

Stop the microbial madness - New news on super bugs



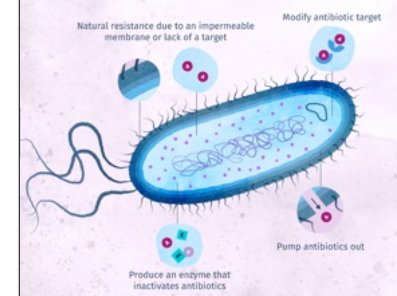
Anne N. Guignon, RDH, MPH, CSP  
anne@anneguignon.com 832-971-4540

How antibiotics work

New drug developments

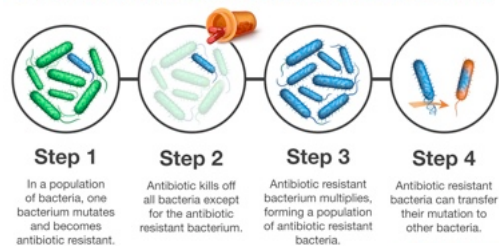
Antibiotic resistance

### Mechanisms of Antibiotic Resistance



Millennium Institute School of Public Health  
ANTIBIOTIC RESISTANCE ACTION CENTER

### Antibiotic Resistance in Bacteria



### WHAT YOU NEED TO KNOW ABOUT ANTIBIOTIC RESISTANCE

Antibiotic resistance arises when bacteria change to protect themselves against an antibiotic.  
Resistance is increasing and the number of effective antibiotics is decreasing. This means that one day no antibiotics may be left to fight life-threatening diseases.

In the last **25 YEARS** no new antibiotics have been developed.

### Antibiotic resistance - 1,000x



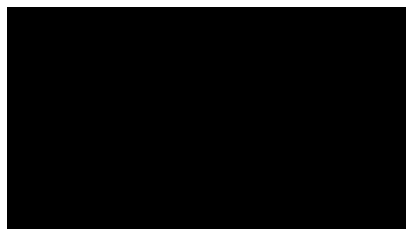
Harvard Study

- as compared planktonic
- to antibiotics and biocides

biofilm-related infections *can't be treated with conventional antibiotic therapy*

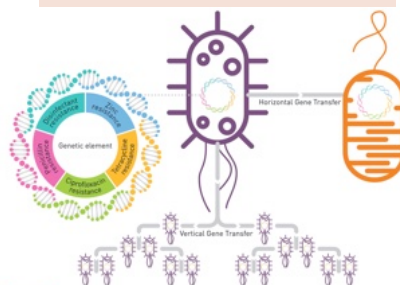
<http://www.npr.org/sections/health-shots/2016/09/08/492965889/watch-bacteria-investigate-antibiotics-and-transform-into-superbugs>  
utm\_campaign=storyshare&utm\_source=twitter.com&utm\_medium=social

### Resistance



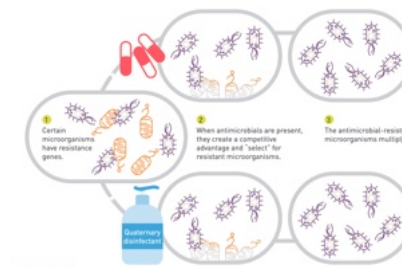
[http://www.npr.org/sections/health-shots/2016/09/08/492965889/watch-bacteria-investigate-antibiotics-and-transform-into-superbugs?utm\\_campaign=storyshare&utm\\_source=twitter.com&utm\\_medium=social](http://www.npr.org/sections/health-shots/2016/09/08/492965889/watch-bacteria-investigate-antibiotics-and-transform-into-superbugs?utm_campaign=storyshare&utm_source=twitter.com&utm_medium=social)

### Horizontal gene transfer

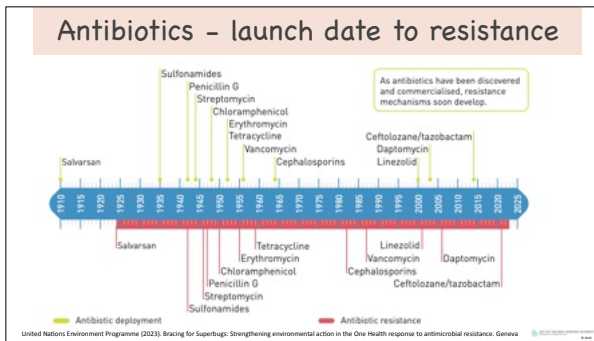


United Nations Environment Programme (2023). Bracing for Superbugs: Strengthening environmental action in the One Health response to antimicrobial resistance. Geneva

