

THE ATHLETE and INFECTION



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I. INTRODUCTION

- A. Types of Infection
 - 1. Genitourinary
 - 2. Gastrointestinal
 - 3. Respiratory
 - 4. Dermatologic
- B. Immune System (Host Defense)
 - 1. Response same regardless of cause
 - 2. Clinical signs / symptoms
 - 3. Timing of events
 - a. hemodynamic changes
 - b. increased permeability
 - c. white blood cell events
- C. Exercise and Immune Function
 - 1. Moderate intensity
 - a. improved immune function
 - b. fewer infections (J-curve)
 - 2. Strenuous training
 - a. elicits inflammatory response (CRP)
 - b. immunomodulators ↓ function
 - c. the 'Open Window'
 - 3. Other factors
 - a. rest / diet
 - b. body temperature (cold)
- D. Infection and Exercise
 - 1. Contagion
 - a. skin / contact
 - b. fomites (mats, etc.)
 - 2. Oxygen delivery
 - a. nasal congestion
 - b. cough / wheeze
 - 3. Fluid / Electrolytes
 - a. vomiting
 - b. diarrhea
 - 4. Fatigue
 - a. ↓ oxidative capacity of muscles
 - b. decreased ATP / glycogen stores
 - c. cytokines 'sickness behavior'

II. GENITOURINARY INFECTION

A. Urinary Tract

1. Lower
 - a. bladder infection
 - b. interstitial cystitis (scarring of bladder wall)
2. Upper
 - a. pyelonephritis (kidney infection)
 - b. perinephric abscess

B. Signs / Symptoms

1. Lower
 - a. dysuria (burning with urination)
 - b. frequency / urgency
 - c. hematuria (blood in urine)
2. Upper
 - a. abdominal (flank) pain
 - b. significant fever (> 101.5 F)
 - c. nausea / vomiting / dehydration

C. Treatment

1. Lower
 - a. antibiotics / pyridium ®
 - b. hydrate
 - c. post-sex voiding (prevention)
 - d. work-up if recurrent (25% are)
2. Upper
 - a. hospitalize
 - b. IV fluids / antibiotics

D. Sexually Transmitted Disease (STD)

1. Urethritis (men 10X women)
 - a. chlamydia
 - b. neisseria gonorrhoea
 - c. ureaplasma urealytica
 - d. E. coli (older athletes)
2. Epididymitis
 - a. NOT an STD
 - b. painful lump behind testicle
3. Female Infections
 - a. vaginitis - candida (yeast) / trichomonas
 - b. cervicitis - chlamydia / gonorrhoea / (?) syphilis
4. Pelvic Inflammatory Disease (PID)
 - a. fever
 - b. nausea / vomiting
 - c. severe pelvic pain
5. History
 - a. new partner?
 - b. associated rash or discharge?

6. Testing

- a. blood - HIV / syphilis
- b. wet mount - yeast / trichomonas
- c. urethral swab - gonorrhea / chlamydia

III. GASTROINTESTINAL INFECTION

A. Types of Infection

1. Gastroenteritis

- a. upper - nausea / vomiting / dehydration
- b. lower - cramping / diarrhea / blood in stool

2. Hepatitis A - E

B. Gastroenteritis

1. Viral

- a. Norwalk (1/3 of all GI) Supportive
- b. Rotavirus (usually kids) Supportive

2. Bacteria

- a. Enterotoxigenic E. Coli Pepto Bismol / Sulfa / Cipro
 - b. Staph aureus Supportive *
 - c. Salmonella Supportive *
 - d. Shigella Pepto / Ampicillin
 - e. Campylobacter Erythromycin
 - f. Yersinia enterocolitica Supportive *
 - g. Clostridium difficile Flagyl ® / Vancomycin
- * NO Lomotil ® or Immodium ®

3. Parasite

- a. Giardia lamblia Flagyl ®

4. Evaluation (stool sample)

- a. gram stain / WBC / culture
- b. ova / parasite
- c. C. difficile toxin

C. Hepatitis

TYPE	VIRUS	ROUTE INFECTION	COMPLICATIONS
A	picorna	Food poisoning	Occasional death (rare)
B	hepadna (DNA)	Blood /secretions (sex) (1/4 no obvious source)	Carrier 10 – 20% Chronic 3 – 5 %
C	flavi	Blood (rarely sex)	Chronic 60 – 80% Cancer / Cirrhosis (20%)
D	delta	ONLY with hepatitis B	Same as B (well, duh)
E	calici	Food poisoning	Same as A

(very rare in U.S., found in Mexico, parts of Asia, India, Africa)

2. Signs / Symptoms

- a. general (fever / fatigue / malaise / headache / nausea)
- b. specific (RUQ pain / jaundice / gray stool / dark urine)

3. Prevention
 - a. educate (condoms / tattoos / needle sticks)
 - b. hygiene (wash hands / street vendors)
 - c. vaccination (for A and B only)

