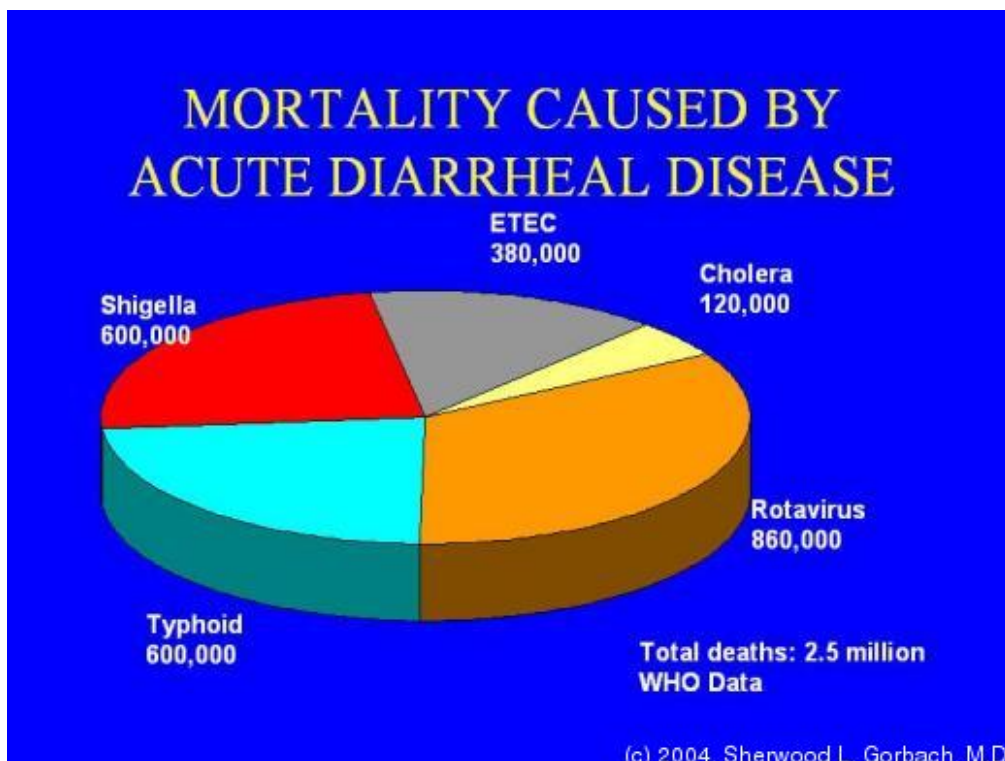


1. Classification of Bacterial Toxins Associated with Diarrhea...

CLASSIFICATION OF BACTERIAL TOXINS ASSOCIATED WITH DIARRHEA	
CYTOTONIC	CYTOTOXIC
Vibrio cholerae	Shigella
Escherichia coli	Clostridium perfringens
LT & ST	Types A & C
Bacillus cereus	Clostridium difficile
? Aeromonas	Staphylococcus aureus
? Other Vibrios	? Salmonella
	? Campylobacter

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2. Mortality Caused by Acute Diarrheal Disease



3. Diagnosis of Diarrhea

DIAGNOSIS OF DIARRHEA

Incidence

- 1-2 cases/year in the USA
- 3-5 cases/year in developing countries
- twice higher figures in children

Laboratory Diagnosis

- 2/3 of outbreaks undiagnosed
- 1/2 of hospitalized cases undiagnosed
- 1/2 of “dysentery” cases undiagnosed
- 4/5 of outpatient cases undiagnosed

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4. Eighth Pandemic of Cholera *Vibrio Cholerae* 0139, Non-01

EIGHTH PANDEMIC OF CHOLERA VIBRIO CHOLERAЕ 0139, NON-01

- ☉ Onset in December 1992 in Bangladesh
- ☉ By March 1993, over 100,000 cases, 1400 deaths
- ☉ 40-50% of cholera cases in affected areas caused by 0139 strain
- ☉ Spread to other parts of India and to Pakistan; imported cases in USA and Europe
- ☉ Indistinguishable clinically from classical cholera
- ☉ Occurs mostly in adults; prior immunity to cholera is not effective
- ☉ Resembles El Tor vibrios, but does not belong to 138 known serogroups
- ☉ Produces large amounts of cholera enterotoxin

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5. Types of E. Coli Pathogens

TYPES OF E. COLI PATHOGENS

- Enteropathogenic EPEC
- Enterotoxigenic ETEC
- Enteroinvasive EIEC
- Enterohemorrhagic EHEC
- Enterοaggregative EAggEC

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6. Virulence Factors in Toxigenic E. Coli

VIRULENCE FACTORS IN TOXIGENIC E. COLI

- Toxin production
- Adherence to small bowel mucosa

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7.

