

Robert Wood Johnson Foundation











Acute Gastrointestinal Infections

Syndromic Approach

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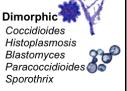
- Introduce the major pathogens that cause gastrointestinal infections including viruses, bacteria, and protozoa.
- Describe the different clinical syndromes associated with acute infections of the gastrointestinal tract

Viruses

Fungi

Malassezia

Mold Yeast Aspergillus Mucor Candida Rhizopus Cryptococcus Fusarium **Pneumocystis**



Microsporidia **Dermatophytes** Microsporum, Epidermophytum Trichophytum

Protozoa

GI/GU Entamoeba Giardia Cryptosporidium Trichomonas

Plasmodium Babesia

Blood

Naegleria

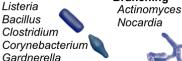
Trvpanosoma

Leishmania

Toxoplasma

Tissue

Gram positive Bacteria



Branching

RSV Enteroviruses Human **Poliovirus** metapneumovirus Rotavirus Coronavirus Norovirus Hepatitis A

Rabies

West Nile

Dengue

Vector borne

Chickengunya

Yellow Fever

RNA

Rhinovirus

Coxsackie

Hepatitis C

HIV

HTLV-1

Measles

Mumps

Rubella

(MERS, SARS) Ebola

Influenza A. B

Parainfluenza

Epstein Barr virus HHV6, HHV7, HHV8 Smallpox

Molluscum contagiosum Hepatitis B

Parvovirus Human papillomavirus BK polyomavirus

Ticks

DNA

Adenovirus

Herpes simplex

Varicella zoster

Cytomegalovirus

Spirochaetes

Treponema

Arthropods

Vectors of: Lyme borreliosis, Relapsing Fever, RMSF, other Rickettsia, Babesia, Anaplasma, Ehrlichia

Trematodes (Flukes) Schistosoma (Schistosomiasis)

Helminths

Clonorchis & Fasciola (Liver Flukes) Paragonimus (Lung Fluke)

Cestodes (Tapeworms)

Taenia saginata (Beef Tapeworm)

(Fish Tapeworm)

(Dog Tapeworm)

Echinococcus

Taenia solium (Pig Tapeworm) Diphyllobothrium

Strongyloides (Strongy) Toxocara (Dog Ascaris) Trichinella (Trichinosis)

Onchocerca (River Blindness) Loa Loa (Eye Worm) Wuchereria & Brugia (Elephantiasis)

Nematodes

(Hookworm)

(Roundworms)

Enterobius (Pinworm)

Trichuris (Whipworm)

Ascaris (Giant worm)

Ancylostoma & Necator

Enteric flora **Respiratory Pathogens** E. coli Haemophilus Klebsiella Spiral Bordatella Proteus Campylobacter Legionella Serratia Helicobacter Enterobacter

Anaerobic

Bacteroides

Fusobacterium

Prevotella

Gram negative Bacteria

Rods

Propionibacterium

Acid Fast Bacilli

Mycobacterium tuberculosis

Non-tuberculous Mycobacteria

Mycobacterium leprae

Cocci

Staphylococcus

Rods

Streptococcus

Enterococcus

No cell wall

Pleomorphic

Mycoplasma 📢

Enteric pathogens

Shiaella

Yersinia

Salmonella

Opportunistic Pseudomonas

> Vibrio Diplococci Neisseria Moraxella

Comma

Yersinia Coxiella Chlamydophila psittaci Rickettsia Ehrlichia Anaplasma Borrelia Leptospira

Zoonotic

Campylobacter

Pasteurella

Bartonella

Brucella Francisella

> Leptospira Intracellular Chlamydia Chlamydophila

Borrelia

Rickettsia

Coxiella Legionella Ehrlichia Anaplasma

Bartonella

Francisella

Salmonella

Brucella

Shigella

Rickettsialpox Mosquitoes

Trench Fever

Mites (scabies)

Fleas

Lice (pediculosis)

Vectors of: Epidemic typhus,

plaque, Tularemia

Vectors of: Malaria, Dengue, Chikungunya, West Nile, Yellow Fever

Vectors of: Scrub typhus,

Vectors of: Cat-scratch fever. Murine typhus, Bubonic

Branching

Nocardia

Actinomyces

Gram positive Bacteria

Rhinovirus

Coxsackie

Poliovirus

Rotavirus

Norovirus

Hepatitis A

Hepatitis C

HIV

HTLV-1

Measles

Mumps

Rubella

Enteroviruses

Viruses RNA

luenza A. B

metapneumovirus

Parainfluenza

Coronavirus

(MERS, SARS)

