Biologic hazard

Presented by: Dr.Izadi •
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Definition

- Human diseases caused by work associated exposure to microbial agents:
  - bacteria
  - viruses
  - fungi

Definition

- The etiology, pathogenesis, clinical findings, diagnosis & treatment of occupational & non-occupational infections are the same.

- practical differences:
  - identification of source of exposure
  - epidemiologic controls
  - prevention

Categories of healthcare workers

Clinical	Physicians
	Dentists
	Physician assistants
	Podiatrists
	Physical and occupational therapists
Nursing	Nurse practitioners
	Medical/surgical/pediatric nurses
	Nurses' aides
Clinical support	Pharmacists
	Laboratory technicians
	Diagnostic imaging technicians
	Operating room technicians
Facility support	Police/security personnel
	Engineering personnel
	Building maintenance staff
	Housekeeping staff
	Food services staff
Office based	Administrators
	Clerical support personnel

Types of Hazard

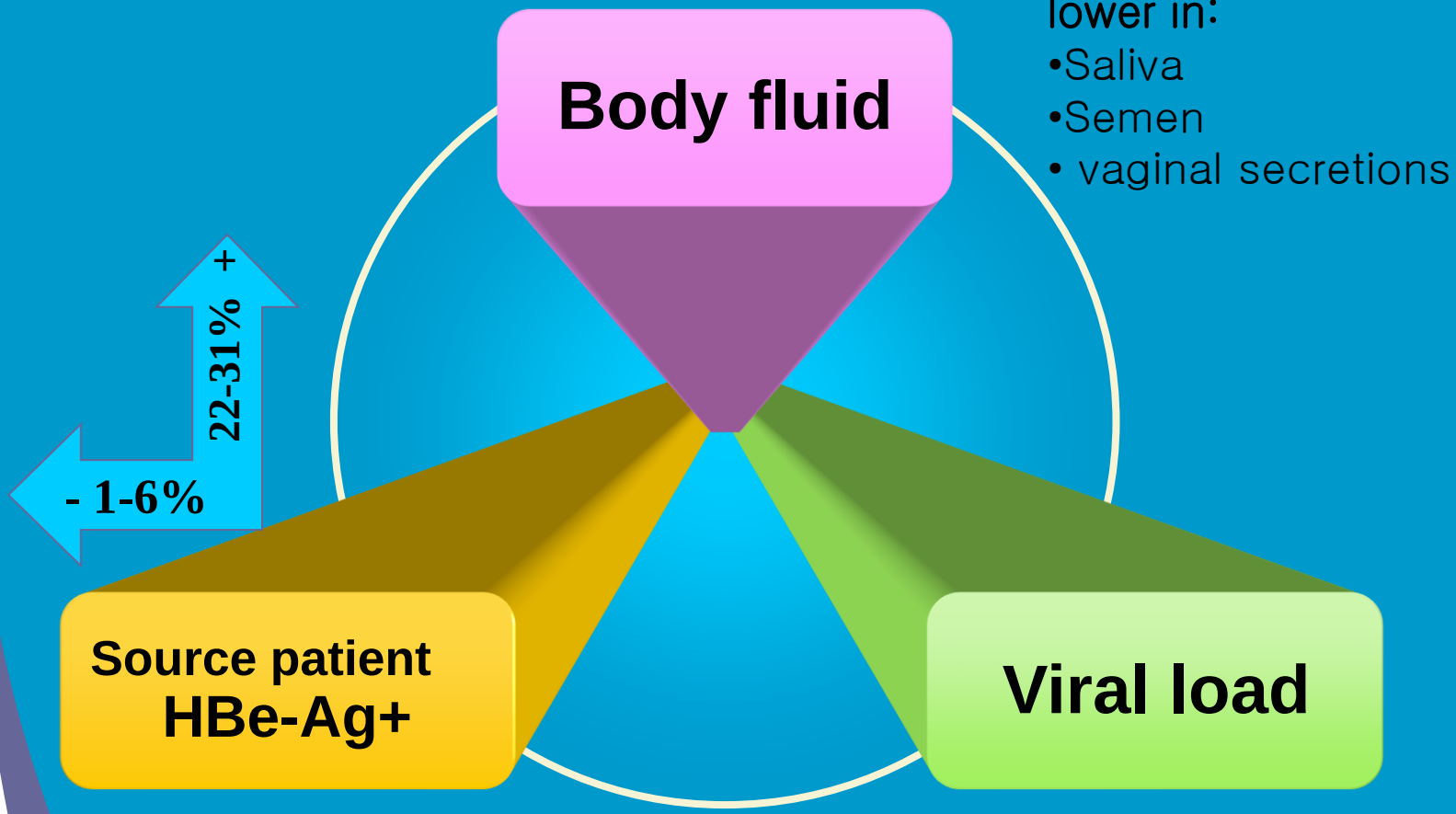
Biologic	blood-borne (HIV,HCV,HBV) air-borne pathogens (TB) & respiratory viruses.
Physical	Radiation, radionuclides, lasers
Chemical	antineoplastic drugs, anesthetic agents, sterilants and disinfectants, latex
Ergonomic	Awkward posture, prolonged standing, lifting, bending
Psychologic	Stress, shift work, violence

Hepatitis B

- Incubation period: 45 to 60 days
- The onset of acute hepatitis B is generally insidious, with anorexia, malaise, nausea, vomiting, abdominal pain, jaundice, skin rash, arthralgia, and arthritis.
- HBsAg serum: 30-60 days after exposure.

