

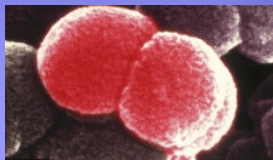
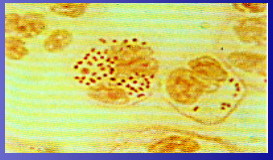


# UPDATES: Meningococcal Disease

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# DEFINITION

a disease caused by Gram negative aerobic spherical or kidney-shaped intracellular diplococci called *Neisseria meningitidis*





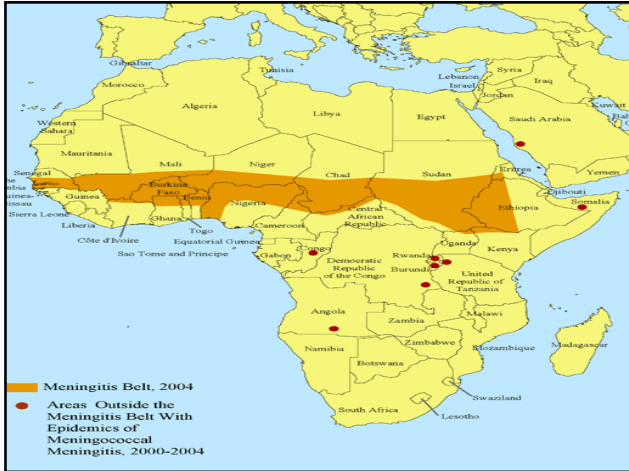
# EPIDEMIOLOGY\*

☛ Meningococcal disease can occur:

1. Sporadic cases  
1-2/100,000
2. Localized/Institutional community-based
3. Large epidemic  
10-1,000/100,000

\* Averitt, Thaddeus, The Menace of Meningococci, 2007



## EPIDEMIOLOGY\*

- 📌 1996-97: largest epidemic >300,000 cases with 30,000 deaths in Africa in caused by *Serogroup A*
- 📌 Europe\*: C & B outbreaks
- 📌 2000\*: W-135 occurred in Muslim pilgrimage to Mecca: Hajj
- 📌 2002\*: W-135 occurred in Africa
- 📌 2004 : Africa
- 📌 2005 : Philippines and India
- 📌 2006-2007 : Africa
- 📌 outbreaks of A,B,C,W-135 in Africa\*\*

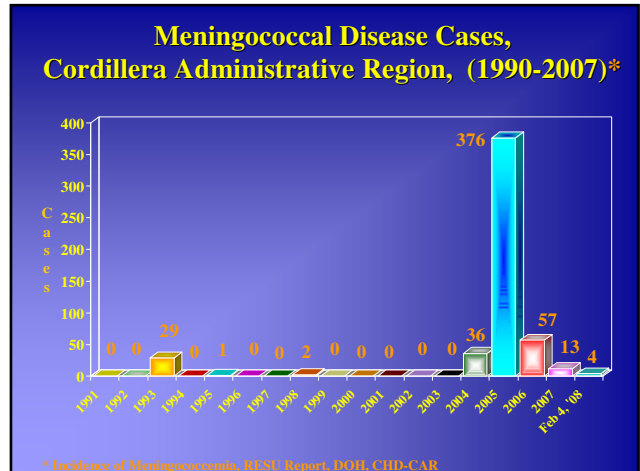
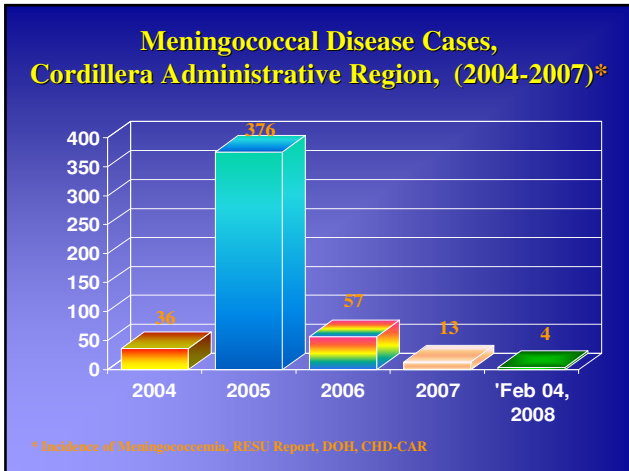
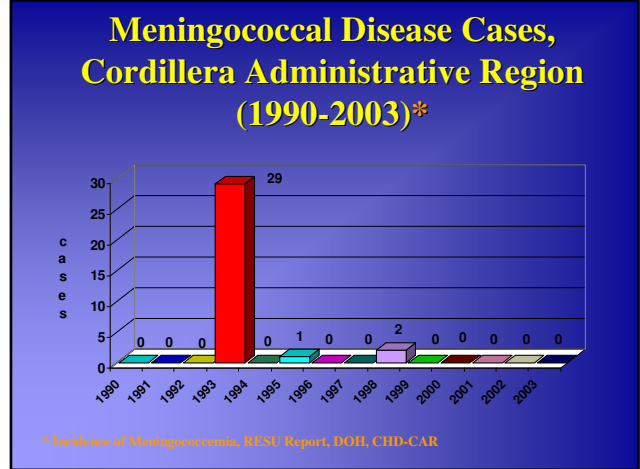
\* Gatchalian, S. Meningococcal Disease. Dengain City, 2005  
 \*\* Condon, G.R. et al. Meningococcal disease in South Africa, 1999-2002. Emerging Infectious Diseases, February 2007



