn on the tap for 30 seconds to flush the drain before using the sink.

Eradicate persistent bacteria.
- **First time use: Use daily for 3 days.**
  - **Efficacy data shows this will eradicate established bacterial biofilm.**
- **Ongoing use: Use twice a week.**
  - **Proven to prevent bacterial biofilm regrowth.**
- **In outbreak situations, use daily until outbreak is declared over.**

Created by: Infection Prevention and Control for Housekeeping
Date: July 2023

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Clinell staff came into the hospital and gave a training session on the correct and safe use of the product.

So the trial began.

Thursday 21/09/2023

No Actichlor down the sinks in the trial.

Notice to be placed onto these sinks.

Commence the bi-weekly dosing of the three sinks in ICU.

Monday 25/09/2023

Thursday 28/09/2023

Monday 02/10/2023

Thursday 05/10/2023

Monday 09/10/2023

Tuesday 10/10/2023 Screen all sinks again for any Serratia growth (IPC)

Thursday 12/10/2023

Monday 16/10/2023

Thursday 19/10/2023

Monday 23/10/2023

Thursday 26/10/2023

Continue on with bi-weekly dosing until end of year.

All environmental swabs on 10/10/2023 were negative for *Serratia*

We have continued to use the Clinell drain disinfectant twice a week.

Still have the traps and aerators on tapware changed every 3 months.

18/09/2024 after a year of screening all patients for Serratia the Medical Advisory Committee (MAC) advised that *Serratia m* has largely abated as an issue for our hospital thanks to the IP&C team's leadership on environmental hygiene initiatives.
On advice from ID physician, that ongoing screening of patients preoperatively for Serratia is no longer recommended and MAC endorsed this. Were things to change on this issue in the future then the practice will be revisited.

We continue to do environmental screening of the sink drains, every 3 months.

We are very aware we have not beaten the *Serratia* in the drains, we are simply managing the situation.

If we were to step away from this management plan the *Serratia* biofilms would return in time and the risk to our patients would return

We still had some Serratia Infections

All pathology, positive for *Serratia* is sent for Whole Genomic Sequencing and the last one related to the ICU cluster is now over a year ago.

Conclusion: The S. marcescens isolate from Pt Name did not cluster with other S. marcescens isolates in our sequencing repository but was gnomically similar to three other isolates from other hospitals

Conclusion: The S. marcescens isolate from Pt Name did not form a genomic cluster with any isolate in our sequencing repository.

Any Questions?

Healthscope