“It’s not thrush!” Challenging the *Candida* narrative

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12th November 2025

Who I am

- Portfolio GP
- Senior Clinical Lecturer
- IBCLC, Breastfeeding Medicine

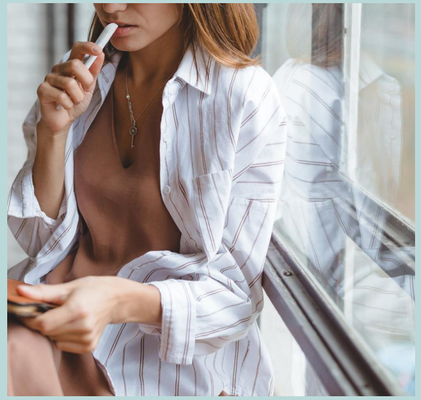
- No conflicts of interest
- Acknowledging privileges
- Inclusive language

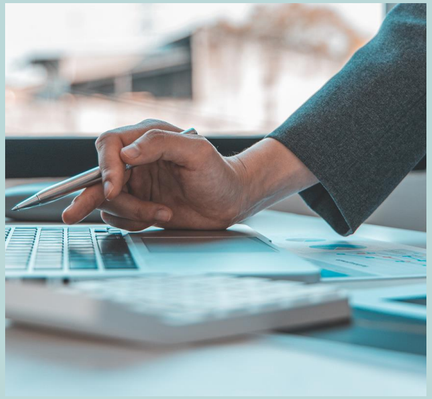
MiLC
Medics' Lactation Community

Psychology: a very good place to start

Accepting change is hard.

What do we need?





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Psychological safety

Does the environment allow deep questioning, without fear of judgement?

↓

Humility

Is it possible we got this wrong? Could we have done things differently?

↓

Logical information

How does this new information fit? Does this now make more sense?

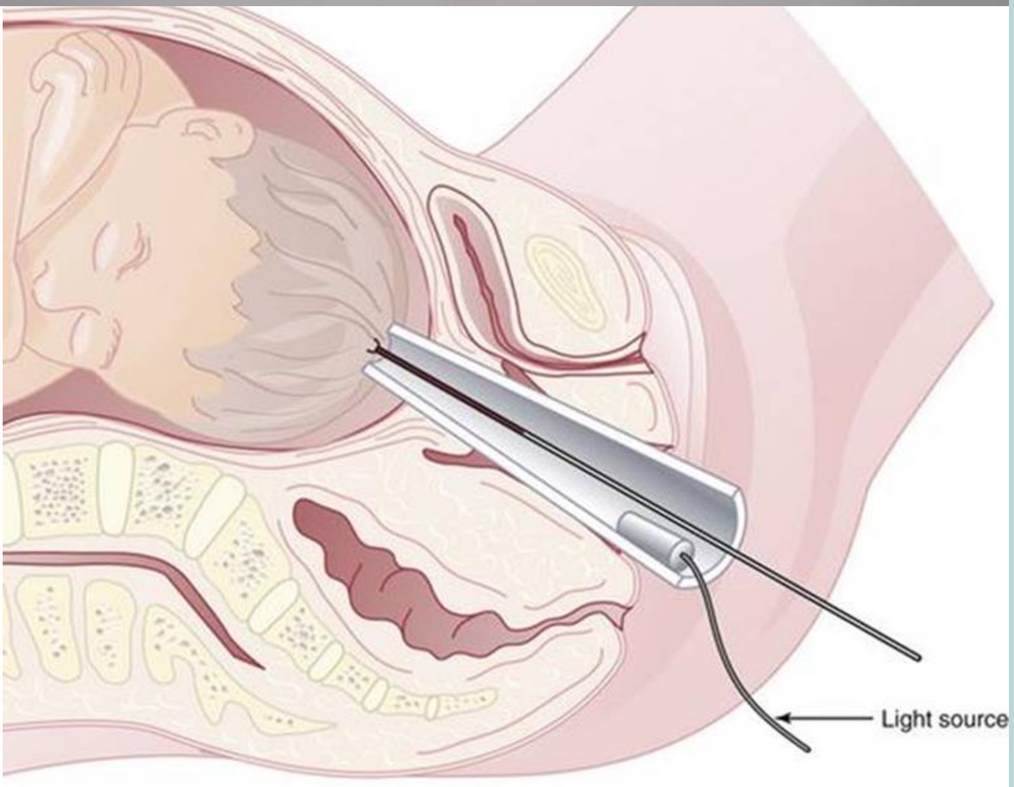
When we know better, we can do better!

The physician's experience of changing clinical practice: a struggle to unlearn. Gupta *et al*, 2017, Implementation Science.