Tests	Interpretation	Vaccinate?
HBsAg, anti-HBc, anti-HBs	susceptible	vaccinate if indicated
HBsAg, anti-HBc anti-HBs	immune due to vaccination (passive transfer of HBIG)	no vaccination
HBsAg anti-HBc, anti-HBs	immune due to natural infection	no vaccination
HBsAg, anti-HBc, IgM anti-HBc anti-HBs	acutely infected	no vaccination
HBsAg, anti-HBc IgM anti-HBc, anti-HBs	chronically infected	no vaccination (may need treatment)
HBsAg, anti-HBs anti-HBc	Resolved infection (common) False-positive "Low level" chronic infection Resolving acute infection	

Risk of HBV infection following exposure



In contrast to HIV, and HCV
HBV is resistant to drying, ambient temperatures, simple detergents, and alcohol, and may survive on environmental surfaces for up to one week.

So, contaminated sharp objects may pose a threat to HCWs for several days following last contact with a source patient.

Hepatitis B vaccine

- The 3-dose vaccine series at 0, 1,6 months.

Protective antibody response ≥10 mIU/mL

Vaccine safety

Revaccination is not associated with an increase in adverse events

- Check for surface antibodies 4 wk-6 months following the primary series.

WHAT IS THE APPROPRIATE ADMINISTRATION SITE FOR HEPATITIS B VACCINE AND WHAT NEEDLE SIZE SHOULD BE USED?

- A deep intramuscular (IM) injection into the deltoid muscle is recommended for adult hepatitis B vaccination.

- A 22–25 gauge," needle should be used, but a longer needle may be needed to reach deep into the muscle of obese persons.

IF A HCW'S ONLY DOSE OF HEPATITIS B VACCINE WAS FOUR MONTHS AGO, SHOULD THE SERIES BE RESTARTED?

- No. The hepatitis B vaccine series should not be restarted when doses are delayed.

- the series should be continued from where it left off.

IS IT SAFE FOR HCWS TO BE VACCINATED DURING PREGNANCY?

- **YES**. Pregnant women in occupations with a high risk of hepatitis B virus (HBV) infection (e.g., HCWs) should be vaccinated.

- Hepatitis B vaccine contains no components that have been shown to pose a risk to the fetus at any time during gestation.

Vaccination is not contraindicated in

- Pregnancy
- Guillain-Barre Syndrome
- Autoimmune disease
- Multiple sclerosis

HOW LONG IS HEPATITIS B VACCINE PROTECTIVE

- Studies indicate that immunologic memory remains intact for at least 30 years and confers protection against clinical illness and chronic HBV infection, even though anti-HBs levels that once measured adequate might become low or decline below detectable levels.

- Studies are on-going to assess whether booster doses of HepB will be needed in the future.

WHICH HCWS NEED SEROLOGIC TESTING AFTER RECEIVING 3 DOSES OF HEPATITIS B VACCINE?

- **All HCWs** should have serologic testing 1–2 months following the final dose of the hepatitis B vaccine series.
- An anti-HBs serologic test result of >10mIU/mL indicates immunity.
- No further routine doses or testing are indicated.

SHOULD A HCW WHO PERFORMS INVASIVE PROCEDURES AND WHO ONCE HAD A POSITIVE ANTI-HBS RESULT BE REVACCINATED IF THE ANTI-HBS TITER IS RECHECKED?

- **No.** Post-vaccination testing needs to be done only once at 1–2 months after the vaccine series is completed.

- If a HCW's test :anti-HBs >10mIU/mL after original vaccination series, no further serologic testing is indicated.

-

- that adequate response to the 3-dose series of hepatitis B vaccine provides long-term immunologic memory that gives long-term protection.

- Only immunocompromised persons (e.g., hemodialysis patients, HIV-positive persons) need to have anti-HBs testing and booster doses of vaccine

IF HCWS WERE VACCINATED FOR HEPATITIS B IN THE PAST AND NOT TESTED FOR IMMUNITY, SHOULD THEY BE TESTED NOW?

- **No**. a HCW does not need to be tested unless he or she has an exposure.

- if prophylaxis (HBIG and a booster dose of vaccine) is indicated, the person should receive post vaccination testing 3–6 months afterwards.

IF HCWS HAVE NO DOCUMENTATION SHOWING THEY RECEIVED HEPATITIS B VACCINE. HOWEVER, THEY ARE RELATIVELY SURE THEY RECEIVED THE DOSES MANY YEARS AGO. WHAT DO WE DO NOW?

- Unfortunately, inadequate documentation of vaccination is common.

- Even if physicians think they may have been fully vaccinated, but it is not documented, the three-dose vaccination series should be administered.

- There is no harm in receiving extra doses of vaccine.

A NURSE WHO RECEIVED THE HEPATITIS B VACCINE SERIES OVER 10 YEARS AGO AND HAD A POSITIVE FOLLOW-UP TITER. AT PRESENT, THE TITER IS NEGATIVE. WHAT SHOULD SHE DO NOW?

- She doesn't need to do anything further.

- For health care workers with normal immune status who have demonstrated an anti-HBs response following vaccination, booster doses of vaccine are not recommended nor is periodic anti-HBs testing.

A PERSON WHO IS A KNOWN NON-RESPONDER TO HEPATITIS B VACCINE HAS A PERCUTANEOUS EXPOSURE TO HBSAG-POSITIVE BLOOD. WHAT IS THE ACTION?

- The two-dose HBIG regimen would be the better choice.

- The first dose of HBIG (0.06mL/kg) should be given as soon as possible after exposure and the second dose (same dosage) given one month later.

Anti-HBs< 10mIU/mL
after initial series

3 dose revaccination

Non responder
Or
Infected with HBV
(HBs-Ag & anti-HBc)

CDC does not recommend more than two vaccine series in non responders .

IF AN EMPLOYEE DOES NOT RESPOND TO HEPATITIS B VACCINATION, DOES HE NEED TO BE REMOVED FROM ACTIVITIES THAT EXPOSE HIM TO BLOOD-BORNE PATHOGENS?
DOES THE EMPLOYER HAVE A RESPONSIBILITY IN THIS AREA BEYOND PROVIDING THE VACCINE?

- No regulations demand removal from the job situations described.

- It is up to each organization to develop a policy concerning non-responders.