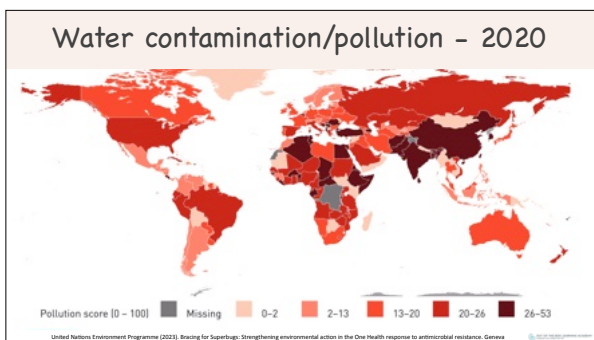
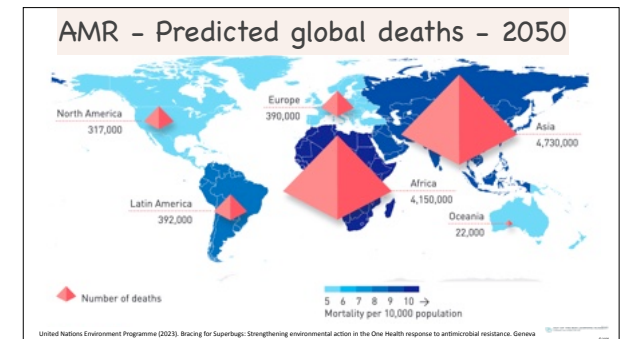
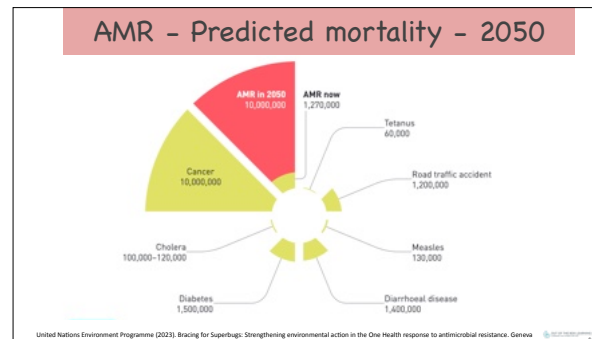
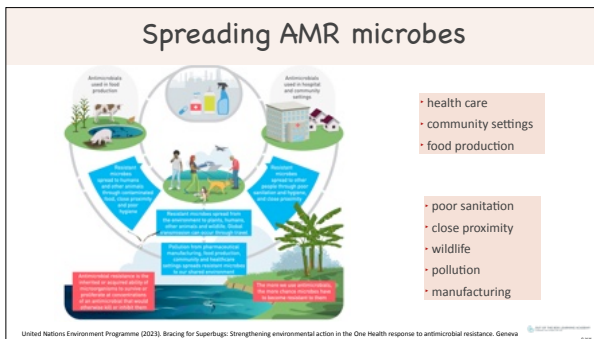
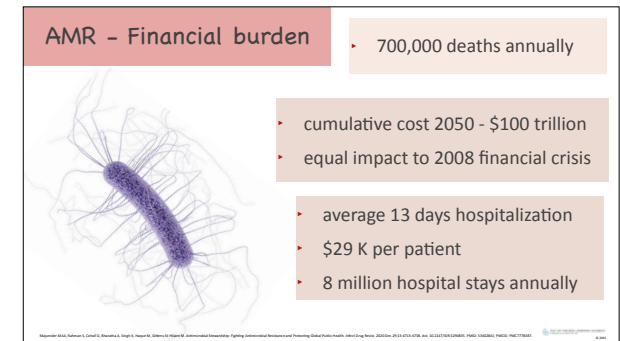
### Selection pressure and resistance



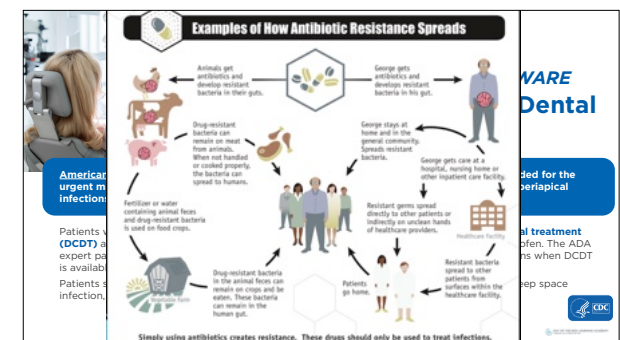
United Nations Environment Programme (2023). Bracing for Superbugs: Strengthening environmental action in the One Health response to antimicrobial resistance. Geneva



## Antibiotic resistance – world wide considerations



## Antimicrobial resistance- Contributing factors..... and the elephant in the room



## More exposures / wider spread

United Nations Environment Programme (2023). Bracing for Superbugs: Strengthening environmental action in the One Health response to antimicrobial resistance. Geneva

- produce in markets
- poor worker PPE
- aquaculture
- agricultural pesticides
- increased bactericides / fungicides

United Nations Environment Programme (2023). Bracing for Superbugs: Strengthening environmental action in the One Health response to antimicrobial resistance. Geneva

## Flooding / runoff / landfills

United Nations Environment Programme (2023). Bracing for Superbugs: Strengthening environmental action in the One Health response to antimicrobial resistance. Geneva

## Wildlife impact / Migration patterns

United Nations Environment Programme (2023). Bracing for Superbugs: Strengthening environmental action in the One Health response to antimicrobial resistance. Geneva

## Americans Use a Lot of Antibiotics

25 Rx per 1,000 people

hospital - Rx antibiotics

- 33% have errors - wrong dose, duration, or drug

outpatient - Rx antibiotics

- 30% unnecessary

acquire a super bug

long term hospital stay 1 in 4 chance

short term hospital stay 1 in 7 chance

Europe

Antibiotics in Global Strategy, 2013 Update, Thomas H. Poole, 2016

## IMPROVE OUTPATIENT ANTIBIOTIC USE

72% of antibiotic prescriptions are likely unnecessary. (But we still need to improve drug selection, dose and duration)

At least 28% of antibiotic prescriptions are unnecessary. In U.S. Doctor's Offices and EDs

Learn more at [www.gandhiantibiotic.org](https://www.gandhiantibiotic.org)

## Ecology of AMR Spread: Environmental Dimensions

Figure adapted from The Australian Centre for Genomic Epidemiological Microbiology (Gauguin et al). Courtesy of Dr. Shrawan Morgan.