The role of confirmation bias

"People's tendency to process information by looking for, or interpreting, information that is consistent with their existing beliefs. This biased approach to decision making is largely unintentional, and it results in a person ignoring information that is inconsistent with their beliefs".

www.brittanica.com

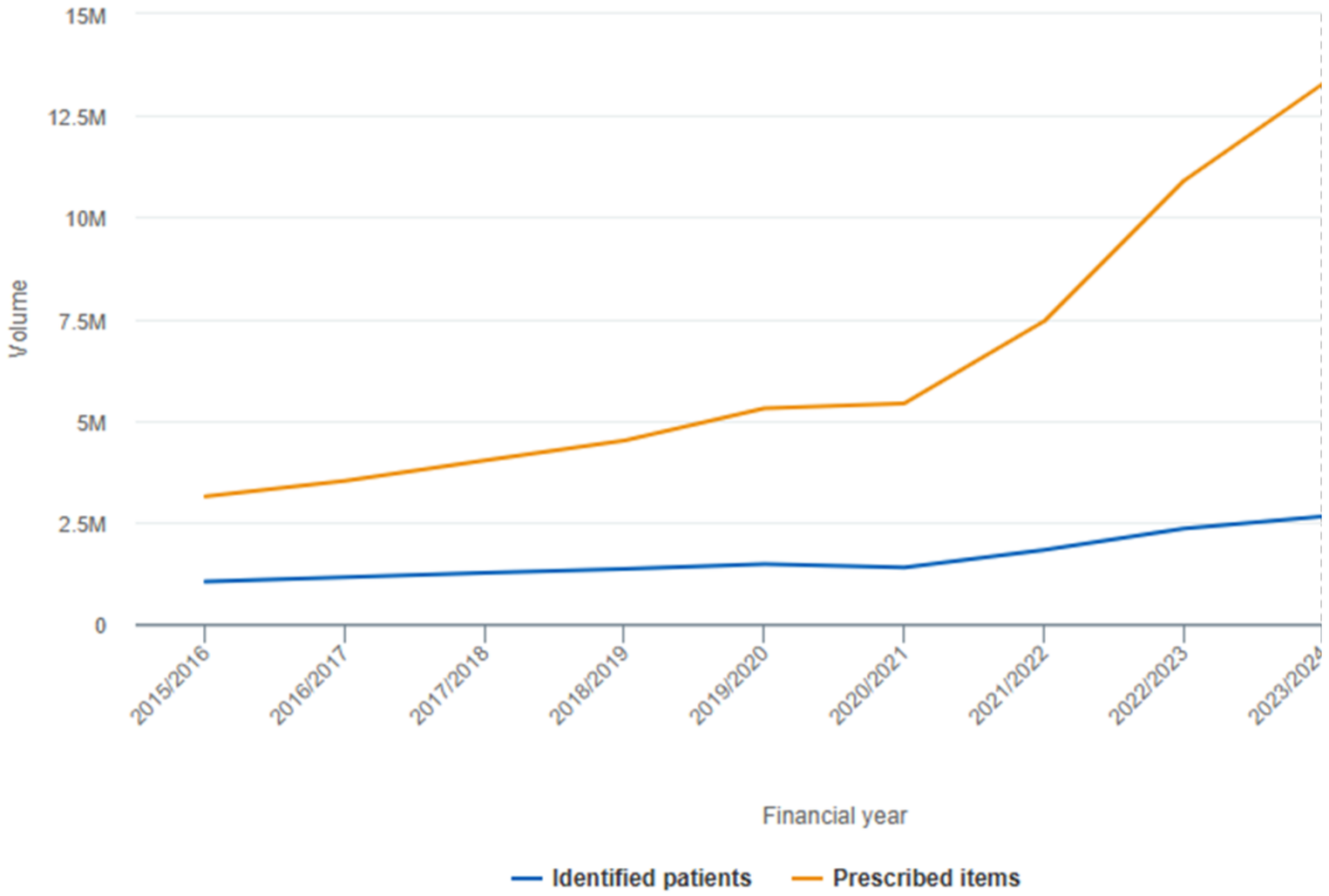


New evidence can reveal harmful practices

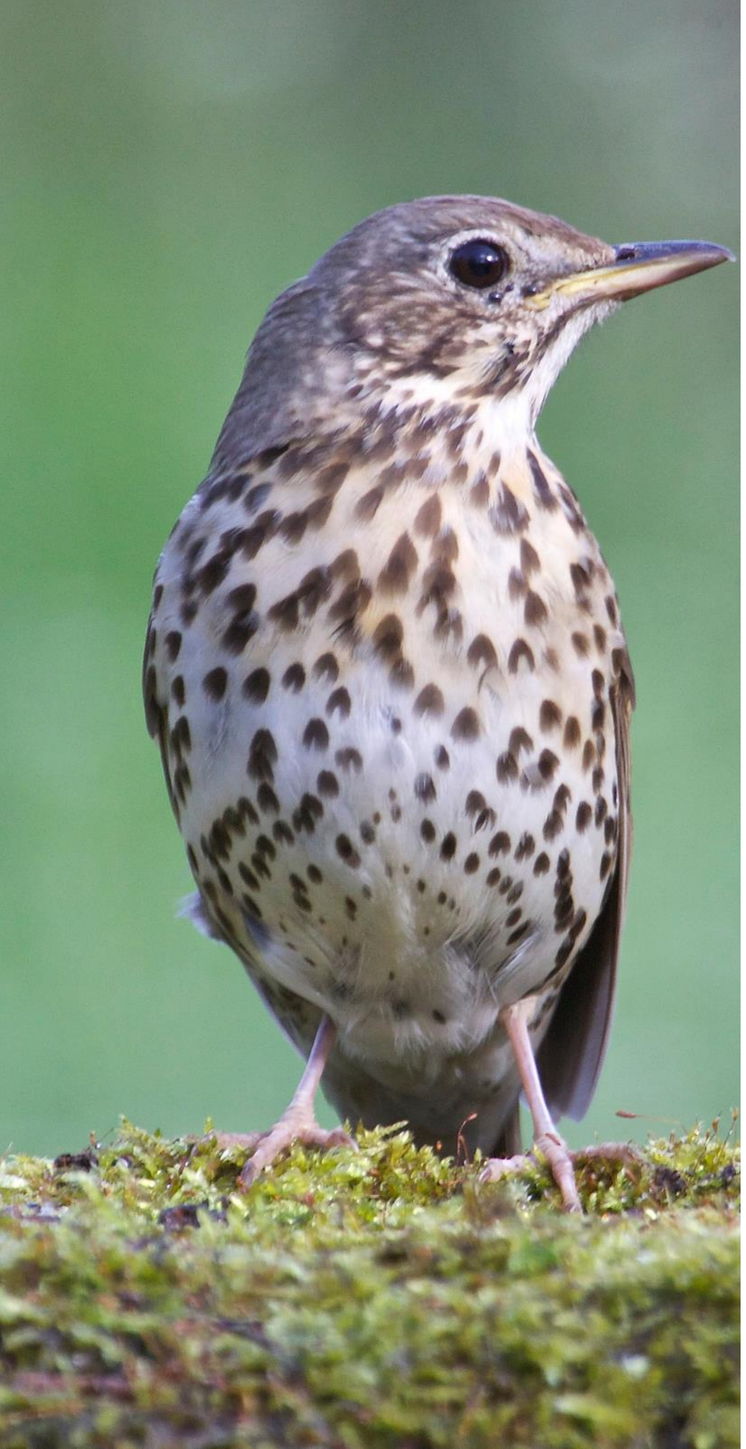
"An updated evidence review found no evidence that CTG monitoring with fetal blood sampling improved outcomes for women and babies when compared with CTG alone and indeed was associated with a reduced 5 minute Apgar score. This may be due to the fetal blood sampling procedure delaying birth."