Toxigenic E. Coli

TOXIGENIC E. COLI

Heat-labile toxin (LT)

- Similar chemically and antigenically to cholera toxin
- Activates adenylate cyclase

Heat-stable toxin (ST)

- Family of toxins in animals and humans
- Activates guanylate cyclase
- Rapid onset, short course

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8.

Shigellosis

SHIGELLOSIS

- 4 serotypes
 - *S. sonnei* most common in developed countries
 - *S. dysenteriae* most severe
- Watery diarrhea most common
- Grossly bloody stool 5-10%
- PMN's and RBC's in stool
- Fever and systemic symptoms
- Tenesmus
- Mild disease in children, more severe in adults
- Antibiotic treatment indicated

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9. Enterohemorrhagic E. Coli

**ENTEROHEMORRHAGIC
E. COLI**

- Children and adults
- Bloody diarrhea
- O157:H7
- Shiga-like toxin
- Vero-cell assay for feces
- Hemolytic-uremic syndrome
(HUS)

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10. Salmonella Syndromes

SALMONELLA SYNDROMES

Gastroenteritis	75%
• mild (most common) to severe, dehydrating	
• Colitis	
Bacteremia	5-10%
• with/without diarrhea	
• Arteritis	
• Endocarditis	
• AIDS	
Typhoidal (enteric fever)	5-10%
• with/without diarrhea	
Localized	5%
• bone, joints	
• meninges	
• wounds	
• gall bladder	
Carrier state (>1 year)	<1%

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11.

Campylobacter

CAMPYLOBACTER

- *C. jejuni* - the GI pathogen
- 5-15% of all diarrhea cases
- Chickens most common vehicle
- “Dysentery”-like disease
- 2-phase disease
- Antibiotic treatment questionable

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12.

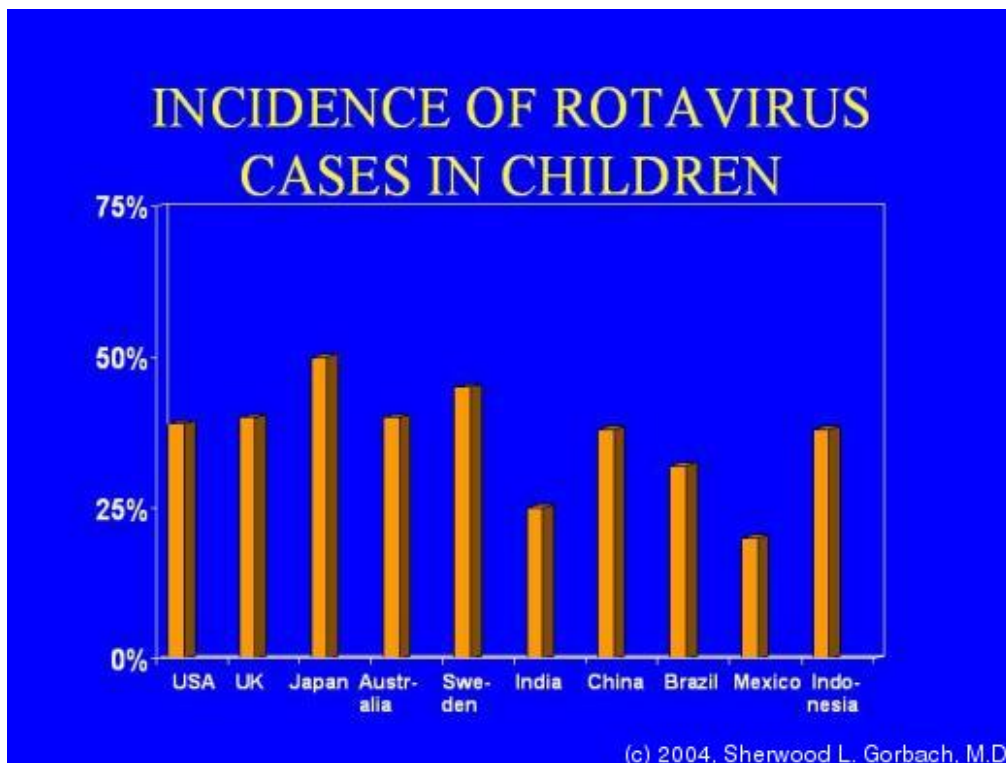
Yersinia

YERSINIA

- Age-related
 - gastroenteritis in children
 - terminal ileitis in adolescents
 - Joints and/or rash in young adults
- Terminal ileum, favorite target
- Acquired from food (animals) and milk
- Antibiotic treatment, questionable
- Causes severe disease in immunocompromised hosts

