DISEASE CONTAINMENT IN PEDIATRICS: PRACTICAL APPLICATIONS

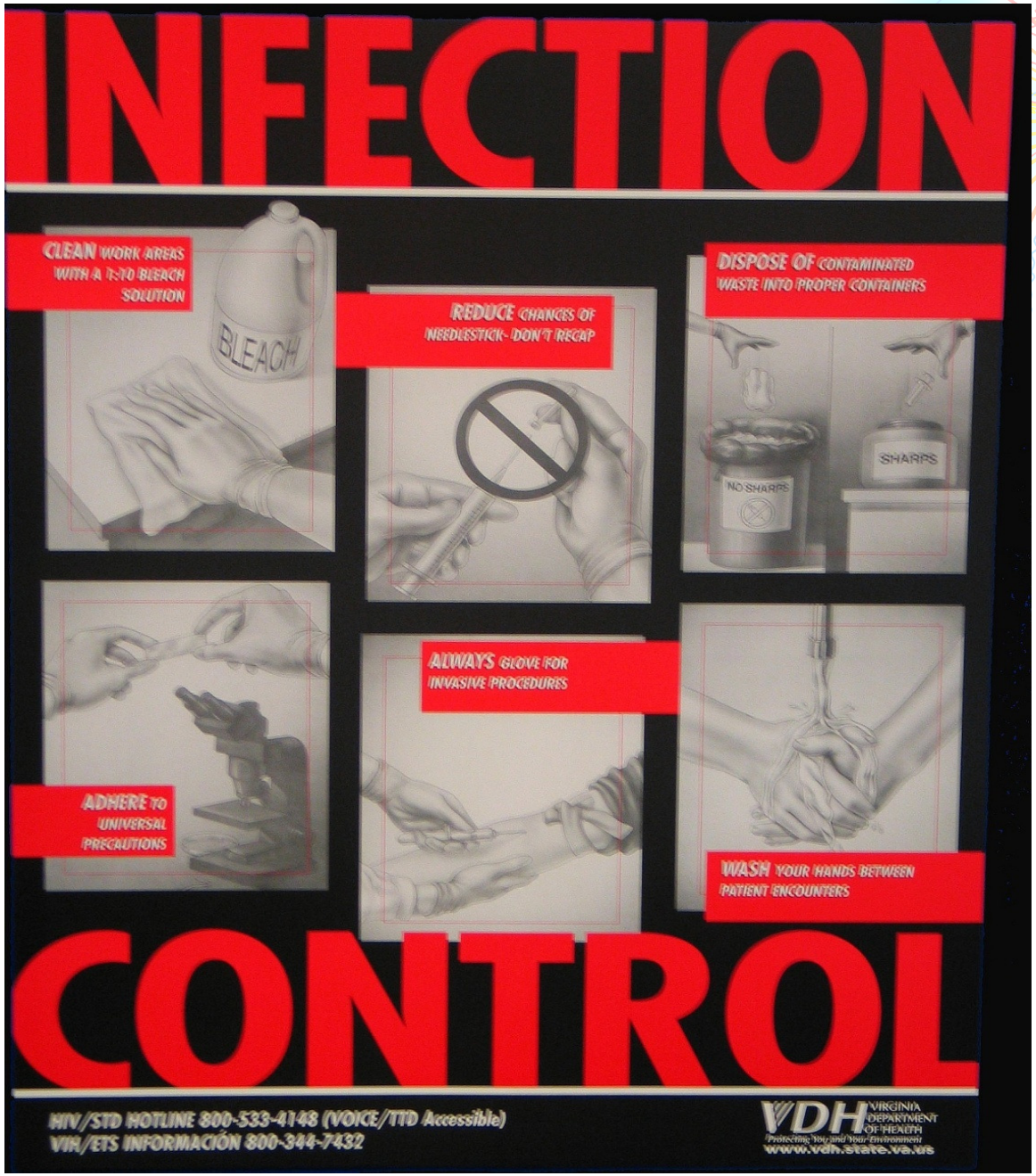
SETTING UP THE FINAL DEFENSE

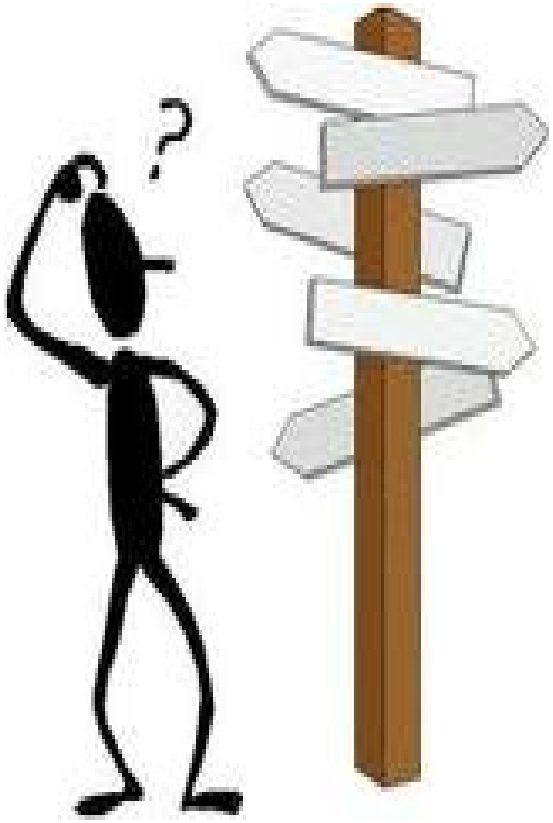
Nancy Nazaire-Bermal ,MD

Fellow – PPS, PIDSP

Objectives

- **To provide practical and rational approach in post-exposure chemoprophylaxis with antiviral or antibacterial agents**
- **To discuss vaccines used for post-exposure prevention**


INFECTION
CLEAN WORK AREAS WITH A 1:10 BLEACH SOLUTION
BLEACH
REDUCE CHANCES OF NEEDLESTICK- DON'T RECAP
DISPOSE OF CONTAMINATED WASTE INTO PROPER CONTAINERS
NO SHARPS
SHARPS
ADHERE TO UNIVERSAL PRECAUTIONS
ALWAYS GLOVE FOR INVASIVE PROCEDURES
WASH YOUR HANDS BETWEEN PATIENT ENCOUNTERS
CONTROL
HIV/STD HOTLINE 800-533-4148 (VOICE/TTD Accessible)