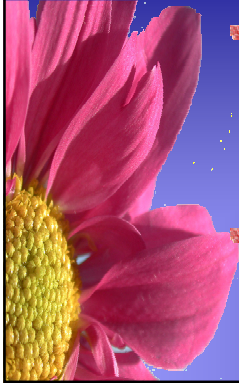
## EPIDEMIOLOGY\*

- 📌 Philippines: Meningococcal Disease Outbreak
- 1988: Mindanao - 36 cases *serogroup B*
- 1989: Negros Occidental - 10 cases *serogroup A*
- 📌 San Lazaro Hospital
- 2002 = 30 cases
- 2003 = 39 cases
- 2004 = 32 cases

\* Averila, Thaddius, The Menace of Meningococci, 2005



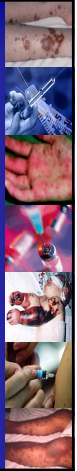
## PATHOPHYSIOLOGY



- ❏ **Invasion/infection:**
  - bacterial pili important for attachment to epithelial cells
  - exact determinants of invasion unknown
- ❏ **Natural immunity:**
  - antibodies directed against capsular polysaccharides and outer membrane proteins

## MENINGOCOCCAL DISEASE PATHOGENESIS

- ❏ organism colonizes nasopharynx
- ❏ in some persons organism invades bloodstream and causes infection at distant site
- ❏ antecedent URI may be a contributing factor



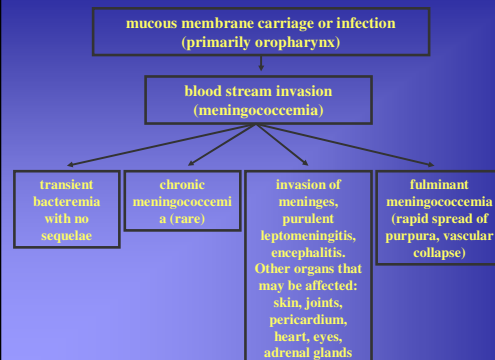
## CONTRIBUTING FACTORS\*

- ❏ influenzae virus, *Mycoplasma hominis*, *Mycoplasma pneumoniae*\*
- ❏ climate: late winter, drought, dust storm
- ❏ respiratory infection: cough, sore throat
- ❏ colds: 18%\*\*
- ❏ diarrhea: 17%\*\*



\* Control of Epidemic Meningococcal Disease, WHO Practical Guidelines, 1998

## PATHOPHYSIOLOGY\*



\* Gorbach, S., et al. Infectious Diseases, Third Edition, 2004



## PATHOPHYSIOLOGY\*

- The two common presentations of meningococcal infections are:
  - meningococcal meningitis: infection of the membranes surrounding the brain & spinal cord
  - meningococemia: infection of the blood

