

# Microbe of the month

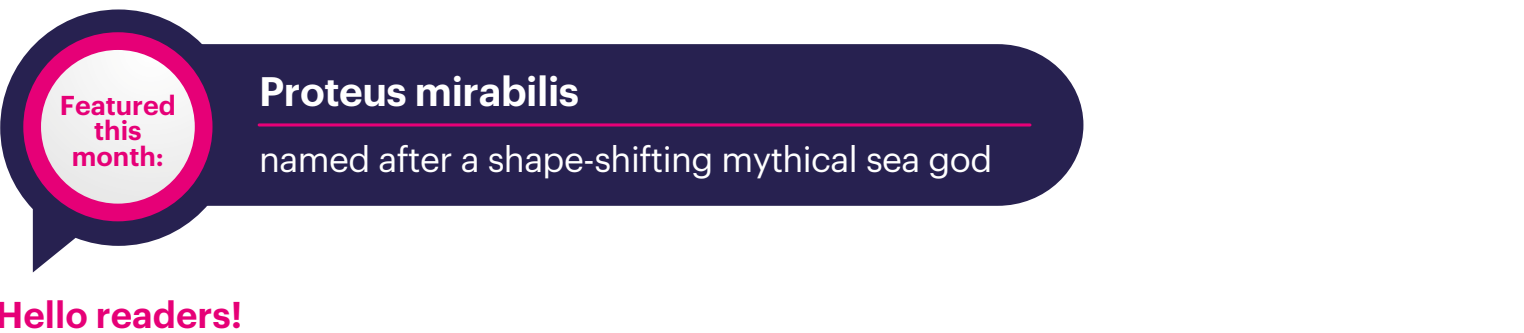
## Breaking The Chain of Infection

**Cutimed®**

**JULY 2020**

Newsletter

Compiled by Helen Loudon, Independent IPC Practitioner



### Featured this month: **Proteus mirabilis**

named after a shape-shifting mythical sea god

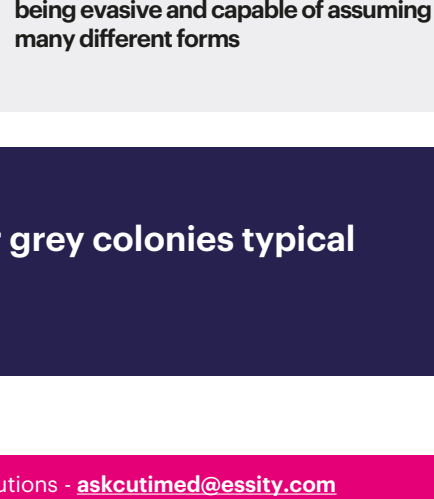
#### Hello readers!

**Proteus mirabilis** is an extraordinary microbe and an important opportunistic pathogen. It was named Proteus after an elusive character in Homer's Odyssey who was able to escape capture by changing its form; and 'mirabilis', from the Latin for 'wonderful or surprising'.

*Proteus mirabilis* is a rod-shaped, Gram-negative bacterium and a facultative anaerobe – a highly flexible characteristic which enables this microorganism to survive both in the presence and absence of oxygen.

It is part of the intestinal flora of humans and many other mammals, and can be isolated from sewage or polluted soil and water with ease.

This organism does not usually pose a problem for healthy individuals, but given a debilitated host, it is notorious for causing catheter-associated urinary infections, wound infections, pneumonia and septicaemia.

