

# Updates on Adult & Pediatric Vaccination

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# Outline

- CDC, AAP, AAFP 2008 Immunization Schedules: Pediatric, Adolescent & Adult
- Vaccines in Focus
  - Burden of Disease
  - Vaccine Description
  - Side effects & Precautions
- Health Care Personnel Vaccinations
- Lebanese Data
- Introduce new vaccines?

# Benefits of Vaccination

- Individual Benefits include:
  - Protection from symptomatic illness
  - Improved quality of life and productivity
  - Prevention of death.
- Societal benefits include:
  - Creation and maintenance of herd immunity against communicable diseases
  - Prevention of disease outbreaks
  - Reduction in health-care--related costs.

**No vaccine is completely safe. Side effects may be common minor or severe and life threatening.**

# 2008 CDC, AAP, AAFP Pediatric Immunization Schedule

Vaccine ▼	Age ►	Birth	1 month	2 months	4 months	6 months	12 months	15 months	18 months	19-23 months	2-3 years	4-6 years
Hepatitis B <sup>1</sup>		HepB	HepB		<i>see footnote 1</i>		HepB					
Rotavirus <sup>2</sup>				Rota	Rota	Rota						
Diphtheria, Tetanus, Pertussis <sup>2</sup>				DTaP	DTaP	DTaP	<i>see footnote 3</i>	DTaP				DTaP
<i>Haemophilus influenzae</i> type b <sup>2</sup>				Hib	Hib	<i>Hib</i> <sup>2</sup>	Hib					
Pneumococcal <sup>1</sup>				PCV	PCV	PCV	PCV				PPV	
Inactivated Poliovirus				IPV	IPV		IPV					IPV
Influenza <sup>4</sup>								Influenza (Yearly)				
Measles, Mumps, Rubella <sup>2</sup>							MMR					MMR
Varicella <sup>2</sup>							Varicella					Varicella
Hepatitis A <sup>2</sup>								HepA (2 doses)			HepA Series	
Meningococcal <sup>2</sup>											MCV4	

# 2008 CDC, AAP, AAFP Adolescent Immunization Schedule

Vaccine ▼	Age ►	7-10 years	11-12 years	13-18 years
Diphtheria, Tetanus, Pertussis <sup>1</sup>	<i>see footnote 1</i>		<b>Tdap</b>	<b>Tdap</b>
Human Papillomavirus <sup>2</sup>	<i>see footnote 2</i>		<b>HPV (3 doses)</b>	<b>HPV Series</b>
Meningococcal <sup>3</sup>		<b>MCV4</b>	<b>MCV4</b>	<b>MCV4</b>
Pneumococcal <sup>4</sup>		<b>PPV</b>		
Influenza <sup>5</sup>		<b>Influenza (Yearly)</b>		
Hepatitis A <sup>6</sup>		<b>HepA Series</b>		
Hepatitis B <sup>7</sup>		<b>HepB Series</b>		
Inactivated Poliovirus <sup>8</sup>		<b>IPV Series</b>		
Measles, Mumps, Rubella <sup>9</sup>		<b>MMR Series</b>		
Varicella <sup>10</sup>		<b>Varicella Series</b>		

# 2008 CDC, AAP, AAFP Adult Immunization Schedule

VACCINE ▼	AGE GROUP ▶	19–49 years	50–64 years	≥ 65 years
Tetanus, diphtheria, pertussis (Td/Tdap) <sup>1,*</sup>		1 dose Td booster every 10 yrs		
		Substitute 1 dose of Tdap for Td		
Human papillomavirus (HPV) <sup>2,*</sup>		3 doses females (0, 2, 6 mos)		
Measles, mumps, rubella (MMR) <sup>3,*</sup>		1 or 2 doses	1 dose	
Varicella <sup>4,*</sup>		2 doses (0, 4–8 wks)		
Influenza <sup>5,*</sup>		1 dose annually		
Pneumococcal (polysaccharide) <sup>6,7</sup>		1–2 doses		1 dose
Hepatitis A <sup>8,*</sup>		2 doses (0, 6–12 mos or 0, 6–18 mos)		
Hepatitis B <sup>9,*</sup>		3 doses (0, 1–2, 4–6 mos)		
Meningococcal <sup>10,*</sup>		1 or more doses		
Zoster <sup>11</sup>				1 dose

# Recently Developed Vaccines

## ■ Childhood

- Rotavirus Vaccine

## ■ Adolescence

- Tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis vaccine (Tdap)
- Quadrivalent meningococcal conjugate vaccine (MC V4)
- Quadrivalent human papillomavirus (HPV) vaccine

All three vaccines may be given together ideally at the 11-12 years visit.