United Nations Environment Programme (2023). Bracing for Superbugs: Strengthening environmental action in the One Health response to antimicrobial resistance. Geneva

## Antibiotics

no longer recommended in dentistry for many situations

Dentists and physicians often prescribe antibiotics to relieve dental pain and intraoral swelling.

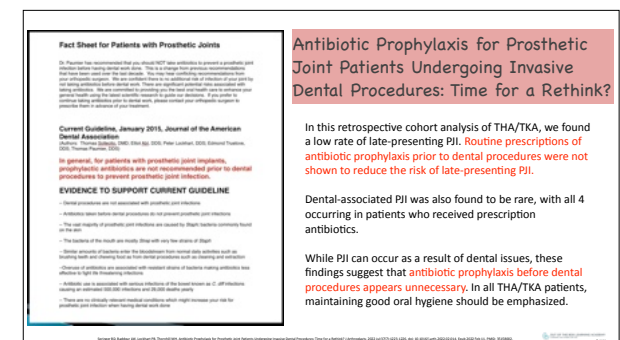
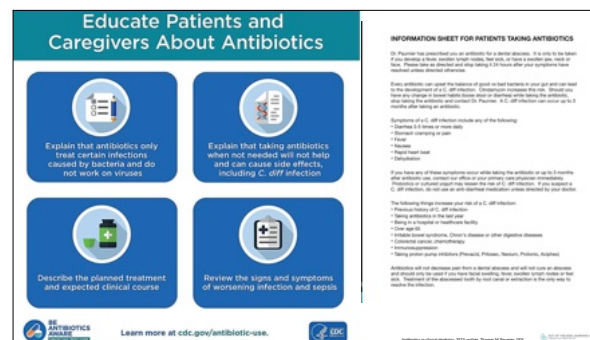
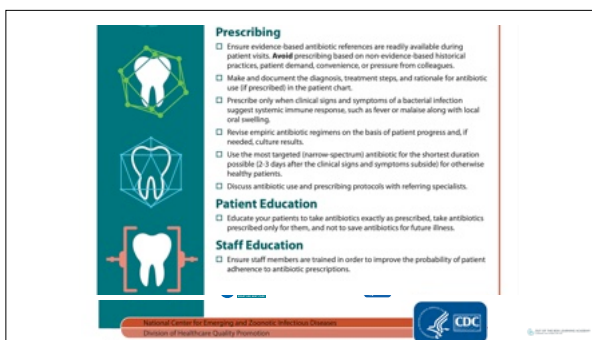
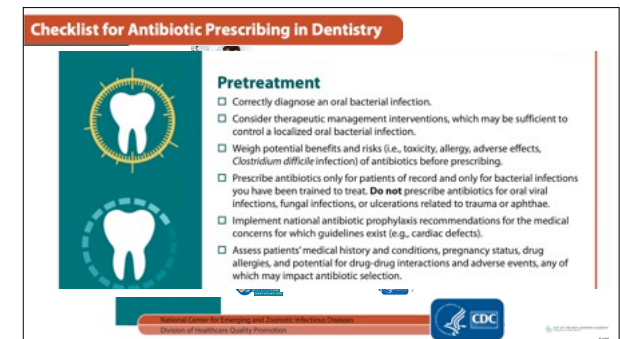
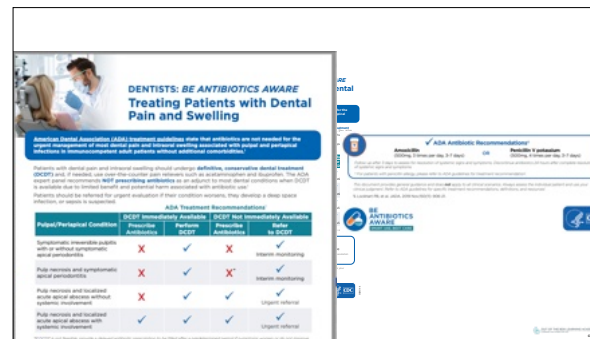
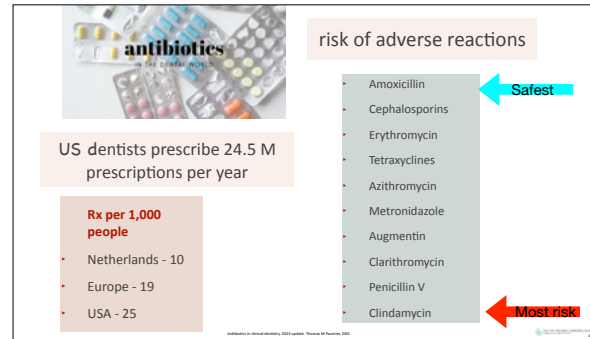
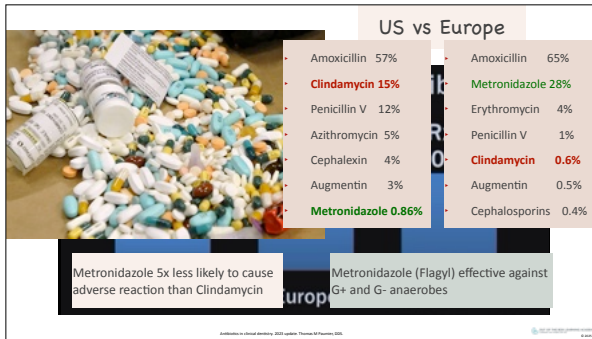
General and specialty dentists are the third highest prescribers of antibiotics in all outpatient settings in the United States.