VIH/ETS INFORMACIÓN 800-344-7432
VDH VIRGINIA DEPARTMENT OF HEALTH
Protecting You and Your Environment
www.vdh.state.va.us



- **Prophylaxis**
  - **Use of antimicrobial drugs in the absence of suspected or documented infection to prevent development of infection**
- **Effective chemotherapy**
  - **Directed at specific pathogens,for infection prone body sites and among vulnerable hosts**

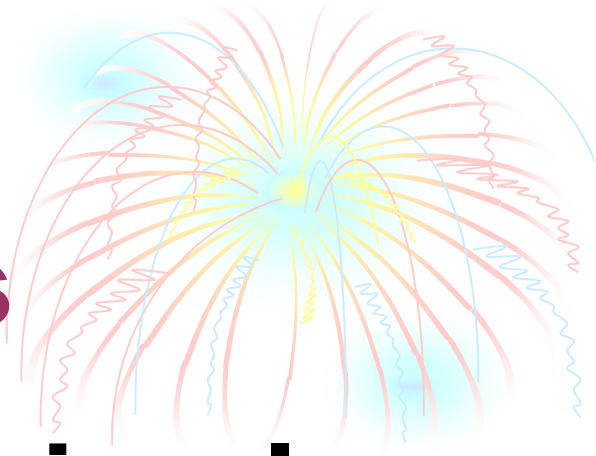
Prophylactic agents

- **Narrow spectrum of activity**
- **Used for as brief a period of time as possible**

Post-exposure Prophylaxis

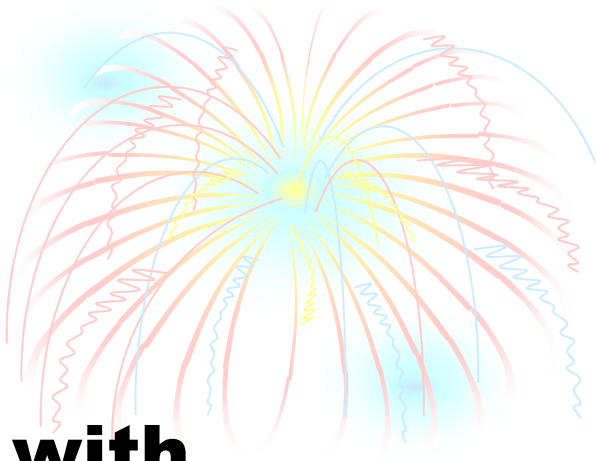
- **Prophylaxis targeted against specific organisms after an individual is exposed**
- **WHO?**
- **WHY?**
- **WHAT?**
- **WHEN?**
- **HOW LONG?**