Vector borne

Chickengunya

Yellow Fever

RSV

Human

Ebola

Rabies

West Nile

Dengue

Adenovirus

Smallpox

Hepatitis B

Parvovirus

Herpes simplex

Varicella zoster

Cytomegalovirus

Epstein Barr virus

HHV6, HHV7, HHV8

Molluscum contagiosum

Human papillomavirus

BK polyomavirus

Fungi

Yeast

Candida

Malassezia

Microsporidia

Mold Aspergillus Mucor Rhizopus Cryptococcus Fusarium **Pneumocystis**

Dimorphic 7 Coccidioides Histoplasmosis 300 Blastomyces Paracoccidioides 65 Sporothrix

Tissue

Nematodes

(Roundworms)

Enterobius (Pinworm)

Dermatophytes

Microsporum, Epidermophytum Trichophytum

Protozoa GI/GU

Entamoeba Giardia Cryptosporidium

Trichomonas

Helminths

Trematodes (Flukes)

Clonorchis & Fasciola

Plasmodium Babesia

Blood

Trvpanosoma Leishmania Toxoplasma Naegleria

Gram negative Bacteria

Respiratory Pathogens

Haemophilus

Bordatella

Legionella

Rods

Listeria

Bacillus

Clostridium

Gardnerella

Corynebacterium

Propionibacterium

Acid Fast Bacilli

Mycobacterium tuberculosis

Non-tuberculous Mycobacteria

Mycobacterium leprae

Cocci

Staphylococcus

Streptococcus

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Enteric flora

Klebsiella

Proteus

Serratia

Shiaella

Yersinia

Salmonella

Enterobacter

E. coli

Mycoplasma 🚮

Rods

Campylobacter Pasteurella Bartonella Yersinia Coxiella Chlamydophila psittaci Rickettsia

Zoonotic

Brucella Francisella Spirochaetes Treponema Borrelia Leptospira

Ticks Vectors of: Lyme borreliosis, Relapsing Fever, RMSF, other Rickettsia, Babesia, Anaplasma, Ehrlichia Lice (pediculosis) Vectors of: Epidemic typhus,

Vectors of: Scrub typhus,

Rickettsialpox

plaque, Tularemia

Arthropods

Paragonimus (Lung Fluke)

Taenia solium

Schistosoma

(Liver Flukes)

(Schistosomiasis)

Cestodes (Tapeworms) Taenia saginata (Beef Tapeworm) (Pig Tapeworm) Diphyllobothrium

Trichuris (Whipworm) Ascaris (Giant worm) Ancylostoma & Necator (Hookworm) Strongyloides (Strongy) Toxocara (Dog Ascaris) Trichinella (Trichinosis) Onchocerca (River Blindness) Loa Loa (Eye Worm)

Wuchereria & Brugia

(Elephantiasis)

Helicobacter **Opportunistic** Pseudomonas Enteric pathogens Comma Vibrio

Spiral

Campylobacter Ehrlichia Anaplasma Borrelia

Intracellular

Chlamydia Chlamydophila Rickettsia Coxiella Legionella Ehrlichia Anaplasma

Trench Fever Mites (scabies)

Mosquitoes Leptospira Vectors of: Malaria, Dengue, Anaerobic Chikungunya, West Nile, Bartonella Yellow Fever **Bacteroides** Brucella Fleas Diplococci (Fish Tapeworm) Prevotella Vectors of: Cat-scratch fever. Francisella Neisseria Echinococcus Fusobacterium Murine typhus, Bubonic Shigella (Dog Tapeworm) Moraxella

Salmonella

Gram positive Bacteria

Viruses RNA

Ebola

Rabies

West Nile

Dengue

Vector borne

Chickengunya

Spirochaetes

Yellow Fever

luenza A. B

Rhinovirus

Norovirus

Hepatitis A

Hepatitis C

HIV

HTLV-1

Measles

Mumps

Rubella

Branching Actinomyces Nocardia

Parainfluenza Coxsackie RSV Enteroviruses **Poliovirus** Rotavirus

Human metapneumovirus Coronavirus (MERS, SARS)