Reports from 2017 through 2019 suggest that 30% through 85% of dental antibiotic prescriptions are "suboptimal or not indicated."

Antibiotic Use for Urgent Management of Dental Pain and Swelling: ADA Clinical Practice Guideline XXX

Antibiotics





**Dentists in the United States are under pressure from orthopedic surgeons and their patients with prosthetic joints to provide antibiotic prophylaxis before invasive dental procedures (IDP) to reduce the risk of late prosthetic joint infection (LPII).**

## 2022 JAMA - prosthetic joints

- lack of evidence of antibiotic prophylaxis efficacy
- cost of providing antibiotic prophylaxis
- risk of adverse drug reactions
- potential for antibiotic resistance

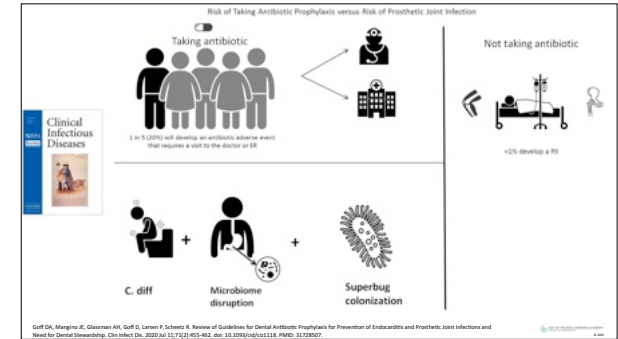
*A common practice for decades, despite a lack of evidence for an association between IDP and LPII*

Thornhill MN, Cohen AS, Rao S, Bore T, Campbell R, Brothman M, Fisher V, Lockhart PE, Springer S, Reddour SM. Quantifying the risk of prosthetic joint infections following invasive dental procedures in England. *JAMA Network Open*. 2022 Jan 5;5(1):e210587. doi: 10.1093/jamanetworkopen/2021/23007. PMID: 35044575. PMCID: PMC8727726.

## 2023 JADA - Antibiotic premed - prosthetic joints

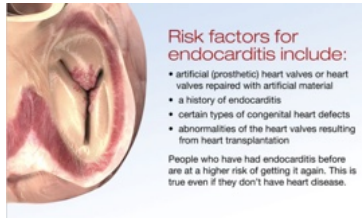
In the absence of benefit, the continued use of AP poses an unnecessary risk to patients from adverse drug reactions and to society from the potential of AP to promote development of antibiotic resistance. **Dental AP use to prevent LPIIs should, therefore, cease.**

Thornhill MN, Gibson TB, Park C, Rosario BL, Bloomers S, Lockhart PE, Springer S, Reddour SM. Quantifying the risk of prosthetic joint infections after invasive dental procedures and the effect of antibiotic prophylaxis. *J Am Dent Assoc*. 2023 Jan;154(1):43-52.e12. doi: 10.1016/j.adaj.2022.10.001. Epub 2022 Dec 2. PMID: 36476606.



## 2025 - American Heart Association

Adults with the highest risk for poor outcomes from IE may be prescribed antibiotics (IE prophylaxis) before certain dental procedures to reduce their risk of developing it. These include procedures that involve manipulation of gingival (gum) tissue or the periapical region (area around the roots) of teeth, or perforation of the oral mucosa.



<https://www.heart.org/en/health-topics/infective-endocarditis>

## 2025 - Premed - endocarditis



**Objective:** Antibiotic prophylaxis is recommended before invasive dental procedures to prevent endocarditis in those at high risk, but supporting data are sparse. We therefore investigated any association between invasive dental procedures and endocarditis, and any antibiotic prophylaxis effect on endocarditis incidence.

**Subjects and methods:** Cohort and case-crossover studies were performed on 1,678,190 Medicaid patients with linked medical, dental, and prescription data.

**Conclusions:** Invasive dental procedures (particularly extractions and oral surgery) were significantly associated with endocarditis in high-risk individuals, but AP significantly reduced endocarditis incidence following these procedures, thereby supporting current guideline recommendations.

Thornhill MN, Gibson TB, Park C, Rosario BL, Bloomers S, Lockhart PE, Springer S, Reddour SM. Endocarditis, medical dental procedures, and antibiotic prophylaxis efficacy in US Medicaid patients. *StatRx*. 2023 Apr;20(2):149-155. doi: 10.1136/statrx-2022-000075. Epub 2023 Apr 27. PMID: 37020575.