DOES BEING CHRONICALLY INFECTED WITH HBV PRECLUDE ONE FROM BECOMING A HEALTH PROFESSIONAL?

- **No**. All health professionals should practice standard precautions.

- Those who are HBsAg-positive and HBeAg-positive should not perform exposure-prone invasive procedures (e.g., gynecologic, cardiothoracic surgery) unless they have been counseled by an expert review panel and been advised under what circumstances, if any, they may perform these procedures.

- Such circumstances might include notifying prospective patients of the health professional's seropositivity before they undergo exposure-prone invasive procedures.

HOW LONG AFTER EXPOSURE TO HBV CAN HBSAG BE DETECTED IN AN INFECTED PATIENT'S BLOOD?

- HBsAg will be detected in an infected person's blood an average of 4 weeks (range: 1–9 weeks) after exposure to the virus.
-

Post exposure HBV

Exposed person	Source positive/ unknown	Source negative
Unvaccinated	HBIG*1;Vaccine series	Vaccine series
Non responder		
After 3 dose	HBIG*1;revaccination	revaccination
After 6 dose	HBIG*2	-
Unknown		
Anti-HBs inadequate	HBIG*1 Revaccination	Revaccination

HIV/AIDS in the Workplace

- **How is HIV transmitted:**
  - from an infected person by body fluids such as blood or other blood-containing secretions
- **Preventive measures:**
  - wearing protective clothing, gowns,
  - gloves, masks and goggles

HIV

US: 5% of individuals with AIDS have been employed in healthcare setting.

<0.3% of HCW were documented to have become HIV positive following occupational exposure most are nurses and laboratory workers.

Increase risk

- Deep injury
- Visible contamination of the device with blood
- needle placement directly into an artery or vein
- exposure to an individual with elevated viral titers

Post-Exposure Management

If exposure occurs:

- Skin
  - Wash with soapy water
  - Do not use caustic agent or bleach
- Eye, nose, mouth
  - Rinse with water for 10 minutes
- Needle stick or cut
  - Wash with soapy water
  - Allow to bleed freely
  - Apply first aid

Post-Exposure Management

Test healthcare worker for HIV after exposure at baseline.

Treatment, if started, should be initiated immediately after exposure, within 1-2 hours.

Continue treatment for 4 weeks.

Follow-up Testing and Appointments
Follow-up testing

HIV testing at baseline, 6 wk., 12 wk., and 6 months post-exposure

- **4th generation combination p24 antigen- antibody HIV test :**

- HIV testing :at baseline, 6 wk. , and at 4 months post exposure.
- CBC, Renal and Hepatic Function Tests
- (At baseline and 2 weeks post exposure)

ویژه متخصصین و پزشکان
درمانگر ایدز

مجموعه دستورالعمل و استاندارد فعالیت های مرتبط با
چهارمین برنامه استراتژیک ملی کنترل عفونت اچ آی وی جمهوری اسلامی
ایران

مجموعه دستورالعمل های مراقبت و درمان HIV/AIDS

۶. دستورالعمل مدیریت مواجهه شغلی با HIV/AIDS

ویرایش پنجم –تیر ۱۳۹۹

مرکز مدیریت بیماری‌های واگیر ، وزارت بهداشت درمان و آموزش پزشکی

زیر کمیته تخصصی مراقبت و
درمان

Ag/Ab
نسل ۴

Rapid test

HCV +

آزمایش	پایه	۶ هفته پس از تماس	۳ ماه پس از تماس	۶ ماه پس از تماس
HIV Ag/Ab testing	●	●	●	●
HBs Ag, HBs Ab, HBc Ab	●	—	—	●
HCV Ab	●	—	—	●
CBC [۷]	●	—	—	—
Serum Cr	●	—	—	—
ALT & AST	●	●	-	—

HCV

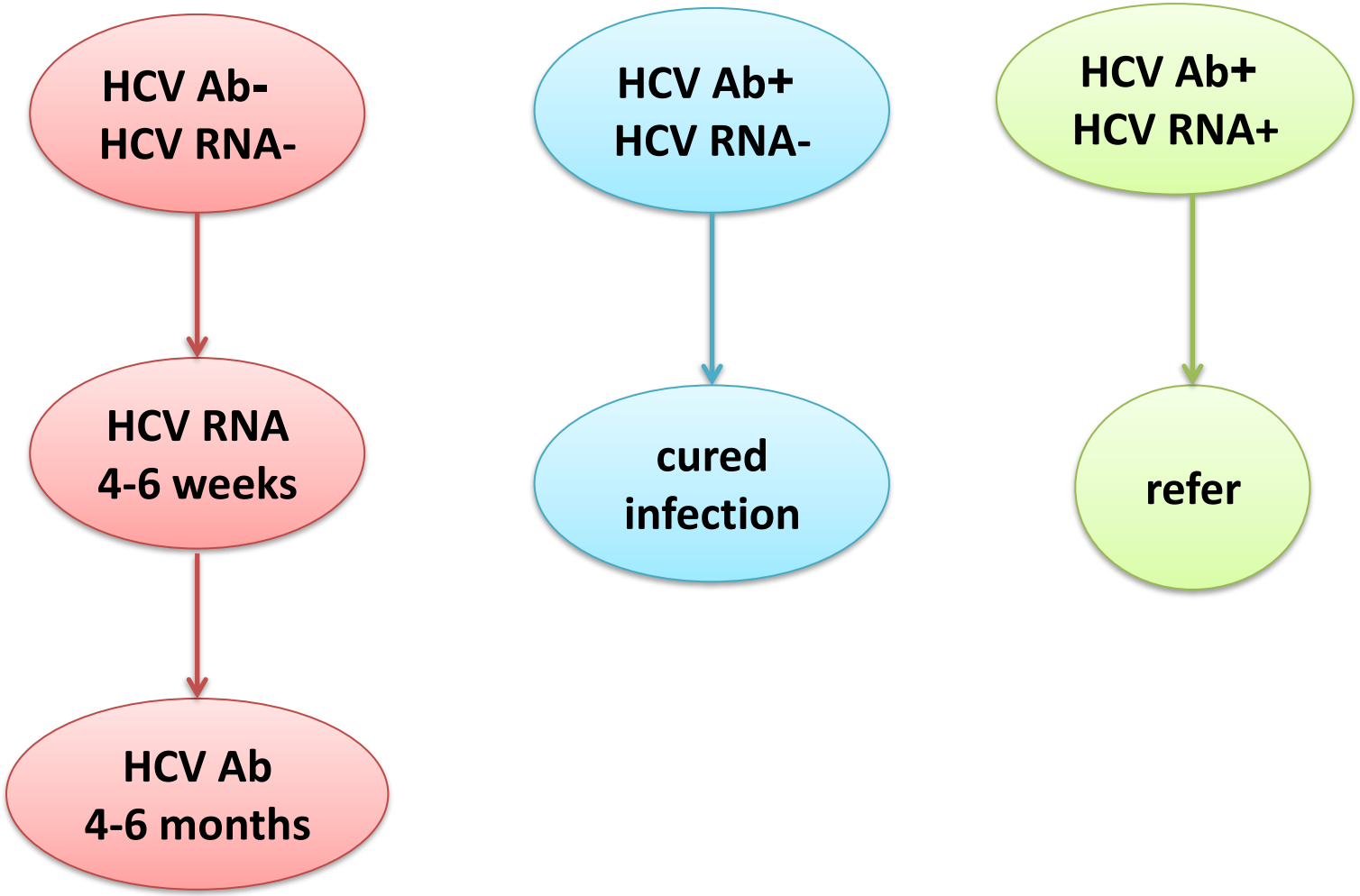
Risk factors in the general population:
Intravenous drug abuse & contaminated blood transfusions.
Among healthcare = general population.