Fetal monitoring in labour: summary and update of NICE guidance. O'Heney *et al*, 2022, The British Medical Journal.

A real example of changing clinical practice



NHS Business Service Authority. Hormone Replacement Therapy, England April 2015 to June 2024.

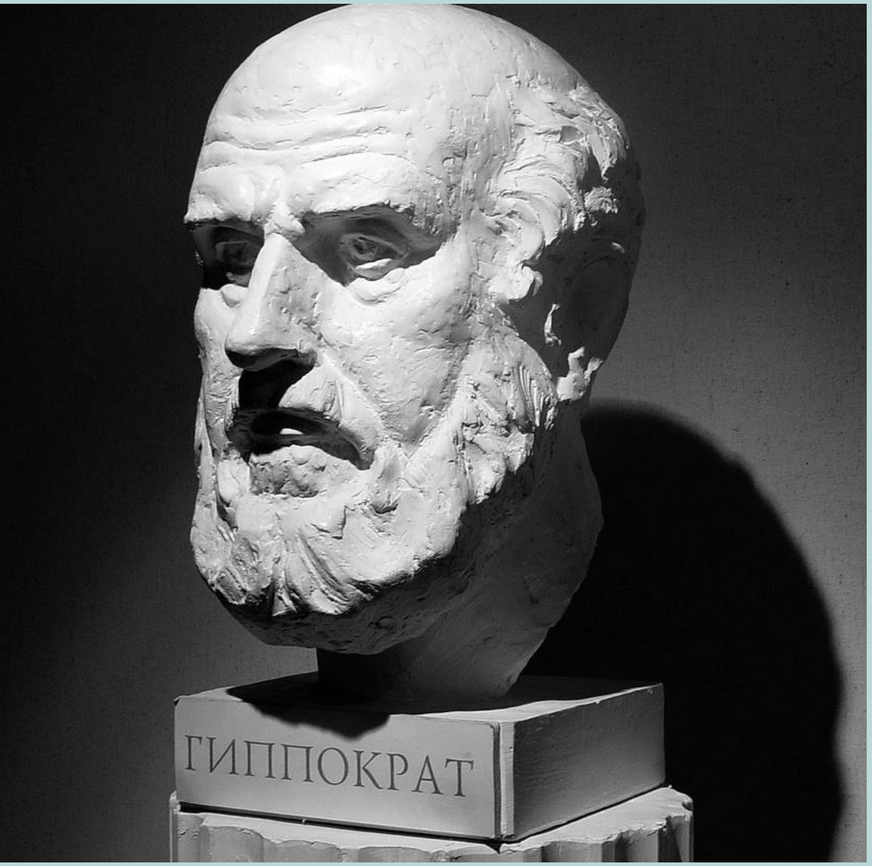


Candida - a normal part of us!

- Part of the normal flora in mouth, gut and vagina
- Also present in low numbers on healthy skin in other moist areas
- More than 200 different types – most common is *Candida albicans*
- Most common fungal commensal in the human body - may actually benefit us!

Romo and Kumamoto. On Commensalism of *Candida*, 2020, Journal of Fungi (Basel).

Candida's role in disease



- An opportunistic fungus - Hippocrates (400 BC) "a disease of the diseased"

- Most commonly causes vulvovaginal or oral candidiasis (thrush)

- Can also cause invasive (life-threatening) systemic candidiasis, but only in severely immunocompromised people

Diagnosis and management of oral candidosis. Lewis and Williams, 2017, British Dental Journal.
Oral Candidiasis: A Disease of Opportunity. Vila *et al*, 2020, Journal of Fungi (Basel).

Transmissibility of *Candida*

- *Candida* thrives in warm, moist areas
- It changes from commensal to infection due to changes in the host environment
- Thrush (versus *Candida* commensal) is not infectious in the way that herpes or flu are

The Role of Host and Fungal Factors in the Commensal-to-Pathogen Transition of *Candida albicans*. Jacobsen, 2023, Current Clinical Microbiology Reports.