## Desiccation Therapy



Sucks water out of biofilm and organic matter

- not an antibiotic
- FDA approved adjunct

- disregulates protein chains
- denatures organic matter
- creates a coagulant mess
- deposits - crumble, peel off, detach

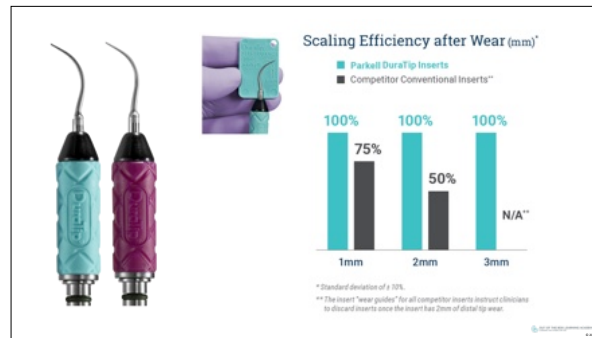
- perio / endo / restorative
- creates a coagulant mess
- deposits - crumble, peel off, detach

## Anticipated outcomes

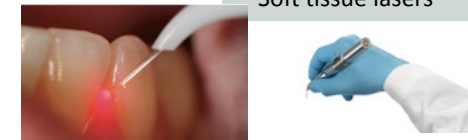


- reduce bacteremia risk
- deposits detach
- eliminate red complex / persisters
- create a hostile environment for pathogens
- inhibits pathogen regrowth

Isola G, Molander S, Williams MC, Sullivan M, Akerman S, Carlsson G, Nunn JH. The effects of a desiccant agent in the treatment of chronic periodontitis: a randomised, controlled clinical trial. *Clin Oral Implants Res*. 2016 Mar;27(3):346-354. doi: 10.1111/cior.12555. Epub 2015 Jun 17. PMID: 26045554.



## Soft tissue lasers



- alters tubule fluid viscosity
- may need to increase setting
- contact manufacturer
- varnish - post treat - occlusion

Bagli A, Casaroli G, et al. Laser-assisted treatment of dental hypersensitivity: a literature review. *Ann Stomatol (Roma)*. 2016;61(4):75-80. Published 2016 Feb 12. doi: 10.1007/s12187-016-9155-5. Epub 2016 Feb 12. PMID: 26845554.

2025 Antibiotics Midwestern Dental Conference - Anne Guignon, RDH, MPH, CSP.key - March 30, 2025

## Arginine products



### EPS Impact

- interferes - EPS formation
- reduces biofilm thickness
- reduces EPS matrix density
- compromises P gingivalis



Nascimento MM. Potential uses of Arginine in Dentistry. *Adv Dent Res*. 2018 Feb;28(1):98-103.

Nascimento MM, Alaker AJ, Huang H, et al. Arginine Metabolism in Supragingival Oral Biofilms as a Potential Predictor of Caries Risk. *JDR Clin Trans Res*. 2019 Jul;4(1):262-271.

Marsh PD. In sickness and in health: what does the Oral Microbiome Mean to UK? An Ecological Perspective. *Adv Dent Res*. 2018 Feb;28(1):60-65.

Huang X, Zhang H, Dong H, Nishikawa NM, Liu C, Zhou X, Cheng L, Ter Cate JM. Effect of arginine on the growth and biofilm formation of oral bacteria. *Arch Oral Biol*. 2017 Oct;82:254-262.

## Polyester filaments



- ▶ Hydrosonic Pro -
- ▶ Ultra small tear drop head



- ▶ antimicrobial products - kill bacteria
- ▶ dense biomass - nutritional source
- ▶ up-regulate virulence - *P. Gingivalis* and *P. intermedia*
- ▶ increased epithelial cytotoxicity

Rodriguez-Hernandez E, Bounie H, Pascual M, et al. Neurotrophic growth of periodontopathogens is a novel virulence factor in oral biofilms. *Sci Rep*. 2017 Apr 26;7(1):1.



- gingivitis reduction - 80% more effective than air floss
- less bleeding than interproximal brushes
- peri-implant mucositis - appropriate alternative to string or IP brushes

Sharma M, Iyer SM, Gargh A, Schuller R. Comparison of two power interdental cleaning devices on plaque removal. *J Clin Dent.* 2012;26(2):17-21.



Probiotics are live microorganisms that, when administered in adequate amounts, confer a health benefit on the host.....



- Gingivitis, peri-implant mucositis, caries
- Non-surgical perio - adjunct
- 1 lozenge - twice daily - 1 to 3 months



- 1 lozenge daily



<http://dx.doi.org/10.1016/j.jmb.2010.05.008>

### Prescription trays



**Problem:** "Therapeutic delivery of  $H_2O_2$  to prevent periodontal disease required mechanical access to subgingival pockets."



- trays create hydraulic seal
  - eliminates dilution
  - up to 9mm
- 10 min therapeutic
  - 15 min full O<sub>2</sub> release



- frequency - caries risk
- mild - none
- moderate - 6x / year
- high/extreme - monthly



- antiseptic
- interferes with glycan production
- reduces microbe adhesion
- unit dose

- 8 drops povidone iodine
- saturate side of swab
- no re-dipping

iodine use in caries prevention and management. Jeremy Horst Keeper, DDS, PhD  
youtube.com/watch?v=vPrkD1w6388&t=8s

C diff - Clostridioides difficile




- ▶ Obligate anaerobe
- ▶ gram positive
- ▶ rod shaped bacillus

- ▶ spore forming
- ▶ toxin producing
- ▶ oral-fecal transmission
- ▶ cross contamination
- ▶ spores are everywhere