## ■ Adulthood

- Zoster Vaccine

# Existing Vaccines

- Recent Changes in Existing Vaccines
  - Influenza
  - Varicella
  - Hepatitis A
  - Hepatitis B
- Existing Vaccines with no changes:
  - MMR
  - Hib
  - Pneumococcal vaccine (PCV)
  - DTaP for children
  - IPV

# Rotavirus

- It is the most common cause of severe gastroenteritis in infants and young children worldwide, especially among children between the ages of 6 months and 2 years.
- In developing countries rotavirus gastroenteritis is responsible for approximately 500,000 deaths per year among children younger than 5 years.
- In the USA, each year, Rotavirus infection causes:
  - >400,000 doctors' visits
  - >200,000 emergency room visits.
  - 55,000 to 70,000 hospitalizations
  - 20-60 deaths
- Direct and indirect costs of infection approaching \$1 billion per year in USA
- Children are most likely to get Rotavirus Gastroenteritis between November and May.

# Rotavirus Vaccine 1

- Two Oral Rotavirus Vaccines are available:
  - Attenuated Human Rotavirus Vaccine (HRV): a monovalent vaccine derived from the most common human rotavirus strain.
  - A Pentavalent human-bovine rotavirus (PRV): that contains five human bovine reassortants. Each reassortant virus contains a single gene encoding a major outer capsid protein from the most common human serotypes: G1, G2, G3, G4, and P1A.
- Efficacy
  - ↓ Hospitalizations by 85-96%
  - ↓ Risk of severe Gastroenteritis by 85-88%.
  - ↓ Emergency Room visits by 94%

# Rotavirus Vaccine 2

## Schedule & Mode of Administration:

- 2 Oral Doses (1ml each) : first at 6 weeks and second at least 4 weeks later and before 24 weeks of age for HRV.
- 3 oral doses (2ml each) at 2, 4, and 6 months of age for the PRV
- First dose should be administered between 6 and 12 weeks of age

**A minimum interval of 4 weeks should be left between doses.**

## Caution

- Do not initiate vaccination for children older than 12 weeks of age because of a lack of safety data when the series is begun after 12 weeks of age.
- All 3 doses should be administered by 32 weeks of age because of lack of safety data.

# Rotavirus Vaccine 3

- Side effects
  - Risk is minimal
  - Allergic reaction
  - Fever
- Contraindications in infants with:
  - Previous severe life threatening reaction to a dose of rotavirus vaccine.
  - Severe allergy to any component of the vaccine including Latex.
  - Known immunodeficiency.

# Rotavirus Vaccine 4

## ■ Precautions

- Acute moderate to severe gastroenteritis
- Moderate to severe febrile illness
- History of intussusception

Infants with preexisting chronic gastrointestinal disease and are not receiving immunosuppressive therapy should benefit from the vaccine

# Pertussis 1

- The current childhood immunization series against tetanus, diphtheria, and pertussis induces antibodies that are highly protective ( $> 95$  percent) against diphtheria and tetanus, although immunity wanes with time.
- Primary vaccination against pertussis is less effective (50 to 90 percent), and passive and active immunity wanes after 5 to 10 years, leaving many adults and adolescents susceptible.
- The incidence of pertussis began to rise in 1980 with around 25616 reported cases in 2005 in USA (60% among persons 11-64 years of age).

# Pertussis 2

- Adolescents & Adults will suffer from cough that can remain paroxysmal for long time.
- Adolescents and adults are a reservoir of infection for un-immunized infants leading to high rate of death and complications.
- Adolescent & Adult DTap contains the same tetanus toxoid, diphtheria toxoid, and three of the five pertussis antigens as those in pediatric DTaP, but with decreased quantities of the diphtheria and pertussis components.