An infected individual may have one or both clinical manifestations

\* Gorbach, S, et al. Infections Diseases, Third Edition, 2004



## CLINICAL MANIFESTATIONS

| CLINICAL FEATURES       | MENINGOCOCCAL MENINGITIS  | MENINGOCOCCAL SEPTICAEMIA  |
|-------------------------|---|--|
| Signs & Symptoms        | - fever<br>- headache<br>- stiff neck<br>- photophobia<br>- vomiting<br>- bulging fontanelle in children < 1 year | - fever<br>- rash: petechiae, purpura (fulminans purpura)<br>- low blood pressure<br>- altered mental status<br>- seizures<br>- coma |
| Appearance of CSF       | cloudy  | cloudy or clear  |
| Response to antibiotics | good<br>(up to 10% may die despite correct diagnosis & treatment)   | poor<br>(30% may die within 12 to 48 hours)  |
| % during epidemic       | 80-90% of patients  | 10-20% of patients   |



## CLINICAL MANIFESTATIONS

Padilla, CB, et.al.

### Meningococemia Outbreak, the BGHMC Experience

- fever: 83%      headache: 24%
- rashes: 58.9%      body malaise: 20%
- vomiting: 41%      seizure: 11.5%



## CLINICAL MANIFESTATIONS

Dacuycuy, F, et.al.

### Profile of Pediatric Patients with Meningococcal Disease at a Local Tertiary Hospital

- fever: 98.88%      body malaise: 11.11%
- vomiting: 50%      diarrhea: 8.88%
- headache: 32.22%      neck pain: 8.88%



# CLINICAL MANIFESTATIONS

Aswat, RP, et.al.,

Clinical Profile of Adult Meningococcal Disease Patients Admitted at BGHMC from November 2004 to June 2006

- fever: 100%      headache: 72.72%
- purpuric rashes: 46.46%
- myalgia and/or arthralgia: 40.40%



# CLINICAL MANIFESTATIONS

Fabay, XJ

Terror in the Air: Meningococcal Disease Outbreak, the Philippine Experience



- fever: 100%
- rashes: 90%
- vomiting: 57%
- headache: 42%



# TRANSMISSION

A cartoon illustration of a stick figure with a large, dark, oval-shaped object (representing a meningococcal bacterium) on its head, with radiating lines indicating it is spreading the disease. Below it, two children are shown coughing into their hands, illustrating person-to-person transmission.

# TRANSMISSION

the causative agent, *Neisseria meningitidis* is spread through:

- person to person
- droplets (infected person sneezing or coughing)
- close contact

A diagram illustrating transmission. On the left, a patient is lying in a hospital bed being attended to by two medical professionals. A red arrow with four white bars points to the right, where a man is shown coughing into his hand, illustrating the spread of the disease through droplets or close contact.

## Close Contacts of Patients with Meningococcal Disease

- household members
- anyone especially hospital staff exposed to respiratory secretions of infected individuals
- individuals who have sat directly next to an index case on a prolonged travel of more than 8 hours



## Risk Factors for Invasive Meningococcal Disease

- Host Factors**
  - lack of bactericidal antibody to acquired strain
  - age: < 1 year or 15-24 years of age
  - household crowding
  - cigarette smoking, active or passive



## PROGNOSIS\*

- mortality rate : 5-19%
- endemic disease due to *N. meningitidis*:
  - 1 - 3 cases per 100,000 population in developed countries
  - 10 - 25 cases per 100,000 population in developing countries
- during epidemics:
  - 4 - 1000 per 100,000 population



\* Gattaliani, S. Meningococcal Disease. In: *Principles of Infectious Diseases*, 2005

## PROGNOSIS\*

- case fatality rate: 21.2%\*
- case fatality rate : 32.5%\*\*
  - Meningococemia: 26.9%
  - Meningococcal meningitis: 3.8%
  - Meningococemia with meningitis: 1.2%

\*MMWR, RESU, DOI:10.1093/CDC

\*\*Padilla, CB, et al. Meningococcal Outbreaks. In: *MMWR*, 2005



## PROGNOSIS\*

case fatality rate: 33.33%\*

Meningococemia: 27 deaths

Meningococcal meningitis: 1

Meningococemia with meningitis: 1

case fatality rate: 32%\*\*

\* Dacuycuy, et.al., Profile of Pediatric Patients with Meningococcal Disease in a Local Tertiary Hospital