## C. diff Burden

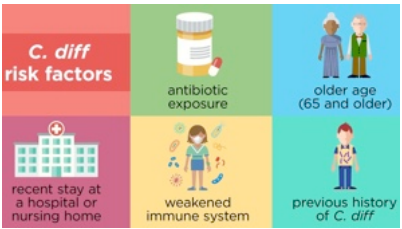


C. diff is estimated to cause **ALMOST HALF A MILLION** infections in the U.S. each year.

**BE ANTIBIOTICS AWARE**  
SMART USE. BEST CARE.

**CDC**

## C. diff risk factors



antibiotic exposure

older age (65 and older)

recent stay at a hospital or nursing home

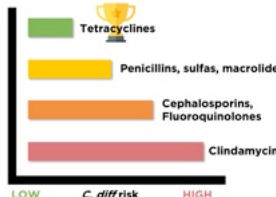
weakened immune system

previous history of C. diff

**Antibiotics - increase the risk for acquiring C diff by 7-10X**

## Risk factors for C. difficile Infection

**C. diff risk from antibiotics can be seen up to 90 days after stoppage**



LOW C. diff risk HIGH

Tetracyclines

Penicillins, sulfas, macrolides

Cephalosporins, Fluoroquinolones


Clindamycin

**IM FAST**

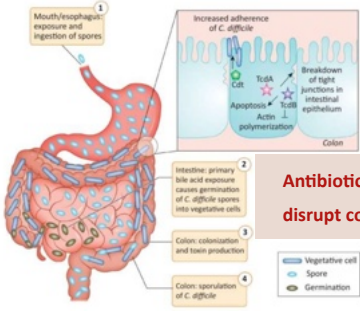
Guerguerian MP, Guenness A, Delbecq C, Ruppert E. Time interval of increased risk for Clostridium difficile infection after exposure to antibiotics. J Antimicrob Chemother. 2012 May;67(5):945-51.

Wong CK, Shorrock N, Spencer RC, Topley DC. Meta-analysis of Antibiotics and the Risk of Community-acquired Clostridium difficile Infection. Antimicrob Agents Chemother. 2012;56(12):3287-91.

**SimonWuMD**



- Is the colon's specialized defense system
- The community of bacteria and other microbes in the colon (microbiome/microbiota) that protect it from pathogens to fight off C. diff infection



1 Mouth/esophagus exposure and ingestion of spores

2 Increased adherence of C. difficile

3 Breakdown of tight junctions in intestinal epithelium

4 Intestine: primary bile acid exposure causes germination of C. difficile spores into vegetative cells

5 Colon: colonization and toxin production

6 Colon: sporulation of C. difficile

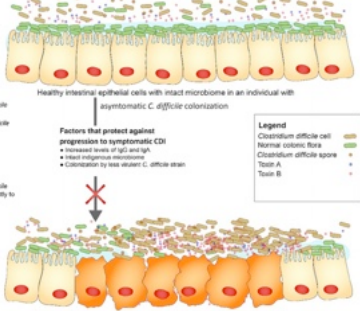
**Antibiotics - disrupt colonization resistance**

Vegetative cell

Spore

Germination

**Trends in Microbiology**



**Risk factors for C. difficile colonization**

- Antibiotic colonization
- Exposure to antibiotics
- Chemotherapy treatment
- Concomitant use
- Healthcare-associated disease

Exposure to C. difficile spores leading to asymptomatic C. difficile colonization

Healthy intestinal epithelial cells with intact microbiome in an individual with asymptomatic C. difficile colonization

**Factors that protect against progression to symptomatic CDI**

- Increased rates of tight and tight
- Host indigenous microbiota
- Colonization by less virulent C. difficile strain

**Risk factors for symptomatic CDI**


- Increased age
- Exposure and duration of antibiotics
- Presence of comorbidities
- Severe underlying disease
- Prolonged healthcare admission
- Exposure to drugs that reduce stomach pH

Exposure to C. difficile spores leading directly to symptomatic CDI

Damaged intestinal epithelial cells in an individual with symptomatic CDI

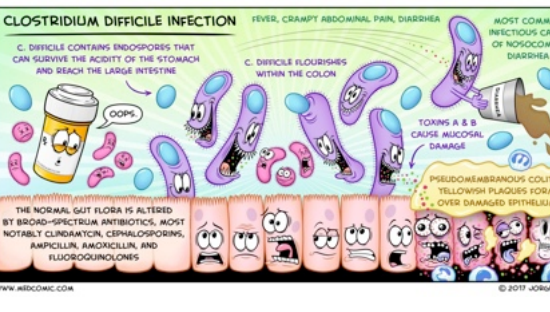
**Legend**

- Clostridium difficile cell
- Normal colonic flora
- Clostridium difficile spore
- Toxin A
- Toxin B



- severe, watery diarrhea
- 10 - 20 episodes daily
- dehydration
- malnutrition
- fatigue
- cramping
- incontinence
- bloating
- abdominal pain

## CLOSTRIDIUM DIFFICILE INFECTION



FEVER, CRAMPY ABDOMINAL PAIN, DIARRHEA

MOST COMMON INFECTIOUS CAUSE OF NOSOCOMIAL DIARRHEA

C. DIFFICILE CONTAINS ENDOSPORES THAT CAN SURVIVE THE ACIDITY OF THE STOMACH AND REACH THE LARGE INTESTINE

C. DIFFICILE FLOURISHES WITHIN THE COLON

TOXINS A & B CAUSE MUCOSAL DAMAGE

PSEUDOMEMBRANOUS COLITIS: YELLOWISH PLAQUES FORM OVER DAMAGED EPITHELIUM

THE NORMAL GUT FLORA IS ALTERED BY BROAD-SPECTRUM ANTIBIOTICS, MOST NOTABLY CLINDAMYCIN, CEPHALOSPORINS, AMPICILLIN, AMOXICILLIN, AND FLUOROQUINOLONES

