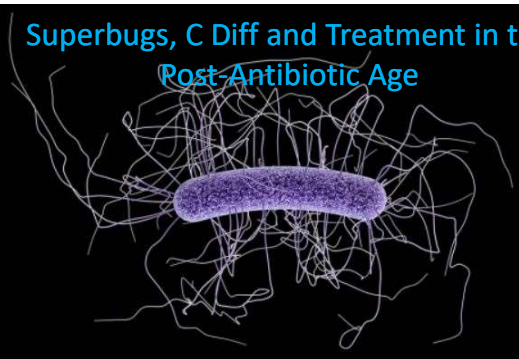
Superbugs, C Diff and Treatment in the Post-Antibiotic Age



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Superbug

A STRAIN OF BACTERIA THAT HAS BECOME RESISTANT TO ANTIMICROBIAL DRUGS.

2

Antibiotic-resistant bacteria **infect**
someone in the US
every 11 seconds
and
kill someone every 15 minutes.

Antibiotic Resistance Threats in the US 2019. https://www.cdc.gov/drugresistance/pdf/threats-report/2019-ar-threats-report-508.pdf

3

MINNESOTA DEPARTMENT OF PUBLIC HEALTH

Studied 5 counties, 2009-2015

2176 reported C. diff infections, 1626 confirmed

57% prescribed antibiotics, of which 15% prescribed for dental procedures

"Antibiotics Prescribing for Dental Procedures in Community-Associated Clostridium difficile cases. Minnesota. 2009-2015." Open Forum Infectious Diseases.

4

NUMBER OF OUTPATIENT RX/YEAR IN 2021

25 Million by Dentists

211 Million by all Prescribers

https://www.cdc.gov/antibiotic-use/pdfs/annual-report-2021-h.pdf

5

% OF 168,420 DENTAL VISITS WHEN ABX NOT NECESSARY 2011-2015

80.6 %

https://www.cidrap.umn.edu/antimicrobial-stewardship/researchers-highlight-serious-side-effects-unneeded-dental-antibiotics

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PATIENTS MORE LIKELY TO RECEIVE UNNECESSARY ANTIBIOTICS

Prosthetic Joint Devices

https://www.cidrap.umn.edu/antimicrobial-stewardship/researchers-highlight-serious-side-effects-unneeded-dental-antibiotics

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ANTIBIOTIC RELATED ADVERSE EVENTS

1 in every 5 ER visits for adverse drug events in the US is for antibiotic-related adverse events

Fluent et al. JADA 2016

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DENTAL SCRIPTS FOR CLINDAMYCIN

Dentists are #1 outpatient prescribers of Clindamycin

https://www.cidrap.umn.edu/antimicrobial-stewardship/researchers-highlight-serious-side-effects-unneeded-dental-antibiotics

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ADVERSE EVENT MOST COMMONLY ASSOCIATED WITH CLINDAMYCIN

Clostridioides difficile infection (CDI)

https://www.cidrap.umn.edu/antimicrobial-stewardship/researchers-highlight-serious-side-effects-unneeded-dental-antibiotics

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C diff is found everywhere….including your shoes

- New research presented at IDWeek 2021 found 26% of samples from both sites inside and outside health care tested positive for toxigenic *Clostridium difficile* strains.
- Shoe soles had the highest positivity rates with 45% of worldwide samples testing positive for *C difficile*, even though it is usually thought of as a hospital-associated infection.
- In this study, researchers collected samples from public areas, health care settings, and shoe soles at locations in the United States and 11 other countries between 2014 and 2017, comparing the rates of *C difficile* between settings.
- The researchers included shoe soles to learn more about their potential role in environmental transmission.
- To help prevent the spread of the infection, both authors said simply washing your hands and taking off your shoes in your home can drastically help.

https://www.ajmc.com/view/shoe-soles-are-a-major-cause-of-c-difficile-transmission

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Two phases of C. difficile infection

- **Vegetative form:** Associated with symptoms (diarrhea). Produce toxins A and B leading to colitis
- **Spore form:** Spore is released and can live in the open environment for several months to years. Very difficult to kill

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Vegetative Form: Associated with Symptoms

Vegetative Form is associated with symptoms:

- Can live on moist surfaces for up to 6 hours
- Produces Toxins A and B
- Susceptible to:
  - ✓ Gastric acids
  - ✓ Antimicrobial soap
  - ✓ Alcohol based hand sanitizer

Jump, R. L., Pultz, M. J., & Donskey, C. J. (2007). Vegetative Clostridium difficile survives in room air on moist surfaces and in gastric contents with reduced acidity: a potential mechanism to explain the association between proton pump inhibitors and C. difficile-associated diarrhea?. *Antimicrobial agents and chemotherapy*, *51*(8), 2883–2887. https://doi.org/10.1128/AAC.01443-06

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Spore Form: Difficult to kill

- C Diff Spore can survive on surfaces and inanimate objects for 6+ months to years
- Resistant to:
  - ✓ Gastric Acid
  - ✓ Antibacterial soaps
  - ✓ Alcohol based hand sanitizers
- Rapidly changes to the vegetative form

Jump, R. L., Pultz, M. J., & Donskey, C. J. (2007). Vegetative Clostridium difficile survives in room air on moist surfaces and in gastric contents with reduced acidity: a potential mechanism to explain the association between proton pump inhibitors and C. difficile-associated diarrhea?. *Antimicrobial agents and chemotherapy*, *51*(8), 2883–2887. https://doi.org/10.1128/AAC.01443-06

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Transmission

- Spore is ingested
- Resistant to gastric acids/stomach
- Reaches the small intestine, exposed to bile salts and germinates converting to the vegetative form where it multiplies as it continues on to colonize the colon and produce toxins.

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Colonization Resistance = Gut Microbiome

- 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

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Antibiotics Disrupt Colonization Resistance

Colonization Resistance is disrupted when antibiotics are introduced allowing C. difficile to proliferate, produce toxins and cause symptoms.

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Moderate to Severe Symptoms

- Watery diarrhea, as often as 10 to 15 times a day
- Abdominal cramping and pain, which may be severe
- Rapid heart rate
- Dehydration
- Fever
- Nausea
- Increased white blood cell count
- Kidney failure
- Blood or pus in the stool

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Life threatening Complications

- Ileus
- Toxic Megacolon

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Who is affected? *Anyone* but the following populations are at greater risk:

- Anyone taking antibiotics
- Admitted to hospital
- Nursing home resident
- Over 65 years of age
- Female
- Immunocompromised (Cancer, HIV…)
- Anyone with prior C. diff infection

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2021 Infective Endocarditis AHA Guidelines Removed Clindamycin for Pen Allergic Patients. All other 2007 recommendations remain the same:

A recent study in the United Kingdom suggested that a single dose of clindamycin may cause complications, including death, from Clostridioides difficile infection

- Clindamycin may cause more frequent and severe reactions than other antibiotics used for AP, and its use is no longer suggested in this document.
- Up to 15% of community-acquired C difficile infection may be attributable to antibiotics prescribed for a dental procedure.

Prevention of Viridans Group Streptococcal Infective Endocarditis A Scientific Statement From the American Heart Association.
https://www.ahajournals.org/doi/pdf/10.1161/CIR.0000000000000969?cookieSet=1

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Antibiotics and CDI Risk

Very Commonly Related	Less Commonly Related	Uncommonly Related
• Clindamycin • Ampicillin • Amoxicillin • Cephalosporins • Fluoroquinolones	• Beta-lactam inhibitors • Macrolides • Carbapenems • Tigecycline	• Aminoglycosides • Metronidazole • Rifampin • Tetracyclines • Daptomycin • Sulfonamides • Trimethoprim

CDC

(Bouza E, *Med Clin North Am*, 2006; Loo VG, N Engl J Med, 2005)

8

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C. DIFF

56% of CDI associated with Healthcare Facility

44% of CDI associated with community

65% of community associated CDI occurred after use of antibiotics

https://www.ada.org/resources/research/science-and-research-institute/oral-health-topics/antibiotic-stewardship?utm_source=adaorg&utm_medium=vanityurl

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C. DIFF

1 in 6 patients who get *C. diff* will get it again in the next 2-8 weeks.