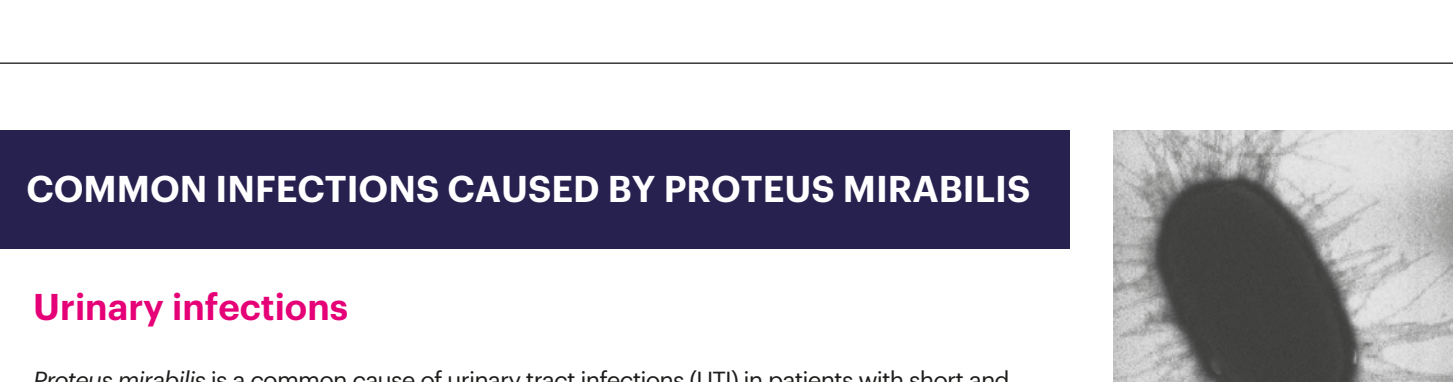


The word 'Proteus' was derived from Greek mythology, which described Proteus as an early sea-god, noted for being evasive and capable of assuming many different forms

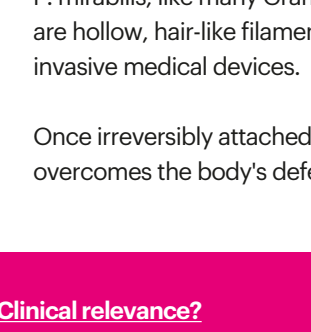


**The large, smooth, circular grey colonies typical of Proteus mirabilis**

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### COMMON INFECTIONS CAUSED BY PROTEUS MIRABILIS

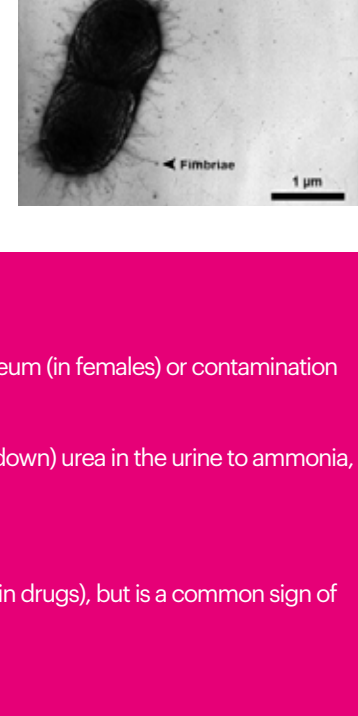
#### Urinary infections

*Proteus mirabilis* is a common cause of urinary tract infections (UTI) in patients with short and long-term indwelling urinary catheters, and in individuals with structural or functional abnormalities of the urinary tract.

These infections may become chronic, causing serious complications such as pyelonephritis, septicaemia and stone formation, resulting in severe damage to kidney tissue, while encrustation and the build-up of microbial biofilm blocks the lumen of catheters.

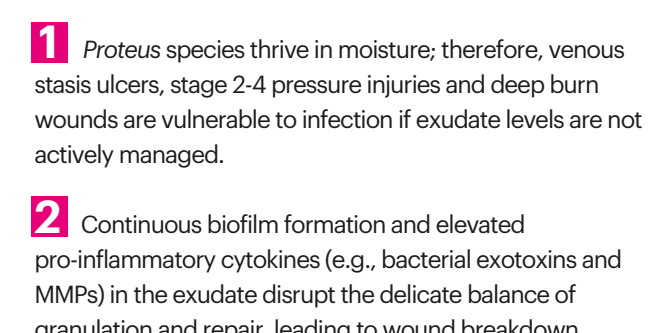
*P. mirabilis*, like many Gram-negative bacteria, is covered with hundreds of tiny fimbriae. These are hollow, hair-like filaments which it uses to stick firmly to mucous membranes, tissue and invasive medical devices.

Once irreversibly attached to tissue using the fimbriae, the bacteria form biofilm, which overcomes the body's defense mechanisms and infection ensues.