Sex does not need to be avoided from an infection perspective as VVC is not a STI. Women may wish to avoid sex until symptoms have improved particularly if there is fissuring of the skin.

Guidelines

INTERNATIONAL JOURNAL OF STD & AIDS

British Association for Sexual Health and HIV national guideline for the management of vulvovaginal candidiasis (2019)

International Journal of STD & AIDS
2020, Vol. 31(12) 1124–1144

DOI: 10.1177/0956462420943034
journals.sagepub.com/home/std
SAGE

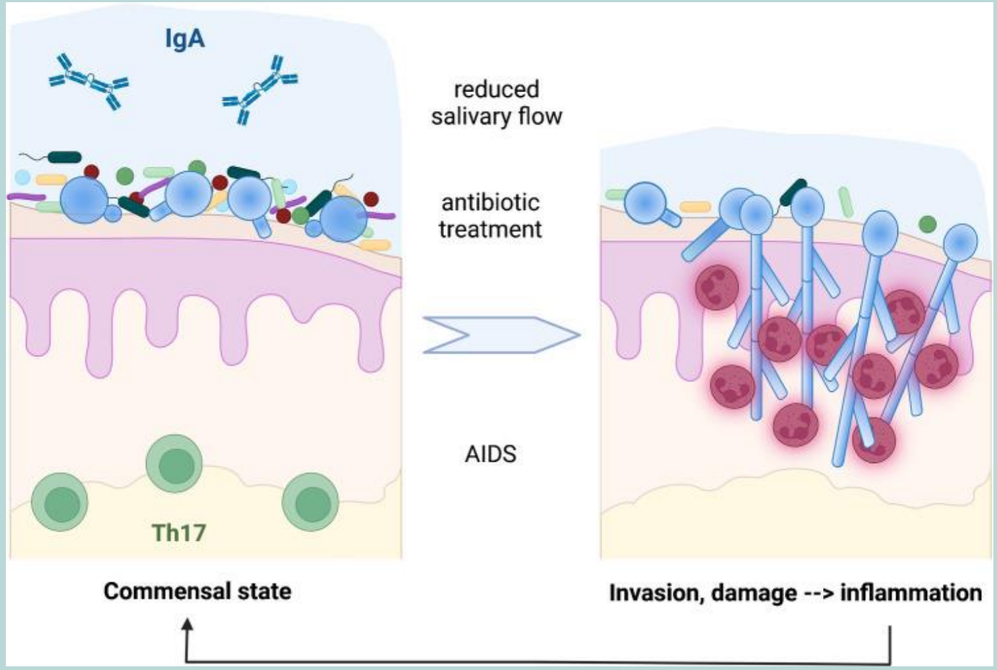
Guideline Development Group: Cara Saxon (Lead Author), Anne Edwards, Riina Rautemaa-Richardson, Caroline Owen, Bavithra Nathan, Bret Palmer, Clare Wood, Humera Ahmed, Sameena Ahmad, Patient Representatives and Mark FitzGerald (CEG Editor)

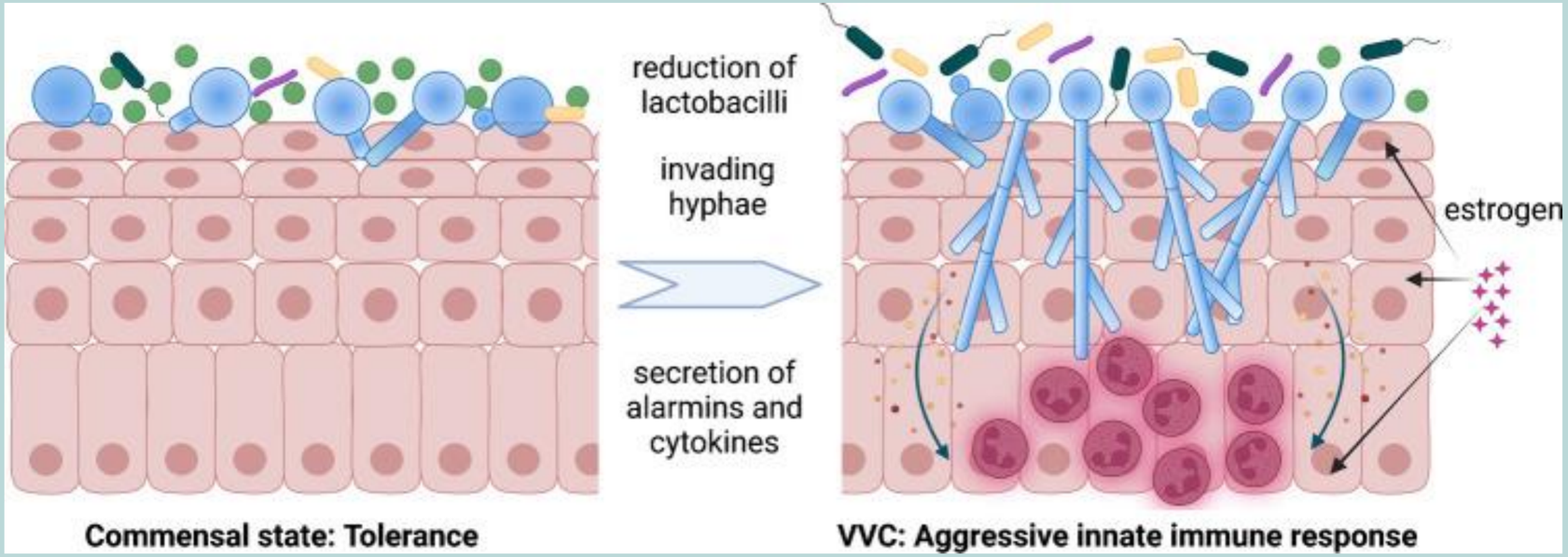
Date received: 15 June 2020; accepted: 19 June 2020

