# Viruses and Vaccines

# Desensitizations or Immunizations of a Non-Viral Nature

Generic Name: Poison Ivy Extract

Trade Name: Rhus Tox Antigen

Immunogenic Substrate: irritating compound in poison ivy extract

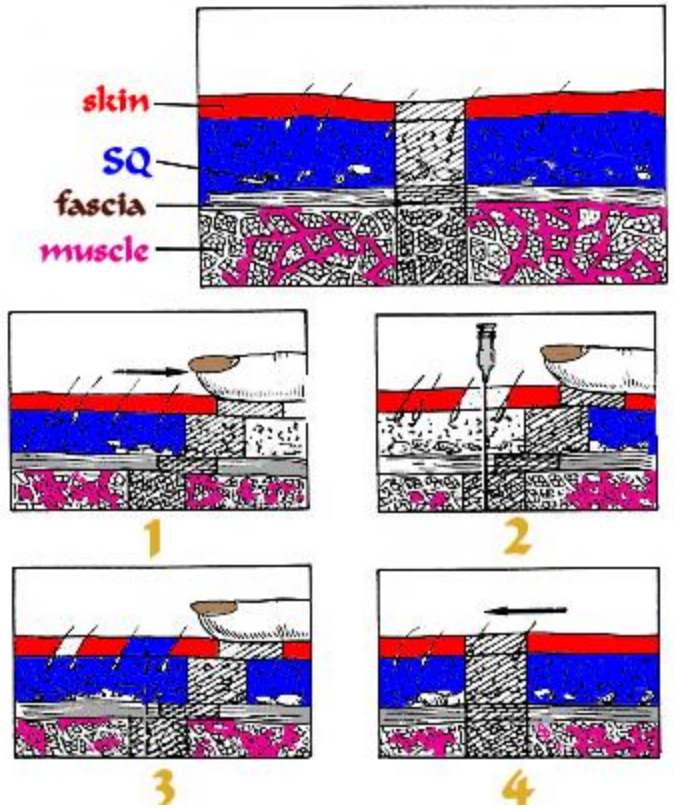
Indication/Use: prevention of Rhus dermatitis

Warnings: Wipe extract OFF skin with alcohol and new cotton each time
Use 2 needles: 1 to get from vial, second to inject into body:
WEAR GLOVES WHILE DOING THIS (This needle has no extract on its edges and won't permit dermatitis to occur)
Seal point of injection to prevent back-leakage

Pregnancy Category: ?

Administration: IM; avoid exercise that might "back milk" extract onto skin that would cause dermatitis; Z-track may be useful with this inoculation

# Z-Tracking




1. Pull skin
2. Inject
3. Wait 10 seconds (or per manufacturer's label)
4. Release skin
5. E.g., Rhus toxin and Z-track

**Generic Name:** Rho (D) Immune Globulin

**Trade Name:** RhoGAM; Hyprho-D

**Immunogenic Substrate:** Anti-$Rh_o$

**Indication/Use:** To prevent HDN:

1) when mother is $Rh_o$ negative

2) mother has no prior sensitization to $Rh_o$

3) infant is $Rh_o$ positive with a negative Coombs test

Give to all non-sensitized Rh negative mothers after:

1) abortion*; 2) ruptured tubal pregnancy*; 3) amniocentesis; 4) abdominal trauma; 5) ANY transplacental hemorrhage UNLESS fetus in KNOWN to be $Rh_o$ negative

*Assume fetus is Rh positive and give Hyprho-D UNLESS male is known to be Rh negative

**Warnings:** Do NOT give to Rh positive infant post partum
Do NOT give IV

**Pregnancy Category:** C

**Administration:** Make certain mother is Rh negative; IM; 1 vial post partum within 72 hours; antepartum prophylaxis: IM at 28 weeks and within 72 hours post partum IF infant Rh positive

**Generic Name:** BCG (Bacille de Calmette et Guerin) Vaccine

**Trade Name:** Tice BCG

**Immunogenic Substrate:** Attenuated, live M. bovis prepared by Calmette and Guerin, modified at University of IL

**Indication/Use:** In situ treatment of some bladder cancers (give intravesical);

Infants and children at high risk of TB infection, but skin test negative

OR

At risk of constant exposure to M. tuberculosis resistant to INH and rifampin

OR

People in groups with higher infection than the rest of the population

**Warnings:** BLADDER CA: Tice BCG is NOT a vaccine for CA;
Test with PPD before treatment since will be sensitive after treatment;
Suspend treatment if patient taking antibiotics

TB IMMUNIZATION: Do NOT give to immunocompromised patients

**Pregnancy Category:** C

**Administration:** BLADDER CA: wear gloves, mask and gown when preparing this; discard after 2 hours; wait 1-2 weeks after biopsy or TURP before treatment; npo (liquids) for four hours before treatment; empty bladder; gravity flow into bladder; retain for 2 hours and void; void sitting down for safety; add an equal amount of Clorox to urine to disinfect; treat every 6 weeks, thereafter, every month for 6-12 months

TB: 0.5 drop dropped onto skin; with multi-puncture disc, "tine" material percutaneously; MAY infect others; discard reconstituted vaccine after 2 hours; protect from light; great variation in efficiency of vaccination

Generic Name: Cholera Vaccine

Trade Name: Cholera vaccine

Immunogenic Substrate: killed V. cholerae

Indication/Use: For people in or going to areas high in cholera

Warnings:
Do not give IV
Do not give if acutely ill
Determine prior sensitivity: if occurred, d/c
Do not give IM to anyone with coagulation disorder
May develop malaise, headache, fever for 1-2 days
Do not give concurrently with Yellow Fever vaccine, but separate by about three weeks; if this is impossible, give simultaneously

Pregnancy Category: C

Administration: IM in deltoid; primary course of treatment is 2 injections given between 1 week to one month apart; this series does NOT have to be regiven for boosters to work; provides about 50% protection for 3-6 months

**Generic Name:** Diphtheria Tetanus Toxoids

**Trade Name:** Diphtheria Tetanus Toxoids

**Immunogenic Substrate:** Formaldehyde toxoids of C. tetani and C. diphtheriae

**Indication/Use:** Infants/children through 6 YOA

**Warnings:** For routine immunization: Defer if acute respiratory infection/general acute infection
Do not give to patients undergoing immunosuppressive therapy
Determine hypersensitivity [of Hg, too]

**Pregnancy Category:** Only well infants or children should be injected

**Administration:** < 6 YOA:

two primary doses 4-8 weeks apart; one secondary dose 6-12 months later; If actively immunized by 1 YOA, give 1 tertiary dose at 4-6 YOA; Do NOT inject each site more than one time: rotate between deltoid and midlateral thigh muscles

**Generic Name:** Diphtheria, Haemophilus B, Pertussis, Tetanus Vaccine

**Trade Name:** Tetramune

**Immunogenic Substrate:** Formaldehyde toxoids of C. diphtheriae and C. tetani; thimerosal inactivated B. pertussis, oligosaccharide of H. influenzae type b

**Indication/Use:** For active immunization of children 2 mo to 5 YOA

**Warnings:**
Determine hypersensitivity
Do not give if patient is ill or has fever -- mild URI no reason to defer
FUO within 48 hours of injection: reconsider future immunization
Shock within 48 hours: reconsider future immunization
Convulsions within 3 days (with or without fever): reconsider future immunization
NOT recommended for injection if older than 7 YOA

**Pregnancy Category:** C

**Administration:** Younger children: 2, 4, 6, 15-18 months with Tetramune; 4-6 YOA with DTP

Older children without vaccination: three doses of DTP at two months' intervals; fourth dose of DTP 12 months later; fifth dose at 4-6 YOA

For Hib: 7-11 months of age: three doses of HbOC; 12-14 months: 2 doses of HbOC; 15-59 months: 1 dose of HbOC

Give IM in deltoid or mid-lateral thigh muscle -- NOT in gluteal region (># nerves)

Generic Name: DPT Vaccine

Trade Name: DTP Adsorbed

Immunogenic Substrate: Formaldehyde inactivated exotoxins of C. tetani and C. diphtheriae; formaldehyde inactivated endotoxins of B. pertussis

Indication/Use: fourth and/or fifth dose for children 15 months to 7 YOA who have received previous immunizations with Tetramune

Warnings:
Determine hypersensitivity [and of Hg, too]
Do NOT give with fever and/or illness
Mild URI no reason to defer
Do not use in children less than 15 months
Tyelenol at time of injection and q4h for 24 hours decreases post-injection fever
Only full doses are to be given
FUO (105°F or above) within 48 hours = contraindication to further use

Pregnancy Category: Not been evaluated

Administration: Shake vial well; IM in deltoid and anterolateral thigh muscles; rotate sites!

Generic Name: H. influenzae b conjugate vaccine

Trade Name: Pedvax HIB; ProHIBIT

Immunogenic Substrate: purified capsular polysaccharide

Indication/Use: immunization in 2-71 month old children

Warnings: Use only the $Al(OH)_3$ diluent supplied
Refrain from use with fever and/or illness

Pregnancy Category: C

Administration: IM; deltoid, anterolateral thigh muscles

2-10 months: 2 injections about 60 days apart; booster: 12-15 months of age

11-14 months: 2 injections about 60 days apart; booster: none

15-71 months: 1 injection; booster: none

**Generic Name:** H. influenzae b Conjugate Vaccine

**Trade Name:** HibTITER

**Immunogenic Substrate:** purified capsular polysaccharide

**Indication/Use:** immunization in 2 months - 5 YOA children

**Warnings:** Use only $Al(OH)_3$ diluent supplied
Refrain from use with fever and/or illness

**Pregnancy Category:** C

**Administration:** IM; anterolateral thigh muscle

2-6 months: 3 doses two months apart and booster at 15 months or older, but not less than 6 weeks after previous dose

7-11 months: 2 doses and booster

12-14 months: 1 dose and booster

15 months or older: 1 dose, no booster

There is no data to signify equivalence between Pedvax HIB and HibTITER

THEREFORE:

If start with Pedvax HIB, finish with Pedvax HIB; if start with HibTITER, finish with HibTITER

**Generic Name:** Pneumococcal Vaccine

**Trade Name:** Pnu-Imune 23

**Immunogenic Substrate:** mixture of capsular polysaccharide of 23 most invasive pneumococcal capsules

**Indication/Use:** for vaccination against pneumococci; routine revaccination contraindicated (2° increased rate of adverse reactions), but may occur if the patient was originally vaccinated with Pneumovax-14 more than 4 years previous and if patient is at great risk of fatal pneumococcal disease

**Warnings:**
Do not give to patients with Hodgkin's disease who have had chemotherapy and immunosuppressive therapy
Do NOT d/c PCN prophylaxis after immunization
Fever to 100.9°F may occur within 24 hours
Not used in children < 2 YOA

**Pregnancy Category:** C -- give ONLY if clearly indicated

**Administration:** SQ or IM; with IM, give in deltoid or anterolateral thigh muscles; discard after expiration date

Generic Name: Tetanus toxoid

Trade Name: Tetanus Toxoid Adsorbed

Immunogenic Substrate: Formaldehyde inactivated C. tetani exotoxin

Indication/Use: active immunization against tetanus

Warnings: Only well individuals to be vaccinated
Refrain from treating people on immunosuppressive therapy
Determine sensitivity

Pregnancy Category: ?

Administration: IM; deltoid or anterolateral thigh muscles; 2 primary doses 1-2 months apart; 1 secondary dose 6-12 months later*; Routine Booster q 10 years; In the event of an injury, if Tetanus toxoid indicated:

1) clean, minor wounds: if patient more than 10 years without tetanus toxoid, give booster

2) all other wounds: if patient more than 5 years without tetanus toxoid, give booster

*Critical for full immunity to occur

**Generic Name:** Typhoid Vaccine

**Trade Name:** Vivotif Berna

**Immunogenic Substrate:** phenol/heat inactivated endotoxin of S. typhi

**Indication/Use:** for active immunity from typhoid fever, i.e., travelers, those exposed to typhoid fever

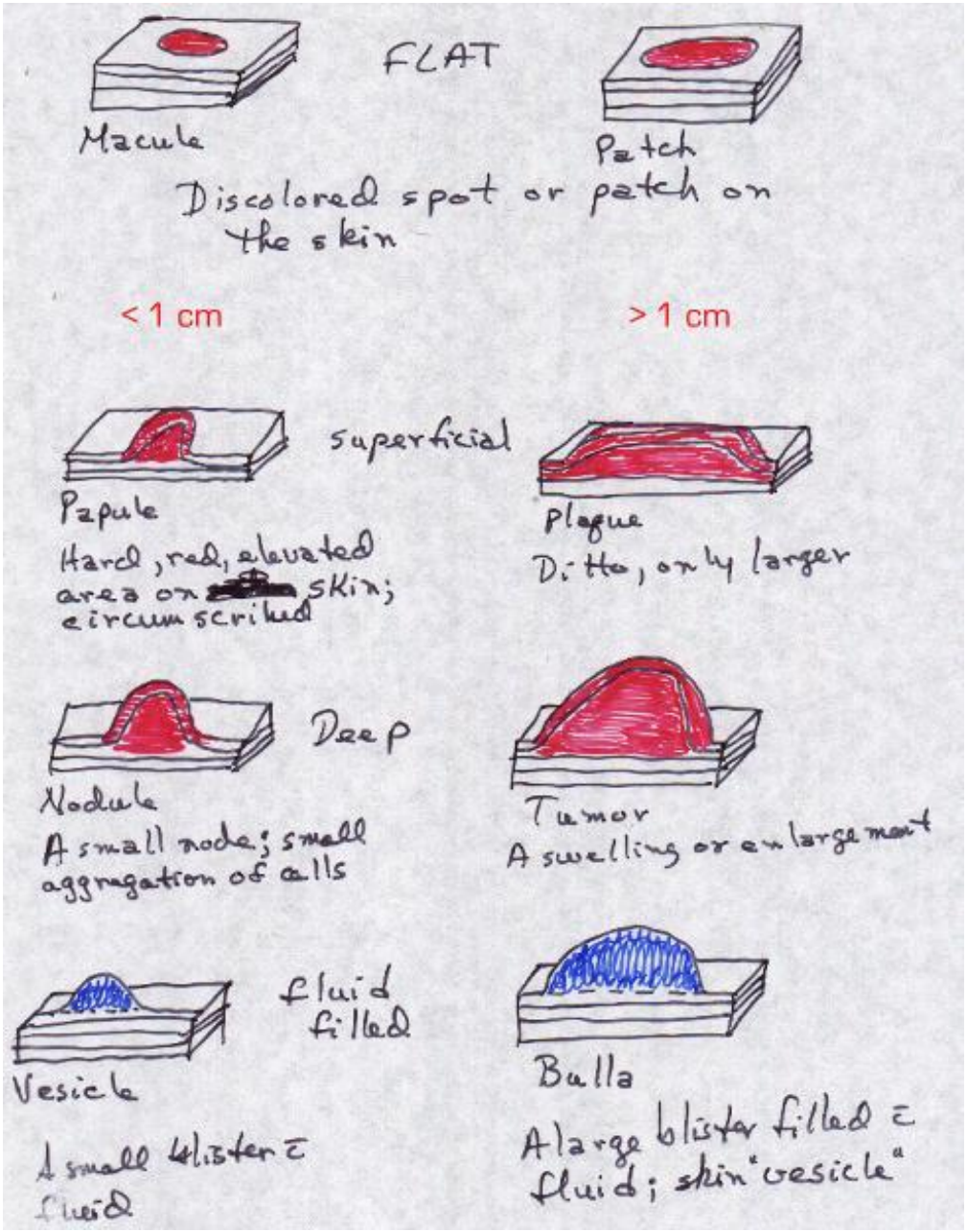
**Warnings:** Do not give with acute respiratory/other infections

**Pregnancy Category:** not available, but its use is not contraindicated unless hypersensitive to it

**Administration:** Primary immunity: SQ; 25 g, 5/8" needle: people over 10 YOA: 2 doses separated by 4 weeks; people under 10 YOA: 2 doses separated by 4 weeks; when necessary, 3 doses separated by 1 week, each, may be given

BOOSTERS: people over 10 YOA: 1 dose q 3 years after primary vaccination; people under 10 YOA: 1 dose q 3 years after primary vaccination; OK to give booster if more than 3 years have passed; about 70% protective