# DTaP1

- Routine for children at 2 months, 4 months, 6 months, 15-18 months, 4-6 years of age
  - Dose #1 as early as 6 weeks of age
  - Dose #4 as early as 12 months of age if 6 months have elapsed since dose #3 and the child is unlikely to return at age 12-15 months of age
- Minimum interval between doses:
  - 4 weeks between doses #1 and #2
  - 4 weeks between doses #2 and #3
  - 6 months between doses #3 and #4
  - If dose #4 is given before the 4th birthday, wait at least 6 months for dose #5 (age 4-6 years)
  - If dose #4 is given on or after the 4th birthday, dose #5 is not needed

# DTaP 2

- Administer at age 11–12 years for those who have completed the recommended childhood DTP/DTaP vaccination series and have not received a tetanus and diphtheria toxoids (Td) booster dose.
- 13–18 year olds who missed the 11–12 year Tdap or received Td only, are encouraged to receive one dose of Tdap 5 years after the last Td/DTaP dose.
- DTaP should replace a single dose of Td for adults aged <65 years who have not previously received a dose of DTaP (either in the primary series, as a booster, or for wound management)

# DTaP 3

- Contraindications :
  - encephalopathy within seven days of receiving a pertussis-containing vaccine
  - allergic reaction to any of the vaccine components
  - an unstable neurologic condition, or a history of Guillain-Barré syndrome within six weeks of receiving a tetanus-containing vaccine.



# Meningococcal Disease

- Caused by Gram Negative Diplococci *Neisseria Meningitidis*.
- Meningococci are classified by serology based on the polysaccharide capsule that helps the bacteria resist phagocytosis and complement-mediated lysis.
- Most invasive disease is caused by Serogroups A, B, C, Y, and W-135.
- Leading cause of Bacteremia and Meningitis.
- In USA, it affects 1400 to 2800 persons per year.
- Case-fatality rate is 9 to 12 percent, with 11 to 19 percent of survivors having serious sequelae even with appropriate Antibiotic therapy.
- Persons at higher risk for Meningococcal disease:
  - Functional or Anatomic Asplenia
  - Terminal complement compound deficiencies
  - Military recruits
  - Those who travel to or live in endemic areas (sub-Saharan Africa)
  - Microbiologists exposed to isolates.



# Meningococcal Vaccine 1

- **MPSV4 : Quadrivalent Meningococcal Polysaccharide vaccine** approved in 1978 (S/C)
  - Approved for persons 2 years of age and older if previous Hx of GBS
  - Adverse events: mild including fever.
  - Acceptable for persons ages 11-55 years if MCV4 is not available
  
- **MCV4:** Quadrivalent polysaccharide vaccine (serotypes A, C, Y, W-135) conjugated to diphtheria toxin (IM)
  - MCV4 is recommended for children aged 2–10 years with risk factors.
  - Approved for persons up till the age of 55 years.
  - Adverse events mild including fever.
  - History of Guillain-Barré syndrome is a precaution for MCV4
  - **Contraindication:** Previous anaphylactic or neurologic reaction to diphtheria toxoid is a contraindication.



# Meningococcal Vaccine 2

- The main advantages of MCV4 include:
  - booster response after the second dose
  - longer duration of immunity, and effectiveness against most of the common strains.
- **Revaccination**
  - If previous vaccine was MPSV4, revaccinate after 5 years if the risk continues:
  - If previous vaccine was MCV4, revaccination is not recommended

# Human Papilloma Virus 1

- HPV-related disease includes genital warts, cytologic abnormalities; and cervical, vaginal, and vulvar cancers and their associated precursor lesions.
- Virtually all cervical cancers are causally related to persistent HPV infection with HPV types 16 and 18 accounting for
  - 70 percent of cervical cancers
  - 14 and 50 percent of cervical intraepithelial neoplasia grades 2 and 3 (CIN 2/3) lesions.
- Most HPV infections are transient and resolve or become undetectable within two years. However, when HPV infection persists, the stepwise development of invasive cancer takes an average of 20 years.

# Human Papilloma Virus 2

- In Lebanon:
  - Age Standardized Incidence (ASR) per 100,000 women for cervical cancer was estimated for the year 2003 to be 4.3 ( 7.9 in USA, 9.8 in UK and 10.1 in France).
  - The prevalence of the HPV HPV16 DNA in around 1,000 women, 18-76 years, seeking regular gynecological care at a tertiary care center was 4.9%, almost similar to its prevalence in the Mediterranean countries.