Contact tracing and treatment

There is no evidence to support the treatment of asymptomatic male sexual partners in acute or recurrent VVC.[154–157] (Grade 1A)

Commensal to Pathogen - Mouth and Vagina





The Role of Host and Fungal Factors in the Commensal-to-Pathogen Transition of *Candida albicans*. Jacobsen, 2023, Current Clinical Microbiology Reports.

Candida on the skin

Can change from commensal to infection under certain conditions:

- Occluded areas of skin
- Increased humidity
- Increased CO_2
- Friction
- Increased pH
- Lipases and proteases

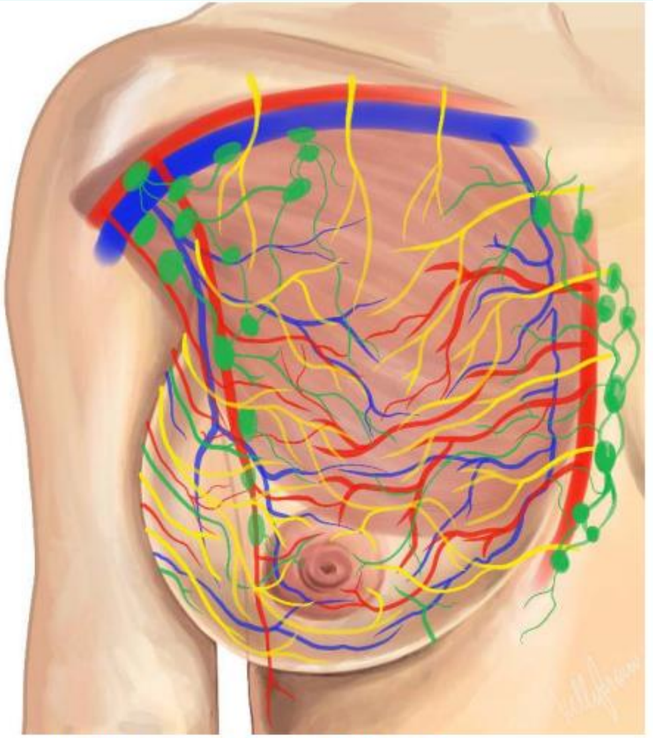
However, it cannot invade deeper tissues in immunocompetent people

Interaction of *Candida* Species with the Skin. Kühbacher *et al*, 2017, Microorganisms.

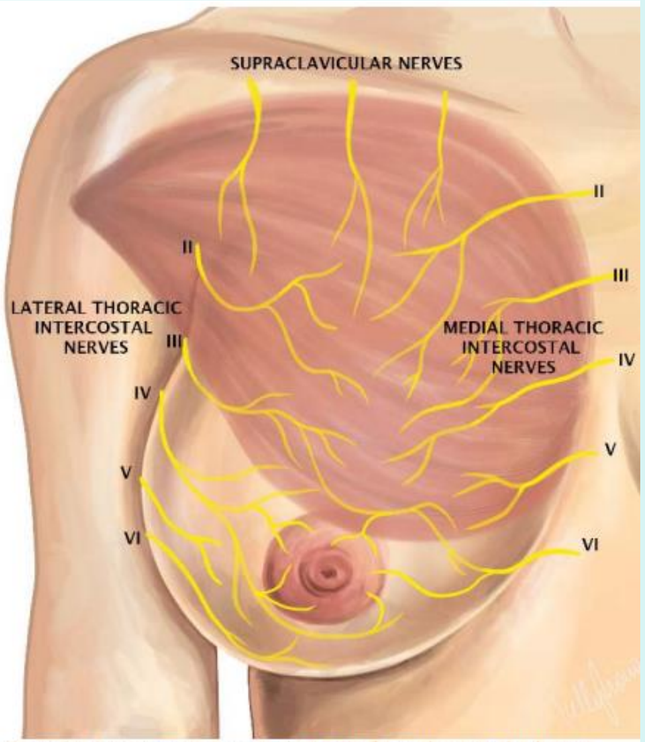
Breast Anatomy and Physiology

The lactating breast and nipple are highly vascularised and resistant to infection (bacterial and fungal). Human milk and saliva have numerous antimicrobial properties.

The breast and nipple are also highly innervated: pain from one site can be referred to another.



In addition to glandular tissue, the breast has innumerable arteries (red), veins (blue), lymphatics (green), nerves (yellow)!