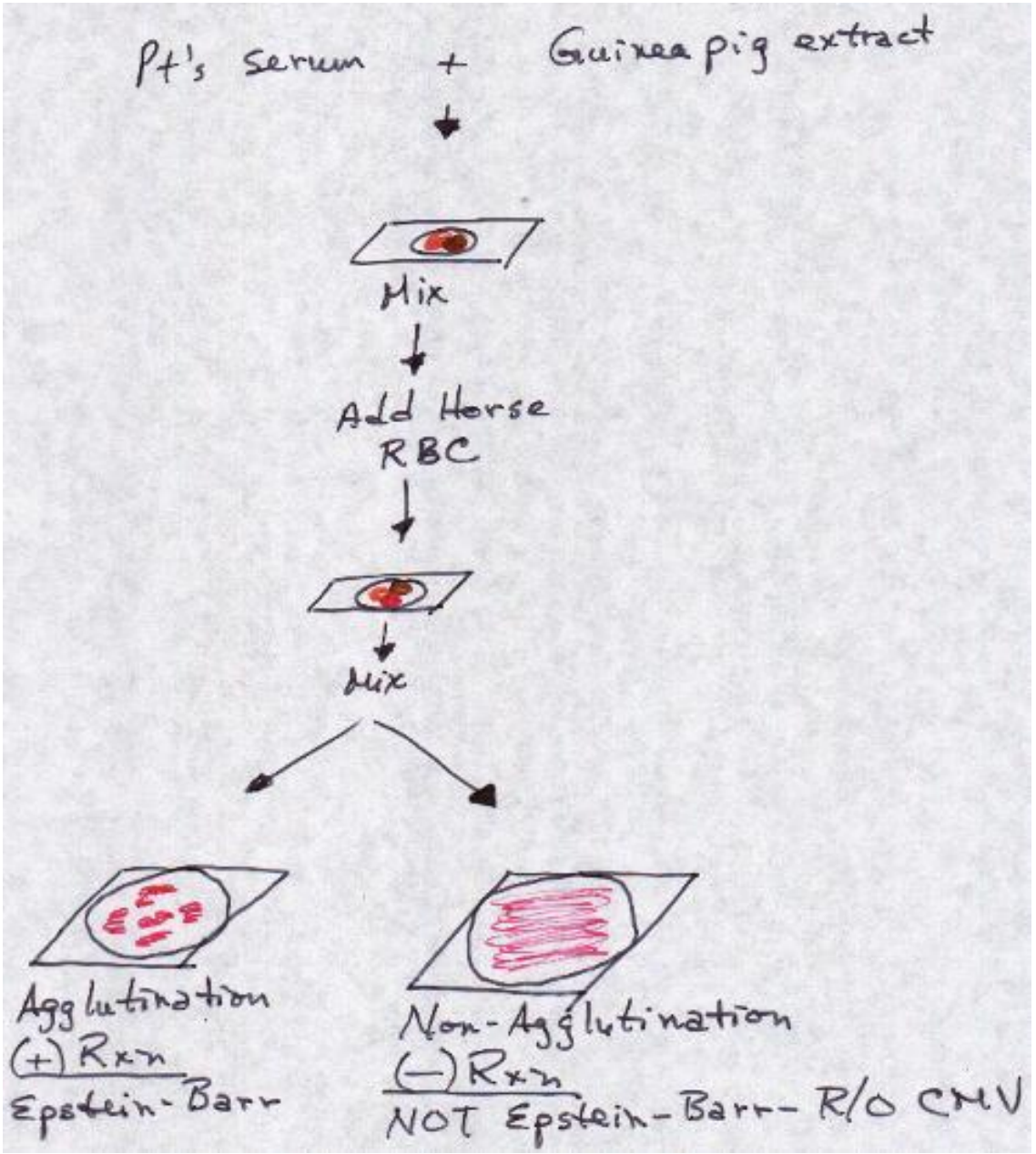
# DNA Viruses


FLAT
Macule
Patch
Discolored spot or patch on the skin
< 1 cm
> 1 cm
superficial
Papule
Hard, red, elevated area on skin; circumscribed
Plaque
Ditto, only larger
Deep
Nodule
A small node; small aggregation of cells
Tumor
A swelling or enlargement
fluid filled
Vesicle
A small blister of fluid
Bulla
A large blister filled of fluid; skin "vesicle"

| |
|---|
| Viral Family: Adenoviridae |
| Virus: Adenovirus |
| Viral Disease: Respiratory Infections; Conjunctival Infections (2) |
| Incubation Period: 5-10 days; 5-7 days |
| Nucleic Acid Core: DNA |
| Strandedness: DS |
| Symmetry: Icosahedral |
| Virion: Naked |
| Transmission: Droplets, contact, fecal contamination, birth canal, inhalation |
| Affected Organs: Lungs, meninges, eyes, lymphadenopathy |
| Disease Characteristics: potentially oncogenic; fever, pharyngitis, tonsillitis, cough, coryza, N/V, diarrhea, pulmonary infiltrates; also common cause of non-streptococcal exudative pharyngitis (particularly in children less than 3 YOA), laryngitis, croup; Virus shed for 6-18 months after acute phase WITHOUT producing illness in the host |

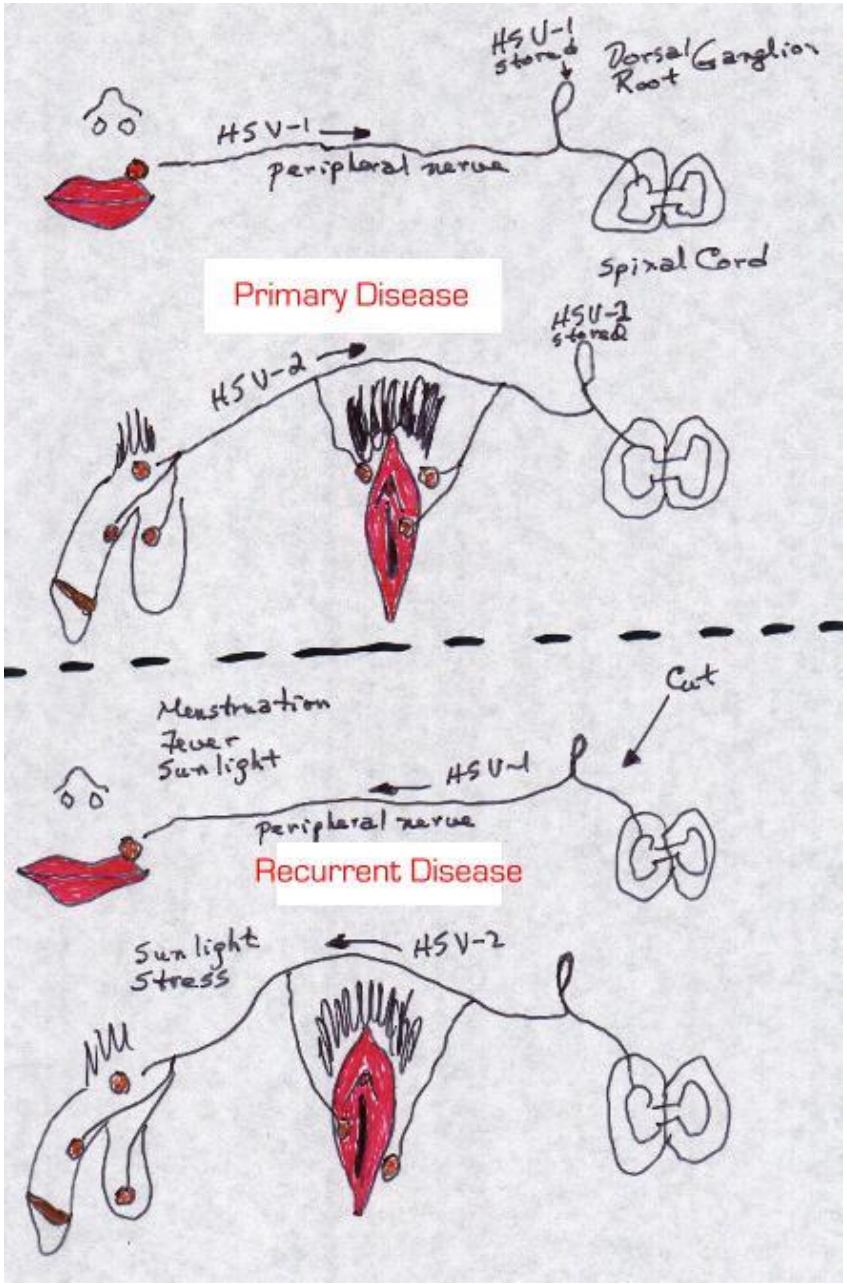
| |
|---|
| Viral Family: Herpesviridae |
| Virus: Cytomegalovirus (CMV) |
| Viral Disease: Infectious mononucleosis (heterophile negative) |
| Incubation Period: 4-8 weeks -- some sources are not certain |
| Nucleic Acid Core: DNA |
| Strandedness: DS |
| Symmetry: Icosahedral |
| Virion: Enveloped |
| Transmission: Urine, saliva, throat (oropharyngeal secretions), cervical secretions, semen, breast milk, feces (rarely), tissues, iatrogenic (transfusion), nosocomial (minor) |
| Disease Characteristics: Potentially oncogenic; fever (with or without chill) elevated SGOT and SGPT; virus shed from pharynx and urine for months to years; may be asymptomatic, may mimic mono or cause mono: fever, tonsillitis, lymphadenopathy, leukocytosis, lymphocytosis, malaise; "flu-like" syndrome, myalgia, fever; FETAL: abortion, stillbirth, premature delivery, IUGR, inguinal hernia, polycystic kidneys, pulmonic/mitral stenosis, abnormal teeth; NEONATE: jaundice, microcephaly (normal at birth, shows up abnormally small later), deaf, anemia, abnormal LFT (liver Function Tests), pneumonia |

| |
|---|
| Viral Family: Herpesviridae |
| Virus: Epstein-Barr virus (heterophile positive) |
| Viral Disease: Infectious mononucleosis (Burkitt's lymphoma) |
| Incubation Period: 30-50 days; 21-49 days; sources vary |
| Nucleic Acid Core: DNA |
| Strandedness: DS |
| Symmetry: Icosahedral |
| Virion: Enveloped |
| Transmission: Oropharyngeal, infected saliva |
| Disease Characteristics: potentially oncogenic; onset insidious over 5-7 days, but may manifest within 1 day; Symptoms: malaise; 2-5 days later, fever (lasts about 10 days) and sore throat; jaundice, frontal headaches, N/V, abdominal pain, chills, myalgias; Signs: lymphadenopathy (usually peaks by 4-5 days and recedes generally by 3-4 weeks), splenomegaly, fever that may last 4 or more weeks (once temp normal for 72 hours, if the temp increases, double check for alternative diagnosis or mono complications), multiple complications; GENERALLY, illness lasts between 2-4 weeks |


Pt's serum + Guinea pig extract
Mix
Add Horse RBC
Mix
Agglutination
(+) Rxn
Epstein-Barr
Non-Agglutination
(−) Rxn
NOT Epstein-Barr – R/O CMV

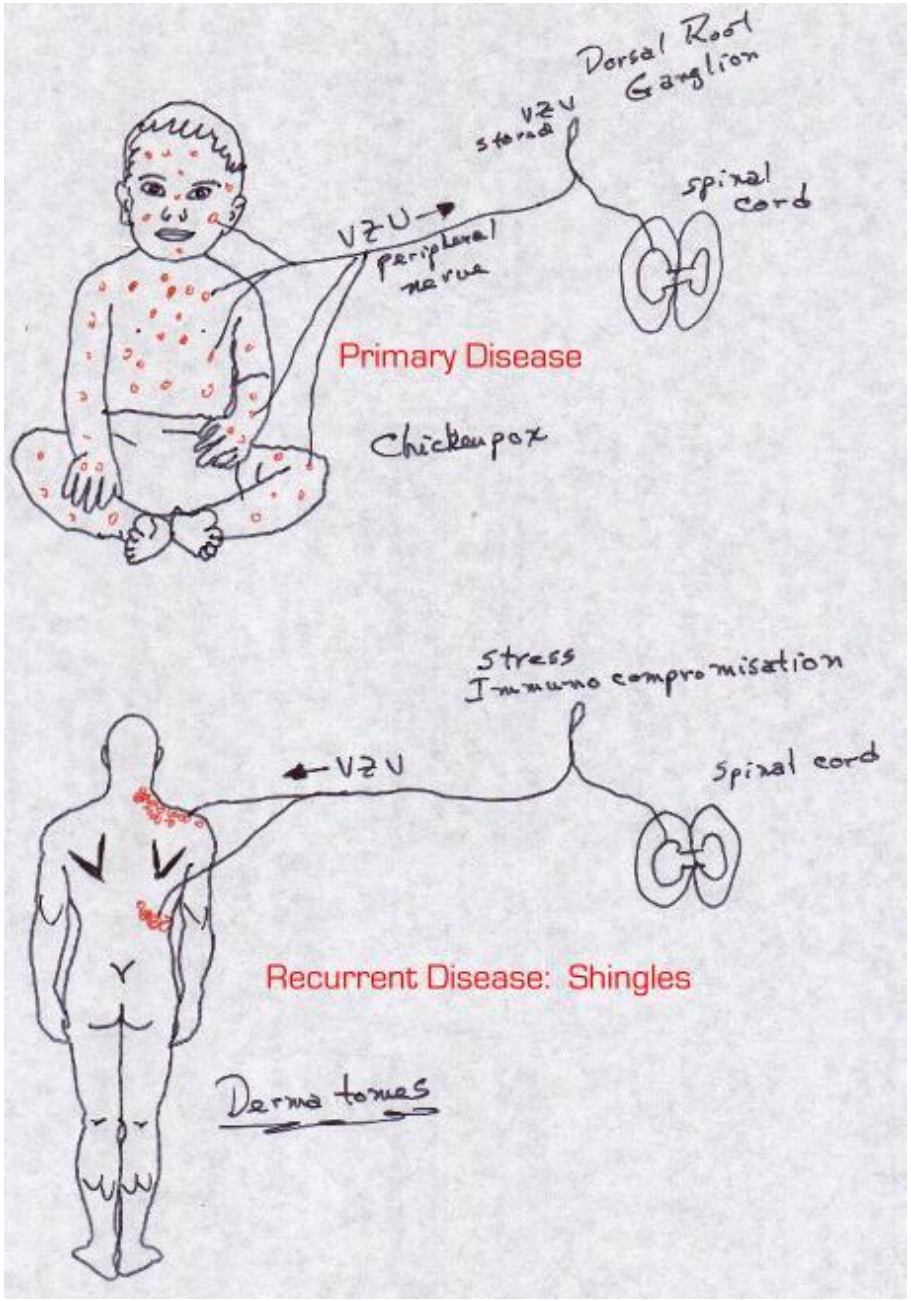
| |
|---|
| Viral Family: Herpesviridae |
| Virus: HSV-1 (Human Herpes Virus Type 1; HHV-1) |
| Viral Disease: Mucocutaneous infections/lesions |
| Incubation Period: 2-14 days; clinical disease lasts about 2-3 weeks |
| Nucleic Acid Core: DNA |
| Strandedness: DS |
| Symmetry: Icosahedral |
| Virion: Enveloped |
| Transmission: Direct contact of infectious lesions and/or saliva |
| |
| Disease Characteristics: "cold sores"; disease usually "above the waist"; typically unilateral; sever pharyngitis, maximal pain at 24 hours; maximal lesion size at 24 hours; maximal viral amount at about 24 hours; lasts on the average of 8 days; sunlight "triggers" event; seem to recur about twice a year; events decrease after patient is 35 YOA |

| |
|---|
| Viral Family: Herpesviridae |
| Virus: HSV-2 (Human Herpes Virus Type 2; HHV-2) |
| Viral Disease: Genital mucocutaneous lesions |
| Incubation Period: 2-14 days |
| Nucleic Acid Core: DNA |
| Strandedness: DS |
| Symmetry: Icosahedral |
| Virion: Enveloped |
| Transmission: direct [sexual] contact with tissues that are shedding virus (symptomatic OR asymptomatic) |
| |
| Disease Characteristics: "below the waist"; genital sores; bilaterally distributed; PRIMARY: fever, malaise, myalgia, lymphadenopathy, shed virus about 15-20 days; takes about 3 weeks to heal; RECURRENT: 3-5 days for viral shedding; milder, lesions heal within 7-8 days |


HSV-1 stored
Dorsal Root Ganglion
HSV-1
peripheral nerve
Spinal Cord
Primary Disease
HSV-2 stored
HSV-2
Menstruation
Fever
Sunlight
Cut
HSV-1
peripheral nerve
Recurrent Disease
Sunlight
Stress
HSV-2

| |
|---|
| Viral Family: Herpesviridae |
| Virus: HSV-6 (Human Herpes Virus Type 6; HHV-6) |
| Viral Disease: Roseola infantum |
| Incubation Period: ? |
| Nucleic Acid Core: DNA |
| Strandedness: DS |
| Symmetry: Icosahedral |
| Virion: Enveloped |
| Transmission: As with HIV; co-infective with HIV |
| |
| Disease Characteristics: Attacks $T_8$ cells; alters $T_4/T_8$ ratio; generally a disease of children 6 months to 4 YOA; aka exanthem subitem = sudden rash; rapid onset of pyrexia, may be convulsions, after 3-5 days, fever drops quickly with secondary rash within hours; difficult to classify: infects lymphocytes, but genetically resembles CMV |

| |
|---|
| Viral Family: Herpesviridae |
| Virus: Varicella-Zoster Virus |
| Viral Disease: Chicken pox; Shingles |
| Incubation Period: 13-21 days; disease develops 10-23 days after exposure -- IF susceptible |
| Nucleic Acid Core: DNA |
| Strandedness: DS |
| Symmetry: Icosahedral |
| Virion: Enveloped |
| Transmission: Droplets, contact; if working with VZV and are pregnant, stay away AT LEAST through first trimester |
| |
| Disease Characteristics: First lesions on face, scalp, trunk; spread to limbs and thence to mouth; greatest number of lesions on trunk and "unscab" in about a week; fever lasts as long as there are new lesions, i.e, new lesions = fever; no new lesions = no more fever; infectiousness of patient stops after last lesions scab over; covered regions have worse rash; SHINGLES: "dew drops on a rose petal"; trunk, head and neck primarily involved; follow dermatomes, generally; generally, unilaterally dispersed |


Dorsal Root Ganglion
VZV stored
spinal cord
VZV
peripheral nerve
Primary Disease
Chickenpox
Stress
Immuno compromisation
VZV
spinal cord
Recurrent Disease: Shingles
Dermatomes

GENERIC TRADE NAME: Varicella Vaccine

TRADE NAME: Varivax

IMMUNOGENIC SUBSTRATE: Live attenuated varicella virus

INDICATIONS/USE: To prevent chicken pox in individuals between 12 MOA and into adulthood

WARNINGS: Have anaphylactic kits available in case of reaction
Defer use X 5 months p blood transfusions, VIG or VZIG administration
Give NO immunoglobulin within 2 months after vaccination
The potential exists (as with other live vaccines) that the receiver may be able to transmit varicella to those susceptible
Avoid use of salicylates X 1.5 months to minimize the risk of getting Reye's Syndrome (happens naturally, no vaccine data available at this time, however)
Use caution if mother is nursing as it is not known if this virus crosses into breast milk
May give with (concomitantly) MMR-II, DTaP, PedvaxHIB utilizing multiple injection sites and syringes
May cause fever, rash, redness at injection site
>102°

PREGNANCY CATEGORY: C, although pregnancy is to be avoided for three months after immunization -- as with other live, attenuated vaccines

ADMINISTRATION: SC

| 1-12YOA | >12YOA |
|---|---|
| Single dose | First dose: pick a time |
| | Second dose: between 1-2 months later |
| utilize deltoid [preferred site]; (anterolateral thigh is acceptable alternative site, however); use two separate needles: 1 to reconstitute and another to inject into patient; discard if not used within 30 minutes: do NOT re-freeze | |

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|---|
| **Viral Family:** Papovaviridae |
| **Virus:** Papilloma virus |
| **Viral Disease:** Condyloma accuminatum |
| **Incubation Period:** Cutaneous warts: 1-3 months (average; 6-20 months, too); condyloma: 6-8 weeks |
| **Nucleic Acid Core:** DNA |
| **Strandedness:** DS |
| **Symmetry:** Icosahedral |
| **Virion:** Naked |
| **Transmission:** Skin contact, fomites, anogenital, peripartum, or because of acquired/iatrogenic immunocompromisation |
| |
| **Disease Characteristics:** Common warts, plantar warts, venereal warts, conjunctival warts; Types 6 (condyloma) and 11 are associated with benign warts; Types 16, 18, 31 associated with warty malignancies of genitals; about 60 different strains of this virus |

- Also keep in mind that condyloma accuminatum, genital warts, is also caused by HPV -- specifically, HPV6d.
- These lesions tend to be soft, pink, cauliflower-like lesions and occur on the external genitalia, in the vagina, on the cervix and in the rectum.
- The risks of developing cervical cancer and perianal cancer increase with a history of genital warts. 79% of common warts are caused by HPV2; 14% by HPV1 and plantar warts (on the plantar surface of the foot) are caused by HPV1a.
- Those with penile carcinoma tend to be co-infected with either HPV16 or HPV18; those with cervical cancer tend to be co-infected with HPV16.