Adenovirus Herpes simplex Varicella zoster Cytomegalovirus Epstein Barr virus HHV6, HHV7, HHV8

Human papillomavirus

BK polyomavirus

Ticks

Smallpox Molluscum contagiosum Hepatitis B Parvovirus

Arthropods

Vectors of: Lyme borreliosis,

Vectors of: Epidemic typhus,

Vectors of: Scrub typhus,

Murine typhus, Bubonic

plaque, Tularemia

Relapsing Fever, RMSF,

other Rickettsia, Babesia,

Anaplasma, Ehrlichia

Lice (pediculosis)

Entamoeba Giardia Cryptosporidium Trichomonas

Helminths

Trematodes (Flukes)

Clonorchis & Fasciola

Paragonimus (Lung Fluke)

Cestodes (Tapeworms)

Schistosoma

(Liver Flukes)

(Schistosomiasis)

GI/GU

Fungi

Yeast

Cryptococcus

Pneumocystis

Microsporidia

Malassezia

Candida

Mold

Mucor

Aspergillus

Rhizopus

Fusarium

Protozoa

Paracoccidioides 65 Sporothrix **Dermatophytes** Microsporum, Epidermophytum Trichophytum

Dimorphic 7

Coccidioides

Blastomyces

Histoplasmosis

Tissue

Trvpanosoma

Leishmania

Toxoplasma

Naegleria

300

Pleomorphic Mycoplasma 🚮 Gram negative Bacteria

Enteric flora

Klebsiella

Proteus

Serratia

Shiaella

Yersinia

Salmonella

Enterobacter

Enteric pathogens

E. coli

No cell wall

Cocci

Staphylococcus

Streptococcus

Enterococcus

Mycobacterium tuberculosis

Respiratory Pathogens

Haemophilus

Opportunistic

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Anaerobic

Bacteroides

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Prevotella

Bordatella

Legionella

Rods

Listeria

Bacillus

Clostridium

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Corynebacterium

Propionibacterium

Acid Fast Bacilli

Mycobacterium leprae Non-tuberculous Mycobacteria

Spiral

Comma

Diplococci

Neisseria

Moraxella

Vibrio

Campylobacter

Helicobacter

Zoonotic Brucella Francisella

psittaci

Rickettsia

Ehrlichia

Borrelia

Anaplasma

Leptospira

Campylobacter Pasteurella Bartonella Yersinia Coxiella Chlamydophila

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Intracellular Chlamydia

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Bartonella

Francisella

Salmonella

Brucella

Shigella

Ehrlichia

Chlamydophila Rickettsia Coxiella

Rickettsialpox Mosquitoes Vectors of: Malaria, Dengue, Chikungunya, West Nile,

Fleas

Mites (scabies)

Trench Fever

Yellow Fever Vectors of: Cat-scratch fever.

Taenia solium (Pig Tapeworm) Diphyllobothrium (Fish Tapeworm) Echinococcus (Dog Tapeworm)

Taenia saginata

(Beef Tapeworm)

Nematodes

(Roundworms) Enterobius (Pinworm)

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Blood

Babesia

Plasmodium

Major Human Pathogens Gram positive Bacteria Rods Branching Listeria

Bacillus

Gram negative Bacteria

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Haemophilus

Opportunistic

Pseudomonas

Bordatella

Legionella

Clostridium

Gardnerella

Corynebacterium

Propionibacterium



Poliovirus

Rotavirus

Norovirus

Hepatitis A

Hepatitis C

HIV

HTLV-1

Measles

Mumps

Rubella

Nocardia

Viruses RNA luenza A. B Rhinovirus Parainfluenza Coxsackie RSV Enteroviruses Adenovirus

metapneumovirus

(MERS, SARS)

Vector borne

Chickengunya

Yellow Fever

Coronavirus

Human

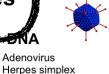
Ebola

Rabies

West Nile

Dengue







Varicella zoster

Smallpox

Hepatitis B

Parvovirus

Ticks

Cytomegalovirus

Epstein Barr virus

HHV6, HHV7, HHV8

Molluscum contagiosum

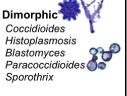
Human papillomavirus

BK polyomavirus

Yeast

Fungi

Aspergillus Mucor Candida Rhizopus Cryptococcus Fusarium **Pneumocystis** Malassezia Microsporidia