# Human Papilloma Virus Vaccine 1

- Two prophylactic (Bivalent and Quadrivalent) HPV vaccines have been developed that elicit strong and sustained immunity to HPV types 16 and 18 in clinical trials; one of the vaccines also protects against two low-risk HPV types that are associated with 90 percent of cases of genital warts (HPV types 6, 11, 16, and 18)
- Clinical trials showed that these vaccines are:
  - 75 to 100 percent effective in preventing persistent type-specific HPV 16 or 18 infection and
  - 90 to 100 percent effective in preventing CIN 2/3
- Routine HPV vaccination is recommended for girls 11 and 12 years of age in three separate doses at 0,2,6 months (IM).
- Girls as young as nine years can be vaccinated with an eligible age of 9 to 26 years.
- HPV vaccination is recommended for all females 13 through 26 years of age to catch up missed doses or to complete the vaccination series.
- Minimum intervals:
  - 4 weeks between doses 1 and 2
  - 12 weeks between doses 2 and 3

# Human Papilloma Virus Vaccine 2

- The vaccine ideally should be administered before potential exposure to genital HPV because the potential benefit is likely to diminish as the number of lifetime sex partners increases.
- HPV vaccine can be given to:
  - women with minor acute illnesses (e.g., diarrhea, respiratory tract illnesses with or without fever) but should not be given until recovery from a moderate or severe illness.
  - women who are immunocompromised by disease or medications, but the immune response and vaccine effectiveness may be reduced.
  - Lactating women but never to pregnant women

# Human Papilloma Virus Vaccine 3

- **Contraindications:**
  - Pregnancy
  - Severe acute illness
  - Hypersensitivity to the vaccine components or to yeast.
- **Side Effects:** most adverse events are mild to moderate:
  - injection site reactions: pain, redness, and swelling.
  - systemic adverse effects: fever, headache, and nausea

# Human Papilloma Virus Vaccine 4

- Vaccination is expected to lead to a
  - Reduction in the number of abnormal pap tests, colposcopy referral, cervical biopsies and excisional procedures.
  - Leading to a decrease in procedure-associated complications.
  - There is insufficient evidence to alter screening recommendations. Women who receive the HPV vaccine should continue to follow current Pap screening guidelines
  - No need to do screening for HPV before the vaccination



# Herpes Zoster

- Elderly are at increased risk of Herpes Zoster and Post-herpetic Neuralgia.
- Complications occur in almost 50% of elderly: pneumonia, blindness, or encephalitis.
- A new vaccine was released in 2006. In clinical trials and compared to the placebo group the vaccine group had:
  - 51.3% fewer episodes of Herpes zoster
  - 66.5% less post-herpetic neuralgia
- The efficacy of the vaccine was greater in patients 60-69 years old and decreased with increasing patient age.



# Herpes Zoster Vaccine 1

- It is a live attenuated virus vaccine indicated for prevention of Herpes Zoster.
- It contains the same live attenuated virus as the Varicella vaccine but at a much higher titer (14\*).
- It should never be used for primary immunization in children.
- A single dose of the vaccine administered subcutaneously is recommended for adults 60 years of age and older whether or not they report a prior episode of herpes zoster.



# Herpes Zoster Vaccine 2

- Side effects include:
  - Local injection site reaction such as redness, pain, swelling, itching, and warmth.
  - Risk that patients may still develop shingles and post-herpetic neuralgia, even after vaccination.
- Not give in elderly with:
  - History of anaphylactic reaction to gelatin, neomycin or any other component of the vaccine.
  - Immunosuppression due to disease or chronic steroid intake.



# Influenza 1

- In USA, influenza epidemics caused around
  - 36,000 deaths per year from 1990 to 1999 (More than 90% are among patients older than 65 years old).
  - 226,000 hospitalizations annually from 1979 to 2001
- Children have the Highest rates of infection
- Highest rates of serious illness and death are among:
  - Persons aged >65 years
  - Children aged <2 years
  - Persons of any age who have medical conditions that place them at increased risk for complications.
- Complications: bacterial pneumonia, ear infections, sinus infections, dehydration, and worsening of chronic medical conditions, such as congestive heart failure, asthma, or diabetes.