- 2005:  vaccine announced for the treatment of HPV – effectiveness represented as very high – will see if over time it has to be given more than once – like MMR.
- 2011:  discussions on boys receiving Gardasil more active

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|---|
| Viral Family: Parvoviridae |
| Virus: Parvovirus |
| Viral Disease: Erythema infectiosum (aka fifth disease or academy rash) |
| Incubation Period: On the average between 4 and 20 days; after 17 MORE days, the second phase of the disease "kicks in" |
| Nucleic Acid Core: DNA |
| Strandedness: DS |
| Symmetry: Icosahedral |
| Virion: Naked |
| Transmission: Contact? primarily by respiratory route |
| Disease Characteristics: infects erythropoietic cells (aplastic crisis), arrests RBC production; itching; malaise, pyrexia, chills, "slapped cheek" appearing exanthem in children; non-specific symptoms; MOST common in late winter, spring (BIGGEE) and early summer; EXCLUDE atypical rubella infection due to the similarities between these two diseases; SECOND phase of disease lasts about 2-3 days with a "fine", "lace-like" rash over the extremities and trunk |

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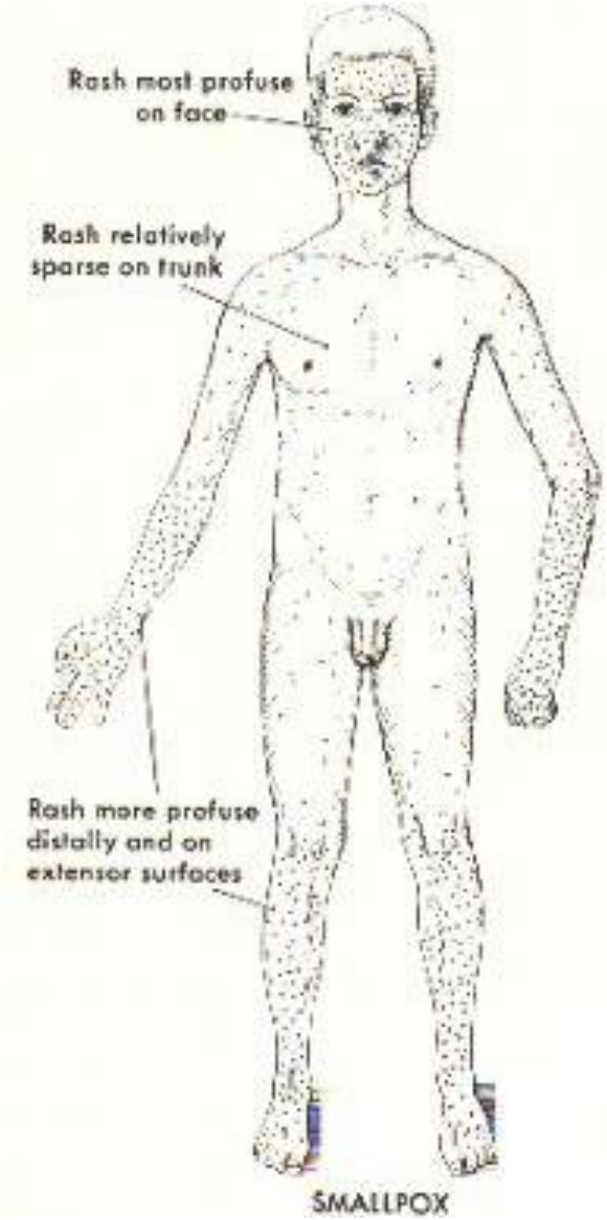
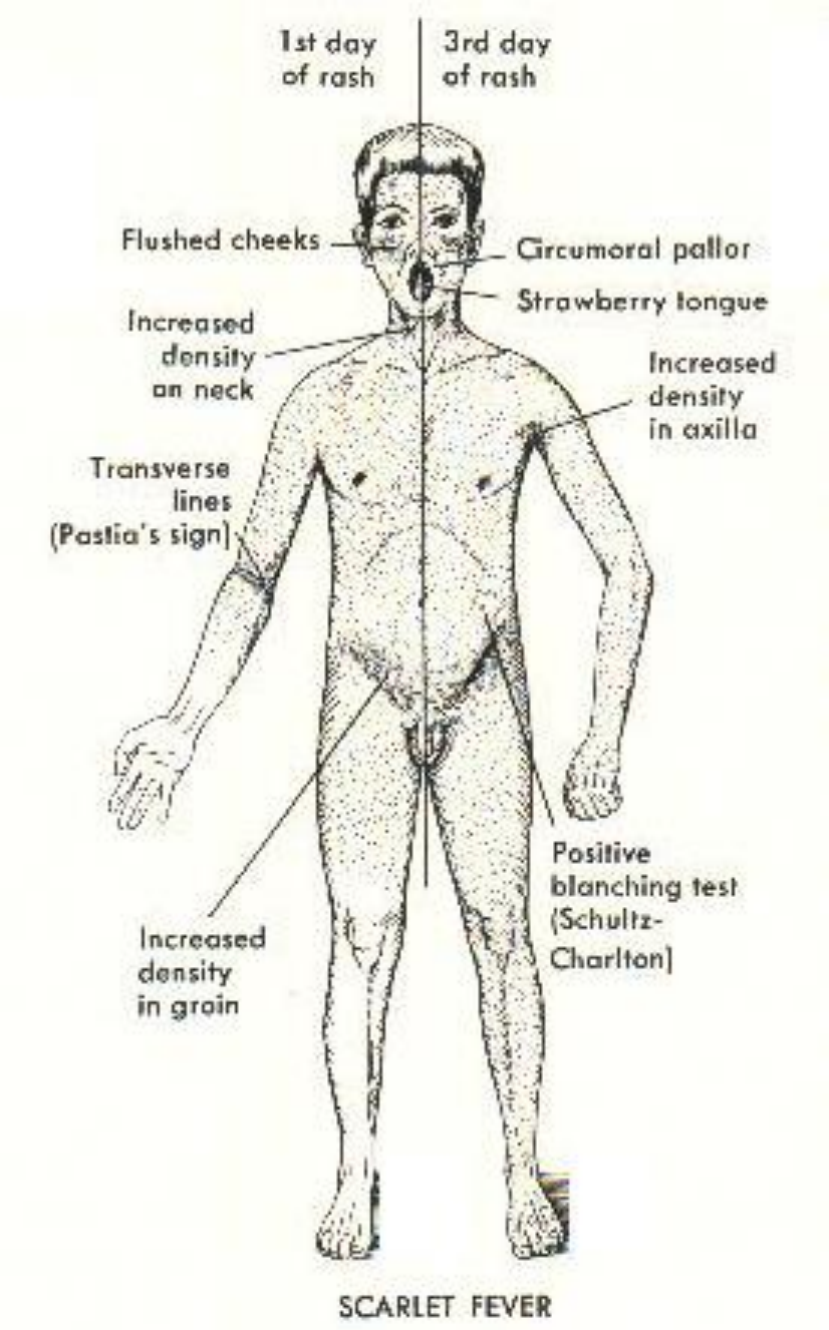
|---|
| Viral Family: Poxviridae |
| Virus: Orthopoxvirus |
| Viral Disease: Small pox (variola) |
| Incubation Period: 12-14 days; as short as 4-5 days |
| Nucleic Acid Core: DNA |
| Strandedness: DS |
| Symmetry: Complex |
| Virion: Complex |
| Transmission: Close contact with infected patient |
| |
| Disease Characteristics: malaise, headache, backache, fever to 40.5°C, characteristic "pox" rash; rash begins 72 - 96 hours after incubation; crust falls off lesions 2-4 weeks after lesion first appears; body temperature drops within 24 hours of exanthem |




SMALLPOX




SCARLET FEVER

# Smallpox Vaccine

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|---|
| Generic Trade Name: Smallpox Vaccine |
| Trade Name: Dryvax |
| Immunogenic Substrate: "live" vaccinia virus -- does not contain the smallpox virus and cannot give you smallpox. |
| • The vaccine is provided as a lyophylized (freeze-dried) powder in a 100-dose vial, and contains the antibiotics polymyxin B, streptomycin, tetracycline and neomycin (immunologically inert, see below). |
| • The diluent used to reconstitute the vaccine is 50 percent glycerin and a small amount of phenol as a preservative (both immunologically inert). |
| Indications/Use: The prevention of smallpox. |

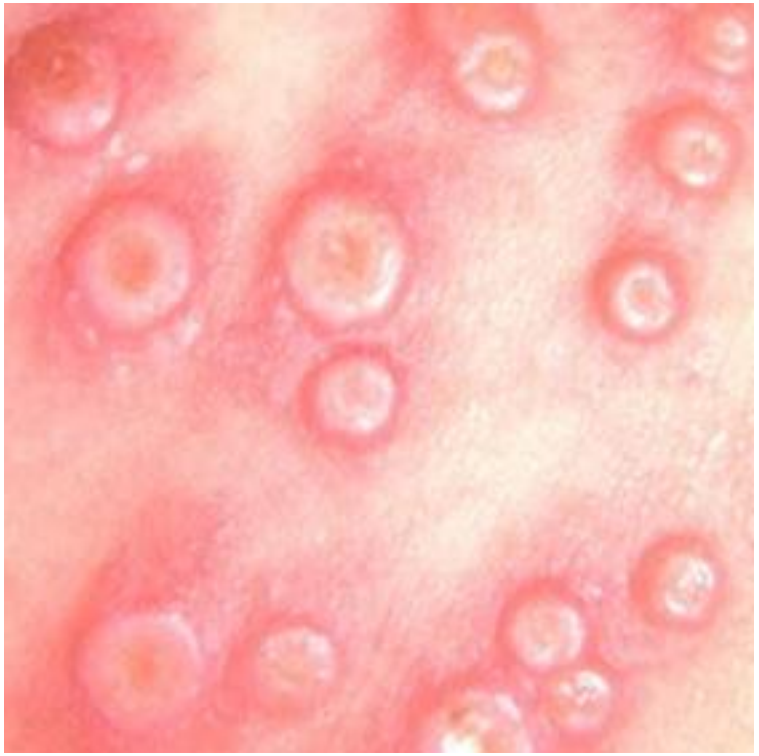
| |
|---|
| Data Sources: http://www.bt.cdc.gov/agent/smallpox/vaccination/facts.asp |
| http://www.bt.cdc.gov/agent/smallpox/vaccination/aboutvaccine.asp |
| http://www.bt.cdc.gov/agent/smallpox/vaccination/contraindications-clinic.asp |
| Image Sources: http://www.bt.cdc.gov/images/VAXSIT5A.jpg |
| http://www.bt.cdc.gov/training/smallpoxvaccine/reactions/ec_vac.html |

# Smallpox Vaccine Warnings - 1

- Because the virus is live, it can spread to other parts of the body, or to other people. The vaccinia virus (the live virus in the smallpox vaccine) may cause rash, fever, and head and body aches.
- Some people are at greater risk for serious side effects from the smallpox vaccine. **Individuals who have any of the following conditions, or live with someone who does**, should **NOT** get the smallpox vaccine **unless they have been exposed to the smallpox virus**:
- Eczema or atopic dermatitis. (This is true even if the condition is not currently active, mild or experienced as a child.) Persons who have ever been diagnosed with eczema or atopic dermatitis should not be vaccinated, even if the condition is not currently active. These patients are at high risk of developing eczema vaccinatum, a potentially severe and sometimes fatal complication. Additionally, persons with household contacts that have a history of eczema or atopic dermatitis, irrespective of disease severity or activity, should not be vaccinated.
- Skin conditions such as burns, chickenpox, shingles, impetigo, herpes, severe acne, or psoriasis. (People with any of these conditions should not get the vaccine until they have completely healed.)
- Weakened immune system. (Cancer treatment, an organ transplant, HIV, Primary Immune Deficiency disorders, some severe autoimmune disorders and medications to treat autoimmune disorders and other illnesses can weaken the immune system.)
- Pregnancy or plans to become pregnant within one month of vaccination.

# Eczema vaccinatum

- Umbilicated papules – the virus is shed via lesions – even microscopic ones in atopic dermatitis and spreads over the skin – very similar to how HSV-2 is shared between people even in the absence of active lesions.



# Smallpox Vaccine Warnings - 2

- In addition, individuals should not get the smallpox vaccine if they:
- Are allergic to the vaccine or any of its ingredients (polymyxin B, streptomycin, chlortetracycline, neomycin).
- Are younger than 12 months of age. However, the Advisory Committee on Immunization Practices (ACIP) advises against non-emergency use of smallpox vaccine in children younger than 18 years of age. In addition, the vaccine manufacturer's package insert states that the vaccine is not recommended for use in geriatric populations in non-emergency situations. The term geriatric generally applies to people age 65 and above.
- Have a moderate or severe short-term illness. (These people should wait until they are completely recovered to get the vaccine.)
- Are currently breastfeeding.

# Smallpox Vaccine Warnings - 3

- Are using steroid drops in their eyes. (These people should wait until they are no longer using the medication to get the vaccine).
- Have been diagnosed by a doctor as having a heart condition with or without symptoms, including conditions such as previous myocardial infarction (heart attack), angina (chest pain caused by lack of blood flow to the heart), congestive heart failure, cardiomyopathy (heart muscle becomes inflamed and doesn't work as well as it should), stroke or transient ischemic attack (a "mini-stroke" that produces stroke-like symptoms but not lasting damage), chest pain or shortness of breath with activity (such as walking up stairs), or other heart conditions being treated by a doctor. (While this may be a temporary exclusion, these people should not get the vaccine at this time.)
- Have 3 or more of the following risk factors: high blood pressure diagnosed by a doctor; high blood cholesterol diagnosed by a doctor; diabetes or high blood sugar diagnosed by a doctor; a first degree relative (for example, mother, father, brother, sister) who had a heart condition before the age of 50; and, you smoke cigarettes now. (While this may be a temporary exclusion, these people should not get the vaccine at this time.)

- ***Again, people who have been directly exposed to the smallpox virus should get the vaccine, regardless of their health status.***

# Smallpox Vaccine:  Pregnancy Category

- Live virus vaccines are generally contraindicated during pregnancy. Pregnant women who receive the smallpox vaccine are at risk of fetal vaccinia. Although this is a very rare condition (fewer than 50 cases have ever been reported), it usually results in stillbirth or death of the infant shortly after delivery.  people should be asked if they or any of their household contacts are pregnant or intend to become pregnant in the next 4 weeks; those who respond positively should not be vaccinated. In addition, women who are vaccinated should be counseled not to become pregnant during the 4 weeks after vaccination, and abstinence or highly effective contraceptive measures should be recommended to reduce the risk of pregnancy within four weeks of vaccination.

- If a pregnant woman is inadvertently vaccinated or if she becomes pregnant within 4 weeks after vaccinia vaccination, she should be counseled regarding the basis of concern for the fetus. However, vaccination during pregnancy should not ordinarily be a reason to terminate pregnancy.