Meningitis chemoprophylaxis



- **Prophylaxis of contacts is only indicated when meningococcal or Hib disease is the "probable" or "confirmed" diagnosis**
- **Prophylaxis is not necessary in pneumococcal and viral meningitis.**

Meningococcal Infection



- **Close contacts of patients with invasive disease caused by *Neisseria meningitides***
- **Secondary cases and outbreaks may occur in household, childcare centers, schools and military camps**
- **Attack rate for household contact – 0.3 to 1.0 %**
- **Spread from patients to HCW not frequent**

Close contacts

- **Household contacts, children < 2 y.o.**
- **Child care or pre school contact at any time during 7 days before onset of illness**
- **Direct exposure to index patients secretion at any time during 7 days before onset of illness**
- **Mouth to mouth resuscitation unprotected contact during intubation**
- **Frequently slept in same dwelling as index patient**
- **Passengers directly next to the index case during airline flights lasting > 8 hours**

Low risk : no chemo

- **Casual contact – no direct exposure to index oral secretion**
- **Indirect contact – only contact is with high-risk contact**
- **Health care professional without direct exposure to patients's oral secretion**

In outbreak or cluster

- **For people other that at high risk – consult local public health authorities**

Chemoprophylaxis

- **Started as soon as possible within 24 hours of identifying the index case**
- **If given more than 14 days after the onset of disease, chemoprophylaxis is probably of limited or no benefit**
- **Should also be given to index case to eradicate nasopharyngeal carriage**

Recommended chemoprophylaxis regimens for high-risk contacts and persons with invasive meningococcal disease

Drug	Age	Dose	Duration	Efficacy	Caution
Rifampin	< 1 mo	5 mg/kg, orally, every 12 h	2 days		
Rifampin	≥ 1 mo	10 mg/kg (maximum 600 mg), orally, every 12 h	2 days	90-95	Can interfere with efficacy of oral contraceptives and some seizure prevention and anticoagulant medications; may stain soft contact lenses. Not recommended for pregnanwomen ■
Ceftriaxone	< 15 y	125 mg, IM	Single dose	90-95	To decrease pain at injection site, dilute with 1% lidocaine
Ceftriaxone	≥15 y	250 mg, IM	Single dose	90-95	
Ciprofloxacin	≥ 18	500 mg, orally	Single dose	90-95	Not recommended for persons <18 years of age. Not recommended for pregnant women

Ceftriaxone vs Rifampicin

- **eradication of nasopharyngeal carriage :**
  - **at 1 week: 97 vs 81%**
  - **at 2 weeks 97 vs 81%**
  - **Ceftriaxone , not recommended for routine prophylaxis though with advantage of ease of administration, possibly greater efficacy and safety in pregnant**

Rifampin-resistant Meningococcal Disease

- **Emerging Infectious Diseases • www.cdc.gov/eid • Vol. 11, No. 6, June 2005**
- **3 cases of rifampin-resistant meningococcal isolates in cases of invasive disease reported in the United States**
- **Point mutations in the RNA polymerase β subunit (*rpoB*) gene**
- **Although rifampin-resistant meningococcal disease is still rare after 30 years of using rifampin for chemoprophylaxis and ciprofloxacin resistance has rarely been observed, susceptibilities to chemoprophylactic agents should be monitored to ensure that recommendations are sufficiently effective to minimize the occurrence of secondary cases.**

Rifampin Prophylaxis

- **Fails to eradicate pharyngeal carriers in 10-20% of cases**
- **Not recommended for pregnant**
- **Side effects: headache, dizziness,GI symptoms, discoloration of body secretions, hepatotoxicity**

Meningococcal Vaccine Recommendations

- **Both MCV and MPSV recommended for control of outbreaks caused by vaccine-preventable serogroups**
- **Outbreak definition:**
  - **3 or more confirmed or probable primary cases**
  - **Period <3 months**
  - **Primary attack rate >10 cases per 100,000 population***