Trvpanosoma

Leishmania

Toxoplasma

Naegleria

Tissue

Dermatophytes

Protozoa

Blood

Babesia

Mold

Microsporum, Epidermophytum Trichophytum

Plasmodium

No cell wall **Pleomorphic** Mycoplasma 📢

Enteric flora

Klebsiella

Proteus

Serratia

Shigella

Enterobacter

Enteric pathogens

E. coli

Cocci

Staphylococcus

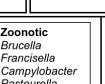
Streptococcus

Enterococcus

Acid Fast Bacilli Mycobacterium tuberculosis Mycobacterium leprae Non-tuberculous Mycobacteria

Spiral

Comma





Arthropods

Vectors of: Lyme borreliosis,

Vectors of: Epidemic typhus,

Vectors of: Scrub typhus,

Relapsing Fever, RMSF,

other Rickettsia, Babesia,

Anaplasma, Ehrlichia

Lice (pediculosis)

Trench Fever

Rickettsialpox

Helminths Trematodes (Flukes) Schistosoma

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(Schistosomiasis)

(Fish Tapeworm)

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Clonorchis & Fasciola



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(Elephantiasis)

Bartonella Yersinia Campylobacter Helicobacter

Coxiella Chlamydophila psittaci Rickettsia Ehrlichia Anaplasma Borrelia Leptospira

Zoonotic

Brucella Francisella

Pasteurella

Intracellular

Chlamydia Rickettsia

Chlamydophila

Coxiella

Legionella Ehrlichia Anaplasma

Bartonella

Francisella

Salmonella

Brucella

Shigella

Fleas

Mosquitoes Vectors of: Malaria, Dengue, Chikungunya, West Nile, Yellow Fever

Mites (scabies)

Vectors of: Cat-scratch fever. Murine typhus, Bubonic

plaque, Tularemia

Vibrio Salmonella Anaerobic Yersinia **Bacteroides** Diplococci Prevotella Neisseria Fusobacterium Moraxella

Major Human Pathogens Gram positive Bacteria Rods Branching Listeria

Bacillus

Gram negative Bacteria

Anaerobic

Bacteroides

Fusobacterium

Prevotella

Respiratory Pathogens

Clostridium

Gardnerella

Corynebacterium

Propionibacterium

Acid Fast Bacilli

Mycobacterium tuberculosis

Non-tuberculous Mycobacteria

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Enteric flora

Klebsiella

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Serratia

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Salmonella

Enterobacter

Enteric pathogens

E. coli

Mycoplasma 📢







Varicella zoster

Smallpox

Hepatitis B

Parvovirus

Cytomegalovirus

Epstein Barr virus

HHV6, HHV7, HHV8

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Human papillomavirus

BK polyomavirus





Fungi

Yeast

Pneumocystis

Microsporidia

Malassezia

Candida

Mold Aspergillus Mucor Rhizopus Cryptococcus

Fusarium

Coccidioides Histoplasmosis 300 Blastomyces Paracoccidioides 65 Sporothrix

Dimorphic 7

Dermatophytes

Microsporum, Epidermophytum Trichophytum



Protozoa GI/GU Entamoeba Blood

Plasmodium Babesia

Leishmania Toxoplasma Naegleria

Strongyloides (Strongy)

Toxocara (Dog Ascaris)

Trichinella (Trichinosis)

Tissue

rvpanosoma

Actinomyces Nocardia

RSV Enteroviruses Human **Poliovirus** metapneumovirus Rotavirus Norovirus Hepatitis A Hepatitis C

HIV

HTLV-1

Measles

Mumps

Rubella

Coronavirus (MERS, SARS) Ebola Rabies Vector borne

West Nile Dengue Chickengunya

Spirochaetes Treponema

Yellow Fever

Arthropods Ticks

Lice (pediculosis)

Vectors of: Lyme borreliosis, Relapsing Fever, RMSF, other Rickettsia, Babesia, Anaplasma, Ehrlichia

Vectors of: Epidemic typhus,

Vectors of: Scrub typhus,

Helminths Trematodes (Flukes) Schistosoma

(Schistosomiasis) Clonorchis & Fasciola

(Roundworms) Ancylostoma & Necator

Enterobius (Pinworm) Trichuris (Whipworm) Ascaris (Giant worm)

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Onchocerca (River Blindness) Loa Loa (Eye Worm) Wuchereria & Brugia (Elephantiasis)