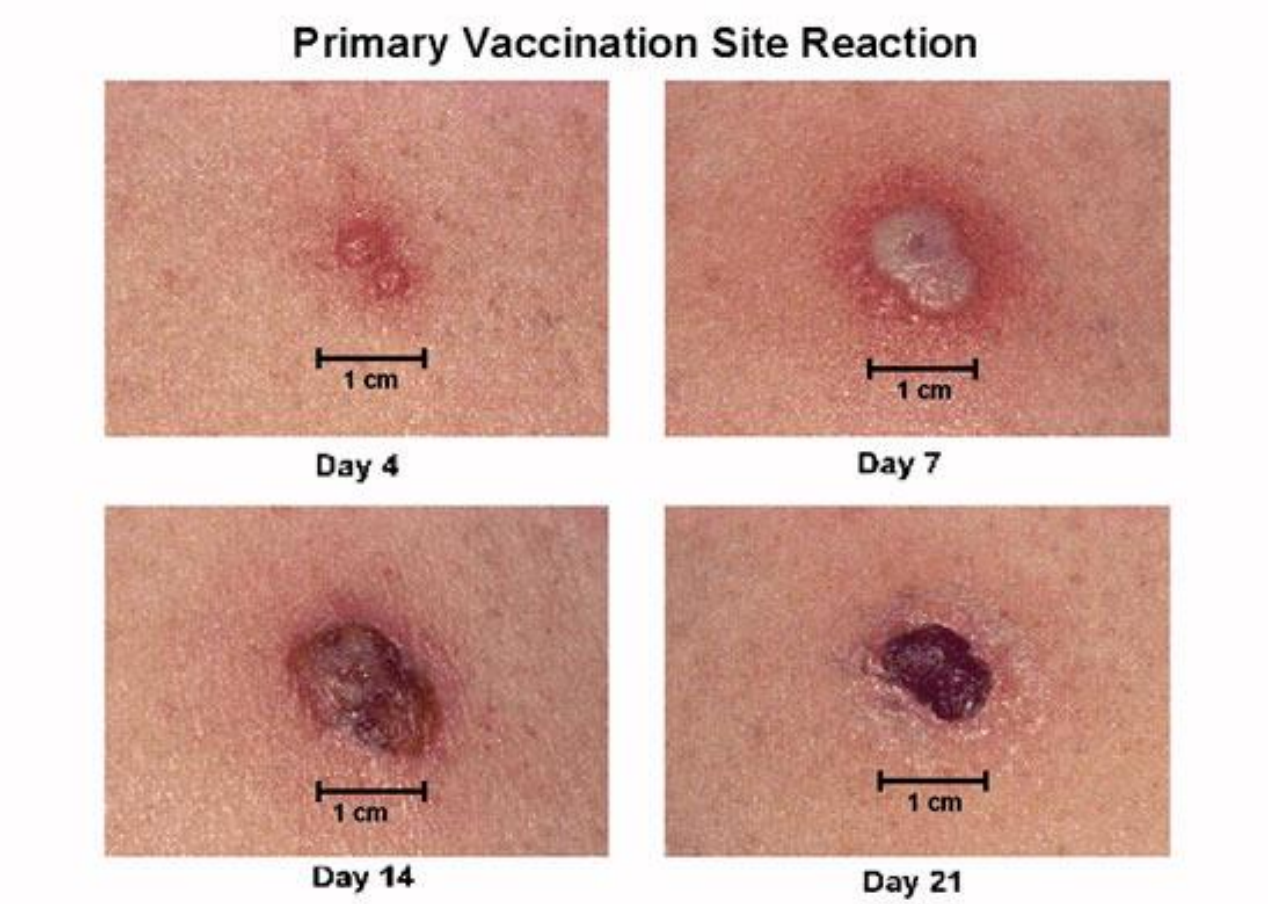
- Sounds like “X” to me.

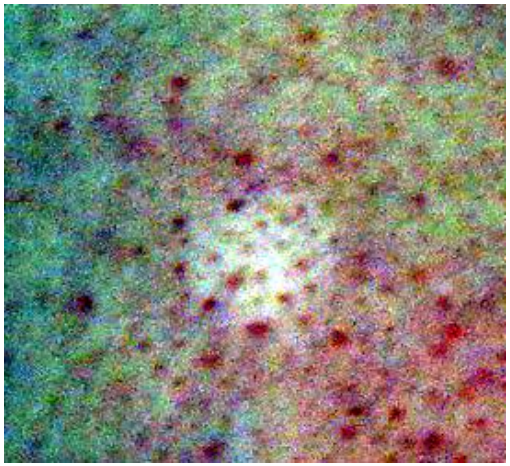
# Smallpox Vaccine: Administration

- The smallpox vaccine is not given with a hypodermic needle. It is not a shot as most people have experienced. The vaccine is given using a bifurcated (two-pronged) needle that is dipped into the vaccine solution. When removed, the needle retains a droplet of the vaccine. The needle is used to prick the skin a number of times in a few seconds. The pricking is not deep, but it will cause a sore spot and one or two droplets of blood to form. The vaccine usually is given in the upper arm.

- If the vaccination is successful, a red and itchy bump develops at the vaccine site in three or four days. In the first week, the bump becomes a large blister, fills with pus, and begins to drain. During the second week, the blister begins to dry up and a scab forms. The scab falls off in the third week, leaving a small scar. People who are being vaccinated for the first time have a stronger reaction than those who are being revaccinated.

# Smallpox Vaccine -- Rxn




- 30 year old smallpox vaccination scar
- Normal Image, Left
- Auto Level Adjustment, Center
- Auto Contrast adjustment, Right

# Smallpox Vaccine: Comments

- Smallpox vaccination provides high level immunity for 3 to 5 years and decreasing immunity thereafter. If a person is vaccinated again later, immunity lasts even longer. Historically, the vaccine has been effective in preventing smallpox infection in 95% of those vaccinated.
- Routine smallpox vaccination among the American public stopped in 1972 after the disease was eradicated in the United States. Until recently, the U.S. government provided the vaccine only to a few hundred scientists and medical professionals working with smallpox and similar viruses in a research setting.
- After the events of September and October, 2001, however, the U.S. government took further actions to improve its level of preparedness against terrorism. One of many such measures—designed specifically to prepare for an intentional release of the smallpox virus—included updating and releasing a smallpox response plan. In addition, the U.S. government has enough vaccine to vaccinate every person in the United States in the event of a smallpox emergency.

# Heterophile Antibodies:

| **Antigen** | | | |
|---|---|---|---|
| **B cell** | | | |
| **Plasma cell** | | | |
| **$Ab_1$** | **$Ab_2$** | **$Ab_3$** | $Ab_4$ |
| **Non-specific Ab's, INCLUDING some Ab's to RBC's of some animals** | | | |
| **Heterophile Ab's used for diagnosis of Epstein Barr virus-caused mono (heterophile positive) *vs* CMV-caused mono (heterophile negative)** | | | |

# RNA Viruses

# West Nile Virus

- **Viral Family**: Flaviviridae
- 
- **Virus**: West Nile Virus (**WNV**)
- 
- **Viral Disease**: Severe Human Meningoencephalitis
- 
- **Incubation Period**: 3 to 14 days.
- 
- **Nucleic Acid Core**: RNA
- 
- **Strandedness**: SS

# Transmission:

- **Infected Mosquitoes.** Generally, WNV is spread by the bite of an infected mosquito. Mosquitoes are WNV carriers that become infected when they feed on infected birds. Infected mosquitoes can then spread WNV to humans and other animals when they bite.

- **Transfusions, Transplants, and Mother-to-Child.** In a very small number of cases, WNV also has spread through blood transfusions, organ transplants, breastfeeding and even during pregnancy from mother to baby.

- **Not through touching.** WNV is not spread through casual contact such as touching or kissing a person with the virus.

# Characteristics:

- WNV affects the central nervous system. Symptoms vary.
- **No Symptoms in Most People**. Approximately 80 percent of people who are infected with WNV will not show any symptoms at all.
- **Mild Symptoms in Some People.** Up to 20 percent of the people who become infected will display mild symptoms, including fever, headache, and body aches, nausea, vomiting, and sometimes swollen lymph glands or a skin rash on the chest, stomach and back. Symptoms typically last a few days.
- **Serious Symptoms in a Few People**. About one in 150 people infected with WNV will develop severe illness. The severe symptoms can include high fever, headache, neck stiffness, stupor, disorientation, coma, tremors, convulsions, muscle weakness, vision loss, numbness and paralysis. These symptoms may last several weeks, and neurological effects may be permanent.
- Of interest, both birds and humans have died of West Nile virus infection only in the United States and Israel to date; the reason for this is not known.
- A large outbreak of West Nile virus infection has yet to occur in the United States.

# Laboratory Criteria:

- The most efficient diagnostic method is detection of IgM antibody to West Nile virus in serum or cerebrospinal fluid.
- The IgM antibody-capture enzyme-linked immunosorbent assay is optimal for IgM detection because it is simple, sensitive, and applicable to serum samples and samples of cerebrospinal fluid.

- Two caveats must be considered when interpreting serologic tests.
- First, because of close antigenic relationships among the flaviviruses, persons recently vaccinated with yellow fever or Japanese encephalitis vaccines or persons recently infected with a related flavivirus (for example, St. Louis encephalitis or dengue) may have positive results on IgM antibody tests for West Nile virus. The plaque reduction neutralization test, the most specific test for the arthropod-borne flaviviruses, can be used to help distinguish false-positive results on IgM antibody-capture enzyme-linked immunosorbent assay (MAC-ELISA) or other assays (for example, indirect immunofluorescence and hemagglutination inhibition). The plaque reduction neutralization test may also help distinguish serologic cross-reactions among the flaviviruses, although some degree of cross-reaction in neutralizing antibody may still cause ambiguous results.
- Second, because most infected persons are asymptomatic and because IgM antibody may persist for 6 months or longer, residents in endemic areas may have persistent IgM antibody from a previous infection that is unrelated to their current clinical illness. An increase in West Nile virus–specific neutralizing antibody titer in serum specimens from persons with acute and convalescent disease confirms acute infection.

# Treatment:

- Treatment for West Nile virus infection is supportive.
- Of 19 patients hospitalized in New York and New Jersey in 2000, 5 were admitted to intensive care units and 2 required mechanical ventilation.
- Ribavirin in high doses and interferon- $\alpha$2b were efficacious against the West Nile virus in vitro; however, controlled clinical trials have not been completed for either agent.
- One comatose patient treated with both ribavirin and interferon- did not improve.
- In Israel, patients treated with ribavirin had a higher mortality rate than those who did not receive ribavirin, although this difference could have been related to patient selection.
- No controlled studies have examined the use of steroids, antiseizure medications, or osmotic agents in the management of West Nile virus encephalitis.

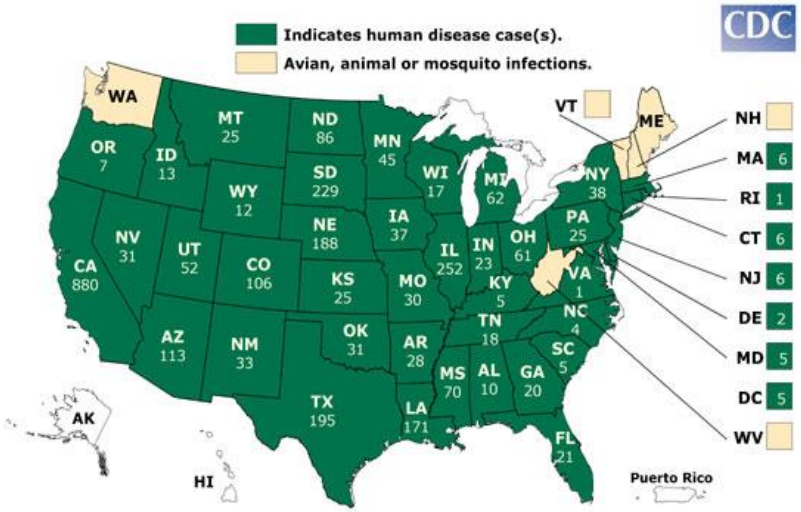
# Prevention:

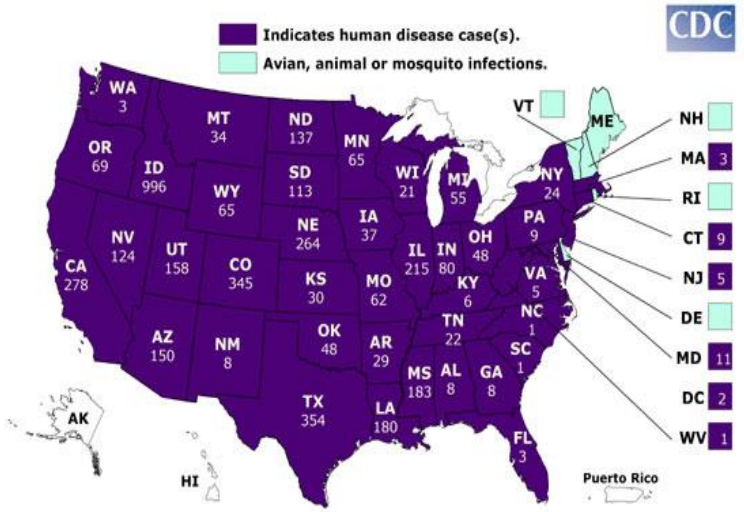
- The easiest and best way to avoid WNV is to prevent mosquito bites.
- When you are outdoors, use insect repellents containing DEET (N, N-diethyl-meta-toluamide). Follow the directions on the package.
- Many mosquitoes are most active at dusk and dawn. Consider staying indoors during these times or use insect repellent and wear long sleeves and pants. Light-colored clothing can help you see mosquitoes that land on you.
- Make sure you have good screens on your windows and doors to keep mosquitoes out.
- Get rid of mosquito breeding sites by emptying standing water from flower pots, buckets and barrels. Change the water in pet dishes and replace the water in bird baths weekly. Drill drainage holes in tire swings so water drains out. Keep children's wading pools empty and on their sides when they aren't being used.

- The American Academy of Pediatrics recommends that repellents containing no more than 10% DEET be used on children. DEET is registered for direct application to skin, pets, clothing, tents, bedrolls, and screens. It has a remarkable safety profile, and serious toxicity has been limited to encephalopathy in a few children, most of whom had a history of long-term, excessive use of DEET repellents. DEET is not recommended for infants younger than 2 months of age.
- Permethrin, a pyrethroid with repellent and insecticidal characteristics, is found in Environmental Protection Agency–approved repellents that can be applied to clothing, tent walls, mosquito nets, or other fabrics, but not to skin. Many other repellents, such as citronella, are marketed but are not as effective as DEET.

# Additional Caveat

- DEET-slathered ankle and through 2 socks: wool and spandex.



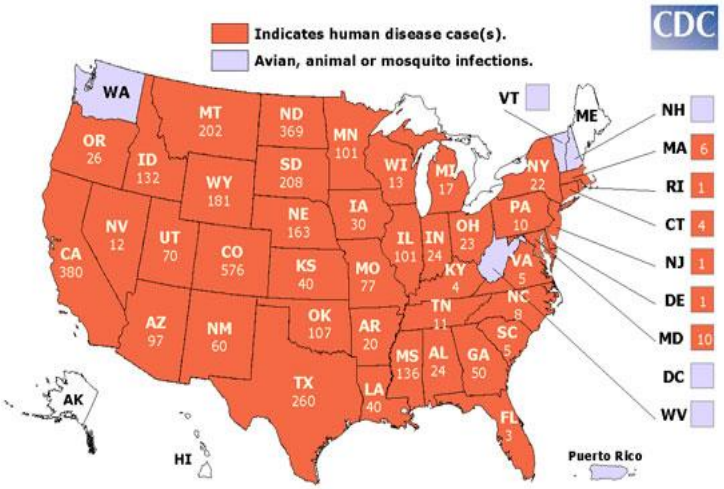

2005, 2006, 2007 and through mid-2008 WNV Data.

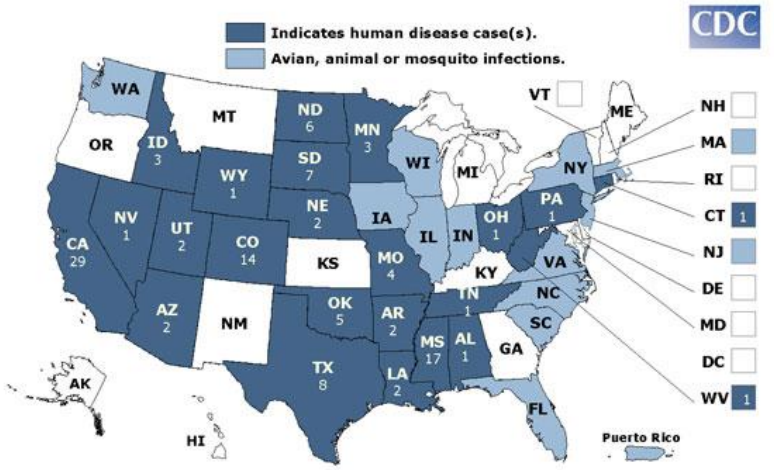
Source: http://www.cdc.gov/ncidod/dvbid/westnile/Mapsactivity/surv&control05Maps.htm

Source: http://www.cdc.gov/ncidod/dvbid/westnile/Mapsactivity/surv&control06Maps.htm

Source: http://www.cdc.gov/ncidod/dvbid/westnile/Mapsactivity/surv&control07Maps.htm

Source: http://www.cdc.gov/ncidod/dvbid/westnile/Mapsactivity/surv&control08Maps.htm



# WNV **Sources/Citations/References**


- http://www.cdc.gov/ncidod/dvbid/westnile/wnv_factSheet.htm
- http://www.cdc.gov/ncidod/dvbid/westnile/surv&control03Maps.htm
- http://www.annals.org/issues/v137n3/full/200208060-00009.html
- http://www.cdc.gov/ncidod/dvbid/westnile/qa/symptoms.htm
- http://www.37c.com.cn/literature/analecta/data/zhsyhlcbdxzz/200004/019.html
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- http://www.uhl.uiowa.edu/wnv/humantesting.html
- http://www.cvm.ncsu.edu/info/ce/downloads/jones.doc
- http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=retrieve&db=pubmed&list_uids=9836324&dopt=Abstract
- http://www.co.arlington.va.us/westnile/physicians.htm

# Severe Acute Respiratory Syndrome: SARS

- **Viral Family**: Coronaviridae
- 
- **Virus**: Provisionally termed SARS-associated coronavirus (SARS-CoV)
- 
- **Viral Disease**: Severe Acute Respiratory Syndrome
- 
- **Incubation Period**: typically 2-7 days; however, isolated reports have suggested an incubation period as long as 10 days
- 
- **Nucleic Acid Core**: RNA
- 
- **Strandedness**: SS
- **Virion**: Enveloped

# Transmission

- The primary way that SARS appears to spread is by close person-to-person contact.
- Most cases of SARS have involved people who cared for or lived with someone with SARS, or had direct contact with infectious material (for example, respiratory secretions) from a person who has SARS.
- Potential ways in which SARS can be spread include touching the skin of other people or objects that are contaminated with infectious droplets and then touching your eye(s), nose, or mouth.
- This can happen when someone who is sick with SARS coughs or sneezes droplets onto themselves, other people, or nearby surfaces.
- It also is possible that SARS can be spread more broadly through the air or by other ways that are currently not known.