\*\* Fabay, XJ, Terror in the Air: Meningococcal Disease Outbreak, the Philippine Experience

## PROGNOSIS\*

case fatality rate: 25.25%\*

Meningococemia: 28.00%

Meningococcal meningitis:  
no death

Meningococemia  
with meningitis: 72.00%

\* Aswat, RP, et.al. Clinical Profile of Adult Meningococcal Disease Patients Admitted at BGIHC from November 2004 to June 2006

## COMPLICATIONS & SEQUELAE

10-15%

deafness, ataxia, seizures, blindness,  
paresis of cranial nerves 3,4,6,7  
hemi or quadriplegia, obstructive  
hydrocephalus

arthritis, myocarditis, pericarditis,  
pneumonia, endophthalmitis, DIC

## COMPLICATIONS & SEQUELAE\*

pure musculoskeletal

complication : 2.22%

musculoskeletal with psychotic  
complication: 1.11%



\* Dacuycuy, et.al., Profile of Pediatric Patients with Meningococcal Disease in a Local Tertiary Hospital



## COMPLICATIONS & SEQUELAE\*

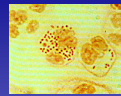
- perioral vesicular lesions: 11.11%
- UGIB: 4.04%
- pneumonia: 4.04%
- arthritis: 4.04%
- hematuria: 2.02%
- epistaxis: 2.02%
- unilateral ptosis: 2.02%

\* Aswan, RP, et al. Clinical Profile of Adult Meningococcal Disease Patients Admitted at BGIMC from November 2004 to June 2006



## DIAGNOSIS

- culture and sensitivity
  - blood, CSF, skin lesions
- CSF analysis
  - Gram's stain
- rapid antigen detection test
- PCR analysis



## VACCINES

Vaccines against *N. meningitidis*

- serogroup A and C
- serogroup A, C, W135 and Y
- serogroup C
- serogroup B, based on Outer membrane proteins (OMP)



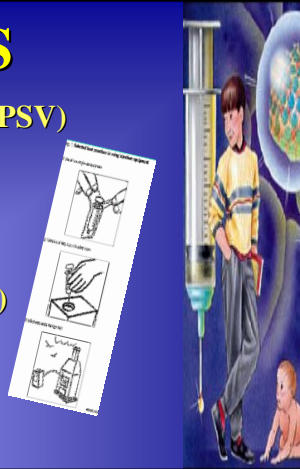
## VACCINES

### Polysaccharide (MPSV)

- ▣ bivalent
- ▣ quadrivalent

### Conjugated (MCV)

- ▣ monovalent
- ▣ bivalent
- ▣ quadrivalent



## VACCINES

▣ only a single intramuscular or deep subcutaneous injection of 0.5 ml

▣ unit dose is the same for both adults and children

▣ revaccination should be given 3 to 5 years after initial vaccination



## VACCINES

▣ early vaccination:

≥ 6 months old even 3 months in certain cases (during epidemics)  
second dose needed 2-3 months after

▣ percentage of individuals who responded (a four-fold or higher increase in the haemagglutination titre) was 97.9% for polysaccharide A and 94.8% for the polysaccharide C



## ANTIBIOTIC PROPHYLAXIS

Recommended **ONLY** for **close contacts** of patients with meningococcal disease

- ▣ household members
- ▣ anyone especially hospital staff exposed to respiratory secretions of infected individuals
- ▣ individuals who have sat directly next to an index case on a prolonged travel of more than 8 hours



## ANTIBIOTIC PROPHYLAXIS

- personnel who have had intensive close contact (e.g. mouth-to-mouth resuscitation, endotracheal intubation, endotracheal tube management) with a patient with meningococcal disease before administration of antibiotics without the use of proper precautions  
*Category IB\**

\* Bolyard, EA, et al. Guidelines for Infection Control in Healthcare Personnel, 1998. CDC Personnel Health Guidelines, p. 232.