III. RESPIRATORY INFECTION

- A. Anatomy / Physiology
 1. Upper respiratory tract
 - a. sinuses / pharynx
 - b. larynx (epiglottis divides upper from lower tract)
 2. Lower respiratory tract
 - a. bronchi
 - b. lungs
 3. Mechanical barriers
 - a. cilia / mucus
 - b. sneeze / gag / cough reflexes
- B. Specific Respiratory Infections

TYPE	ORGANISM(S)	TREATMENT	COMPLICATIONS
Common Cold	Rhinovirus 40% Coronavirus (20%)	'supportive' 'Breathe-Rite'	viral myocarditis (?) viral meningitis
Acute Sinusitis	Hemophilus Influenza Pneumococcus Streptococcus	antibiotics saline nasal spray (?) lavage	air travel (rupture) brain abscess (rare)
Chronic Sinusitis Anaerobes		antibiotics	osteomyelitis
Otitis Media (ear infection)	Pneumococcus Hemophilus Influenza Moraxella Catarrhalis	antibiotics insufflation decongestant	air travel TM perforation mastoiditis
Otitis Externa (swimmer's ear)	bacteria / fungi pseudomonas	cortisporin drops ciprofloxacin drops	cellulitis
Vestibular neuronitis	virus	supportive	none
Mastoiditis	same as Otitis media	(?) surgery	abscess
Pharyngitis	Group A strep (5%) Ebstein Barr virus (mono) Coxsackie virus	antibiotics rest / rest / rest	rheumatic fever chronic (rhabdomyolysis)
Tonsillitis	Group A strep (40%)	antibiotics	same as above
Epiglottitis	H. flu / Pneumococcus	hospitalize	airway obstruction
Bronchitis	Strep Pneumonia	antibiotics	pneumonia
Bacterial Pneumonia	Strep Pneumonia (30-60)	antibiotics	aspiration

Walking Pneumonia	Mycoplasma	erythromycin	none
Viral Pneumonia	Influenza A / B	Tamiflu / Flumadine	viral myocarditis
Legionnaire's	Legionella	erythromycin	respiratory arrest
TWAR	chlamydia	erythromycin	bronchospasm
Tuberculosis	Mycobacterium	INH / Rifampin	musculoskeletal
Fungal	Coccidiomycosis Blastomycosis Histoplasmosis	Anti-fungals	cavitary lesions

IV. SKIN INFECTION

- A. Herpes Simplex (gladiatorum)
 - 1. Clusters of vesicles / pruritis / pain
 - 2. Cover / quarantine
 - 3. Acyclovir / Valacyclovir
- B. Impetigo
 - 1. Yellow-crust lesion
 - 2. staph or strep
 - 3. oral Keflex ® / topical Bactroban ®
- C. Methicillin-resistant Staph Aureus
 - 1. becoming epidemic in sports
 - 2. oral Keflex ® PLUS Septra DS ® ii P.O. BID
 - 3. treat fro MRSA until cultures return
 - . serious infections = vancomycin IV
- D. Athlete's Foot
 - 1. cracking / scaling / itching
 - 2. topical antifungal / Lotrisone ®
- E. Molluscum contagiosum
 - 1. umbilicated (dimpled)
 - 2. curette / freeze / Duofilm ® topical

V. TREATMENT ISSUES

- A. Anticipate
 - 1. Stress of training
 - 2. Travel
 - a. novel pathogens / vectors
 - b. room mates
 - c. airplane / bus (tight quarters)
- B. Predict
 - 1. Resting heart rate (\uparrow 5 bpm for 2 consecutive days)
 - 2. Salivary IgA levels
 - 3. TB testing

C. Treat

1. Decongestant (caution... + drug test)
2. Antihistamine (drowsiness)
3. Cough medication (codeine... + drug test)
4. Antibiotics
 - a. tetracycline - sun sensitivity
 - b. erythromycin - GI upset
 - c. fluoroquinolones (Cipro, etc.) - tendon rupture
5. Inhalers (albuterol / alupent with letter only)

D. Prevent

1. Spread of infection
 - a. isolate ill team mates (? travel)
 - b. flu shots
 - c. water bottles / team towels
2. Complications (Do not train / compete if...)
 - a. fever > 102 F (viral myocarditis)
 - b. productive cough (mucus plug aspiration)
 - c. severe pharyngitis (coxsackie B4, B5 rhabdomyolysis)
 - d. vomiting / diarrhea / dehydration (electrolytes)
3. Theoretical
 - a. carbohydrate supplementation
 - b. Vitamin C (anti-oxidant)
 - c. Indocin (anti-inflammatory)
 - d. Glutamine (stimulates WBC / depleted by exercise)

VI. REFERENCES

- Castell LM Glutamine and the immune response. *CanJPhysiolPharmacol* 1998 May; 76(5):524-32
- Friman G Acute infection and myocarditis. *IntJSportsMed* 1998 Jul;19 Suppl 3():S172-82
- Nieman, DC Exercise and resistance to infection. *CanJPhysiolPharm* 1998 May; 76(5):573-80
- Rhind SG Indomethacin reverses inhibition of NK cells. *AmJPhysiol* 1999 May;276:R496-505