- Human coronaviruses (HCoVs) were previously only associated with mild diseases.
- They are found in both group 1 (HCoV-229E) and group 2 (HCoV-OC43) and are a major cause of normally mild respiratory illnesses.
- They can occasionally cause serious infections of the lower respiratory tract in children and adults and necrotizing enterocolitis in newborns.
- The known human coronaviruses are able to survive on environmental surfaces for up to 3 hours.
- Coronaviruses may be transmitted from person-to-person by droplets, hand contamination, fomites, and small particle aerosols.

# Characteristics:

- In general, SARS begins with a fever greater than 100.4°F [>38.0°C]. Other symptoms may include headache, an overall feeling of discomfort, and body aches. Some people also experience mild respiratory symptoms. After 2 to 7 days, SARS patients may develop a dry cough and have trouble breathing.
- 
- After 3-7 days, a lower respiratory phase begins with the onset of a dry, nonproductive cough or dyspnea, which might be accompanied by or progress to hypoxemia. In 10%--20% of cases, the respiratory illness is severe enough to require intubation and mechanical ventilation. The case-fatality rate among persons with illness meeting the current WHO case definition of SARS is approximately 3%.

# Clinical Criteria

- Asymptomatic or mild respiratory illness
- Moderate respiratory illness
  - Temperature of >100.4°F (>38°C), and
  - One or more clinical findings of respiratory illness (e.g., cough, shortness of breath, difficulty breathing, or hypoxia).
- Severe respiratory illness
  - Temperature of >100.4°F (>38°C), and
  - One or more clinical findings of respiratory illness (e.g., cough, shortness of breath, difficulty breathing, or hypoxia), and
    - radiographic evidence of pneumonia, or
    - respiratory distress syndrome, or
    - autopsy findings consistent with pneumonia or respiratory distress syndrome without an identifiable cause

# Laboratory Criteria

- Confirmed
  - Detection of antibody to SARS-associated coronavirus (SARS-CoV) in a serum sample, or
  - Detection of SARS-CoV RNA by RT-PCR confirmed by a second PCR assay, by using a second aliquot of the specimen and a different set of PCR primers, or
  - Isolation of SARS-CoV.
- Negative
  - Absence of antibody to SARS-CoV in a convalescent–phase serum sample obtained >28 days after symptom onset.
- Undetermined
  - Laboratory testing either not performed or incomplete.

- Initial diagnostic testing for suspected SARS patients should include chest radiograph, pulse oximetry, blood cultures, sputum Gram's stain and culture, and testing for viral respiratory pathogens, notably influenza A and B and respiratory syncytial virus.
- A specimen for Legionella and pneumococcal urinary antigen testing should also be considered.
- Clinicians should save any available clinical specimens (respiratory, blood, and serum) for additional testing until a specific diagnosis is made.
- Acute and convalescent (greater than 28 days after onset of symptoms) serum samples should be collected from each patient who meets the SARS case definition.
- Paired sera and other clinical specimens can be forwarded through State and local health departments for testing at CDC.

# **Treatment**:

- No specific treatment recommendations can be made at this time.
- Empiric therapy should include coverage for organisms associated with any community-acquired pneumonia of unclear etiology, including agents with activity against both typical and atypical respiratory pathogens.
- Treatment choices may be influenced by severity of the illness.
- Infectious disease consultation is recommended.

- Not much new to add about SARS since 2004.

# SARS **Sources/Citations/References**


- http://www.cdc.gov/ncidod/sars/casedefinition.htm
- http://www.cdc.gov/ncidod/sars/clinicians.htm
- http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5212a5.htm
- http://www.cdc.gov/ncidod/sars/diagnosis.htm
- http://www.cdc.gov/ncidod/sars/treatment.htm
- http://sarsreference.com/sarsref/virol.htm
- http://www.newscientist.com/hottopics/sars/article.jsp?id=99993662&sub=The%20pathogen
- http://content.nejm.org/cgi/content/abstract/348/20/1967
- http://content.nejm.org/cgi/content/abstract/348/20/1953
- http://www.afip.org/Departments/Pulmonary/SARS/pathogen.html

# MERS-CoV

- Viral Family: Coronaviridae
- Virus Name: Middle East Respiratory Syndrome Coronavirus, or MERS-CoV
- Viral Disease: “Saudi Arabia's SARS-like virus”
- Viral Origin: The source of infection is not yet known. Based on what is known about coronaviruses in general and the accumulating evidence on this virus, MERS-CoV appears to have originated in bats. [http://www.euro.who.int/en/what-we-do/health-topics/communicable-diseases/influenza/news/news/2013/05/novel-coronavirus-update-new-virus-to-be-called-mers-cov]
- Viral Hosts: Human, Bats, Porcine species
- Nucleic Acid: RNA
- Strandedness: SS

# MERS-CoV

- Method[s] of Transmission: Unknown at this time; To date, evidence of person-to-person transmission has been limited. Although this case is suggestive of person-to-person transmission, on the basis of current evidence, the risk of sustained person-to-person transmission appears to be very low. [http://www.who.int/csr/don/2013_02_13/en/index.html]. "Human-to-human transmission occurred in at least some of the disease clusters; however, the exact mode of transmission is unknown.", but appears "very difficult to acquire." [Dr. William Schaffner, infectious disease specialist at Vanderbilt University Medical Center in Nashville]

- Incubation Period: Uncertain; history of travel from the Arabian Peninsula or neighboring countries **(***Bahrain, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Palestinian territories, Oman, Qatar, Saudi Arabia, Syria, the United Arab Emirates, and Yemen*) within 10 days. [http://www.cdph.ca.gov/programs/cder/Pages/MERS-CoV.aspx]

# MERS-CoV

- Symptoms: The disease acts like a cold and causes upper respiratory system problems. Symptoms include fever (38°C , 100.4°F) and cough and can lead to kidney failure and pneumonia; expectoration, and shortness of breath [**N Engl J Med 2012;367:1814-20. DOI: 10.1056/NEJMoa1211721**]. 49 known infections as of 29 May 2013; of these 27 deaths have resulted (27th death on 29 May 2013).
- 
- Treatment: None known; supportive treatments to relieve symptoms.
- 
- Cautionary Note: CDC is recommending that infection control guidance developed for SARS be implemented for patients with known or suspected MERS-CoV infection. Therefore, Airborne and Contact Precautions, in addition to Standard Precautions, should be applied when caring for patients with known of possible MERS-CoV infection. CDC infection control guidance for SARS is available at: http://www.cdc.gov/sars/infection/.

# Noroviruses

| |
|---|
| Viral Family: *Caliciviridae* |
| Virus: Norovirus -- Norovirus was recently approved as the official genus name for the group of viruses provisionally described as “Norwalk-like viruses” (NLV). (CDC) |
| Viral Disease: Gastroenteritis |
| Incubation Period: 24-72 hours |
| Nucleic Acid Core: RNA |
| Strandedness: SS |
| Transmission: Infected feces; improper hand washing (occurred at the Reno Hilton in 1996) |
| Symmetry: Icosahedral |
| Virion: Non-enveloped |
| Characteristics: onset of diarrhea occurs within 24-72 hours of ingestion. Lasts for 18-36 hours. Diarrhea accompanied with vomiting (as often as 20 times a day). Headache, malaise, myalgia. Seems to be self-limiting to 72 hours. Typically picked up within groups of people from closed, isolated environments: schools, camps, cruise ships, casinos; ingesting contaminated shellfish or water. |

# Noroviruses

- **If I have had a Norwalk-like virus infection in the past, can I get it again?**
- Yes. Immunity is believed to last around 14 weeks, but long-term immunity may not occur. Detecting antibody against these viruses in the blood does not assure a person is immune.

- Source: http://www.idph.state.il.us/public/hb/hbnorwalk.htm

| |
|---|
| Viral Family: Arenaviridae |
| Virus: Arenavirus |
| Viral Disease: Hemorrhagic fever; Lassa fever (similar to hanta virus infection) |
| Incubation Period: 7-15 days; 10-14 days |
| Nucleic Acid Core: RNA |
| Strandedness: SS |
| Transmission: Infected rodents to humans |
| Symmetry: Unknown |
| Virion: Enveloped |
| |
| Characteristics: Anorexia, myalgia, fever, back pain, epigastric pain, cephalalgia, photophobia, fever, flushing of upper torso, neurologic disorders, bleeding mucous membranes, hypovolemic shock, coma (patients improving by week three will survive), bradycardia, hemorrhagic manifestations; diagnosis generally comes about from asking about travel history; ISOLATE from general population and contact Public Health for further instructions |

| |
|---|
| Viral Family: Bunyaviridae |
| Virus: California encephalitis virus |
| Viral Disease: Encephalitis |
| Incubation Period: 3-7 days |
| Nucleic Acid Core: RNA |
| Strandedness: SS |
| Transmission: Mosquitoes in July, August, September |
| Symmetry: Helical |
| Virion: Enveloped |
| |
| Characteristics: recognized clinically the best in Ohio-Wisconsin-Minnesota; primarily distributed in mid-west; fever, headache, N/V, disorientation changing to seizures, coma may last 2 weeks, frontal headaches; 38-40°C fever |

| |
|---|
| Viral Family: Bunyaviridae |
| Virus: Hantavirus |
| Viral Disease: Four Corners Disease |
| Incubation Period: Still debating |
| Nucleic Acid Core: RNA |
| Strandedness: ?SS |
| Transmission: dust containing deer mouse urine droplets and/or feces; to prevent, DO NOT dry mop when observe mouse droppings: wet mop with clorox |
| Symmetry: ? |
| Virion: Enveloped |
| |
| Characteristics: Respiratory disease with rapid onset and outcome; some survive the infection, others don't |

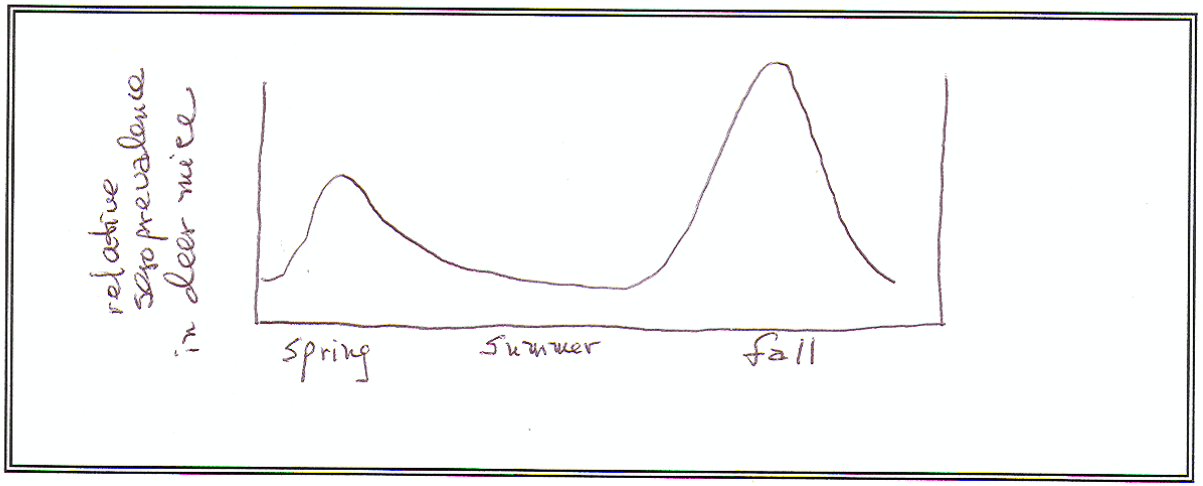
# ***Hantavirus*: 1**

| |
|---|
| Viral Family: Bunyaviridae |
| Virus: (Synonyms) Hantavirus, Black Creek Canal Virus, Four Corners Hantavirus, Sin Nombre Virus, Convict Creek Virus, Muerto Canyon Virus |
| Viral Disease: Four Corners Disease; Hantavirus Pulmonary Syndrome (HPS; 1st recognized on 5/14/1993; oldest case known from 1959). |
| Incubation Period: Still debating; 10-21 days depending on the author. |
| Nucleic Acid Core: RNA |
| Strandedness: Negative-sense single strand (DS = double strand and SS = single strand, BTW) |

# *Hantavirus*: 2

Transmission: aerosols of urine/feces from rodents; through broken skin, into eyes; possibly ingested in contaminated food/water; after bitten by the rodent; dust containing deer mouse urine droplets and/or feces. To prevent: DO NOT dry mop when you observe mouse droppings: wet mop with Clorox. (Feces from the deer mouse, BTW, look like peppercorns; those from the common house mouse appear as rice grains in shape.) There is a biphasic manner of seropositivity in rodents: One spike of seroprevalence in deer mice in spring that drops off over late spring and summer, then a spike approximately twice that of the spring spike in fall that drops off over winter to cycle back into the spring spike of seroprevalence.

Biphasic manner of seropositivity in rodents:




Deer mouse (except on East Coast and SE USA), Cotton rat (southern USA) -- these two are the BIGGEES! BUT! Hantavirus is also found in the following rodents ALTHOUGH they have NOT been shown/demonstrated/proven to cause disease in man: white-footed mouse (NE USA), harvest mouse, rice rat (in LA and TX), pinion mouse, brush mouse, western chipmunks. Deer mouse is generally NOT found in urban areas. House mice have not been shown to carry hantavirus to date.

House mouse (left) Deer Mouse (right)

# *Hantavirus*: 3

| |
|---|
| Nosocomial Transmission: has not been reported in the Northern Hemisphere. HCW's caring for HPS patients are seronegative. This suggests no human-to-human transmission. |
| BUT: June 1997: 20 cases in Argentina have epidemiological evidence of human-to-human transmission. RNA studies are showing that the virus has different genomic materials in the Argentinean cases than in the virus causing HPS. This latter virus, while from the same family, is being called Andes virus. |
| Susceptibility: Dilute bleach, detergents, 70% EtOH, general household disinfectants, i.e., it's pretty easy to inactivate. 2005: Susceptible to 10% commercial bleach solution, 2% glutaraldehyde, formaldehyde and 70% EtOH. |
| Symmetry: helical |
| Replication Site: Cytosol of host cell |
| Virion: Enveloped |

# Hantavirus: 4

**Characteristics**: Respiratory diseases with rapid onset and outcome; some survive the infection, others don't. Mortality was about 80% early on -- now about 40-50% (due to increased recognition and treatment); chances of getting HPS are very small, but if you get it, it's very dangerous.

**Clinical Features**: Prodrome: pyrexia, rigors and muscle pains, cephalalgia, N/V, diarrhea, malaise, abdominal pain, joint pain, chest pain/back pain, sweats. After Prodrome: SOB, cough, reduced platelets, neutrophilia, "severe hemodynamic instability", atypical lymphs, elevated LDH.

**Pre-Clinical Diagnosis**: 1) draw baseline sample, freeze serum at -20° C; 2) if develop fever or LRI within 45 days of potential exposure get thee to an MD and inform him/her of the risk of exposure to Hanta; 3) send samples through State Health Department to CDC.

**Clinical Features**: Difficult to diagnose HPS before day 7. Once it settles in the lungs, it leads to rapid deterioration (within 24 hours).

Rule out (R/O) HPS by comparing against disease states with rashes, conjunctival hemorrhage, red throat/conjunctivae, petechiae and peripheral/periorbital edema: these are NOT consistent with HPS!