## ANTIBIOTIC PROPHYLAXIS

- Rifampicin:**  
5-10 mg/kg/day q12H x 2 days, maximum of 600mg/day
- Ceftriaxone:**  
125-250 mg/day IM SD
- Ciprofloxacin:**  
500 mg orally SD



## Indication for Standard and Isolation Precautions\*

| Standard        | All patients  |
|-----------------|---|
| <b>Contact</b>  | hemorrhagic fever such as <i>Ebola</i> , croup, bronchiolitis, skin infections, cutaneous infections, <i>Herpes simplex virus</i> , <i>zoster</i>   |
| <b>Droplet</b>  | meningitis with <i>Haemophilus influenzae</i> type B or <i>Neisseria meningitidis</i> , diphtheria, <i>M. pneumoniae</i> , pertussis, influenza, adenovirus, mumps, <i>parvovirus B19</i> , rubella, streptococcal pharyngitis, pneumonia, scarlet fever. |
| <b>Airborne</b> | pulmonary or laryngeal (suspected) tuberculosis, measles, varicella, disseminated zoster  |

\* Gordis, B. A Guide to Infection Control in the Hospital 3rd ed, 2004, pp.38-44.

## STANDARD PRECAUTIONS\*

- ALL PATIENTS**
- apply when contact is possible with ruptured skin or mucous membranes, blood & all body fluids, secretions, or excretions except sweat
- personal protective equipment (unsterile)

\* Gordis, B. A Guide to Infection Control in the Hospital 3rd ed, 2004, pp.38-44.



## DROPLET PRECAUTIONS\*

- ☞ particles >5microns
- ☞ travels <1meter/3feet
- ☞ mask is worn if within 1 meter or 3 feet, limit patient transport
- ☞ meningitis: *Hemophilus influenzae* type B, *N. meningitidis*; diphtheria, *M. pneumoniae*, pertussis, influenzae, adenovirus, parvovirus B19, streptococcal pharyngitis, pneumonia, scarlet fever

\* Gordis, B, A Guide to Infection Control in the Hospital, 3rd ed, 2004, pp.38-44.



## HOSPITAL-BASED PREVENTIVE MEASURES

- ☞ health education, re-orientation
- ☞ standard and droplet precautions
- ☞ isolation procedures
- ☞ cohorting
- ☞ antibiotic prophylaxis
- ☞ immunization
- ☞ post-mortem care



## POSTMORTEM CARE\*

- ☞ most of the microorganisms that kill people do not survive for long after their host dies
- ☞ whether dealing with old burials or with the recently dead, and regardless of which infectious agent may be present, the risk of acquiring infection can be greatly reduced by:
  - covering cuts or lesions with waterproof dressings
  - careful cleansing of any injuries sustained during procedures
  - good personal hygiene
  - the use of appropriate protective clothing

\* Wenzel, R, et al. A Guide to Infection Control in the Hospital, 3rd ed, 2004.



## POSTMORTEM CARE\*

- ☞ use of protective clothing
  - examination gloves
  - filter mask/ surgical mask
  - visor/ respiratory protective masks
  - apron
  - rubber boots
  - gowns/coats/overall with hood
  - other protective equipment: safety helmets, safety glasses, work gloves to protect against mechanical injuries



\* Wenzel, R, et al. A Guide to Infection Control in the Hospital, 3rd ed, 2004.

## POSTMORTEM CARE\*

While a person is alive, invading pathogens can multiply and are readily transmitted, for example by coughing or sneezing. The patient is a continuing source of infection. Once the host is dead, most pathogens stop multiplying and die rapidly, particularly as decomposition proceeds, and dispersion of infectious microbes is unlikely

\* Wenzel, R, et al. A Guide to Infection Control in the Hospital. 3<sup>rd</sup> ed. 2004.