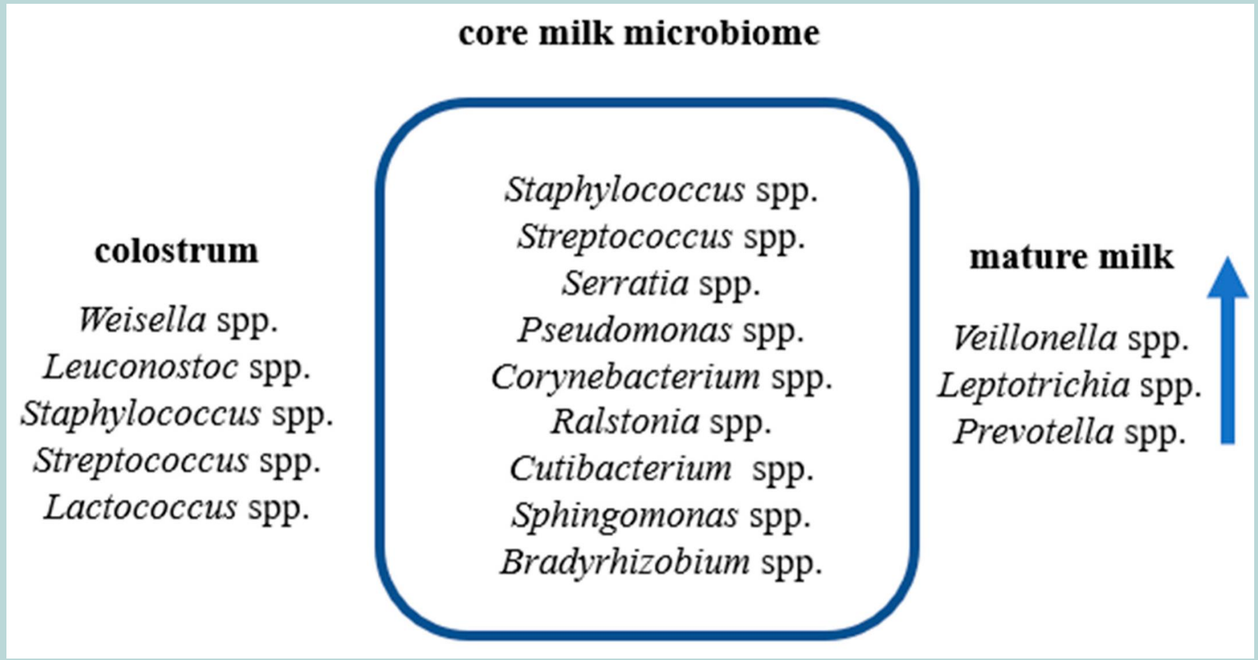


Complex innervation means that pain from deep in the breast travels to the nipple and nipple pain travels deep into the breast.

PhysicianGuideToBreastfeeding.org

Re-thinking lactation-related nipple pain and damage. Douglas, 2022, Women's Health.

Human Milk Microbiology



The breastmilk microbiome is a complex living community of microbes (mostly bacteria), driven by the entero-mammary pathway and infant oral retrograde flow.

Human Milk Microbiome—A Review of Scientific Reports. Dombrowska-Pali *et al*, 2024, Nutrients.

Hale *et al*, 2009

Symptomatic mothers (n=16)	Control mothers (n=18)
Total samples = 32	Total samples = 36
1 sample grew 1 CFU of *Candida* (not significant)	No *Candida* growth

- No evidence of significant *Candida* growth in breastmilk, even when exogenous iron was added to the samples
- However, when *Candida* was deliberately added by the lab to breastmilk, it grew well (especially when iron was added too)
- What does this mean? *Candida* CAN grow in breastmilk – but they found no evidence that it actually does

The Absence of *Candida albicans* in Milk Samples of Women with Clinical Symptoms of Ductal Candidiasis.
Hale *et al*, 2009, Breastfeeding Medicine.

Amir *et al*, 2013

- 360 pregnant women prospectively followed for 8 weeks postpartum
- Looked for *Candida* and *Staphylococcus Aureus* in nipple/breastmilk/baby oral samples, using enhanced microbiological techniques (culture plus PCR)

- 18.8% of all study participants reported symptoms consistent with "thrush"
  - Of these, 48% had *Candida* isolated; 52% did not
- Of the 81.2% of study participants who did NOT have symptoms
  - 34% had *Candida* isolated; 66% did not

- No evidence *Staphylococcus Aureus* was implicated in symptomatic people, and concluded *Candida* was associated with burning nipple and breast pain

Does *Candida* and/or *Staphylococcus* play a role in nipple and breast pain in lactation? A cohort study in Melbourne, Australia. Amir *et al*, 2013, BMJ Open.

So why are these results so different?

Hale *et al*, 2009

Following consent, each nipple and areola was thoroughly washed to remove cotton fibers or skin contamination from infant saliva. [Cotton fibers can lead to false-positive (1 → 3)-β-D-glucan findings.] Washing consisted of careful scrubbing with a non-cotton polyvinyl alcohol sponge (PVA, Qosmedix, Edgewood, NY) moistened with sterile pyrogen-free distilled water and a non-antibiotic detergent. After a thorough washing, each nipple was thoroughly rinsed with 500 mL of warm sterile distilled water. Each breast was then emptied by pumping (12 minutes) with a Medela® (McHenry, IL) Symphony breast pump using sterile pumping kits. A small aliquot of milk was then removed from each bottle and stored in sterile Nunc (Copenhagen, Denmark) CryoTube vials at –80°C. All solutions, pumping equipment, and vials were tested for (1 → 3)-β-D-glucan content before use and were free of β-glucan contamination.