# Influenza 2

- 57 % of hospitalizations occur in persons younger than 65 years
- Most deaths among children occur in those who have no known risk factors.
- According to CDC reports, the number of influenza-related deaths among children in USA in 2005, 2006, 2007 influenza seasons ranged from 46 to 74.
- The effectiveness of influenza vaccines varies from 30 to 95 percent, depending on the antigenic drift, similarity of the vaccine strain to the circulating strain, and the health and age of the recipient.
- Two Types of Vaccines are available in the market:
  - Trivalent Inactivated Influenza Vaccine
  - Live attenuated Influenza Vaccine



# Influenza Vaccine 1

- Annual Influenza Vaccination is recommended for:
  - Children 6-59 months of age
  - All persons 50 years of age and older
  - Persons 6 months of age and older with chronic illness (pulmonary, cardiac, metabolic, renal dysfunction, homoglobinopathy, immunosuppression)
  - Residents of long-term care facilities and institutional settings
  - Persons 6 months – 18 years of age receiving chronic aspirin therapy
  - Pregnant women, regardless of trimester
  - Household members of high-risk persons
  - Health care providers including home-care personnel
  - Providers of essential community services
  - International travelers
  - Anyone who wants to reduce the likelihood of influenza



# Influenza Vaccine 2

- AAP issued updated guidelines for routine use of Influenza vaccine in children and adolescents in the 2008 to 2009 influenza season.
- The expansion targets all school-aged children being the population that bears the greatest disease burden and is significantly higher risk of needing influenza-related medical care compared with healthy adults.
- Reducing influenza transmission among school-aged children will reduce transmission of influenza to household contacts and community members.
  - Vaccination includes now all children aged 6 months to 18 years.



# Influenza Vaccine 3

- Inactivated subunit (TIV) – Intramuscular
  - Approved for persons 6 months of age and older
  - Preferred for close contacts of severely immunosuppressed persons who require care in a protective environment.
  - Contraindications: Allergy to vaccine components including anaphylactic reaction to eggs, moderate illness with and without fever, History of Guillain-Barre Syndrome.
  - Adverse Reactions:
    - Fever
    - Malaise & myalgia
    - Flu like symptoms
    - Rarely, allergic reactions such as hives and angioedema in case of hypersensitivity to vaccine components (e.g., residual egg protein).



# Influenza Vaccine 4

- Live attenuated vaccine (LAIV) – Intranasal
  - Approved only for healthy persons 5-49 years of age.
  - Should not be administered to persons younger than 5 years of age or older than 49 years.
  - Contraindications: same as TIV + Pregnancy, concomitant Aspirin Therapy, Hx of recurrent wheezing, altered immunocompetency.
  - Persons who receive LAIV should refrain from contact with severely immunosuppressed persons for 7 days after vaccination
  - Adverse reactions: significantly increased rate of cough, coryza, nasal congestion, sore throat, chills. No increase in fever.



# Influenza Vaccine 5

- Age determines the number of influenza vaccine doses to be administered:
  - Adults receive one dose of the vaccine (0.5 ml IM TIV or 1 vial intranasal LAIV)
  - Children aged at least 9 years who have not previously received the influenza vaccine require only **one dose** in their first season of immunization.
  - Any child younger than 9 years who is vaccinated against influenza for the first time should receive a second dose at least 4 weeks after the first (0.25 ml for children aged 6 to 35 months and 0.5 ml for children aged 3 years and older.
  - Children younger than 9 years who received only 1 dose of influenza vaccine in the first season they were vaccinated should receive 2 doses of influenza vaccine the following season.



# Influenza Vaccine 6

- The best time to administer the vaccination is during October and November.
- May give starting September to March.
- Antibody titer peaks within 2 weeks after receiving the vaccine.



# Influenza Vaccine 7

- Influenza vaccination has positive effects on patient outcomes, work absences, and infection rates.
- Studies have shown
  - 13 to 44 percent reduction in health care visits
  - 18 to 45 percent reduction in work absences
  - 18 to 28 percent reduction in reduced productivity
  - 25 percent reduction in antibiotic use for influenza-like illness
  - vaccination has been shown to save approximately \$60 to \$4,000 per illness, depending on effectiveness, cost, and infection rates.



# Varicella

- It is an endemic disease worldwide.
- It is a highly contagious disease caused by Varicella- zoster virus.
- It usually results in lifetime immunity.
- Complications include congenital varicella infection, shingles, severe illness, and death.
- Hospitalization: approximately 3 per 1,000 cases and varies by age – higher in infants younger than 1 year and adults older than 20 years of age
- Death: approximately 1 per 60,000 cases.
- A single antigen life-attenuated vaccine was developed several years ago and has shown a 96-100% efficacy rate.
- Over the past 10 years, the widespread use of the vaccine has substantially decreased the rates of chicken-pox and vaccine-related complications.