H. Influenzae infections

- **Risk of secondary invasive disease is age dependent**
- **Highest risk – household contact**
  - **< 1 yo – 6%**
  - **< 4 yo – 2.1%**
  - **> 6 and adults – little or no risk**
- **Exposed hospital personnel – no risk**
- **Prophylaxis recommended for all household contacts if at least one of the contacts is < 4 yo and not completely immunized**

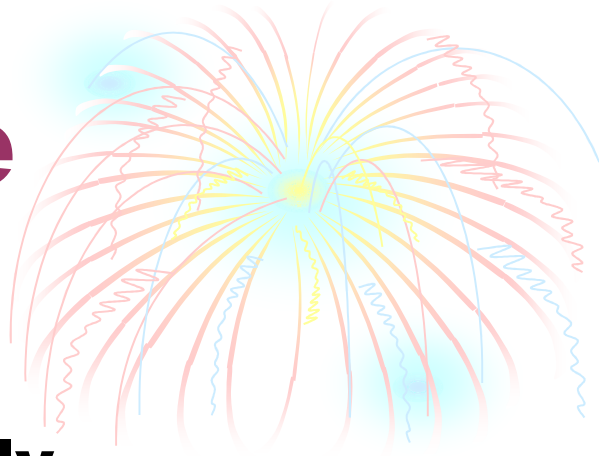
Prophylaxis for nursery and daycare

- **The center is attended by unvaccinated or incompletely vaccinated < 2 yo where contact is 25 hr/week or more**
- **2 or more cases of invasive Hib within 60 days and with unvaccinated and incompletely vaccinated children**

Regimen

- **Rifampicin 20 mg/kg/day (max 600 mg) single dose for 4 days**
- **Given ASAP as secondary cases occur during the first week**
- **Given also to index case initiated during hospitalization and just before discharge**

Hib Post-exposure Prophylaxis



- **May be unnecessary eventually**
- **given widespread childhood immunization with the Hib conjugate vaccine**
- **In addition to protecting the vaccinated child against Hib infection, conjugate vaccine appears to decrease Hib pharyngeal colonization which would also reduce Hib transmission to unvaccinated children.**

Pertussis

- **Close contacts**
  - **Household members**
  - **Attendees of childcare facilities**
  - **Others who are in contact with index case for 4 or more hours /day**
  - **Monitor close contacts for 2 weeks for any respiratory symptoms after last contact to index case – maybe mild**
- **Chemoprophylaxis**
  - **Recommended regardless of age or vaccination status as immunity after immunization not absolute**
  - **Erythromycin 40-50mg/kg/Day (max 2 g/day) in 4 divided doses x 14 days**
  - **TMP-SMX 8 mg/kg/day (TMP) BID x 14 days**

Influenza PEP Indication

- **risk for influenza complications**
- **The type and duration of contact**
- **recommendations from local or public health authorities**
- **clinical judgment**

Centers for Disease Control and Prevention

MMWR

Morbidity and Mortality Weekly Report

Recommendations and Reports / Vol. 60 / No. 1

January 21, 2011

Antiviral Agents for the Treatment and Chemoprophylaxis of Influenza

Recommendations of the Advisory Committee on Immunization Practices (ACIP)

TABLE 1. Recommended dosage and schedule of influenza antiviral medications* for treatment† and chemoprophylaxis§

Antiviral agent		Age group (yrs)				
		1–6	7–9	10–12	13–64	≥65
Zanamivir	Treatment, influenza A and B	NA	10 mg (2 inhalations) twice daily	10 mg (2 inhalations) twice daily	10 mg (2 inhalations) twice daily	10 mg (2 inhalations) twice daily
	Chemoprophylaxis, influenza A and B	NA for ages 1–4	Ages 5–9 10 mg (2 inhalations) once daily	10 mg (2 inhalations) once daily	10 mg (2 inhalations) once daily	10 mg (2 inhalations) once daily
Oseltamivir¶	Treatment,** influenza A and B	Dose varies by child's weight**	Dose varies by child's weight**	Dose varies by child's weight** >40 kg = adult dose	75 mg twice daily	75 mg twice daily
	Chemoprophylaxis, influenza A and B	Dose varies by child's weight††	Dose varies by child's weight††	Dose varies by child's weight†† >40 kg = adult dose	75 mg once daily	75 mg once daily