HCV viral titers are low compared to HBV, and virus
is generally not detected in urine, feces, or vaginal fluids.

Incubation period: 2-24 wk
Most of infected have no acute symptoms
chronic hepatitis C : 85%

HCV-Ig , INF-α
Ab-HCV: 5-6 wk of injection
Exposed HCW: HCV_Ab at baseline,6,12,24 wk
PCR & referred to a liver specialist

Test HCP within the 48 hr for HCV-Ab and HCV-RNA



Patient test

Post exposure prophylaxis

Treatment should begin until 48 or 72 hours Following exposure.
Side effect, drug resistance

Several seroconversions have occurred despite prophylaxis :

- Viral resistance
- late initiation of therapy
- inadequate length of therapy
- overwhelming inoculums of virus

More

Less

30%:HBV

0-10%(1.8%): HCV

0.09%−0.3% :HIV

Infected health care workers

CDC guidelines:
Infected HCW who adhere to universal precautions and who perform noninvasive procedures pose no risk for transmitting HIV or HBV to patients.

Exposure-prone procedures:
A needle tip was digitally palpated in a body cavity
A healthcare worker's fingers and a needle or other sharp instrument or object are simultaneously present in a poorly visualized or highly confined anatomic site.

Risk: 1/42,000-1/420,000.

Tuberculosis

- LTBI(Latent tuberculosis infection)
- Tuberculosis Disease

– Incubation Period :4-12W

The risk of development of clinical disease:

- infancy, 16-21 yr
- Under nutrition
- immunopathologic states
- persons with some coexisting diseases
- (silicosis, ESRD, leukemia, upper GI carcinoma, DM)

Primary infection

- Usually is asymptomatic in adults.
- young adults are at higher risk for rapid progression to active disease, usually characterized by apical cavity disease.

- Once infection occurs, the organism may disseminate from the lungs to other sites: GI,GU & bone.

- The risk for reactivation is highest in the first year after exposure.

Tuberculin Skin Testing

- Prior exposure to TB
- Delayed hypersensitivity
- Neither 100% sensitive nor specific
- 0.1 ml of 5IU , intra dermally into the or volar surface of the forearm(48–72hr)

- Positive TST :
- exposed to TB in the past and is at risk for reactivation

- New TST (+):CXR, smear &culture sputum

TST

5 mm of induration:

- close contacts of infectious patients
- Immuno supressed patients
- organ recipients
- persons with known or suspected HIV infection

TST

- >=10 mm is considered positive in:

- High-risk occupational groups
- High-risk groups such as immigrants from high-prevalence areas
- Alcoholics
- IV drug users
- Those with the other disease states

TST

- In persons with no risk factors in areas of low prevalence, induration of 15 mm or more is required for a positive reaction

The PPD test may be negative:

- overwhelming tuberculosis
- Measles
- Hodgkin disease
- Sarcoidosis, or immunosuppressive states

ریسک برای پرسنل بهداشتی		ریسک فعالیت
پایین	متوسط	
دریک بیمارستان بیشتر از ۲۰۰ تخت و کمتر از۶ بیمار در یک سال با تشخیص TBبستری شوند یا در یک بیمارستان با کمتر از ۲۰۰ تخت و کمتر از ۳ بیمار سالانه با تشخیص TBبستری شوند.	دریک بیمارستان با بیشتر از ۲۰۰ تخت و بیشتر از ۶ بیمار سالانه با تشخیص TBبستری شوند یا کمتر از ۲۰۰تخت و بیشتر از۳ بیمار سالانه با تشخیص TBبستری شوند.	
سالانه و بعدازمواجهه	سالانه و بعدازمواجهه	**بالا**
بعدازمواجهه	سالانه و بعدازمواجهه	**متوسط**
بعدازمواجهه	بعد از مواجهه	**کم**

- Persons having known contact with an infectious patient for whom PPD status is not previously documented should be:
  PPD tested immediately and retested 8-12 wk after the infectious contact.

- If conversion occurs, physical examination and chest radiography should occur to rule out acute clinical infection.