Haemophilus Spiral Bordatella Campylobacter Legionella Helicobacter **Opportunistic** Pseudomonas

Vibrio

Diplococci

Neisseria

Moraxella

Comma

Chlamydophila psittaci Rickettsia Ehrlichia Anaplasma Borrelia Leptospira

Zoonotic

Brucella Francisella

Campylobacter

Pasteurella

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Coxiella

Intracellular Chlamydia Rickettsia Coxiella

Borrelia

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Legionella

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Mosquitoes

Rickettsialpox Anaplasma

Vectors of: Malaria, Dengue, Chikungunya, West Nile, Yellow Fever Fleas

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Bartonella Brucella Francisella Shigella Salmonella

ogens

teria

Branching Actinomyces Nocardia





bacteria

RNA

Rhinovirus

Coxsackie

Poliovirus

Rotavirus

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Hepatitis A

Hepatitis C

HIV

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Measles

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Rubella

Astrovirus

Influenza A, B Parainfluenza RSV Enteroviruses

Human metapneumovirus

Coronavirus (MERS, SARS) Ebola

Vector borne

West Nile

Dengue Chickengunya

Rabies

Yellow Fever

Viruses

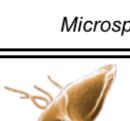
DNA

Hepatitis B

Adenovirus Herpes simplex

Varicella zoster Cytomegalovirus

HHV6, HHV7, HHV8





Entamo Giardia Cryptos Trichon

Fur

Yeast

Candida

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Pneumocys

Malassezia

Microsporid

Epstein Barr virus

Smallpox Molluscum contagiosum

Parvovirus Human papillomavirus

BK polyomavirus



Gram negative Bacteria Rods

Enteric flora

Respiratory Pathogens

Spiral

Comma

Vibrio cholerae

Campylobacter

Helicobacter

Haemophilus Bordatella Legionella

Opportunistic

Pseudomonas Enteric pathogens

Shigella

E. coli

Kiebsiella

Proteus

Serratia

Enterobacter

Salmonella Anaerobic Yersinia Bacteroides Prevotella

Diplococci Neisseria Fusobacterium Moraxella

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Campylobacter Pasteurella 4 6 1 Bartonella

Yersinia Coxiella Chlamydophila psittaci Rickettsia

Ehrlichia Anaplasma Borrelia Leptospira

Spirochaetes

Treponema Borrelia Leptospira

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Salmonella

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Shigella

Intracellular

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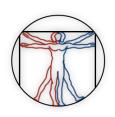
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Spirochaetes

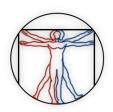
Treponema Borrelia Leptospira

Intracellular Chlamydia Chlamydophila Rickettsia

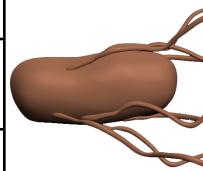
Coxiella Legionella Ehrlichia Anaplasma Bartonella Brucella Francisella Shigella Salmonella

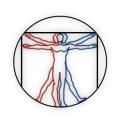


Strain	Syndrome	Site	Pathology	Source
ETEC	Watery Diarrhea	Small Intestine	None	Humans
EPEC	Prolonged watery diarrhea	Small Intestine	Attachment and Effacement	Humans & Animals
StEC EHEC	Hemorrhagic colitis and HUS	Large Intestine	Attachment and Effacement	Animals
EIEC	Dysentery	Large intestine	Invasive	Humans

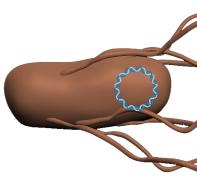


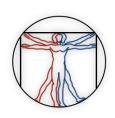
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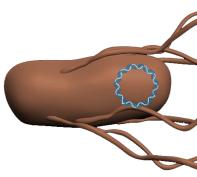


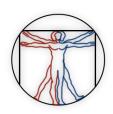
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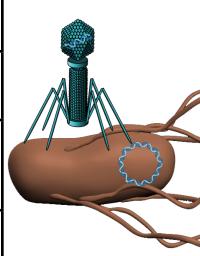