1 in 11 people over age 65 diagnosed with a healthcare-associated *C. diff* infection **die within one month**.

https://www.cdc.gov/cdiff/what-is.html

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Costs hospitals $6,000,000,000/year

https://www.cdc.gov/cdiff/what-is.html

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ANTIBIOTIC STEWARDSHIP

OSAP: https://www.osap.org/antibiotic-stewardship-for-prescribers

MARR: https://www.mi-marr.org/dental-resources/

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ANTIBIOTIC STEWARDSHIP SUMMIT ON SUNDAY FEBRUARY 4

Offers guidelines for the use of antibiotics for prophylaxis and treatment of oral infections

Participants will receive numerous clinical tips, tools, and resources to develop and implement antibiotic stewardship programs in their practice.

https://site.pheedloop.com/event/osapbootcamp/program/overview

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ANTIBIOTIC STEWARDSHIP

Practice Prevention!

Intervene with treatment at the earliest signs of infection and inflammation

Choose non-antibiotic treatment options

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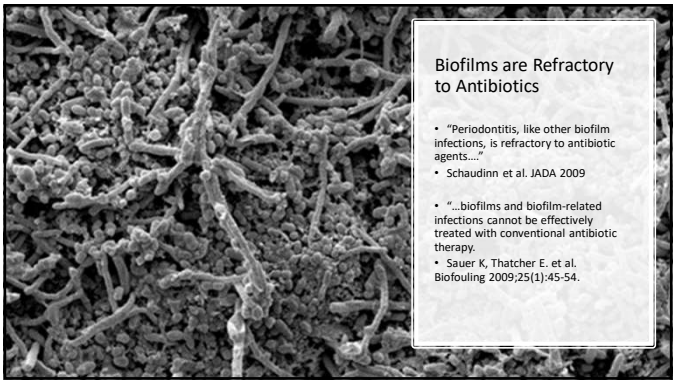

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1.7% Hydrogen Peroxide

- Oral Debriding Agent/Wound Cleanser
- Debrides matrix
- Debrides bacterial cell walls
- Oxygenates the pockets
- No allergic reactions
- Bacteria cannot build up resistance to peroxide as they do to antibiotics

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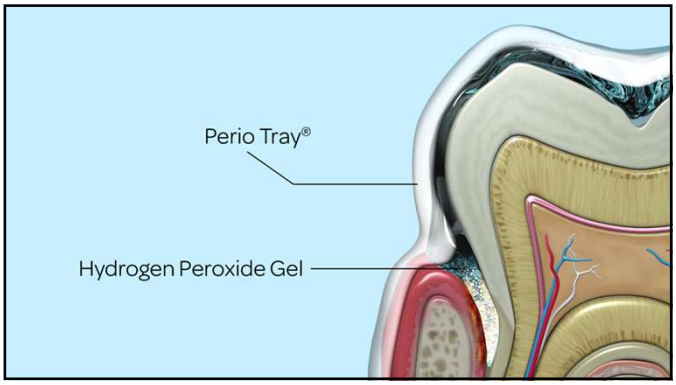

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Do you ask your patients if they have had previous C Diff infection (health history form)?

- C Diff can recur with subsequent antibiotics
- These patients cannot be prescribed antibiotics in most cases

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Legal Cases

1. Total colectomy and permanent fecal incontinence following clindamycin prescription for pulpitis.

$1.25 million verdict. Clindamycin. https://www.robertkreisman.com/medical-malpractice-lawyer/illinois_dental_malpractice_ca_1/

2. Antibiotic prescription leading to C. Diff infection resulting in death of a 35 y/o father.

General dentist prescribed clindamycin based on study club discussions to "quiet a nonvital tooth" prior to endo. Patient developed GI distress, dentist prescribed Lomodil (anti-diarrheal). Patient died a few days later in the hospital with toxic megacolon due to C Diff infection.

https://www.drbicuspid.com/index.aspx?sec=ser&sub=def&pag=dis&ItemID=319315

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Dr. Debra Goff, PharmD, Infectious Disease Specialist – (Husband is a prosthodontist) "When the doctor prescribing the antibiotic never sees the harm, why would they think there's any risk in giving it?"