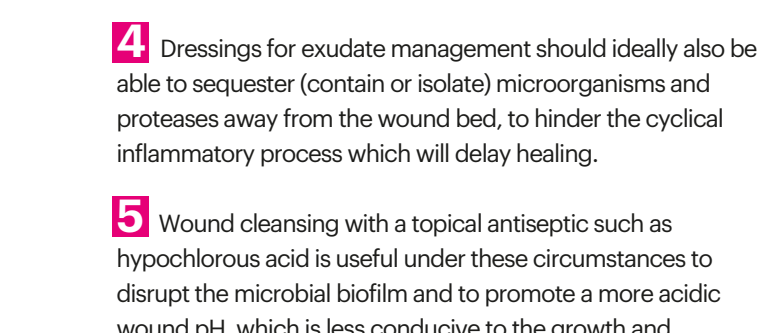


#### Clinical relevance?

- P. mirabilis* is a bowel commensal (part of the natural flora) and accesses the urinary tract either via the perineum (in females) or contamination of urinary catheters / instrumentation during breaches in aseptic technique.
- The pH of healthy urine should be acidic; however, once inside the bladder, *P. mirabilis* hydrolyses (breaks down) urea in the urine to ammonia, making the urine *alkaline*.
- An alkaline pH (e.g., 7.1 to 9.0) should trigger an alert for possible urinary tract infection with *P. mirabilis*.
- An alkaline urinary pH may have several causes (including respiratory alkalosis, pyloric obstruction and certain drugs), but is a common sign of kidney disease or infection and should be reported immediately.
- Prolonged urinary alkalinity can lead to the formation of crystals and kidney stones.
- P. mirabilis* can be found throughout the stones and may cause recurrent urinary infection after antibiotic treatment.
- Over time, kidney stones caused by *P. mirabilis* may grow large enough to cause obstruction and kidney failure.



Severe encrustation of a supra-pubic urinary catheter after 6 months



Large staghorn (or 'staghorn') kidney stones caused by chronic *P. mirabilis* urinary infection

#### Proteus mirabilis and wound infection

- Proteus* species thrive in moisture; therefore, venous stasis ulcers, stage 2-4 pressure injuries and deep burn wounds are vulnerable to infection if exudate levels are not actively managed.
- Continuous biofilm formation and elevated pro-inflammatory cytokines (e.g., bacterial exotoxins and MMPs) in the exudate disrupt the delicate balance of granulation and repair, leading to wound breakdown.
- Dressings for moderate to highly-exuding wounds should have proven fluid handling capacity, be hydroconductive (promote the vertical 'wicking' of exudate) and, ideally, be able to retain the exudate within the dressing even when under compression.
- Dressings for exudate management should ideally also be able to sequester (contain or isolate) microorganisms and proteases away from the wound bed, to hinder the cyclical inflammatory process which will delay healing.
- Wound cleansing with a topical antiseptic such as hypochlorous acid is useful under these circumstances to disrupt the microbial biofilm and to promote a more acidic wound pH, which is less conducive to the growth and multiplication of faecal bacteria.
- In conjunction with an antimicrobial wound cleanser, first line topical antimicrobial dressings (e.g., DACC, PHMB, cadexomer iodine or medical grade manuka honey) should be used to control the wound bioburden.

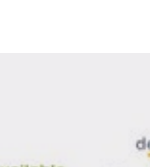


**Chronic and highly exuding wounds are prone to infection with *P. mirabilis*.**

#### Did You Know?

**DID YOU KNOW?** An undiagnosed urinary infection may be a cause of delayed wound healing or an unexpected deterioration in a previously healing wound.

### ANTIBIOTIC THERAPY AND RESISTANCE



Laboratory cultures are always recommended prior to commencing antibiotics, so that local susceptibility data can guide antimicrobial therapy.

*Proteus* species are naturally resistant to antibiotics, such as benzylpenicillin, oxacillin, tetracycline, and the macrolides, and acquire resistance to ampicillin through the production of plasmid mediated beta-lactamases – enzymes which destroy the structure of penicillin-based antibiotics.

For hospitalised patients or those with long-term urinary catheters, the first decision should be whether the isolate is clinically significant, isolates which are not accompanied by pyuria or symptoms do not warrant treatment.

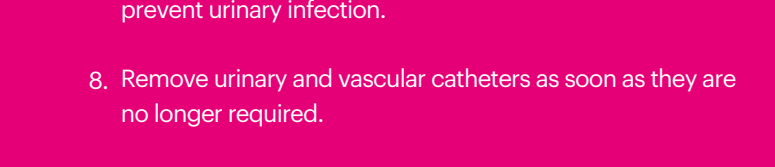
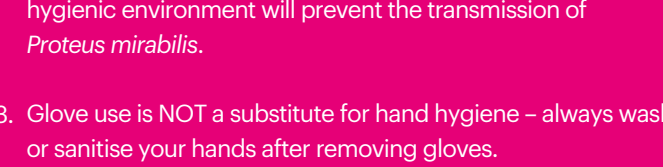
Based on antibiotic resistance data, trimethoprim or cotrimoxazole may no longer be viable treatment options for *P. mirabilis* infections. Quinolone resistance is also

increasing, and *P. mirabilis* is almost uniformly resistant to nitrofurantoin, tetracycline, and polymyxins. The most appropriate treatment may be augmentin, piperacillin/tazobactam, aminoglycosides, carbapenems (except imipenem), and 3rd generation cephalosporins.