Programs to prevent occupational exposure to TB

CDC guidelines

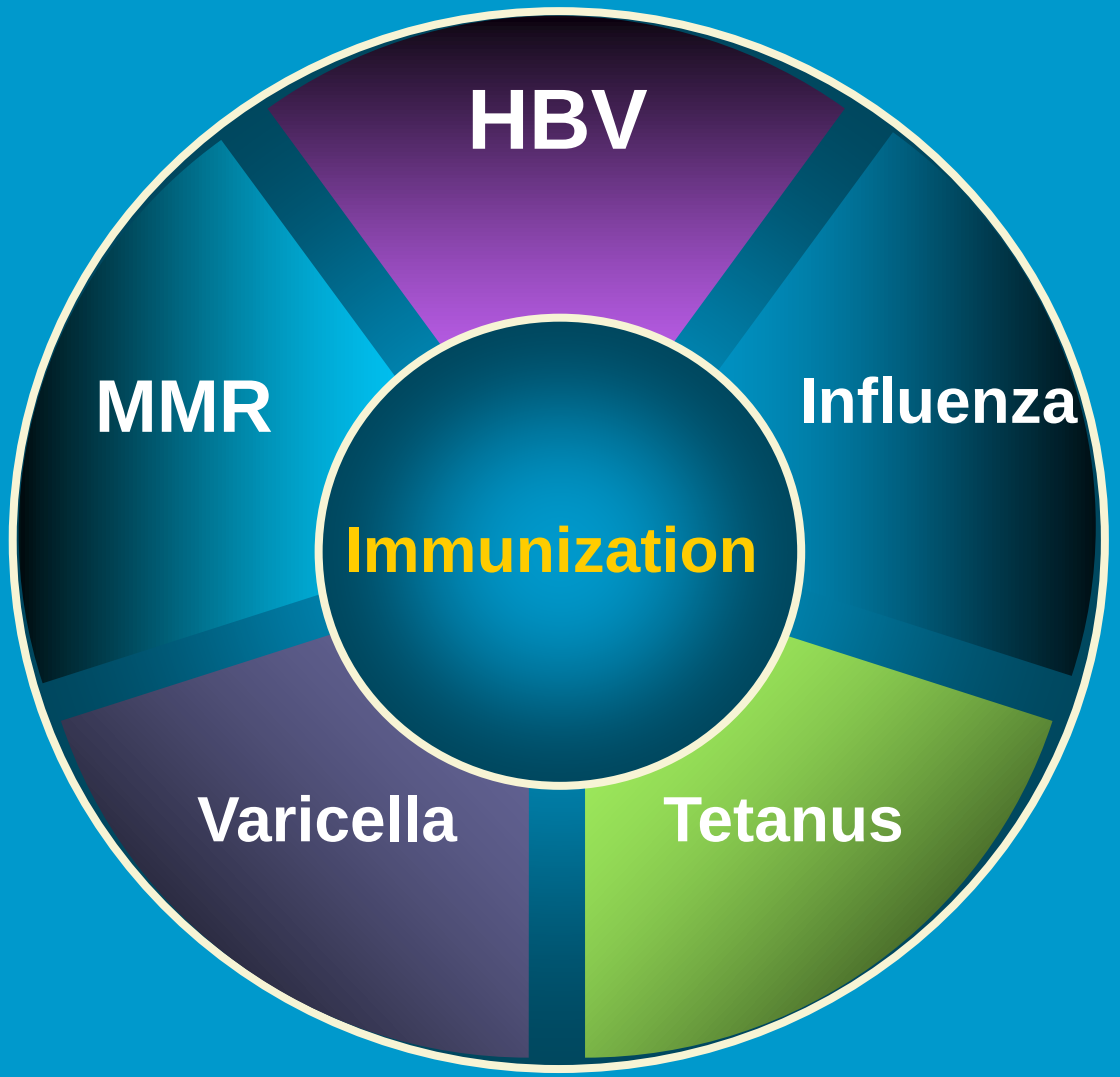
- **Early identification of Infected patients**
- **Engineering controls**
- **Personal protective equipment**
- **Medical surveillance**

Infection control & immunizations

Engineering control for medical center

- ventilation
- Disposable equipment
- Privacy curtains
- Flooring & Surface

Infection control



- HAV vaccine is not currently recommended for HCW.
- Varicella, CMV, rubella :
  teratogen for pregnant employees.
- Immunization for MMR :
  3 months waiting period for pregnancy

Influenza

Vaccine types

LAIN

Live Attenuated Influenza Vaccine

- **Healthy, 2-49 yr, Non pregnant**
- **Except for:**
- **HCW who care for severely immunocompromised persons**

TIV

Trivalent Inactivated Influenza Vaccine

- **Age> 6 mo**

Vaccine effectiveness

Age, Health status of the person(70-90%)