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Gram positive Bacteria



Staphylococcus aureus || Clostridium Streptococcus

Enterococcus

Rods Listeria Bacillus

Corynebacterium

Gardnerella Propionibacterium Branching

Actinomyces Nocardia



No cell wall Pleomorphic

Mycoplasma



Acid Fast Bacilli

Mycobacterium tuberculosis Mycobacterium leprae Non-tuberculous Mycobacteria



Influe

Parai

RSV

Huma

meta

Coro

(MEF

Ebola

Rabie

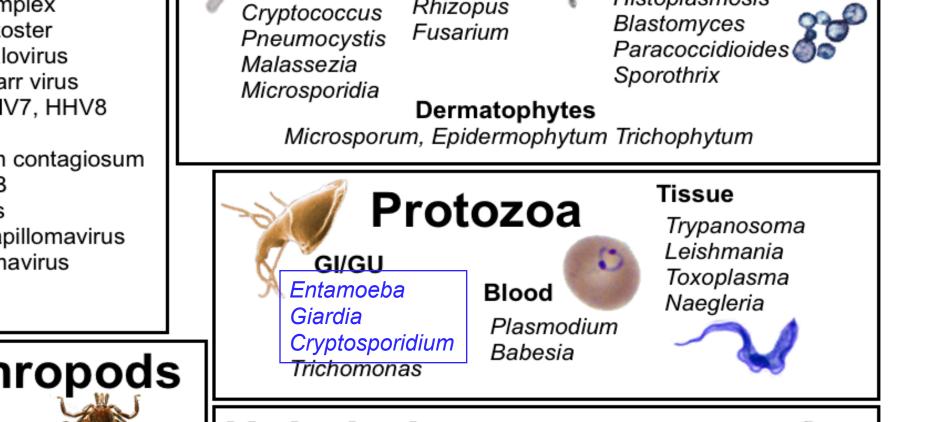
Rhinovirus Coxsackie Enteroviruses Poliovirus Rotavirus Norovirus Hepatitis A Hepatitis C HIV HTLV-1 Measles

Mumps

Rubella

Vecto West Deng

Chick Yellov



Helminths

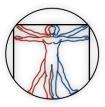
Trematodes (Flukes)

Schistosoma

Nematodes

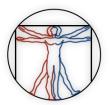
(Roundworms)

: Lyme borreliosis, Fever, RMSF, ettsia, Babesia,



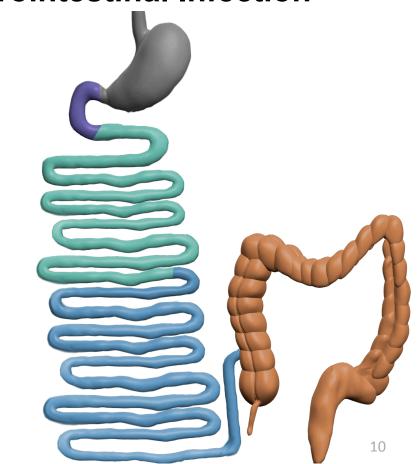
Syndromes of Acute Gastrointestinal Infection

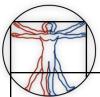
- Watery Diarrhea
- Inflammatory Diarrhea (bloody diarrhea, dysentery, colitis)
- Antibiotic Associated Diarrhea
- Enteric Fever
- Intoxication



Syndromes of Acute Gastrointestinal Infection

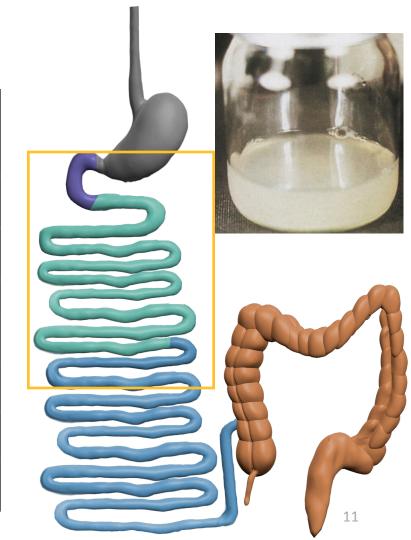
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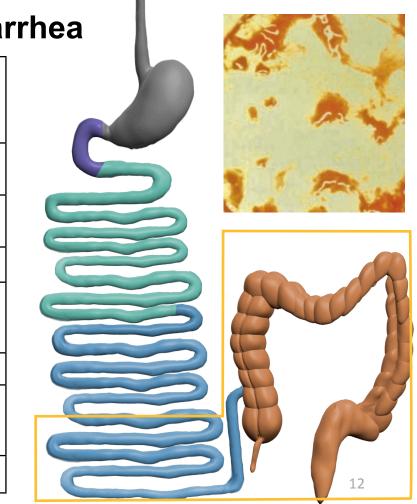