# Varicella Vaccine 1

- The long-term efficacy of the vaccine is controversial. It offers up to eight years of protection though antibody levels are lower than those following natural infection.
- Vaccinated persons develop milder symptoms:
  - Fewer skin lesions, which are more likely to be macular than vesicular
  - Residual scarring is less common
  - Atypical cases are making the diagnosis of varicella more difficult.
- Increased number of outbreaks of chickenpox in vaccinated children led to recommending giving boosters.
- After one dose, children aged 12 months to 12 years have a 97 percent rate of detectable antibody
- After two doses, 99 percent of patients 13 years and older test seropositive.



# Varicella Vaccine 2

- Two doses of varicella vaccine (S/C) are recommended for all susceptible children 12 months of age and older:
  - First dose at age 12-15 months.
  - Second dose at age 4-6 years but can be given earlier, provided that at least 3 months have passed since 1st dose.
- Children 13 years of age and Adults should receive two doses of varicella vaccine 4-8 weeks apart (0, 4-8 weeks).
- Efforts should be made to ensure varicella immunity before age 13 years, because varicella disease can be more severe among older children and adults.



# Varicella Vaccine 3

- A quadrivalent combination of varicella vaccine and MMR is recommended for children who need both components and may be given for both doses in children 12 months to 12 years.
- Adverse Events:
  - Local injection site reaction such as redness, pain, swelling, itching, and warmth.
  - Mild fever
  - Skin rash
  - Irritability, tiredness
- Contraindications for vaccination:
  - Pregnancy
  - Immunosuppression

# Hepatitis A

- Fulminant hepatitis A causes about 100 deaths per year in the U.S.A, with a Case-fatality of 2% among reported cases of adults 40 years and older.
- Disease also results in lost work time and hospitalization among adults.
- After the licensure of the hepatitis A vaccine in 1996 in U.S.A, disease rates have declined to the lowest level ever recorded.
- Initially, only children living in communities with high rates of hepatitis A were immunized.
- In 2006, a new recommendation, based on new epidemiologic data and economic analyses, for universal immunization of children.

# Hepatitis A Vaccine 1

- The vaccine is an inactivated single antigen. Two brands are available and can be used interchangeably (IM).
- Adverse events are mild, local soreness and headache.
- Routine Pediatric Recommendation:
  - All children should receive hepatitis A vaccine at one year of age (12 to 23 months):
    - first dose at the 12- to 15-month visit
    - second dose six to 12 months later.
  - Children not vaccinated by two years of age can be vaccinated at later visits.

# Hepatitis A Vaccine 2

- **Routine adult recommendations** include the following groups, in addition to anyone wishing to be protected:
  - Persons traveling to or working in countries that have high or intermediate indemnity of infection
  - Homosexuals (both adolescents and adults) should be vaccinated.
  - Users of injection and non-injection illicit drugs.
  - Persons who work with HAV-infected primates or with HAV in a research laboratory setting.
  - Susceptible persons who are administered clotting-factor concentrates
  - Susceptible persons with chronic liver disease should be vaccinated.

# Hepatitis A Vaccine 3

- Post-vaccination testing is not indicated because of the high rate of vaccine response among adults and children.
- **Contraindications and Precautions**
  - Hepatitis A vaccine should not be administered to persons with a history of a severe allergic reaction to a previous dose of hepatitis A vaccine or to a vaccine component.
  - The safety of hepatitis A vaccination during pregnancy has not been determined;
  - vaccine is inactivated, no special precautions need to be taken when vaccinating immunocompromised persons.

# Hepatitis B

- Hepatitis B virus (HBV) is a cause of acute and chronic hepatitis, cirrhosis, and hepatocellular carcinoma.
- There are more than 200 million chronically infected persons worldwide.
- The risk of chronic infection is highest when infection occurs in infancy or childhood and declines with age.
- Children have the greatest risk of developing cirrhosis and hepatocellular carcinoma, and they serve as a reservoir of infection for the population as a whole.

# Hepatitis B Vaccine 1

- Recommendations for Hepatitis B dosing is unchanged:
  - Three doses series: at birth, two months, and six to 12 months of age (IM).
  - An extra dose may be given at four months when combination vaccinations are used, but it cannot replace the six-month dose.
  - Infants of HBsAg-positive mothers receive immune globulin and vaccination within 12 hours of birth.