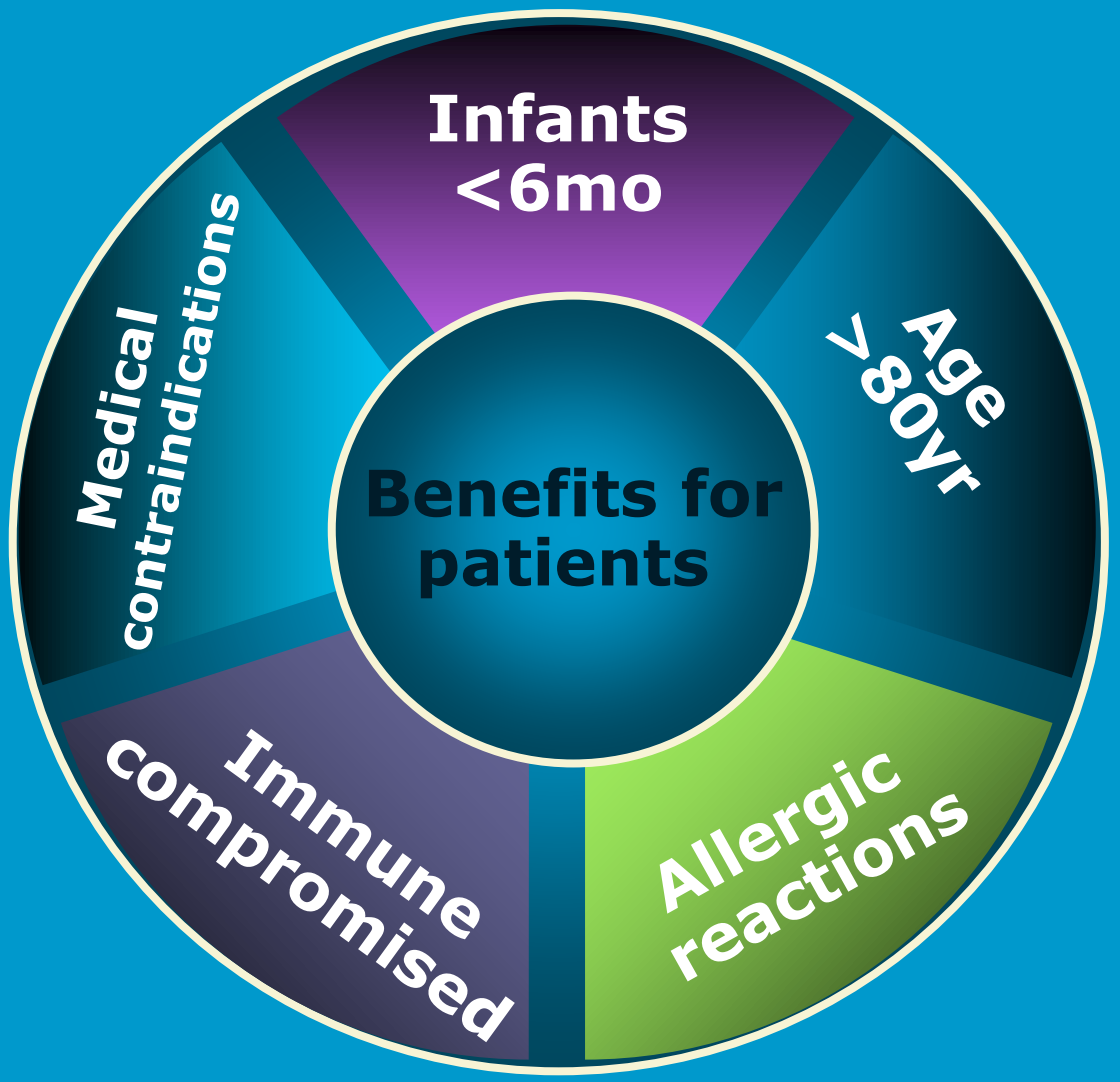
Vaccine side effects

Soreness at the vaccination site<2days

Vaccine contraindication

Hx of anaphylactic reaction

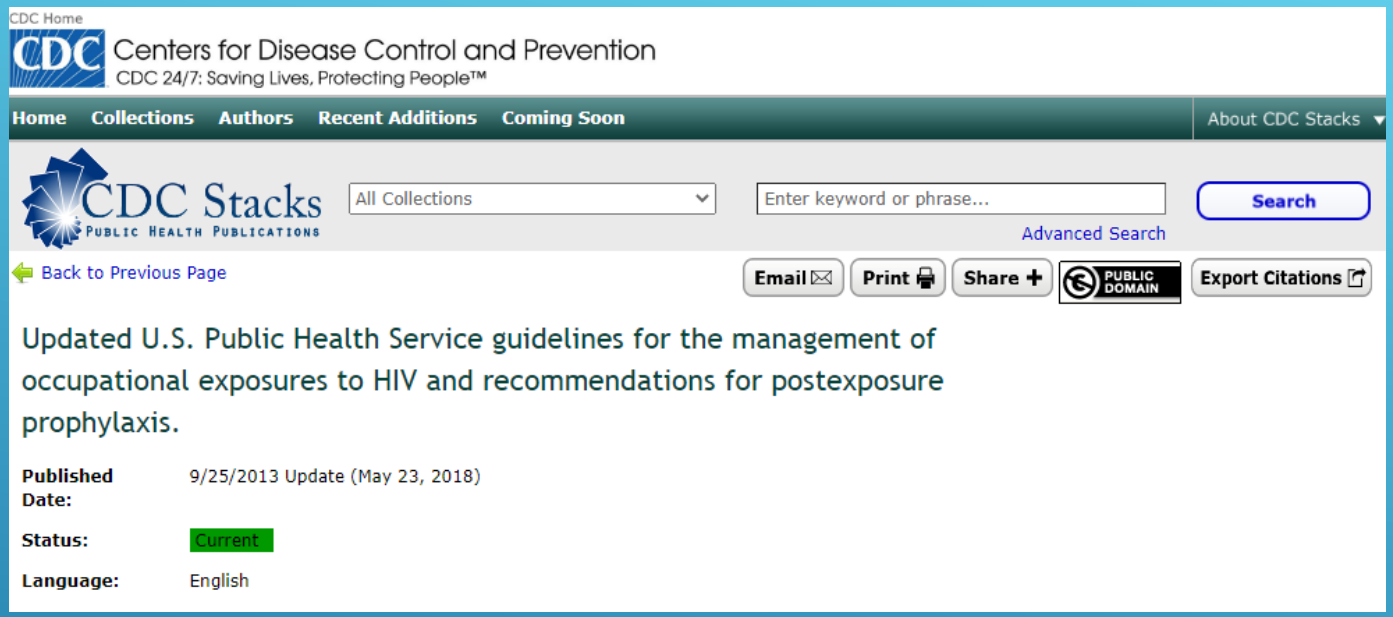
Hx of Guillain-Barre syndrome (6wks after 1th dose)


Infants <6mo
Age >80yr
Allergic reactions
Immune compromised
Medical contraindications
Benefits for patients

Recommendation

- Vaccination of all HCP who have no contraindications is recommended.
- Antibody titers decline during the year after vaccination.
- Annual vaccination with the current season's formulation is recommended.