However, restriction of the use of 3rd generation cephalosporins should also be considered as part of an antimicrobial stewardship programme, to reduce selective pressure leading to mutations which may contribute to ESBL (extended spectrum beta-lactamase) production.

In general, complicated infections should be treated with intravenous agents (or oral therapy for quinolones) until fever has resolved.

In the case of recalcitrant urinary infections, consultation with a medical microbiologist, removal of the urinary catheter, and referral to a specialist urologist is usually necessary.



- 'Dipstick' urinalysis is a valuable patient screening tool and may pick up an asymptomatic urinary infection.
- Frequent hand hygiene, the use of standard precautions (e.g., gloves, disposable apron) when potentially exposed to body fluids and wound exudate, and maintaining a hygienic environment will prevent the transmission of *Proteus mirabilis*.
- Glove use is NOT a substitute for hand hygiene – always wash or sanitise your hands after removing gloves.
- Practice strict aseptic technique for invasive procedures such as urinary catheterisation, uroscopy, venesection and wound care.
- Avoid unnecessary urinary catheterisation and implement catheter-associated UTI (CAUTI) prevention bundles.
- Maintain a closed system of drainage.
- Bladder instillations and washouts should not be used to prevent urinary infection.
- Remove urinary and vascular catheters as soon as they are no longer required.
- Reusable equipment should be reprocessed by scrupulous cleaning with an appropriate enzymatic detergent and sterilized by an autoclave.

**Contact your local Essity representative for back copies and to sign up for the 'Microbe of the Month' mailing list**

#### REFERENCES

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**Proven infection management...**

**Physical microbe binding technology...**

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- Clinically significant 65% relative risk reduction of acquiring a surgical site infection post caesarean section<sup>1</sup>
- Up to 57% cost reduction of SSI when treating caesarean sections, using NHS cost model<sup>2</sup>
- Effective reduction of the bacterial burden in critically colonised or locally infected wounds<sup>3</sup>

<sup>1</sup> Staniszewski J, Hizon M, Cendrowski K, et al (2016). Randomised controlled trial evaluating dialkylcarbamoyl chloride impregnated dressings for the prevention of surgical site infections in adult women undergoing caesarean section. *Surg Infect (Larchmt)* 17(4): 427-35

<sup>2</sup> Davies N, McKinnon J, et al. Cost effectiveness of DACC dressing to prevent SSIs following caesarean section. Presented at Wounds UK, Harrogate, November 2018

<sup>3</sup> Cutting K, Maguire J (2015) Site bioburden management: A clinical review of DACC technology. *Journal of Wound Care* Vol 24, No 5

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- Low risk of strike-through bedding
- To protect patients clothes and
- To improve patient comfort
- Printed surface
- Enables easy dressing application

#### Super-absorbent core

- Absorbs and retains large volumes of exudate into the dressing even under pressure
- Reduces the risk of skin maceration and assists with the management of different wounds e.g. leg ulcers and pressure ulcers

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- No known risk of bacterial or fungal resistance
- In contrast to antimicrobial wound dressings, it does not increase cell debris in the wound
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- No contraindications
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- Allows for optimal distribution of fluid throughout the dressing and prevents exudate returning to the wound bed
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#### Rounded edges

- Remains flat
- To provide additional patient comfort

**Ordering Information Cutimed® Sorbion® Sorbact®**

Ref No.	Size	Wound Pad Size	Items per Unit	NAFPI Code
72889-01	10 x 10 cm	8 x 9 cm	10	274714-001
72889-01	10 x 20 cm	7.7 x 17.8 cm	10	274715-001
72889-02	20 x 20 cm	17.8 x 17.8 cm	10	274716-001
72889-02	20 x 30 cm	17.5 x 27.5 cm	10	274717-001

Wound depth: □ Superficial - deep □ Wound phase □ Infected □ Soupy □ Exudate level □ Moisture to keep

<sup>1</sup> Heycocks S, Chadwick P (2011). Use of a DACC coated antimicrobial dressing in people with diabetes and a history of foot ulceration. *Wounds UK* Vol 6 No 4. 14-18 | <sup>2</sup> Langh et al (2006) Using the principle of hydrophobic interaction to bind and remove wound bacteria. *Journal of Wound Care*, 15 (4): 172-79

## It's time to fight antimicrobial resistance

### Wound Warriors

**CLICK TO GET YOUR FREE AMR KIT**

Antimicrobial resistance is a heavy burden and individual wound management is key in fighting it. Dedicated to improving well-being through leading hygiene and health solutions, Essity supports the antimicrobial stewardship initiative.

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