# Hepatitis B Vaccine 2

- There is emphasis on vaccination before hospital discharge for infants of both HBsAg-negative and -positive mothers.
- Birth Dose:
  - Required for effective prophylaxis of perinatal hepatitis B virus (HBV) exposure
  - Provides a safety net for infants of women not identified as HbsAg+ during pregnancy (mother acquired HBV subsequent to testing, test results not passed on, other human error)
  - Provides protection for exposure from a source other than the mother
  - May improve completion rates for other childhood vaccines

Only monovalent HBV vaccine can be used for the birth dose.

# Hepatitis B Vaccine 3

- Emphasis is also placed on vaccinating non-immune adolescents (catch up series).
- For adults, immunization is recommended for high risk persons:
  - Medical indications: end-stage renal disease, HIV infection, chronic liver disease.
  - Occupational indications: health-care personnel and public-safety workers.
  - Behavioural indications: non-monogamous sexual relationship, homosexuals,, current or recent injection-drug users.
  - Other indications: household contacts and sex partners of persons with chronic hepatitis B virus (HBV) infection; international travelers to countries with high or intermediate prevalence; and any adult seeking protection from HBV infection.

# Hepatitis B Vaccine 4

- Contraindications and precautions:
  - individuals with a history of hypersensitivity to yeast, or latex or any of the vaccine components.
- Not Contraindicated
  - in persons with a history of multiple sclerosis, Guillain-Barre syndrome, autoimmune disease, or other chronic disorder
  - in pregnancy

# Hemophilus Influenza Type B Conjugate Vaccine

- *Hemophilus influenzae* bacteria colonize the nasopharynx and can invade the blood stream in certain persons causing an infection at a distant site.
- Case fatality rate: 2%-5% despite antimicrobial therapy
- Hib disease is age dependent and disease is not common among children older than age 5 years.
- **Impact of vaccine: 99% reduction of invasive disease.** There is evidence that Hib vaccines decrease the rate of carriage of Hib among vaccinated children, thereby decreasing the chance that unvaccinated children will be exposed.

# Hemophilus Influenza Type B Conjugate Vaccine

- 3-dose primary series: 2,4,6 months
- Optimal interval between doses: 2 months
- Minimum interval between doses: 4 weeks
- Separate booster dose from previous dose (dose 2 or 3) by at least 8 weeks
- Never give Hib-containing vaccine to a child younger than 6 weeks of age – may induce immunologic tolerance to subsequent doses of Hib vaccine

# Pneumococcal Disease

- Acute bacterial infection caused by *Streptococcus pneumoniae*
- Asymptomatic carriage is common; approximately 2/3 of children are colonized
- The 10 most common (of the 90 known) serotypes cause about 62% of invasive disease worldwide.
- Outbreaks are not common and generally occur in crowded environments (e.g., prison, nursing home)
- Most common presentation of the disease in adults is Pneumococcal Pneumonia. Other forms include meningitis and systemic bacteremia.
- Children at greatest risk for invasive disease include those with sickle cell anemia, immunosuppression, and cochlear implants.

# Pneumococcal Vaccine 1

- In USA, since the beginning of vaccination, there has been a dramatic decrease in invasive pneumococcal disease in children and improved herd immunity, but only a small decrease in pneumococcal otitis media.
- Vaccine is effective against antibiotic-resistant strains, which are increasing.
- Pneumococcal pneumonia is still the most common cause of vaccine-preventable death in the United States.

# Pneumococcal Vaccine 2

## ■ Pneumococcal conjugate vaccine (PCV7)

- Pneumococcal polysaccharide conjugated to nontoxic diphtheria toxin (7 serotypes) causing 86 percent of bacteremia and 83 percent of meningitis among children younger than 6 years.
- More than 90 percent effective against invasive disease in children; less effective against pneumonia and otitis media
- Routine pediatric immunization schedule: 2 months, 4 months, 6 months, 12-15 months of age.
- Not vaccinated and older than 12 months: 2 doses 8 weeks apart.
- Not vaccinated and ages between 24-59 months, receive 1 dose.
- Not routinely given to children 5 years of age or older.