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13. Incidence of Rotavirus Cases in Children



14. Fecal Leukocytes Absent in Infectious Diarrhea

FECAL LEUKOCYTES ABSENT IN INFECTIOUS DIARRHEA

Vibrio cholerae	<u>Viruses:</u>
Enterotoxigenic	Rotavirus,
E. Coli (ETEC)	Norwalk virus
E. coli (ETEC)	<u>Food poisoning:</u>
Giardia	Staph aureus,
E. histolytica	Clostridium

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15. Fecal Leukocytes Present in Infectious Diarrhea

**FECAL LEUKOCYTES PRESENT
IN INFECTIOUS DIARRHEA**

<u>PRESENT</u>	<u>VARIABLE</u>
Shigella	Salmonella
Campylobacter	Yersinia
Invasive E. coli	Clostridium difficile
	Non-cholera Vibrios

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16. Antimicrobial Treatment

ANTIMICROBIAL TREATMENT

- Recommended in symptomatic cases
 - Shigella
 - C. difficile
 - Traveler's diarrhea
 - E. coli (infants)
 - Typhoid fever
 - Cholera
- Not generally recommended, inculsive data
 - Campylobacter
 - Yersinia
 - Vibrios (non-cholera)
 - E. coli (EHEC, EPEC, EIEC)
 - Aeromonas
- Not recommended (except for unusual cases)
 - Non-typhoidal Salmonella
 - E. coli (ETEC)

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17.

Treatment of Diarrhea

TREATMENT OF DIARRHEA	
<u>PATHOGEN</u>	<u>DRUGS OF CHOICE</u>
S. typhi	Quinolone, or TMP/SMX, ampicillin (sensitive strains)
Shigella	Quinolone or TMP/SMX (sensitive strains)
Campylobac	Quinolone, erythromycin
V. cholerae	doxycycline or ciprofloxacin
C. difficile	metronidazole or vancomycin
Giardia	metronidazole, furazolidone, quinacrine, albendazole

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18.

Campylobacter Resistance in Minnesota

Campylobacter Resistance in Minnesota	
<ul style="list-style-type: none">• 1992: 1.3% of isolates were resistant to quinolones• 1998: 10.2% of isolates were resistant to quinolones• Temporally associated with licensure of quinolones in poultry	

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19. Use of Quinolones in Poultry

Use of Quinolones in Poultry

- Campylobacter resistance:
 - In The Netherlands from 1985 to 1989 went from 0% to 11%
 - In Spain from 1989 to 1991 went from 0-3% to 30-50%
- Temporally related to licensing of quinolone use in poultry

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20. In Vitro Campylobacter Resistance in Thailand

In Vitro Campylobacter Resistance in Thailand

1987-1990	0%
1993	40%
1994	50%
1995	84%
1996	96%

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21. Nonspecific Therapy of Infectious Diarrhea - 1

**NONSPECIFIC THERAPY OF
INFECTIOUS DIARRHEA-1**

- Effective
 - Fluid
 - oral or intravenous
 - Food
 - continue nutrition intake
 - avoid caffeine, lactose & methylxanthines
 - Antimotility drugs
 - codeine, paragoric & tincture of opium
 - Diphenoxylate (lomotil)
 - Loperamide (imodium)
 - Bismuth subsalicylate (PeptoBismol)

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22. Nonspecific Therapy of Infectious Diarrhea - 1 (cont.)

**NONSPECIFIC THERAPY OF
INFECTIOUS DIARRHEA-1**

- Effective
 - Fluid
 - oral or intravenous
 - Food
 - continue nutrition intake
 - avoid caffeine, lactose & methylxanthines
 - Antimotility drugs
 - codeine, paragoric & tincture of opium
 - Diphenoxylate
 - Loperamide
 - Bismuth subsalicylate

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23. Nonspecific Therapy of Infectious Diarrhea - 2

NONSPECIFIC THERAPY OF INFECTIOUS DIARRHEA-2

Not effective

Kaolin, pectin, charchol

Anticholinergics

Cholestyramine

Lactobacilli

Hydroxyquinolones (enterovioform,
diiodohydroxyquin)

Warning: may be harmful

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24. Control of Diarrheal Diseases

CONTROL OF DIARRHEAL DISEASES

AVOID FECAL CONTAMINATION

- **Improve food preparation and handling**
- **Control sewage disposal**
- **Provided potable water supplies:
Piped and chlorinated**

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