## OTHER MEASURES

- avoid crowded places
- strengthen your immune system/resistance
- practice **good personal hygiene/cough etiquette** (cover nose and/or mouth when sneezing or coughing; wash hands frequently)



## OTHER MEASURES

- maintain a **healthy lifestyle**: proper sleep, proper diet and good nutrition, enough rest, regular exercise
- individuals with signs and symptoms and have a positive history of exposure to an infected individual should **seek immediate medical consultation**






# TREATMENT

- ❏ **Penicillin G Sodium**  
 250,000-400,000 u/kg/day every 4-6 hours, maximum of 12 million u/day

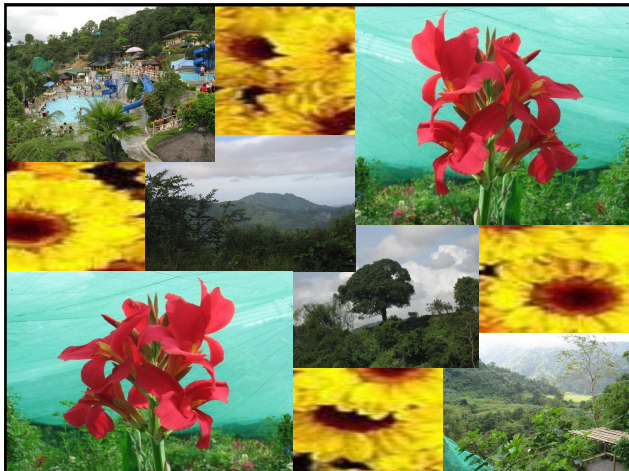
**Alternative Drugs**

- ❏ **Chloramphenicol** 100mg/kg/day q 6H
- ❏ **Cefotaxime** 100-200mg/kg/day q 6H
- ❏ **Ceftriaxone** 100mg/kg/day q 12H




# TREATMENT

- ❏ **Supportive Measures**
  - ❏ fluids
  - ❏ volume expanders
  - ❏ fresh frozen plasma
  - ❏ packed RBC
  - ❏ steroids
  - ❏ other medications for concomitant co-morbid illnesses



# REFERENCES

- ❏ Gordis, B. A Guide to Infection Control in the Hospital 3rd ed. 2004, pp.38-44.
- ❏ Gorbach, S. et. al., Infectious Diseases, Third Edition, 2004
- ❏ City Epidemiology and Surveillance Unit, City Health Office, Baguio City
- ❏ William Atkinson, et.al., Epidemiology and Prevention of Vaccines-Preventable Diseases, Center for Disease Control and Prevention, 7th ed., Jan 2002, page 11
- ❏ Averila, Thaddeus, The Menace of Meningococemia, 2005
- ❏ RESU, DOH-CHD, CAR, Update on Meningococcal Infection Cases, Morbidity Mortality Weekly Report
- ❏ Nicolas, P, Garnotel, L, Meningococcus Unit, Collaborating Centre for Reference and Research, France, 2005
- ❏ Gatchalian, Salvacion, Meningococemia, 2005
- ❏ Padilla, CB, et.al, Meningococemia Outbreak, the BGHMC Experience
- ❏ Dacuycuy, I.A, et.al, Profile of Pediatric Patients with Meningococcal Disease at a Local Tertiary Hospital
- ❏ Meningococcal Disease, Travelers' Health: Yellow Book Health Information for International Travel, 2005-2006
- ❏ Meningococcal Disease, Pink book 2006, CDC
- ❏ Asswat, RP, et.al., Clinical Profile of Adult Meningococcal Disease Patients Admitted at BGHMC from November 2001 to June 2006
- ❏ Emerging Infectious Diseases, CDC, February 2007
- ❏ Redbook 2006
- ❏ Meningococcal Disease Census, BGHMC
- ❏ Wenzel, R, Brewer, T, Beutler, JP, A Guide to Infection Control in the Hospital, 4th ed. 2004
- ❏ Polyzoid, EA, et.al, Guidelines for Infection Control in Healthcare Personnel, 1998, CDC Personnel Health Guidelines, p. 333





**Care for a Lifetime**  
**INFECTION CONTROL**

**Just say NOSocomial™**  
MINIMIZATION OF HEALTHCARE ACQUIRED INFECTIONS

**Fig. 1 Selected best practices in using injection equipment**

(1) Use of new equipment

(2) Collection of dirty sharps in safety boxes

(3) Safe sharps waste management

**Patient Safety**

**Hands That Heal**      **Hands That Kill**

*Which hands are yours?*