Diseases requiring no patient contact	Work restriction
Infectious conjunctivitis	Until the discharge ceases
Acute diarrhea with symptoms* (i.e. fever, cramps, bloody stools)	Until symptoms resolve and infection with salmonella is ruled out, or if caused by salmonella (non-typhoidal), until stool is free of salmonella on 2 consecutive cultures not less than 24 hours apart
Group A streptococcal disease	Until 24 hours after adequate treatment begun
Hepatitis A*	Until 7 days after onset of jaundice
Herpes simplex infection on the hands	Until lesions heal
Active measles infection	Until 7 days after the rash appears
Post-exposure to measles	Susceptible personnel should remain out of the workplace from days 5–21 after exposure, and/or 7 days after rash appears
Active mumps	Until 9 days after onset of parotitis
Post-exposure to mumps	Susceptible personnel should remain out of the workplace from days 12–26 after exposure, and/or 9 days after onset of parotitis
Active pertussis	From beginning of catarrhal stage through the 3rd week after onset of paroxysms or until 7 days after start of effective therapy
Active rubella	Until 5 days after rash appears
Post-exposure to rubella	Susceptible personnel should remain out of the workplace from days 7–21 after exposure and/or 5 days after rash appears
Scabies	Until treated
Staphylococcus aureus infection of skin	Until lesions have resolved
Group A streptococcal infection*	Until 24 hours after starting adequate therapy
Active tuberculosis	Until proven non-infectious
Active varicella (chicken pox)	Until all lesions dry and crust
Post-exposure to varicella (chicken pox or shingles)	Susceptible personnel should remain out of the workplace for days 10–21 after exposure and/or until all lesions dry and crust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Updated U.S. Public Health Service guidelines for the management of occupational exposures to HIV and recommendations for postexposure prophylaxis.
Published Date:
9/25/2013 Update (May 23, 2018)
Status:
Current
Language:
English

Clinical Infectious Diseases

IDSA GUIDELINE

Official American Thoracic Society/Infectious Diseases Society of America/Centers for Disease Control and Prevention Clinical Practice Guidelines: Diagnosis of Tuberculosis in Adults and Children

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HEPATOLOGY

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PRACTICE GUIDANCE | HEPATOLOGY, VOL. 67, NO. 4, 2018

Update on Prevention, Diagnosis, and Treatment of Chronic Hepatitis B: AASLD 2018 Hepatitis B Guidance

Norah A. Terrault,[1] Anna S.F. Lok,[2] Brian J. McMahon,[3] Kyong-Mi Chang,[4] Jessica P. Hwang,[5] Maureen M. Jonas,[6] Robert S. Brown Jr.,[7] Natalie H. Bzowej,[8] and John B. Wong[9]

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Morbidity and Mortality Weekly Report (*MMWR*)

CDC

Testing and Clinical Management of Health Care Personnel Potentially Exposed to Hepatitis C Virus — CDC Guidance, United States, 2020

Recommendations and Reports / July 24, 2020 / 69(6);1–8

Anne C. Moorman, MPH[1]; Marie A. de Perio, MD[2]; Ronald Goldschmidt, MD[3]; Carolyn Chu, MD[3]; David Kuhar, MD[4]; David K. Henderson, MD[5]; Susanna Naggie, MD[6]; Saleem Kamili, PhD[1]; Philip R. Spradling, MD[1]; Stuart C. Gordon, MD[7]; Mark B. Russi, MD[8]; Eyasu H. Teshale, MD[1] (View author affiliations)

Infection Control & Hospital Epidemiology (2020), 1–9
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SHEA White Paper

Management of healthcare personnel living with hepatitis B, hepatitis C, or human immunodeficiency virus in US healthcare institutions

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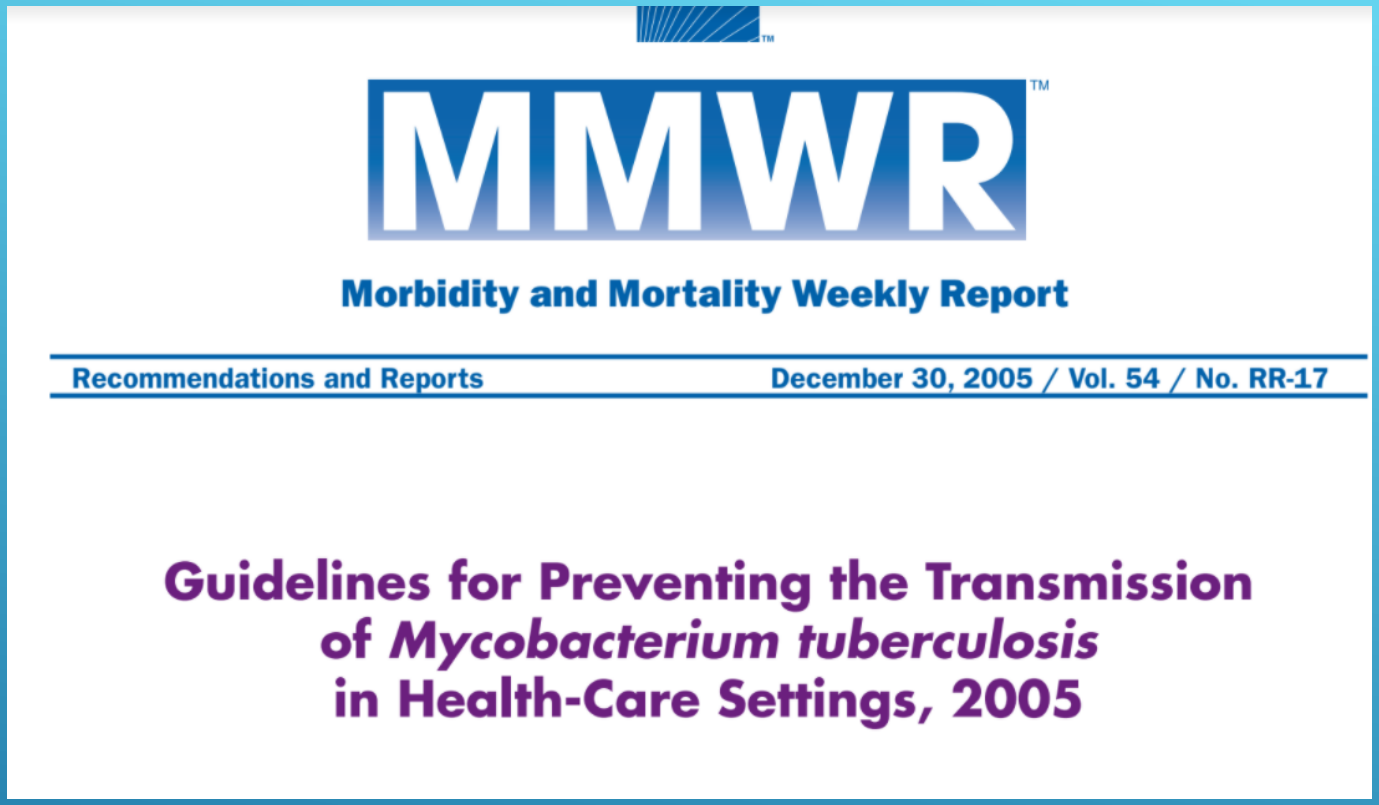