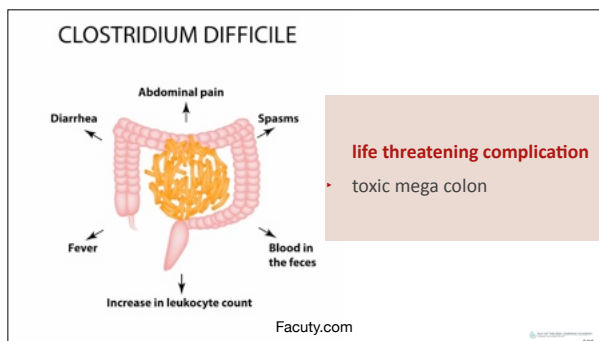
**www.medicamc.com**

Heuvelink AE, Threlkeld N, & Yilmaz S. The burden of CDI in the United States: a multifaceted challenge. BMC Infect Dis. 2012;12(1):28.

## additional risk factors



- co-morbidities (renal disease, liver disease, rheumatoid arthritis, multiple sclerosis, diabetes, inflammatory bowel disease)
- immunosuppressed / recently been hospitalized
- history of corticosteroids / PPI / lipid-lowering therapy



### Emotional toll and fear

- embarrassment
- brain fog

#### Fear

- caught in public - no bathroom
- spreading the infection to others
- recurrence

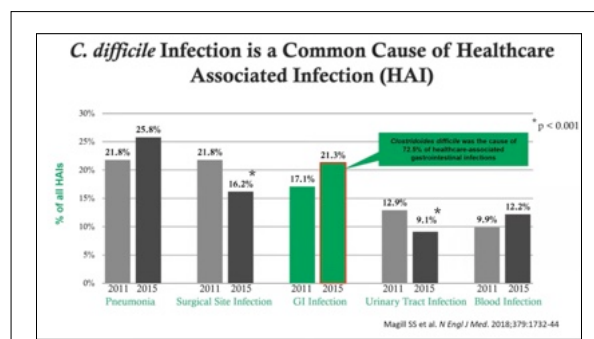
### Quick facts - prevalence

- 60% of all Americans unaware of C diff
- hospital acquired decreased
- community acquired increasing
- overall number remains unchanged
- C diff - may occurs 6 - 12 weeks after antibiotics
- risk - single dose - Clindamycin = full course

### CLOSTRIDIUM DIFFICILE 2013

#### 2015

- 500,000 infections annually
- 30,000 of those with C diff die within one month
- most common microbial cause - health-care associated infections



### Increase in C diff - since 2020

- new strains
- more virulent
- resistant to certain antibiotics
- more easily spread

### 2025 updates

500,000 infections annually / 30,000 die annually

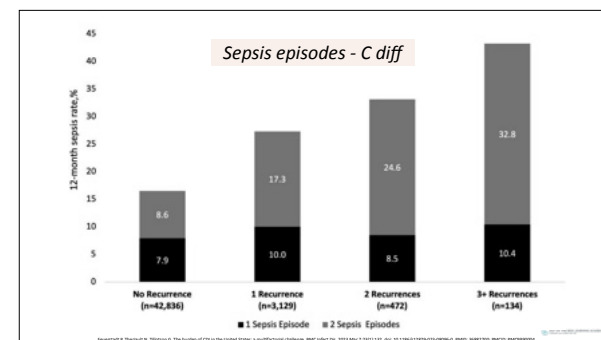
- health-care associated infections - declining
- community-based increasing
- 35% recurrence - (60% multiple recurrences)
- 60% used antibiotics in previous 3 months
- female / older

### Recurrent C. diff Infections

About **1 IN 6** patients who get C. diff infection will get it again in the subsequent 2-8 weeks.

BE ANTIBIOTICS AWARE  
EXACT USE BEST CARE

CDC





## Dental considerations

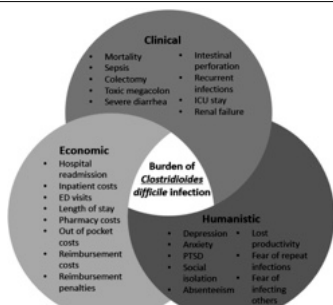


- **medical decision** - MDs should Rx
- do not call in Rx for medical
- do not supply meds to patient
- advise high risk pts on antibiotics at risk for CDI to avoid outpatient care

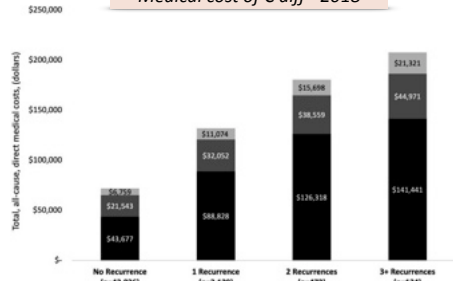
## Talk With Your Healthcare Professional About Your Risks For Developing C. diff Infection Before Starting An Antibiotic



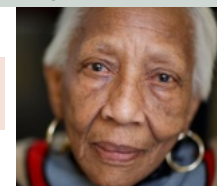
## Financial and life altering impact of C diff



## Medical cost of C diff - 2018



## rCDI (recurrent C diff infection) - significant disability



- extreme loneliness
- isolation

- social life collapse
- fear of recurrence

- high level disability
- episodes unpredictable

## What you need to know about C. diff

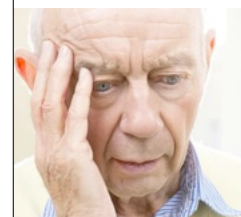


- Clostridium difficile
- 500,000 infections per year/U.S.
- 15% die within first 30 days
- 30,000 die annually/U.S.
- 25-30% infection recurrence, multiple recurrences becoming more common
- Growing resistance to antibiotics
- That's me in the photo - diagnosed with C. Difficile following a dental procedure and Clindamycin prescribed "just in case."
- My fourth hospital admission. No response to multiple rounds of antibiotics.