Watery Diarrhea

Clinical Features	Large volume watery stools without inflammatory cells or blood. Can lead to dehydration. Possibly accompanied by nausea, vomiting, bloating, colicky abdominal pain
Complications	Dehydration, electrolyte abnormalities, malnutrition
Management	Assess degree of dehydration, consider DDx, rehydrate, maintenance hydration
Anatomical Location	Proximal Small Intestine
Pathogenesis	Non-invasive, several are toxin mediated, secretory vs malabsorptive
Viruses	Rotavirus, Norovirus, Adenovirus (all non- enveloped capsids)
Bacteria	Vibrio cholerae, Enterotoxigenic E. coli (ETEC), EPEC, EAEC
Protozoa	Giardia, Cryptosporidium

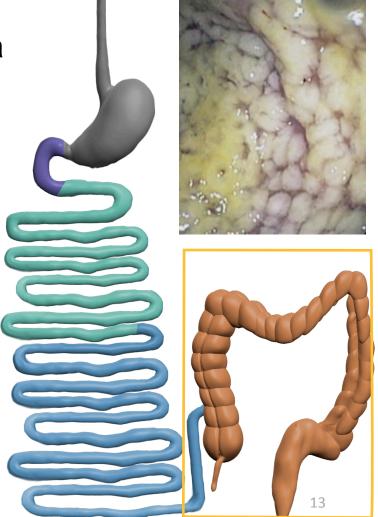


Infla	mmatory or Bloody Dia
Clinical Features	Frequent small volume stools. May have streaks of blood, mucosy from pus. Pain on defecation (tenesmus), ileocolitis, colitis. Fever may be present.
Complications	Depend on etiology and host features- Hemolytic Uremic Syndrome, Bacteremia
Management	Consider stool cultures, antibiotics for some etiologies but may worsen others
Anatomical Location	Distal ileum and colon
Pathogenesis	Damage to enterocytes with local inflammatory responses, direct invasion and cytotoxin damage- Locally invasive
Viruses	none in immunocompetent
Bacteria	Shigella, Shiga-toxigenic E. coli (EHEC, StEC), EIEC, Campylobacter jejuni, non-Typhi- Salmonella, Yersinia
Protozoa	Entamoeba histolytica



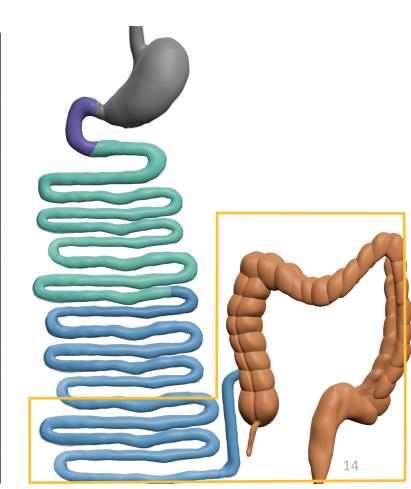
Antibiotic associated diarrhea

Clinical Features	May be watery, can also be inflammatory with pus and blood when due to <i>C. difficile</i> .
Complications	C. difficile - pseudomembranous colitis, toxic megacolon, sepsis
Management	Test for <i>C. difficile</i> toxins, stop offending antibiotics, if <i>C. difficile</i> treat with metronidazole or oral vancomycin
Anatomical Location	colon
Pathogenesis	Antibiotics kill normal flora and may affect gut absorptive functions, <i>C. difficile</i> produces toxins that damage colonic mucosa and are proinflammatory
Viruses	none
Bacteria	Clostridium difficile in the context of antibiotic damage to normal microbiota
Protozoa	none