MMWR

Morbidity and Mortality Weekly Report

Recommendations and Reports — December 30, 2005 / Vol. 54 / No. RR-17

Guidelines for Preventing the Transmission of *Mycobacterium tuberculosis* in Health-Care Settings, 2005

http://ier.tums.ac.ir/files/site1/pages/salamat_darmani.pdf

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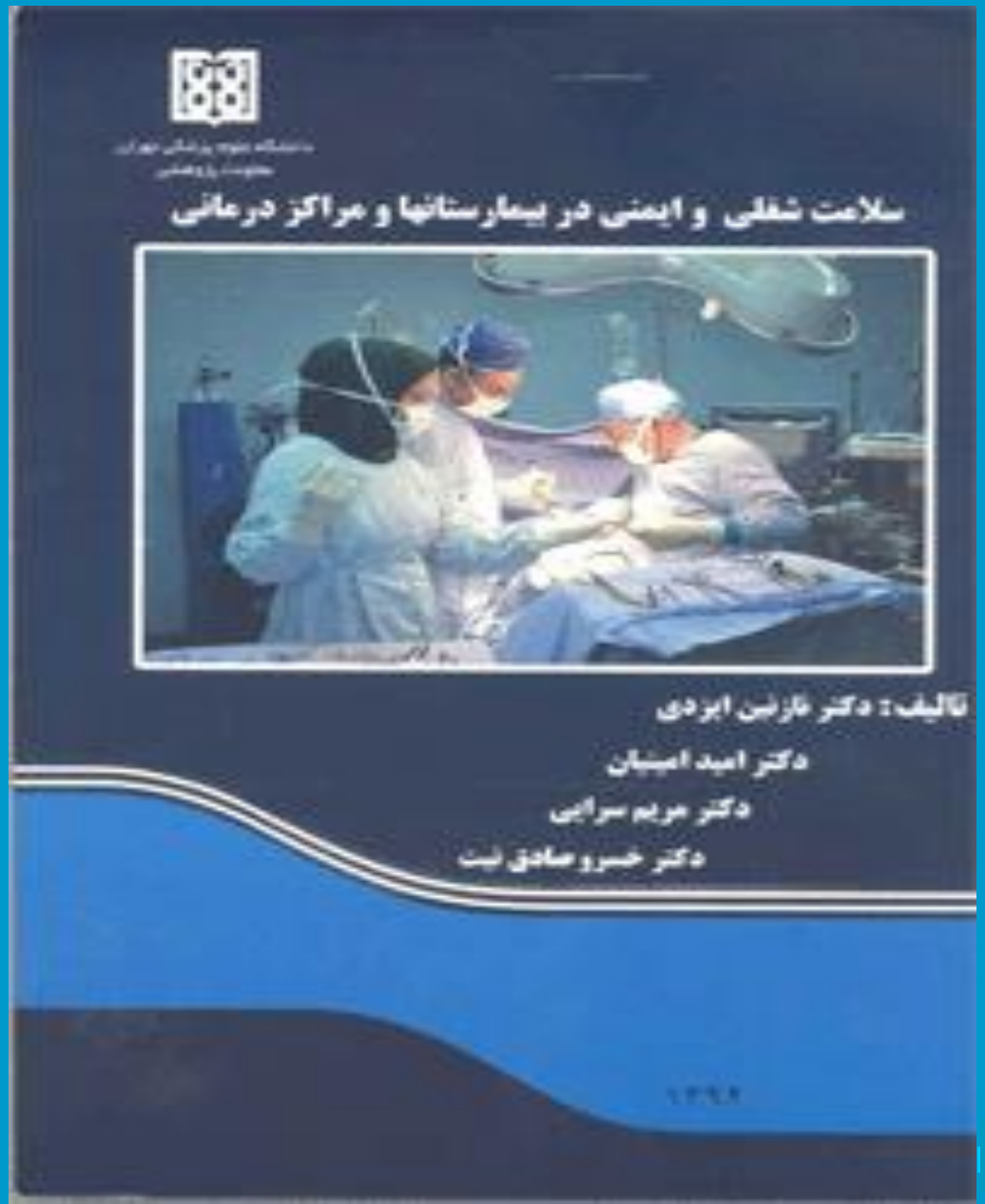

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Thank You !