## My Story

- rCDifficile Recurrence
- One year ago I battled a lethal antibiotic resistant strain of C. difficile
- It followed a simple extraction #3, socket graft with 1-PHF. No infection present, normal oral structure
- I was prescribed clindamycin "just in case" by the periodontist as a defense prescription.
- Here's my story:
  - Diagnosed February 17, 2022
  - 3 more recurrent infections
  - 4 rounds of antibiotics
  - 4 hospital admissions (2x by ambulance)
  - 30 pound weight loss in 4 months
  - My only risk factor was an antibiotic I didn't need
  - A fecal microbiota transplant saved my life on May 3, 2022
  - Total insurance claims = \$83,000

## Dental considerations



- ask about C diff on health Hx
- most disinfectants do not kill spores
- HC workers high risk
- outpatient offices have high levels
- spreading the infection to others



## Product Resources – 2025

### **Personal Care Products**

XyliMelts and XyliGel  
Professional Sample Box  
[oracoat.com/pages/contact-us](http://oracoat.com/pages/contact-us)

Basic Bites Arginine Chews  
[basicbites.com/professional/sample-request/](http://basicbites.com/professional/sample-request/)  
Basicbites.com  
516-484-5600

Salese and Dentiva Lozenges  
877-419-2646  
[nuvorainc.com](http://nuvorainc.com)

Curaprox Velvet toothbrush, 5460 brush,  
Hydrosonic Pro power brush, Samba  
[curaprox.us/info/toothbrushes](http://curaprox.us/info/toothbrushes)

BioGaia Probiotics  
<https://www.biogaia.com/health-areas/probiotic-oral-health/>

WaterPik Water Flosser  
<https://www.waterpik.com/oral-health/pro/trial-offers/>

### **Additional Care Products**

CariScreen - Gum, varnish, rinse, gels,  
spray, lollipops  
Carefree.com

Ice Chips xylitol candy  
[Icechipsandy.com](http://Icechipsandy.com)  
866-202-6623

SalivaMAX saliva support  
[forwardscience.com](http://forwardscience.com)

Elevate Oral Care  
All Day Dry Mouth Spray/Gel,  
5000 toothpaste with xylitol  
[elevateoralcare.com](http://elevateoralcare.com)

Tom's/Maine Rapid Relief  
Sensitive Toothpaste  
OTC at drug stores

Colgate  
Preident 5000 / Varnish

Spry xylitol mints,  
gum, nasal spray  
[Xlear.com](http://Xlear.com)

Theodent toothpaste  
[Theodent.com](http://Theodent.com)

### **Diagnostics /Therapeutics**

Perio Protect RX Trays  
[Providers.perioprotect.com](http://Providers.perioprotect.com)  
877.434.GUMS (4867)

pH paper – 0.0 to 6.0  
[microessentiallab.com](http://microessentiallab.com)

Guided Biofilm Therapy – EMS

Cavity pHighter Test Strips  
[CAOGroup.com](http://CAOGroup.com)

Synapse Dental Pain Eraser  
[dentalpaineraser.com/dental/](http://dentalpaineraser.com/dental/)

Teethmate Desensitizer  
Dental supply companies

Perio DT Desiccation Gel  
Clear Defense Silver Fluoride  
[youngspecialties.com](http://youngspecialties.com)

Papacarie Duo Caries Removal,  
Povi-One Iodine, Advantage  
Arrest – Silver diamine gel,  
Black Diamond Silver Fluoride.  
[elevateoralcare.com](http://elevateoralcare.com)

Cervitex Plus CHX Thymol  
Varnish  
[Ivoclarvivadent.com](http://Ivoclarvivadent.com)

NoGag  
[nogag.com/dentists](http://nogag.com/dentists)

Infinity cordless polisher  
Young polishing handpiece  
Dental supply companies

Loupes and Headlights  
Orascopic.com  
800-369-3698

Crown Seating saddle stools  
[info@crownseating.com](mailto:info@crownseating.com)  
303-693-1104

Parkell DuraTips –  
magneto ultrasonic tips –  
Dental supply companies





**BioGaia**



Scan Me  
For a **FREE**  
Lunch & Learn



waterpik.com/LnL



**Synapse Dental Pain Eraser**



**Parkell Dura Tip**

THE NEW DENTAL ANTIBIOTIC GUIDELINES  
Prophylaxis, Stewardship and Appropriate  
Clinical Use

<https://www.dentalceacademy.com/antibiotics-dentistry-prophylaxis-dentalceacademy>

Desiccation Therapy 1.0 – May 6, 2025  
Desiccation Therapy 2.0 – May 20, 2025

CLOSTRIDIUM DIFFICILE: DENTISTRY'S  
OVERLOOKED THREAT

<https://www.dentalceacademy.com/clostridium-difficile-in-dentistry>