# Hantavirus: 5

| |
|---|
| Clinical Diagnosis and Assessment: draw CBC and chem panel every 8-12 hours; reduce albumin and elevated hematocrit may suggest fluid moving from circulation to the lungs. Elevated WBC with left shift (elevated neutrophils -- in this case referred to as "toxic neutrophilia") and atypical lymphocytes (these appear at the onset of pulmonary edema). Platelets may drop to less than 150,000 (this may also be an indicator of the onset of pulmonary edema). |
| By day 3, PT and PTT are elevated; Fibrinogen is reduced and Fibrin Split Products are elevated (these are the products of the action of plasmin on fibrin or fibrinogen; these products inhibit platelet aggregation, thrombin and fibrin polymerization, i.e., can't clot adequately because nuthin' sticks together to make the clot). |
| ELISA's are available for diagnosis. IgG titer at 4 times elevation is diagnostic in acute/convalescent disease. IgM presence in acute disease is diagnostic. Western blot may also be used. May find increased urinary protein and may or may not find slightly increased serum levels of GOT (AST), GPT (ALT), CK, amylase, creatinine. Survivors are frequently polyuric during recovery. |
| Prognosis is poor if the patient develops metabolic acidosis, prolonged PT and PTT's, if they develop high levels of lactate. Patients with fatal disease generally deteriorate from sinus bradycardia to electromechanical dissociation, ventricular tachycardia or ventricular fibrillation. |
| Treatment: Supportive; broad spectrum antibiotics are mandatory UNTIL HPS is proven!; regulate fluids carefully, watch cardiac function. NO anti-viral drugs appear to be effective. |

| |
|---|
| Viral Family: Coronaviridae |
| Virus: Corona virus |
| Viral Disease: URI/ common cold |
| Incubation Period: 2-5 days; 3 days average for the common cold |
| Nucleic Acid Core: RNA |
| Strandedness: SS |
| Transmission: Respiratory route via droplets |
| Symmetry: Unknown |
| Virion: Enveloped |
| |
| Characteristics: Causes 5-10% of the common cold diseases; coryza, rhinorrhea, nasal congestion, pharyngoalgia and edema; lymphadenopathy not very often, cephalalgia, typically resolves within 7 days; usually AFEBRILE |

| |
|---|
| **Viral Family:** Orthomyxoviridae |
| **Virus:** Influenza virus -- strains A, B, (two most severe illnesses) C (generally causes a common cold syndrome) |
| **Viral Disease:** Influenza |
| **Incubation Period:** 18-96 hours |
| **Nucleic Acid Core:** RNA |
| **Strandedness:** SS |
| **Transmission:** Droplets, talking, coughing, sneezing |
| **Symmetry:** Helical |
| **Virion:** Enveloped |
| **Characteristics:** Affects respiratory tract; survives best with low temperatures and low relative humidity: WINTER; Types A and B on hard smooth surface: infectious for 24 hours; on porous surfaces, infectious for 4-6 hours; high fever for 3 days; myalgia, arthralgia, cephalalgia (A,B,C); rhinorrhea, cough, sore throat (A,B,C); chills, diarrhea (A,B); dry non-productive cough which lasts generally 1-2 weeks after major symptoms go away; do NOT give ASA to children during this or other childhood illnesses: Reye's Syndrome |

**Generic Name:** Influenza Virus Vaccine

**Trade Name:** Fluimmune; Flu Shield

**Immunogenic Substrate:** Sub-virion suspension of "a specific type of virus"

**Indication/Use:** The very young and/or the very old; HCW's; children on long term treatment with ASA who are at increased risk of Reye's Syndrome; anyone who wants protection from influenza

**Warnings:**
Not effective against ALL strains of influenza virus
Revaccination every year
Can NOT cause influenza -- similar sx due to coincidence
Destroy vaccine every year as the vaccines change by year

**Pregnancy Category:** C

**Administration:** Begin in mid-October to mid-November since "flu" peaks between late Dec. and early Mar.; IM; deltoid for adults and older children; anterolateral thigh muscles for infants and young children

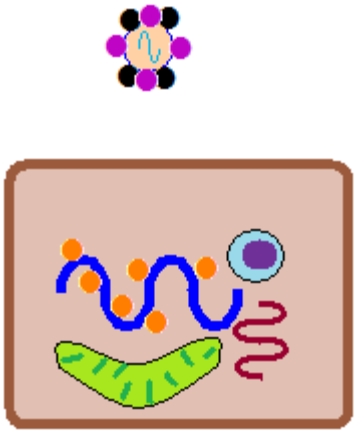
# Influenza A Viruses

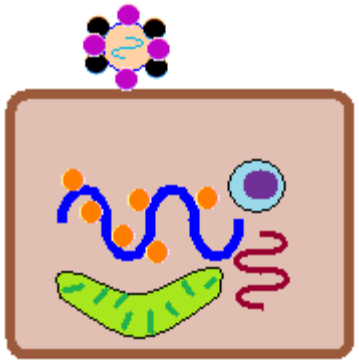
Hemagglutinins and Neuraminidases

The original strains of influenza viruses isolated in 1933 are referred to as Type A or "A classic". Additional strains that have been discovered on the basis of antigenic studies, include types $A_1$ $A_2$ (Asian), B and C.

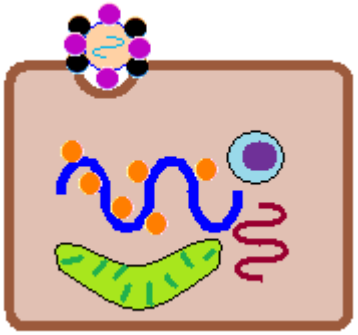
http://textbookofbacteriology.net/themicrobialworld/Influenza.html

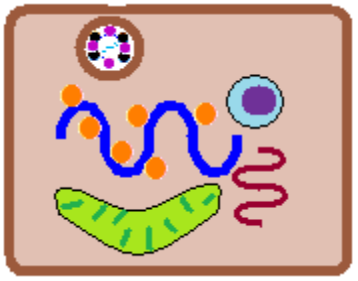
- Influenza A virus (e.g., H9N7) approaching target cell.
- Hemagglutinin (HA – e.g., H9 in most recent “bird flu” – 2013) binds Influenza A to target cell.



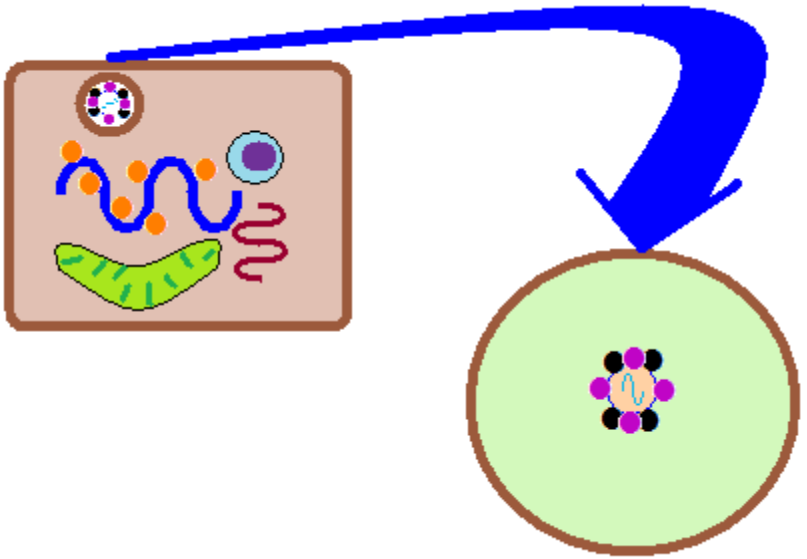


- Influenza A virus internalized into cell via invagination and phagosome formation.

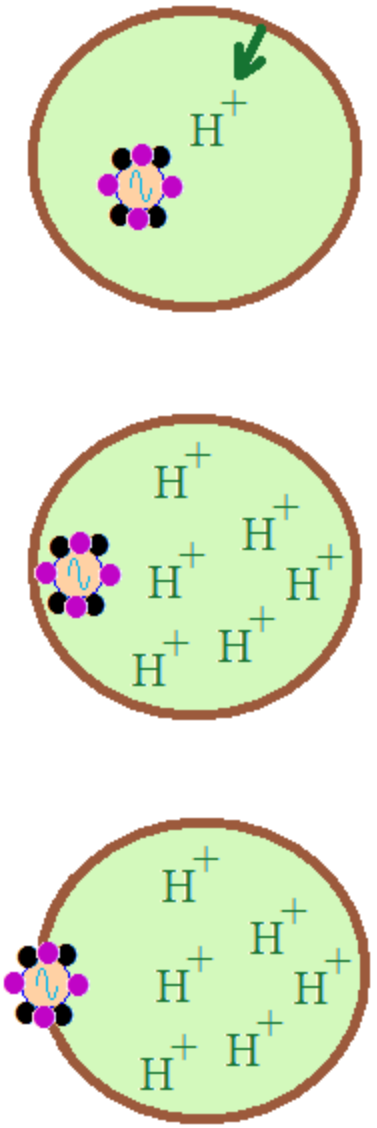




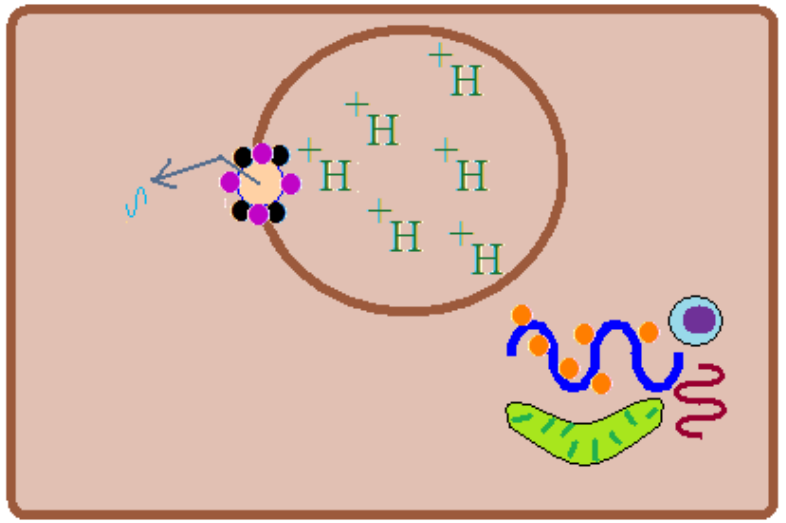
- Exploded view of Influenza A virus in phagosome (endosome could work, too).

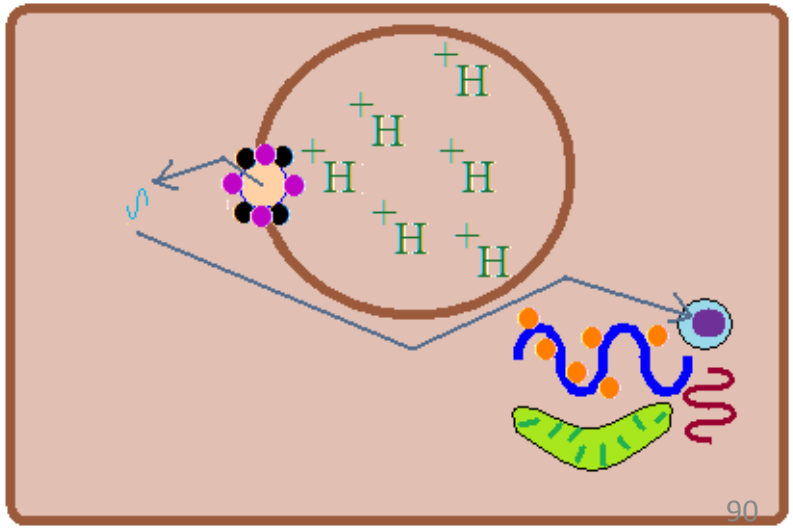


- As phagosome acidifies, about pH 6, the virus is “pushed” towards the membrane and the HA binds to the membrane, fusing it with the phagosome.
- Some sources suggest a hydrophobic portion of the HA (called a “fusion peptide”) undergoes conformational change to act as a “grappling hook” to draw the membrane towards the virus for fusion.

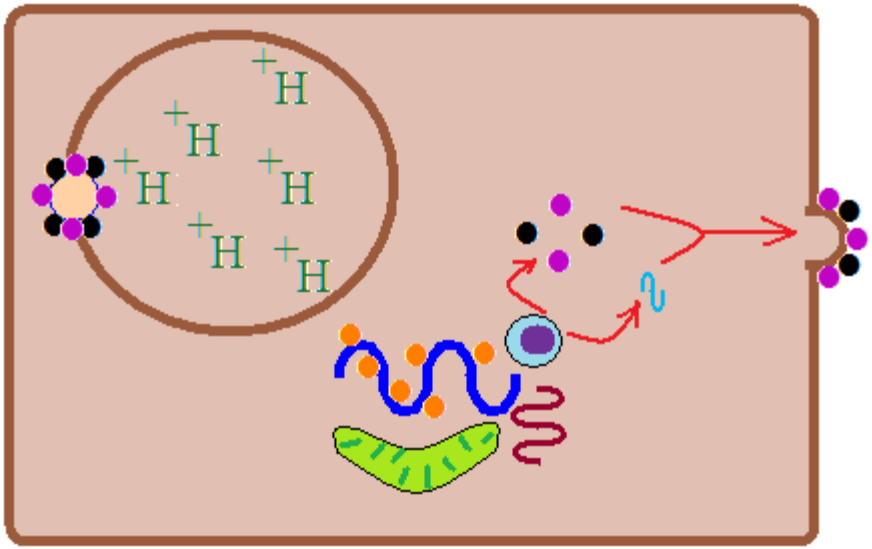


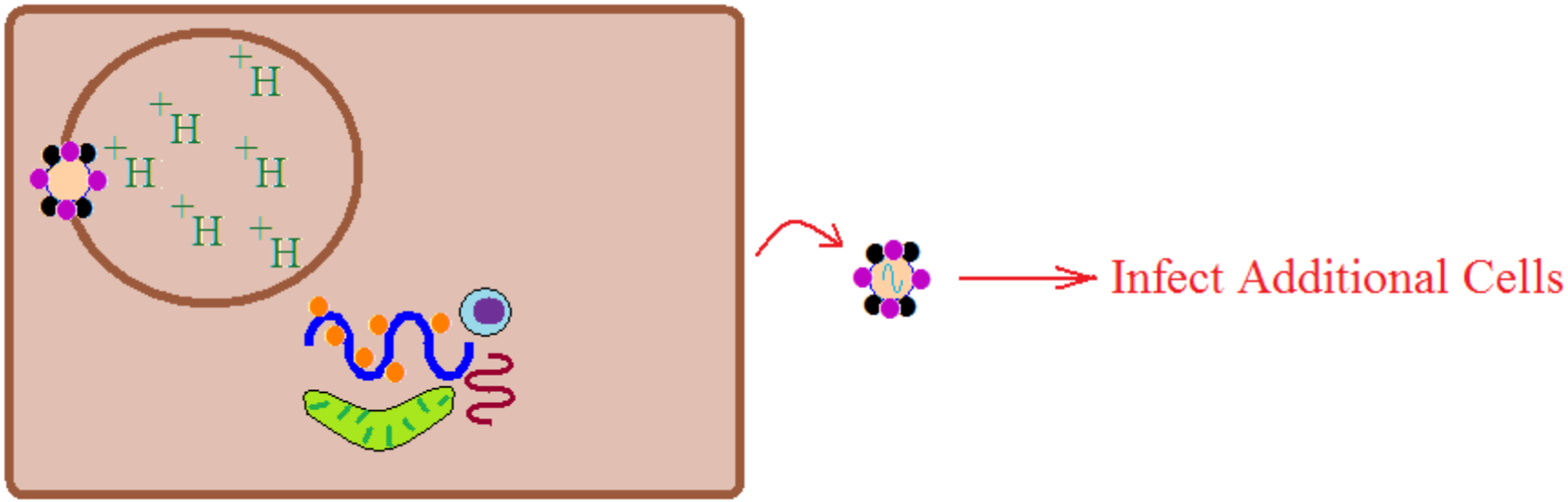
- The viral RNA is then released into the cytosol and infects the target/host cell nucleus.



- HA particles are synthesized and transported to the cell membrane.
- NA – neuraminidase particles are, likewise synthesized and transported to the cell membrane.
- vRNA particles, as well.