Amir *et al*, 2013

Specimens were collected by research assistants. Fresh gloves were worn for each specimen. After sanitising their hands, research assistants collected nipple swabs, then washed the nipple/areola region twice using sterile water wipes. Midstream milk was collected in a sterile container; the first drops of breast milk were expressed and discarded. Two nipple swabs were obtained from each nipple: a standard charcoal swab for microbiological analysis (Copan Diagnostics Inc, California, USA) and a flocked swab for molecular analysis (Copan Diagnostics Inc). After first moistening in sterile saline, both the standard and flocked nipple swabs were rolled over the nipple and areola together using a 10-point swabbing technique,[23] paying particular attention to any cracks/fissures present. Oral and vaginal swabs were collected for culture of *S aureus* and *Candida* spp. Breast milk samples were also cultured for *S aureus*, coagulase-negative staphylococci (CoNS) and *Candida* spp; nasal swabs were collected for culture of *S aureus* only.

Betts *et al*, 2021

- 25 women who had persistent symptoms of:
  - nipple pain/burning/cracking
  - deep breast pain
  - breast redness
  - itchy/flaky/red nipples

- All had been treated unsuccessfully with topical and/or oral antifungals

Final diagnosis	N =
Subacute mastitis	8
Nipple bleb	6
Dermatitis	6
Vasospasm	2
Milk crust	1
Hyperlactation	1
Depression	1
Thrush	**0**

It's Not Yeast: Retrospective Cohort Study of Lactating Women with Persistent Nipple and Breast Pain. Betts *et al*, 2021, Breastfeeding Medicine.

Jiminez *et al*, 2017

Table 3. Microbiological analysis (cultures and PCR assays) of milk samples from 529 women with presumptive symptoms of "mammary candidiasis" after milk extraction by manual expression.

Microorganism	Culture			Genus-specific PCR
	n (%)[1]	Median (IQR) or mean [95% CI] (log_{10} CFU/mL)[2]	min – max[3] (log_{10} CFU/mL)	Positive n (%)[1]
(a) Genus *Staphylococcus*	501 (95)	4.40 (0.92)	2.88–6.18	507 (96)
Staphylococcus epidermidis	481 (91)	4.34 (1.06)	3.46–6.18	
Staphylococcus aureus	37 (7)	3.72 [3.56; 3.89]	3.32–4.54	
Staphylococcus hominis	37 (7)	4.10 (0.54)	3.47–5.30	
Staphylococcus lugdunensis	26 (5)	3.30 (0.53)	2.79–5.48	
Other staphylococcal species[4]	47 (9)	3.08 (1.22)	2.24–5.78	
(b) Genus *Streptococcus*	405 (77)	4.42 [4.35; 4.48]	2.95–6.04	455 (86)
Streptococcus mitis/oralis	243 (46)	4.40 [4.32; 4.48]	3.17–6.04	
Streptococcus parasanguinis	79 (15)	3.32 (0.20)	3.14–3.44	
Streptococcus salivarius	201 (38)	4.38 [4.29; 4.47]	2.95–5.70	
Streptococcus vestibularis	32 (6)	3.43 (0.36)	3.12–5.24	
Other streptococcal species[5]	63 (12)	3.36 [3.33; 3.40]	3.14–3.59	
(c) Other Gram-positive bacteria	187 (35)	2.95 (0.56)	1.94–5.18	
Rothia mucilaginosa	95 (18)	2.98 (0.54)	2.49–4.70	
Corynebacterium tuberculostearicum	26 (5)	2.24 (0.48)	1.97–4.15	
Corynebacterium kroppenstedtii	21 (4)	2.36 (0.36)	1.94–3.58	
Other corynebacterial species[6]	53 (10)	2.84 (0.24)	2.65–4.54	
Enterococci[7]	26 (5)	3.19 (0.35)	2.95–5.18	
(d) Genus *Candida*	11 (2)	2.18 [2,01; 2.35]	1.88–2.70	15 (2.5)
Candida albicans	11 (2)	2.18 [2.01; 2.35]	1.88–2.70	

"The results of the present work clearly shows that no association could be established between painful breastfeeding (including shooting pain and sore nipples) and the presence of yeasts, both in milk or on the nipples."

"our results strongly support that coagulase-negative *Staphylococci* and *Streptococci* (mainly from the *mitis* and *salivarius* groups) are the agents responsible for such cases… the term "mammary candidiasis" or "nipple thrush" should be avoided when referring to such condition and replaced by "subacute mastitis"."

Mammary candidiasis: A medical condition without scientific evidence? Jimenez *et al*, 2017, PLOS One.

“But hold on... I’ve seen antifungals work!”

- Ketoconazole has known anti-inflammatory (and anti-bacterial) effects
- This is comparable with mild-moderate strength steroids
- Miconazole has been shown to have anti-inflammatory effects on the skin, gut and neural tissues
- It is an effective treatment for ‘nappy rash’, even when no *Candida* is isolated from the site

The antiinflammatory effects of ketoconazole. Van Cutsem *et al*, 1991, Journal of the American Academy of Dermatology.
Miconazole Suppresses 27-Hydroxycholesterol-induced Inflammation by Regulating Activation of Monocytic Cells to a Proinflammatory Phenotype. Kim *et al*, 2021, Frontiers in Pharmacology.
Diaper Dermatitis: A Therapeutic Dilemma. Results of a Double-Blind Placebo Controlled Trial of Miconazole Nitrate 0.25%. Concannon *et al*, 2001, Pediatric Dermatology.

So if they work, why can't we just use antifungals for breast/nipple pain?

- 7% of *Candida* found in blood samples in the US are now resistant to fluconazole
- Over-use of antifungals is a major contributor to this issue
- We need antifungals for our sickest and most vulnerable people

Antimicrobial-Resistant Invasive Candidiasis. U.S. Centers for Disease Control and Prevention, 2024.