# Pneumococcal Vaccine 3

- **Pneumococcal polysaccharide vaccine (PPV23)** : Purified capsular polysaccharide antigens from 23 serotypes causing 88 percent of invasive disease
  - Accounts for 88% of bacteremic pneumococcal disease
  - Cross-reacts with types causing additional 8% of disease
  - 60 to 70 percent effective in preventing invasive disease; less effective in preventing pneumonia
  - Not effective in children 2 years and younger.
  - Single Dose in persons 2 years and older with selective revaccination at least 5 years after the first dose
  - Duration of immunity: at least 5 years

# Pneumococcal vaccine 4

- Immunization recommendations:
  - Adults 65 years of age and older
  - Adults of any age with a normal immune system who have a chronic illness cardiovascular or pulmonary disease, diabetes, alcoholism, cirrhosis, cerebrospinal fluid leak, cochlear implant)
  - Adults who are immunocompromised
  - HIV infection
  - Living in an institutional or social environment with an identified increased risk
- Vaccination rates remain well below target goals especially for adults This may be because randomized trials have demonstrated that PPV can prevent invasive pneumococcal disease but not community-acquired pneumonia (CAP).

# Healthcare Personnel Vaccination Recommendations 1

## ■ Hepatitis B:

- 3 doses at 0,1,6 months given IM.
- Obtain anti-HBS serologic testing 1 to 2 months after third dose.

## ■ Influenza:

- 1 dose of Trivalent Inactivated Influenza Vaccine (IM) annually .

## ■ MMR:

- 2 doses of MMR 4 weeks apart (SC) in the absence of serologic evidence of immunity or prior vaccination.

# Healthcare Personnel Vaccination Recommendations 2

## ■ **Varicella :**

- 2 doses of varicella vaccine 4 weeks apart (SC), in the absence of serologic proof of immunity, or prior vaccination or history of varicella disease.

## ■ **Tetanus, Diphtheria, Pertussis:**

- Td booster every 10 years following the completion of the primary 3 dose series.
- HCP younger than age of 65 years with direct patient contact should be given a 1 time dose of Tdap with priority given to those having contact with infants younger than age 12 months (IM).

# Healthcare Personnel Vaccination Recommendations 3

- Meningococcal:
  - 1 dose to microbiologists who are routinely exposed to isolates of *Neisseria Meningitidis*.
  - MCV4 recommended for those younger than 56 years (IM).
- Hepatitis A, Typhoid and Polio vaccines are not routinely recommended for HCP who may have on-the-job exposure to fecal material.

# Combination vaccines

- The use of combination vaccines (eg, hepatitis B/Hib, hepatitis A and B, and diphtheria, tetanus, acellular pertussis (DTaP)/hepatitis B/poliovirus) can help to reduce the number of inoculations at each visit and improve vaccination coverage

# Lebanese Ministry of Public Health

## Immunization Schedule

- Hepatitis B: 0, 1-2, 6-12 months
- DPT : 2,4,6 months, 15-18 months, 4-6 years, 11-12 years.
- Hib: 2,4,6 months
- OPV: 2,4,6 months, 15-18 months, 4-6 years.
- MMR: 12-15 months, 4-6 years.
- Measles: 9 months
- PPD: yearly as of 1 year.

# Lebanon & USA 2006 Statistics

Number of Children Immunized against:		
Vaccine	Lebanon	USA
DPT	92%	96%
Polio	92%	93%
MMR		93%
Measles	96%	
Hepatitis B	88%	93%
HIB	92%	93%

Lebanon (Unicef data)

# Vaccine Preventable Diseases

## ESU

	2005	2006	2007
Measles	644	905	374
Tetanus	3	0	3
Pertussis	43	46	46
Mumps	14	68	233
Rubella	21	18	33
Hepatitis B	235	252	233

# Other Diseases

## ESU

	2005	2006	2007
Food Poisoning	57	134	131
Typhoid Fever	461	759	879
Viral Hepatitis A	210	308	558
Meningitis	166	129	139

# Deciding on the introduction of a vaccine

- Disease Burden:
  - more research studies
  - Better reporting
- Efficacy, Quality and Safety of a vaccine
- Economic & Financial issues

# Price of some vaccines

- Rotavirus: 1 dose @ \$73 (2 doses @ \$146).
- Hepatitis A : 1 dose @ \$32 (2 doses @ \$64)
- Meningococcal: 1 dose @ \$23.
- Varicella: 1 dose @ \$32 (2 doses @\$64).
- HPV: 1 dose @ \$120 (3 doses @ 360)
- Pneumococcal:
  - PCV7: 1 dose @ \$105 (4 doses @ \$420)
  - PPV23: 1 dose @ \$188

# Last Message

- Improve Reporting of Communicable Diseases.
- Establishment of a Vaccination Registry.