- NA may destroy Influenza A receptors on the host cell so that the new virus is released from the host cell to infect other cells.
- Function of NA remains unclear; confusion abounds.

| |
|---|
| Viral Family: Paramyxoviridae |
| Virus: Pneumovirus |
| Viral Disease: Pneumonia, respiratory infections |
| Incubation Period: 1-4 days |
| Nucleic Acid Core: RNA |
| Strandedness: SS |
| Transmission: The major route of transmission of Genus Pneumovirus is via fomites. The aerosol route is a minor way to acquire the virus. |
| Symmetry: Helical |
| Virion: Enveloped |
| Characteristics: Pneumonia; similar to RSV |

| |
|---|
| **Viral Family:** Paramyxoviridae |
| **Virus:** Respiratory Syncytial Virus |
| **Viral Disease:** Pneumonia; bronchitis |
| **Incubation Period:** 1-5 days; severity of disease peaks between day 1 and 3 of the illness |
| **Nucleic Acid Core:** RNA |
| **Strandedness:** ss |
| **Transmission:** Large droplets, secretions, contaminated hands and surfaces: Counter tops infectious for 6 hours; cloth gowns for 45 minutes; paper tissue for 45 minutes; skin for 20 minutes |
| **Symmetry:** Helical |
| **Virion:** Enveloped |
| **Characteristics:** HAND WASHING!!!!!!; Breastfeeding does NOT protect from RSV; affects children <18 months of age; acute illness lasts about 10-14 days; long term effects of children having bronchiolitis 2° RSV: lung problems similar to COPD after this disease; fever less than 102°F; respiratory syncytia (mucous plugs); atelectasis may occur |

- **RSV is treated with Ribavirin as an aerosol (it's a nucleoside analog) using a SPAG-2 (small particle aerosol generator type 2 – links below). RSV causes a yearly outbreak of lower respiratory tract infections. Nasopharyngeal washings are better than swabs for diagnosis (by EIA). Go easy on these kids as this is uncomfortable.**
- **1) induces formation of protoplasmic masses in lung tissue;**
- **2) is a major cause of bronchiolitis and pneumonia in kids**
- **less than 6 months of age;**
- **3) is a major cause of bronchiolitis and pneumonia in nosocomial infection in infants with congenital heart disease. There also seems to be an association of RSV infection with obstructive breathing sorts of respiratory dysfunction, e.g., asthma-like problems.**

(Respir Care 1996; 41(7):647-653)
Second Link from a Resp Care Program

| |
|---|
| Viral Family: Picornaviridae |
| Virus: Coxsackievirus A16 |
| Viral Disease: Hand-foot-and-mouth disease |
| Incubation Period: 1 day up to more than a month; generally 2-10 days; |
| Nucleic Acid Core: RNA |
| Strandedness: SS |
| Transmission: Contact; fecal/oral; pharyngeal secretions |
| Symmetry: ? Icosahedral |
| Virion: ? Naked |
| Characteristics: 4 mm lesions on palms/soles, fingers/toes, lateral aspects of hand/feet and buttocks; may spread to arms and legs; self-limiting within 1 to 2 weeks; rashes may resemble rubella or other diseases; R/O and/or differentiate from varicella |

| |
|---|
| Viral Family: Picornaviridae |
| Virus: Polio virus types 1,2,3 |
| Viral Disease: Poliomyelitis |
| Incubation Period: 1-35 days (some 12-30 hours) |
| Nucleic Acid Core: RNA |
| Strandedness: SS |
| Transmission: fecal/oral and respiratory aerosols |
| Symmetry: Icosahedral |
| Virion: Naked |
| |
| Characteristics: paralysis, encephalitis, carditis, respiratory infections, fever |

**Generic Name:** Polio Vaccine, Inactivated

**Trade Name:** Ipol

**Immunogenic Substrate:** Formaldehyde inactivated polio viruses (Types 1, 2, 3)

**Indication/Use:** to prevent poliomyelitis

**Warnings:** Determine sensitivity to Neomycin, Streptomycin and Polymyxin B (part of growth production)
Fever at or above 102°F may occur

**Pregnancy Category:** C

**Administration:** SQ; in adults in deltoid; in infants/children in anterolateral thigh;

| Infants/children | Adult |
|---|---|
| 3 doses: 2 mo, 4 mo and then at 10-16 mo | 2 doses 1-2 months apart; third dose 6-12 mo later |

Do NOT freeze vaccine

**Generic Name:** Polio Vaccine, Oral Live

**Trade Name:** Orimune

**Immunogenic Substrate:** Attenuated live poliovirus (three different types)

**Indication/Use:** to vaccinate against types 1, 2, 3 polio viruses; infants 6-12 weeks of age; unimmunized children and up to 18 YOA

**Warnings:**
Defer immunization during acute fever/infection
This vaccine is ABSOLUTELY ORAL: NO DEVIATIONS
Keep patient away from immunocompromised patients for 6-8 weeks
Virus is shed for 6-8 weeks fecally/pharyngeally
HANDWASH after changing diapers
May be freeze-thawed 10 times IF temp is not above 46°F when thawed and IF cumulative thaw time is NOT more than 24 hours

**Pregnancy Category:** C

**Administration:** primary series is three doses

| Infants | up to 18 YOA | School entry |
|---|---|---|
| 2 mo = 1st dose, 3.5-4 mo = 2d dose, 15-18 mo = 3d dose | 2 doses 8 weeks apart; 3d dose 6-12 mo after 2d dose | single dose of OPV* |
| | | *not required by those who had 3d primary dose on or after 4th birthday |
| Squeeze container into mouth after thawing | | |

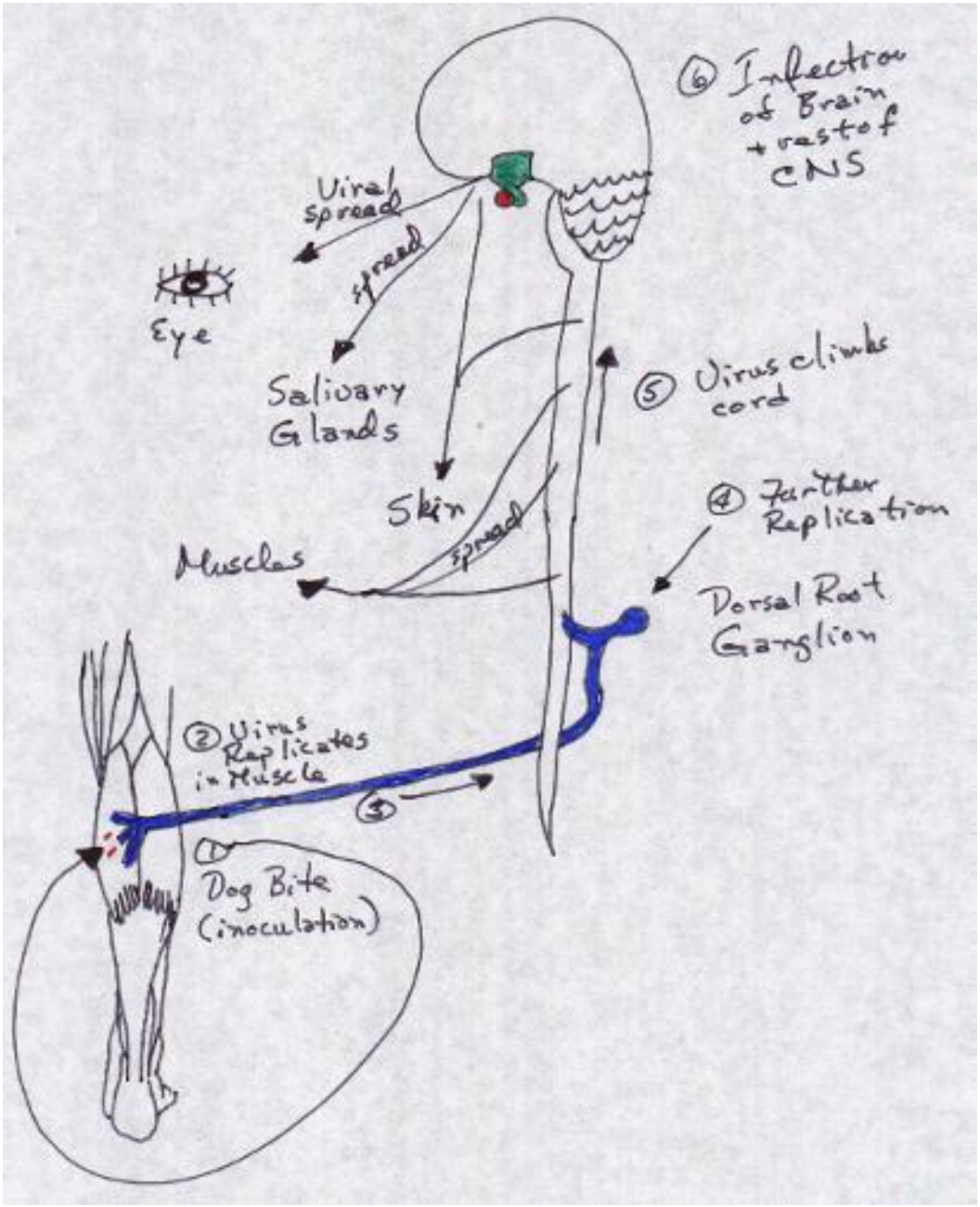
| |
|---|
| **Viral Family:** Picornaviridae |
| **Virus:** Rhinovirus, a.k.a. common cold virus |
| **Viral Disease:** Head cold (3-7 days for acute phase; 7-10 days for recovery) |
| **Incubation Period:** 24-72 hours; 2-4 days |
| **Nucleic Acid Core:** RNA |
| **Strandedness:** SS |
| **Transmission:** droplets, contact, fomites |
| **Symmetry:** Icosahedral |
| **Virion:** Naked |
| **Characteristics:** affect upper respiratory tract; primarily nasal discharge and obstruction; sneezing, pharyngitis, cough, chills; (FEVER is UNUSUAL with rhinovirus); grows best at low temperatures such as in the nasal passages (33°C); peak infections early fall or springtime |

Controlled experiments have proven that chilling and/or wearing wet clothing does NOT produce a cold or increase susceptibility to rhinovirus. Chilliness is an early symptom of the common cold

| |
|---|
| Viral Family: Reoviridae |
| Virus: Rotavirus |
| Viral Disease: Infantile diarrhea; encephalitis |
| Incubation Period: 1-3 days |
| Nucleic Acid Core: RNA |
| Strandedness: DS |
| Transmission: ? oral/fecal |
| Symmetry: Icosahedral |
| Virion: Naked |
| |
| Characteristics: disease peaks in children between 4 months and 3 YOA; CAN be fatal; fever at or above 38.5°C; watery stools that are green (due to mucus); no RBC or WBC in BM UNLESS Shigella or Campylobacter is complicating; diarrhea lasts 2-23 days; accounts for 0.5 to 0.67 of GI problems in kids less than 2 YOA; vomiting lasts 1-3 days; ON AVERAGE, diarrhea lasts 5-8 days; disease starts with vomiting and within hours have diarrhea; DOUBLE CHECK HYDRATION STATE! these kids are dehydrated! |

| |
|---|
| Viral Family: Retroviridae |
| Virus: HTLV's and HIV |
| Viral Disease: Leukemias and AIDS |
| Incubation Period: Varies greatly; not predictable; about 7-15 years |
| Nucleic Acid Core: RNA |
| Strandedness: SS |
| Transmission: Body fluids |
| Symmetry: Unknown |
| Virion: Enveloped |
| |
| Characteristics: Reverse transcriptase; complicated by/with opportunistic diseases |

| |
|---|
| Viral Family: Rhabdoviridae |
| Virus: Rabies virus |
| Viral Disease: Rabies |
| Incubation Period: Depends on bite site: about 9 days to several years; 30-78 days; child less than adult |
| Nucleic Acid Core: RNA |
| Strandedness: SS |
| Transmission: inoculation of infected saliva into SQ or IM |
| Symmetry: Helical |
| Virion: Enveloped |
| Characteristics: Fever, headache, malaise, tingling at site of bite; N/V, tachycardia, seizure, respiratory paralysis, coma, D. insipidus (SIADH), bacterial pneumonia, sepsis, death; hallucinations, muscle spasms; best rule: if UNPROVOKED bite, get the brain of the animal for analysis. |
| Treatment: 1) wash wound site with soap and water; 2) RIG half at wound site and half IM; 3) rabies vaccine: 6 doses (see rabies vaccine notes, too) day 1, 3, 7, 14, 90 after bite; some experts suggest giving another dose at 6 months after the bite: call PUBLIC HEALTH in your area to assist in determining the best dosing schedule |


⑥ Infection of Brain + rest of CNS
Viral spread
spread
Eye
Salivary Glands
⑤ Virus climbs cord
Skin
spread
④ Further Replication
Muscles
Dorsal Root Ganglion
② Virus Replicates in Muscle
③
① Dog Bite (inoculation)

**Generic Name:** Rabies Immune Globulin (Human)

**Trade Name:** Hyperab

**Immunogenic Substrate:** Alcohol fractionated anti-rabies Ig

**Indication/Use:** to anyone who is suspected of being exposed to rabies

**Warnings:**
Beware of patients with IgA deficiency (Hyperab contains IgA and body may make Anti-IgA)
Refrain from giving IV
Do NOT give after Rabies Vaccine (↓ immunity)
BITE = skin broken by teeth
NON-BITE = scratches, abrasion, mucus membranes contaminated with saliva or brain tissue from a rabid animal

**Pregnancy Category:** C

**Administration:** 0.133 mg/kg IM; at time of first vaccine dose; MAY be given up to 8th day after first dose of vaccine given; infiltrate wound area with about half of the dose; rest of dose IM at a different site with a different syringe and needle; do not use gluteal region routinely as this may damage the sciatic nerve

Generic Name: Rabies Vaccine

Trade Name:

Immunogenic Substrate: Killed rabies virus

Indication/Use: Prophylactically and post-rabies exposure

Warnings: Try not to get bit by these beasts
Determine hypersensitivity
May need tetanus toxoid
May need antibiotics

Pregnancy Category: ?

Administration: Prophylactically: 2 doses 1 week apart, third dose 14-21 days later in areas of high incidence of rabies; BITE: 1) dose depends on animal (call public health officials for this information); 2) five doses: day of bite, 3 days after and 1, 2 and 4 weeks after bite

| |
|---|
| Viral Family: Togaviridae |
| Virus: Rubivirus |
| Viral Disease: Rubella (3 day measles, German measles); encephalitis |
| Incubation Period: 14-21 days |
| Nucleic Acid Core: RNA |
| Strandedness: ss |
| Transmission: respiratory secretions, close personal contact (virus not inactivated by heat or desiccation); |
| Symmetry: Icosahedral |
| Virion: Enveloped |
| |
| Characteristics: rash first on face/neck then it spreads to trunk then to the extremities within 1 to 2 days; total rash time = 1-4 days with the AVERAGE = 3 days; rash may resemble heat rash; low grade fever (100.25 +/- 1.25°F) that may last a week; FETAL RISK IN PREGNANT WOMEN |

**Generic Name:** Rubella Virus Vaccine Live

**Trade Name:** Meruvax II

**Immunogenic Substrate:** Live attenuated rubella virus

**Indication/Use:** children 12 months to puberty; international travelers if not immune

**Warnings:**
Do not get pregnant for 3 months after injection
Do not give within +/- 30 days of other vaccines
Do not give as per other rubella vaccines
Arthritis/arthralgia 2-4 weeks after vaccination in post-pubertal women may occur

**Pregnancy Category:** C

**Administration:** SQ: 25 g, 5/8" needle; outer, upper aspect of arm; use only diluent provided (no allergens or viral inactivating agents present in it); protect from light; discard within 8 hours

**Generic Name:** Measles and Rubella Vaccine

**Trade Name:** M-R-Vax II

**Immunogenic Substrate:** Live, attenuated virus for measles (rubeola) and rubella (German measles)

**Indication/Use:** for vaccination of 15 months or older for these communicable diseases; travelers to regions without immunization for these diseases

**Warnings:**
Do NOT become pregnant for 3 months after injection -- this is LIVE virus
Determine sensitivity to eggs
Refrain from use with ANY acute fever/illness
Refrain from use with active untreated TB

**Pregnancy Category:** C

**Administration:** SQ; upper, outer aspect of arm; do NOT give IG with M-R-Vax II; Protect from light (viral inactivation); discard within 8 hours

| |
|---|
| Viral Family: Paramyxoviridae |
| Virus: Rubuluvirus |
| Viral Disease: Mumps |
| Incubation Period: 7-29 days (average = 16-18 days) |
| Nucleic Acid Core: RNA |
| Strandedness: SS |
| Transmission: droplets, fomites |
| Symmetry: Helical |
| Virion: Envelope |
| |
| Characteristics: Humans are the ONLY natural host for mumps; fever, anorexia, myalgia, malaise, parotitis (usually bilateral for about 7-10 days); complication: orchitis, usually unilateral; infertility rare; occurs 3-7 days after parotitis subsides; dill pickle test |


**Mumps**: Note the bilateral parotid and submandibular gland enlargement.

Image Source: CDC and http://www.ratsteachmicro.com/Paramyxo_notes/HCOE_CAI_Review_Notes_Paramyxo.htm

**Generic Name:** Mumps Virus Vaccine Live

**Trade Name:** Mumpsvax

**Immunogenic Substrate:** Attenuated live virus

**Indication/Use:** vaccinate against mumps in children 1 YOA or older; revaccinate children immunized before 1 YOA

**Warnings:**
- Determine hypersensitivity to eggs
- Defer for three months after IG tx or transfusion
- May decrease TB skin sensitivity
- Mild fever (<103°F) may occur
- May get diarrhea -- watch lytes
- Parotitis and orchitis VERY rare
- Wait 3 months before getting pregnant after vaccination

**Pregnancy Category:** C

**Administration:** SQ; upper, outer arm; protect from light; discard within 8 hours; use 25 g, 5/8" needle

**Generic Name:** Rubella and Mumps Virus Vaccine Live

**Trade Name:** Biavax II

**Immunogenic Substrate:** Attenuated, live rubella and mumps viruses

**Indication/Use:** for immunization of children 1 YOA or older; before travel to regions without immunization to these diseases

**Warnings:**
Do not get pregnant for three months after injection
Don't give within 30 days of other vaccines
Determine hypersensitivity to eggs
Do not give when patient has fever
Do not give when patient has active untreated TB
Moderate fever (101-103°F) occurs on occasion
Warn post-pubertal women that self-limiting arthralgia/arthritis may occur within 2-4 weeks of inoculation

**Pregnancy Category:** C

**Administration:** SQ; 25 g, 5/8 inch needle; outer, upper arm; protect from light; use only diluent provided; discard within 8 hours

Generic Name: Measle, Mumps, Rubella Virus Vaccine, Live

Trade Name: M-M-R II

Immunogenic Substrate: Live attenuated viruses for rubeola, mumps and German measles