Oral thrush

- Definitely a thing!
- BUT…hugely over diagnosed
- Up to 80% of the general population carry *Candida* in their mouth as a commensal
- *Candida* isolated from nipples is very likely to have come from the infant's mouth
- "changes in the host microenvironment can promote the transition from one of commensalism to pathogen"

Oral Candidiasis: A Disease of Opportunity. Vila *et al*, 2020, Journal of Fungi.

Credit: Dr Moira Haggarty

What about nipple swabs?

Do NOT swab nipples to diagnose infection (only exception to this is a viral swab for suspected HSV)

- Both intact skin and wounds will always have microbes living in/on them
- Nipple swabs may be positive for *Candida* because of oral transmission
- Skin/wound infection is a clinical diagnosis
- The swab does not make the diagnosis: it only guides the specific treatment

Why does it matter anyway?

- Untreated pain
- Psychological distress (particularly around hygiene measures)
- Unnecessary medication (“recurrent/resistant thrush”)
- Premature cessation of lactation

01 **Wrong diagnosis**

02 **Wrong treatment**

03 **Ongoing symptoms**

So if it's not thrush, then what is it?

- Common things are common…
- Let's not over-medicalise
- Start with P&A and/or pumping assessment
- Look for horses!

Nipple Dermatitis

- Nipple dermatitis can affect anyone
- Risk is increased postpartum: pro-allergenic substances, e.g. lanolin
- Appliances causing maceration, e.g. shells, cups
- Mechanical trauma, e.g. pumps, dysfunctional suck
- Yet thrush (58%) is more commonly (mis)diagnosed than dermatitis (23%) in lactating women
- Pumping is strongly positively associated with being diagnosed with thrush

Skin diseases of the breast and nipple: Inflammatory and infectious diseases. Waldman *et al*, 2019, Journal of the American Academy of Dermatology.

Nipple thrush or dermatitis: A retrospective cohort study of nipple-areolar complex condition and call for coordinated, multidisciplinary care. Sadovnikova *et al*, 2023, Journal of the American Academy of Dermatology.

Dermatitis

Credit: Dr Katrina Mitchell

Credit: Dr Katrina Mitchell

Neuropathic Pain

- Nociceptive pain versus neuropathic pain
- Differing pathology
- Differing symptoms
- Differing management

Breast Dysbiosis/Subacute Mastitis

- Disruption to the normal/healthy microbiome
- Causes of dysbiosis:
  - Hyperlactation
  - Pumping
  - Medications, e.g. antibiotics
- Overgrowth of coagulase negative *Staphylococci*: form thick biofilms inside ducts, narrowing the lumen – this increased pressure on the epithelium causes shooting/ burning pains and blebs

Mammary Dysbiosis. Walker, 2018, Clinical Lactation.

Returning to Confirmation Bias

- Lactating woman/parent with nipple changes and/or breast pain
- Baby may or may not have oral thrush (usually not)
- A nipple or oral swab may or may not be positive for *Candida*
- Antifungals may seem to improve symptoms for some people (often temporarily)

- BUT: none of this means that the nipple, breast or milk is infected with *Candida*!

Case Presentation - Background

- 38yo first time Mum - C
- Baby boy T born at 38+4/40 via SVD
- Sleepy baby, early nipple damage, shields, insufficient weight gain - advised to triple feed at 10 days old
- T had frenulotomy at 5 weeks old, then weaned off shields, pumping and top ups
- T then underwent emergency surgery at 6 weeks old for malrotation and volvulus - recovered well

Case Presentation - Current Issues

- T now 6 months old, right sided pain started about 4 months ago

- Initially burning pain in nipple at start of feed, then stabbing pain deeper into breast

- Over last 2 months pain progressed:
  - "excruciating pain"
  - "worse than childbirth"
  - "nighttime is the worst – it stops me from sleeping"
  - "the breastfeed itself is comfy"
  - "10-20 minutes after a feed I get the sensation of daggers/glass into my breast"
  - "the pain can last up to an hour after the feed"
  - "I have to bite down on something to cope with the pain"

What we did...

Low dose SSRI (25mg sertraline) for neuropathic nipple pain

Moderate potency steroid cream twice daily to bleb

And then...

3 days later...

“Hi Naomi, I hope I’m not speaking too soon but I’ve had almost no pain yesterday and today. I feel like a new person, I can’t believe it! I can’t thank you enough for what you’ve done for me”

Conclusions

- *Candida* infection of the nipple or breast doesn't make biological sense, and the research doesn't support it either

- More likely diagnoses are:
  - P&A/pumping trauma
  - Nipple dermatitis
  - Vasospasm
  - Neuropathic pain
  - Breast dysbiosis

- Identifying the true underlying cause of symptoms is key to resolving them

Future challenges

- Lactation suffers from severe under-investment at all levels
- Change is difficult, and clinical practice is especially hard to change…
- Around 17 years from knowledge gained to being embedded into practice

Getting a clinical innovation into practice: An introduction to implementation strategies. Kirchner *et al*, 2020 – Psychiatry Research.

What next?

- Updated guidance from BfN - ‘Pain: if breastfeeding hurts’
- NICE have updated some of their CKS pages
- Education for HCPs and lactation workers will be key
- Collaborative working, accessible information, clear and consistent messaging
- You can be a part of this!

Acknowledgements

Dr Katrina Mitchell

The IABLE community

My patients

@DRNAOMIDOW_BFMED