Abbreviation: NA = not approved

* Zanamivir is manufactured by GlaxoSmithKline (Relenza — inhaled powder). Zanamivir is approved for treatment of persons aged ≥7 years and approved for chemoprophylaxis of persons aged ≥5 years. Zanamivir is administered through oral inhalation by using a plastic device included in the medication package. Patients will benefit from instruction and demonstration of the correct use of the device. Zanamivir is not recommended for those persons with underlying airway disease. Oseltamivir is manufactured by Roche Pharmaceuticals (Tamiflu — tablet). Oseltamivir is approved for treatment or chemoprophylaxis of persons aged ≥1 year. Oseltamivir is available for oral administration in 30 mg, 45 mg, and 75 mg capsules and liquid suspension. No antiviral medications are approved for treatment or chemoprophylaxis of influenza among children aged <1 year. This information is based on data published by the Food and Drug Administration (FDA), available at http://www.fda.gov/Drugs/DrugSafety/InformationbyDrugClass/ucm100228.htm.

† Recommended duration for antiviral treatment is 5 days. Longer treatment courses can be considered for patients who remain severely ill after 5 days of treatment.

§ Recommended duration is 10 days when administered after a household exposure and 7 days after the most recent known exposure in other situations. For control of outbreaks in long-term care facilities and hospitals, CDC recommends antiviral chemoprophylaxis for a minimum of 2 weeks and up to 1 week after the most recent known case was identified

¶ See Table 4 for information about use of oseltamivir for infants aged <1 year. A reduction in the dose of oseltamivir is recommended for persons with creatinine clearance <30 mL/min.

** The treatment dosing recommendation for oseltamivir for children aged ≥1 year who weigh ≤15 kg is 30 mg twice a day. For children who weigh >15 kg and up to 23 kg, the dose is 45 mg twice a day. For children who weigh >23 kg and up to 40 kg, the dose is 60 mg twice a day. For children who weigh >40 kg, the dose is 75 mg twice a day.

†† The chemoprophylaxis dosing recommendation for oseltamivir for children aged ≥1 year who weigh ≤15 kg is 30 mg once a day. For children who weigh >15 kg and up to 23 kg, the dose is 45 mg once a day. For children who weigh >23 kg and up to 40 kg, the dose is 60 mg once a day. For children who weigh >40 kg, the dose is 75 mg once a day.

Tuberculosis

- **GOAL : prevent initial infection in individuals who have negative tuberculin skin test**
- **Who ?**
  - **Persons with impaired immunity**
  - **Household contact esp < 4 yo**
  - **Persons known to be anergic from populations with high prevalence of TB**
- **INH 10-15 mg/kg/day max 300mg single dose x 12 weeks**
- **Repeat skin test after 12 weeks**
  - **If (+) – continue for total of 9 months**
  - **If (-) - discontinue**

Post-exposure prophylaxis to prevent HIV infection

- **short-term antiretroviral treatment to reduce the likelihood of HIV infection after potential exposure, either occupationally or through sexual intercourse**

- **Guidelines created from a Joint WHO/ILO expert consultation on occupational and non-occupational HIV post-exposure prophylaxis held in Geneva in September 2005**

PEP To Prevent HIV

- **indications for post-exposure prophylaxis**
- **the most suitable antiretroviral medicines to use**
- **various issues relating to prescribing protocols and clinical management.**

HIV nPEP

- ***For persons seeking care ≤72 hours after nonoccupational exposure to blood, genital secretions, or other potentially infectious body fluids of a person known to be HIV infected, when that exposure represents a substantial risk for transmission, a 28-day course of highly active antiretroviral therapy (HAART) is recommended***
- ***Evidence of possible decrease in risks – reduction behavior***

HIV PEP

- **Occupational exposure**
- **28 days of zidovudine and lamivudine**

Vaccines as Post-exposure Prophylaxis

Varicella Vaccine

- **Recommended to exposed without evidence of varicella immunity**
- **70-100% effective if given within 72 hours of exposure**
- **Not effective if given > 5 days but will produce immunity if not infected**
- **If the exposure results in infection, there is no evidence that administration of varicella vaccine during the incubation period or prodromal stage of illness increases the risk for vaccine-associated adverse reactions**

Epidemiology and Prevention of Vaccine-Preventable Diseases
11th Edition (May 2009)