Indication/Use: three way vaccination in children 15 months or older

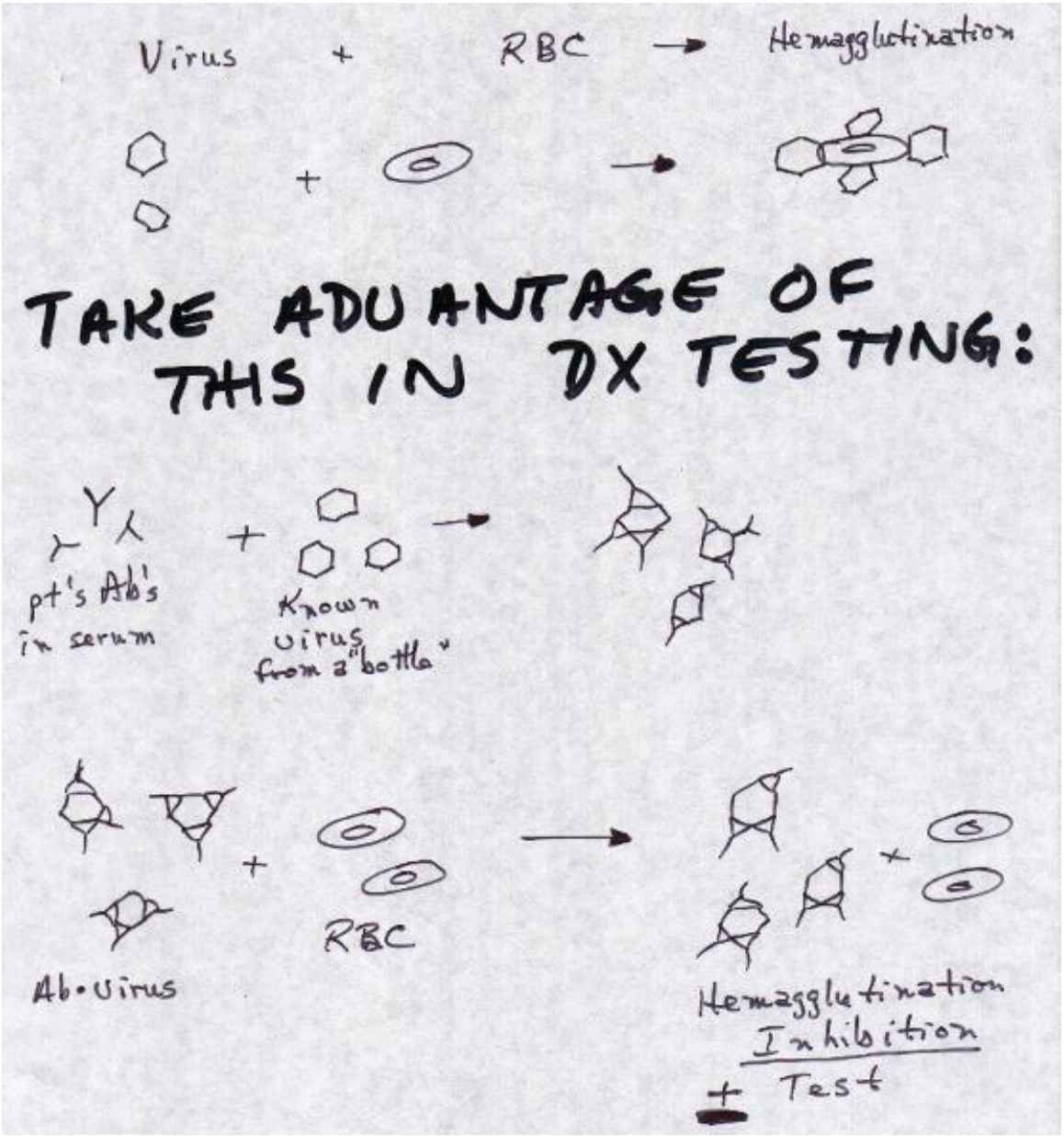
Warnings:
Refrain from becoming pregnant for 3 months
Determine hypersensitivity to eggs
Do not give with any illness with fever
Do not give with untreated TB
Do not give with any blood CA
Do NOT give IG with M-M-R II
Otitis media and conjunctivitis have occurred with this

Pregnancy Category: C

Administration: SQ; upper, outer arm; protect from light; discard within 8 hours; use 25 g, 5/8" needle

# Hemagglutination Inhibition

- In short, a specific virus, e.g., measles and mumps viruses, will bind to RBC's, causing hemagglutination. This can be taken advantage of, diagnostically.
- A patient's serum containing antibodies to a specific virus (we hope) is reacted with known virus from a bottle. The antibodies bind to the virus. RBC's are added to the mixture. No agglutination is a positive test result for the identification of the virus causing the discomfort. This is called hemagglutination inhibition. Of course, the converse reaction is a negative test as it means that the patient does not have those antibodies in his or her serum.


Virus + RBC → Hemagglutination
TAKE ADVANTAGE OF THIS IN DX TESTING:
pt's Ab's in serum
Known virus from a "bottle"
RBC
Ab • virus
Hemagglutination Inhibition Test
+
-

| |
|---|
| Viral Family: Paramyxoviridae |
| Virus: Morbillivirus |
| Viral Disease: Measles (rubeola, hard measles) |
| Incubation Period: 7-19 days; average 9-11 days |
| Nucleic Acid Core: RNA |
| Strandedness: SS |
| Transmission: from infected individuals 3 days before symptoms until rash desquamates |
| Symmetry: Helical |
| Virion: Enveloped |
| Characteristics: illness lasts 7-11 days; fever to 102 - 105°F by day 4-5 after symptoms begin; Koplik's spots opposite upper and lower molars ("grains of salt", bluish/white spots) positive for rubeola; rash first begins at hairline on neck then spreads to face and upper trunk; from upper trunk, rash spreads (within 2-3 days) to distal extremities; distinct rash on extremities and confluent rash on torso; rash lasts 3-5 days before leaving; coryza and cough; COMPLICATION: SSPE: subacute sclerosing panencephalitis -- occurs 5015 years after measles; mentation deteriorates, coma, muscular rigidity, death; less common since vaccines are available; risk of SSPE without vaccine = 1/300000 to 1/1000000 |

**Generic Name:** Measles Virus Vaccine, Live

**Trade Name:** Attenuvax

**Immunogenic Substrate:** Attenuated, live rubeola virus

**Indication/Use:** vaccination of rubeola in children over 15 months;

in people born after 1956 but lack:

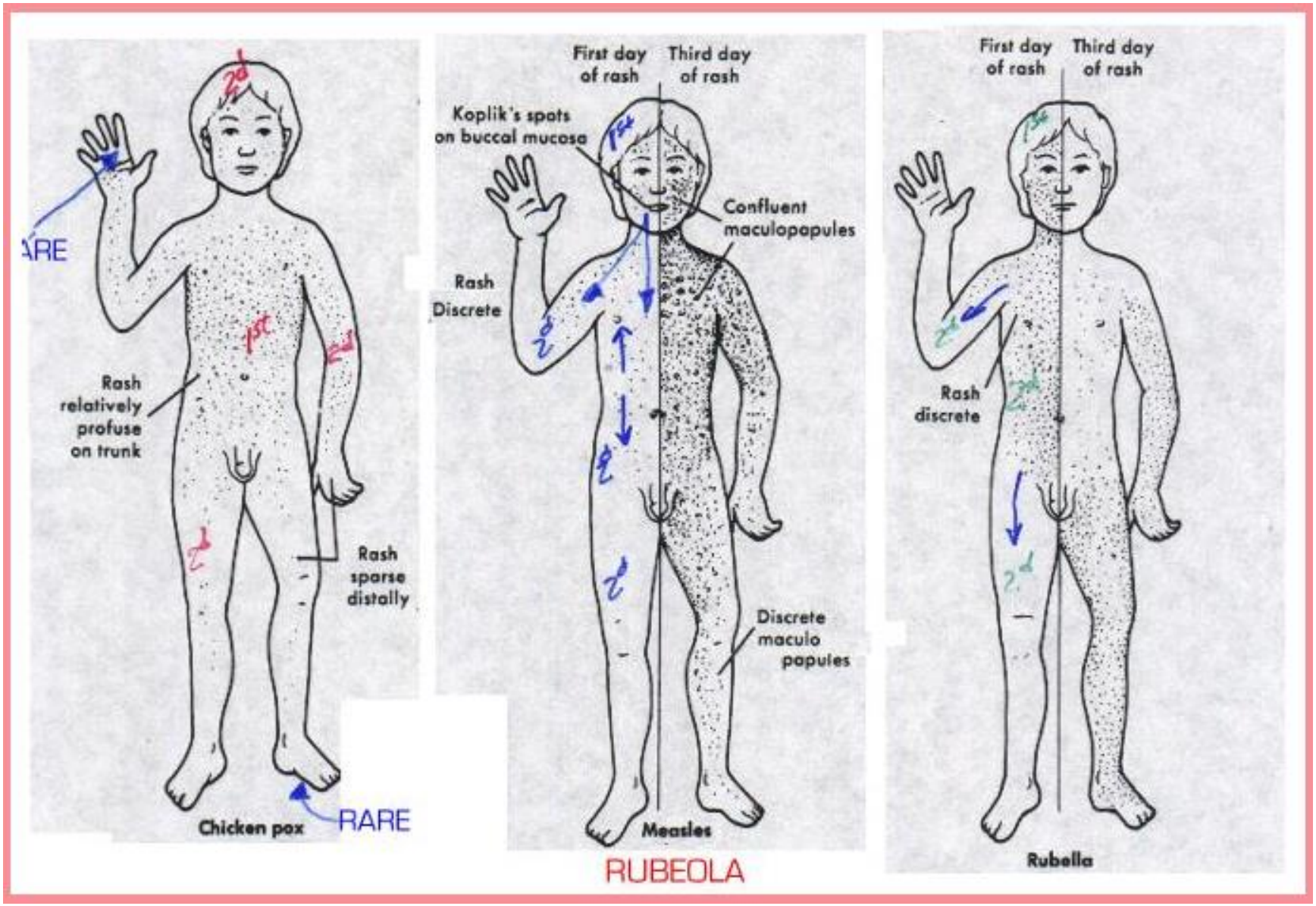
1) physician-diagnosed measles
2) laboratory evidence of immunity
3) vaccinated with live virus by or after first birthday

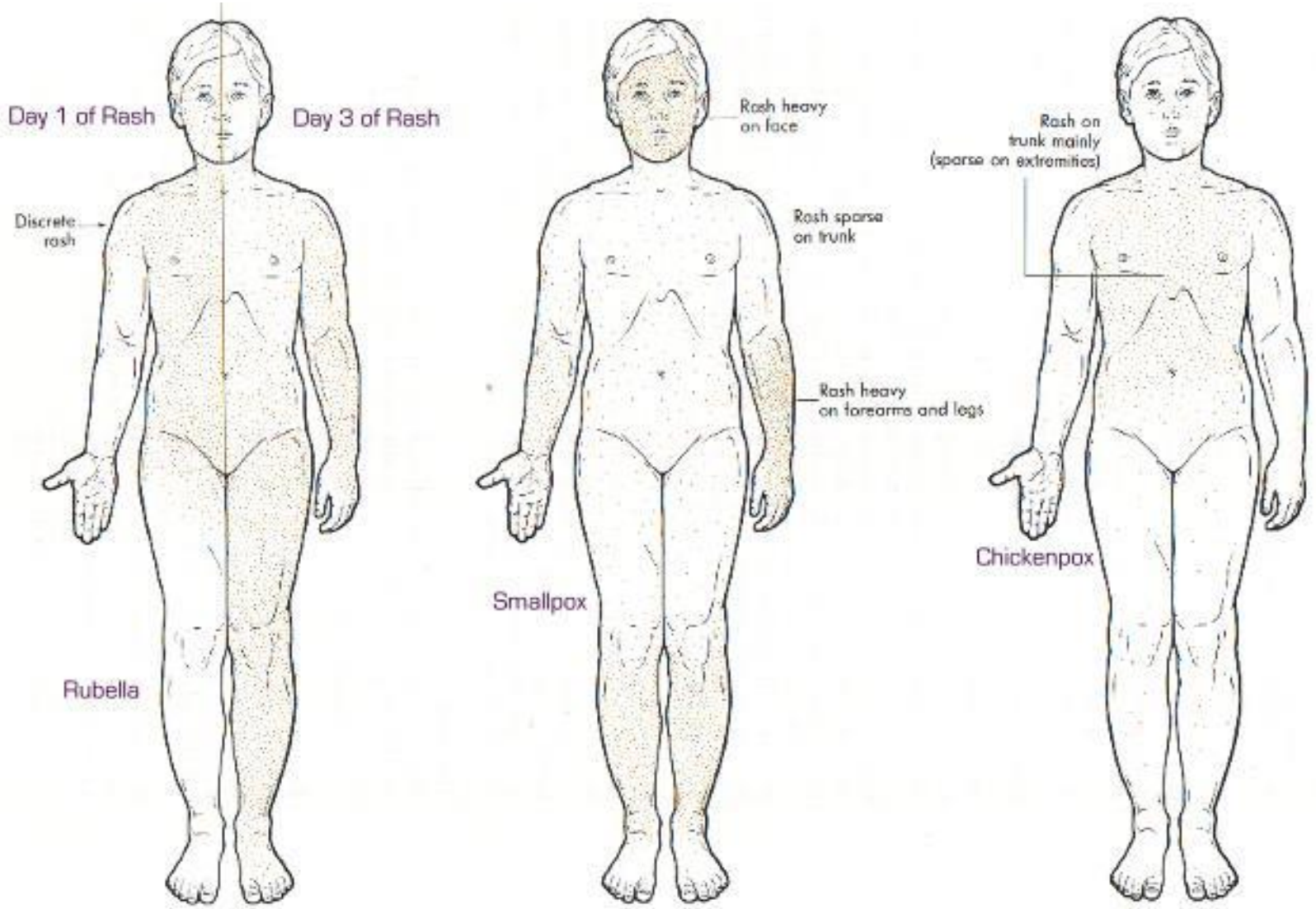
in children vaccinated before 1 YOA (revaccinate at 15 months

**Warnings:**
Do not give to pregnant women
Wait 3 months after injection to get pregnant
Refrain from use while have febrile illness
Refrain from use while with active untreated TB
Refrain from use while with any blood CA's
Determine sensitivity to eggs
May depress TB skin sensitivity

**Pregnancy Category:** C

**Administration:** SQ; upper, outer arm; protect from light; discard within 8 hours; use 25 g, 5/8" needle; may prevent disease if given within 48 hours of exposure to measles


ARE
Rash relatively profuse on trunk
Rash sparse distally
Chicken pox
RARE
First day of rash
Third day of rash
Koplik's spots on buccal mucosa
Confluent maculopapules
Rash Discrete
Discrete maculo papules
Measles
RUBEOLA
First day of rash
Third day of rash
Rash discrete
Rubella


Day 1 of Rash
Day 3 of Rash
Discrete rash
Rubella
Rash heavy on face
Rash sparse on trunk
Rash heavy on forearms and legs
Smallpox
Rash on trunk mainly (sparse on extremities)
Chickenpox

| Comparison of Chicken Pox, Rubella and Rubeola | | | |
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| **Disease** | **Chicken pox** | **Rubeola** | **Rubella** |
| **Infectivity** | **Few days before symptoms until full crusting of lesions** | **2-4 days before the rash to 2-5 days after onset of rash** | **Shortly before symptoms until the rash disappears** |
| **General Comments** | **Starts as macules that differentiate to papules that differentiate to vesicles that crust; eruption lasts a few days to 2 weeks.** | **Starts as a maculopapular exanthem that is brownish/pink; eruption lasts 4-7 days** | **Starts as a fine pinkish macular rash that becomes pinpoint by 2d day; rash goes from proximal to distal; eruption lasts 1-3 days** |

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| Viral Family: Flaviviridae |
| Virus: St. Louis Encephalitis Virus |
| Viral Disease: Aseptic meningitis or Encephalitis |
| Incubation Period: 5 to 15 days |
| Nucleic Acid Core: RNA |
| Strandedness: SS |
| Symmetry: Spherical |
| Virion: Enveloped |
| Transmission: Mosquito bite: Culex spp. |
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| Disease Characteristics: Mild infections occur without apparent symptoms other than fever with headache. More severe infection is marked by headache, high fever, neck stiffness, stupor, disorientation, coma, tremors, occasional convulsions (especially in infants) and spastic (but rarely flaccid) paralysis (http://www.cdc.gov/ncidod/dvbid/arbor/SLE_QA.htm). |

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| Viral Family: ***Orthomyxoviridae*** |
| Virus: Influenza A (H5N1) virus (aka "H5N1 virus") |
| Viral Disease: Bird Flu |
| Incubation Period: 3-5 days |
| Nucleic Acid Core: RNA |
| Strandedness: SS |
| Symmetry: Spherical |
| Virion: Enveloped |
| Transmission: Among birds – some cases in Asia have been reported from birds (chickens) to human – no reports of human-to-human, yet (2005) – experts anticipate it will eventually happen; spreads in the air and in manure; It can also be transmitted by contaminated feed, water, equipment and clothing; however, there is no evidence that the virus can survive in well cooked meat. |
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| Disease Characteristics: fever, cough, sore throat, muscle aches, conjunctivitis and, in severe cases, severe breathing problems and pneumonia that may be fatal. The severity of the infection will depend to a large part on the state of the infected person's immune system and if the victim has been exposed to the strain before, and is therefore partially immune. In one case, a boy with H5N1 experienced diarrhea followed rapidly by a coma without developing respiratory or flu-like symptoms, suggesting non-standard symptoms.<br>Sources: http://en.wikipedia.org/wiki/Avian_flu & http://www.cdc.gov/flu/avian/gen-info/facts.htm; 122 cases of infections in humans, resulting in 62 deaths as of early November 2005 outside of China. |