Apr 5, 2022 Dr. Brown (Periodontist – Temple University/Penn) talks with Dr. Goff about the radical change in the way in which we see antibiotics in clinical practice.

https://youtu.be/RULLC3LU8Zg

Debra Goff Pharm.D., FIDSA, FCCP
Infectious Diseases Specialist
Global Antibiotic Stewardship
The Ohio State University Wexner Medical Center
Professor of Pharmacy Practice
The Ohio State University College of Pharmacy

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Dr. Debra Goff, Antibiotic Stewardship TedX Talk "RISK"

https://youtu.be/ALryAB_AYiA

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Resources

- The Peggy Lillis Foundation: https://peggyfoundation.org/
- Open Biome: https://www.openbiome.org/
- Ferring: https://microbiome.ferring.com/
- The C Diff Foundation: https://cdiff.foundation/
- CDC: https://www.cdc.gov/cdiff/index.html

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Resources: Evidence Based Guidelines for Prophylaxis and Antibiotic Stewarship:

- ADA and Academy of Orthopedic Surgeons – Guidelines: https://www.ada.org/resources/research/science-and-research-institute/oral-health-topics/antibiotic-prophylaxis
- Prevention of Viridans Group Streptococcal Infective Endocarditis A Scientific Statement From the American Heart Association: https://www.ahajournals.org/doi/pdf/10.1161/CIR.0000000000000969
- ADA Evidence Based Guidelines for Antibiotic Stewardship:

https://jada.ada.org/article/S0002-8177(19)30617-8/fulltext?dgcid=PromoSpots_EBDsite_ABX&_ga=2.10794932.1836139384.1655475561-502732509.1654985090

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List K: EPA's Registered Antimicrobial Products Effective against Clostridium Difficile Spores

https://www.epa.gov/pesticide-registration/list-k-epas-registered-antimicrobial-products-effective-against-clostridium

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Literature

Centers for Disease Control and Prevention. Clostridioides difficile Infection. https://www.cdc.gov/HAI/organisms/cdiff/Cdiff_infect.html.

Martin JS, Monaghan TM, Wilcox MH

Clostridium difficile infection: epidemiology, diagnosis and understanding transmission.

Nat Rev Gastroenterol Hepatol. 2016; 13: 206-216

The Joint Commission Center for Transforming Healthcare

Reducing Clostridium Difficile Infections Project. Oakbrook Terrace: The Joint Commission, 2016

Zhu D Sorg JA Sun X

Clostridioides difficile biology: sporulation, germination, and corresponding therapies for C. difficile infection.

Front Cell Infect Microbiol. 2018; **8**: 29

Weber DJ Anderson DJ Sexton DJ Rutala WA

Role of the environment in the transmission of Clostridium difficile in health care facilities.

Am J Infect Control. 2013; **41**: S105-S110

Shaughnessy MK Bobr A Kuskowski MA et al.

Environmental contamination in households of patients with recurrent Clostridium difficile infection.

Appl Environ Microbiol. 2016; **82**: 2686-2692

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ANTIBIOTICS IN CLINICAL PRACTICE: ANTIBIOTIC STEWARDSHIP AND APPROPRIATE ANTIBIOTIC USE

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REGISTER https://www.dentalceacademy.com/antibiotics-clinical-guidelines-dentistry

Dr. Thomas M. Paumier, DDS

Dr. Paumier is on the faculty of the Cleveland Clinic Mercy Hospital GPR in Canton and is a Fellow in the International and American College of Dentists. He was a member of the ADA and American Academy of Orthopedic Surgeons expert panels who wrote the Clinical Practice Guidelines and Appropriate Use Criteria for Antibiotic Prophylaxis for Prosthetic Joint Patients. He also was a co-author of the ADA Clinical Practice Guideline for Appropriate Antibiotic Use for Odontogenic Infections and was the 2019 recipient of the ADA Evidence Based Dentistry Clinical Practice Award. He was one of 6 dentists appointed to the ADA Dental Practice Recovery Task Force during the COVID-19 Pandemic. He regularly lectures to dental residents and students at Case School of Dental Medicine and NYU Langone Medical Center. He is vice-chair of the Cleveland Clinic Mercy Hospital Board and Chairman of the Cleveland Clinic Mercy Development Foundation. He is a past president of the Ohio Dental Association and the Stark County Dental Society.

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