Varicella Outbreaks

- vaccine used successfully
- The ACIP recommends a second dose of varicella vaccine for outbreak control
- During a varicella outbreak, persons who have received one dose of varicella vaccine should receive a second dose, provided the appropriate vaccination interval has elapsed since the first dose
  - 3 months for persons aged 12 months to 12 years and
  - at least 4 weeks for persons aged 13 years of age and older

Measles Postexposure Prophylaxis

- **Live measles vaccine**
  - **provides permanent protection and may prevent disease if given within 72 hours of exposure**
- **Immune globulin**
  - **may prevent or modify disease and provide temporary protection if given within 6 days of exposure.**
  - **dose 0.25 mL/kg body weight, maximum of 15 mL IM**
  - **indicated for susceptible household contacts of measles patients, particularly contacts younger than 1 year of age**
  - **12 months of age or older, give live measles vaccine 5 months later when the passive measles antibodies have waned.**
  - **IG should not be used to control measles outbreaks**

Epidemiology and Prevention of Vaccine-Preventable Diseases
11th Edition (May 2009)

Hepatitis B

Prevention of Perinatal Hepatitis B Virus Infection

- Begin treatment within 12 hours of birth
- Hepatitis B vaccine (first dose) and HBIG at different sites
- Complete vaccination series at 6 months of age
- Test for response at 9-18 months of age

Hepatitis B Post-exposure Prophylaxis

Recommended Postexposure Prophylaxis for Occupational Exposure to Hepatitis B Virus

Vaccination and antibody status of exposed person*		Treatment		
		Source HBsAg** Positive	Source HBsAg** Negative	Source unknown or not available for testing
Unvaccinated		HBIG† X 1 and initiate HB vaccine series	Initiate HB vaccine series	Initiate HB vaccine series
Previously Vaccinated	Known Responder§	No treatment	No treatment	No treatment
	Known nonresponder‡	HBIG X 1 and initiate revaccination or HBIG X 2††	No treatment	If known high-risk source, treat as if source were HBsAg positive
	Antibody response unknown	Test exposed person for anti-HBs¶ – If adequate§, no treatment is necessary – If inadequate‡, administer HBIG X 1 and vaccine booster	No treatment	Test exposed person for anti-HBs¶ – If adequate§, no treatment is necessary – If inadequate‡, administer vaccine booster and recheck titer in 1-2 months

* Persons who have previously been infected with HBV are immune to reinfection and do not require postexposure prophylaxis

** Hepatitis B surface antigen

† Hepatitis B immune globulin; dose is 0.06 mL/kg administered intramuscularly

§ A responder is a person with adequate levels of serum antibody to HBsAg (i.e., anti-HBs ≥10 mIU/mL)

‡ A nonresponder is a person with inadequate response to vaccination (i.e., serum anti-HBs <10 mIU/mL)

†† The option of giving one dose of HBIG and reinitiating the vaccine series is preferred for nonresponders who have not completed a second 3-dose vaccine series. For persons who previously completed a second vaccine series but failed to respond, two doses of HBIG are preferred.

¶ Antibody to HBsAg

Source: *MMWR* 2001; 50(RR-11) pg 22

Hep A Post- exposure prophylaxis

- **Hepatitis A vaccine - for postexposure prophylaxis in healthy persons 12 months through 40 years of age.**
- **Immune globulin**
  - **for persons older than 40 years of age,**
  - **children younger than 12 months of age,**
  - **immunocompromised persons, and**
  - **persons with chronic liver disease.**

MMWR 2007;54(No.41):1080-84 (October 19, 2007)

Immune globulin

- **used for postexposure prophylaxis**
  - **varicella-zoster virus [VZIG]**
  - **hepatitis B virus [HBIG],**
  - **measles and**
  - **hepatitis A virus [IG]**
  - **rabies [RIG]**

Summary

- **Established post-exposure prophylaxis for meningococcemia, Hib, pertussis, tuburculosis, influenzae, varicella, hepatitis,HIV**
- **Decision should be made and PEP regimen given**

- **Some vaccines are also used for post-exposure prophylaxis of susceptible individuals, including varicella , influenza , hepatitis B**
- **In the future, administration of a newly developed *S. aureus* conjugate vaccine (still under investigation) to selected patients may provide a novel method of preventing healthcare-associated *S. aureus,* including MRSA, infections in high-risk groups (e.g., hemodialysis patients and candidates for selected surgical procedures)**

- **THANK YOU!**