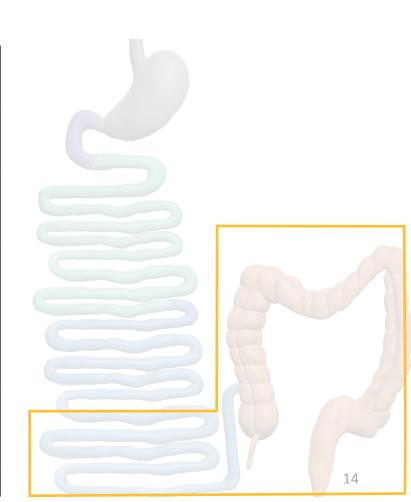
Enteric Fever

Clinical Features	Prolonged fever of unknown origin with chills, hepatosplenomegaly, ± constipation, ±rose spots
Complications	Bowel perforation, osteomyelitis, septic arthritis, meningitis, chronic carriage
Management	Blood cultures essential. Stool cultures may be negative. Requires antibiotic therapy
Anatomical Location	Systemic disease
Pathogenesis	Spread systemically, survives in macrophages, may reseed the bowel and transmit through feces. Survives in lymph nodes, liver, spleen, bone marrow, gall bladder
Viruses	none
Bacteria	Salmonella Typhi and para-Typhi (other systemic invasive enteropathogens- Listeria, Brucella, non-Typhi Salmonella, Yersinia)
Protozoa	none



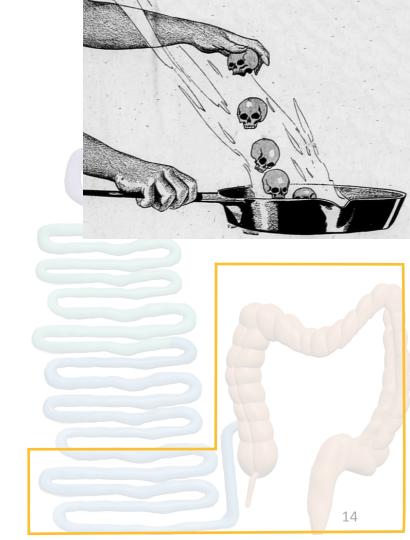
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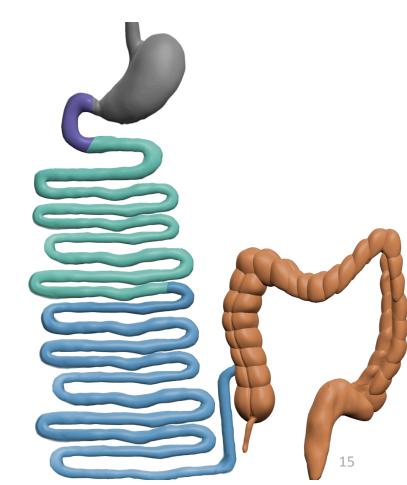
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Protozoa	none



Intoxication

Clinical Features	Food Poisoning- Nausea, vomiting, followed by diarrhea, rapid onset in hours after ingestion, not contagious. Short duration
Complications	Dehydration
Management	Hydration, anti-emetics
Anatomical Location	Depends on toxin
Pathogenesis	Preformed toxins made by bacteria
Viruses	none- mimicked by Norovirus
Bacteria	Staphylococus aureus enterotoxins, Bacillus cereus enterotoxins
Protozoa	none



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Credits: Acute Gastrointestinal Infections- Syndromic Approach

Slide 11: Rice Water Stools. From: Gastrointestinal tract infections. Mims' Medical Microbiology. Goering, Richard V., BA MSc PhD. January 1, 2013. Pages 269-302. © 2013. Figure 22.13.

https://www.clinicalkey.com

Slide 12: Dysenteric stool. Figure 18.6 Typical dysenteric stool is a small-volume mix of blood and pus. Such stools may be passed 30 or more times per day, often with increased pain (tenesmus). From: Shigellosis. Tropical Infectious Diseases: Principles, Pathogens and Practice. Keusch, Gerald T.; Salam, Mohammed A.; Kopecko, Dennis J. January 1, 2011. Pages 137-144. © 2011.

https://www.clinicalkey.com

Slide 13: Clostridium difficile Infection. Fig. 1 Confluent pseudomembranes in a patient with Clostridium difficile colitis Medical Clinics of North America. Knight, Christopher L., MD; Surawicz, Christina M., MD. June 30, 2013. Volume 97, Issue 4. Pages 523-536. © 2013.

https://www.clinicalkey.com

Slide 14: Mary Mallon (1870-1938) was nicknamed "Typhoid Mary". Illustration that appeared in 1909 in The New York American. June 20, 1909). This media file is in the public domain in the United States because its first publication occurred prior to January 1, 1923

http://commons.wikimedia.org/wiki/File:Mallon-Mary_01.jpg

Slide 15: Pumkin Puking

http://oddity.quirkdesign.co.uk/wp-content/uploads/2010/10/pumpkin-puking.jpg