



Exanthemata

Common causes of infectious rashes in childhood

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Learning Objectives

- Clinical features of the major infectious exanthemata
- How to describe rash morphology
- The aetiology of the major infectious exanthemata
- How the incubation and infectious periods differ for each infection
- The most common and severe complications associated with each infection

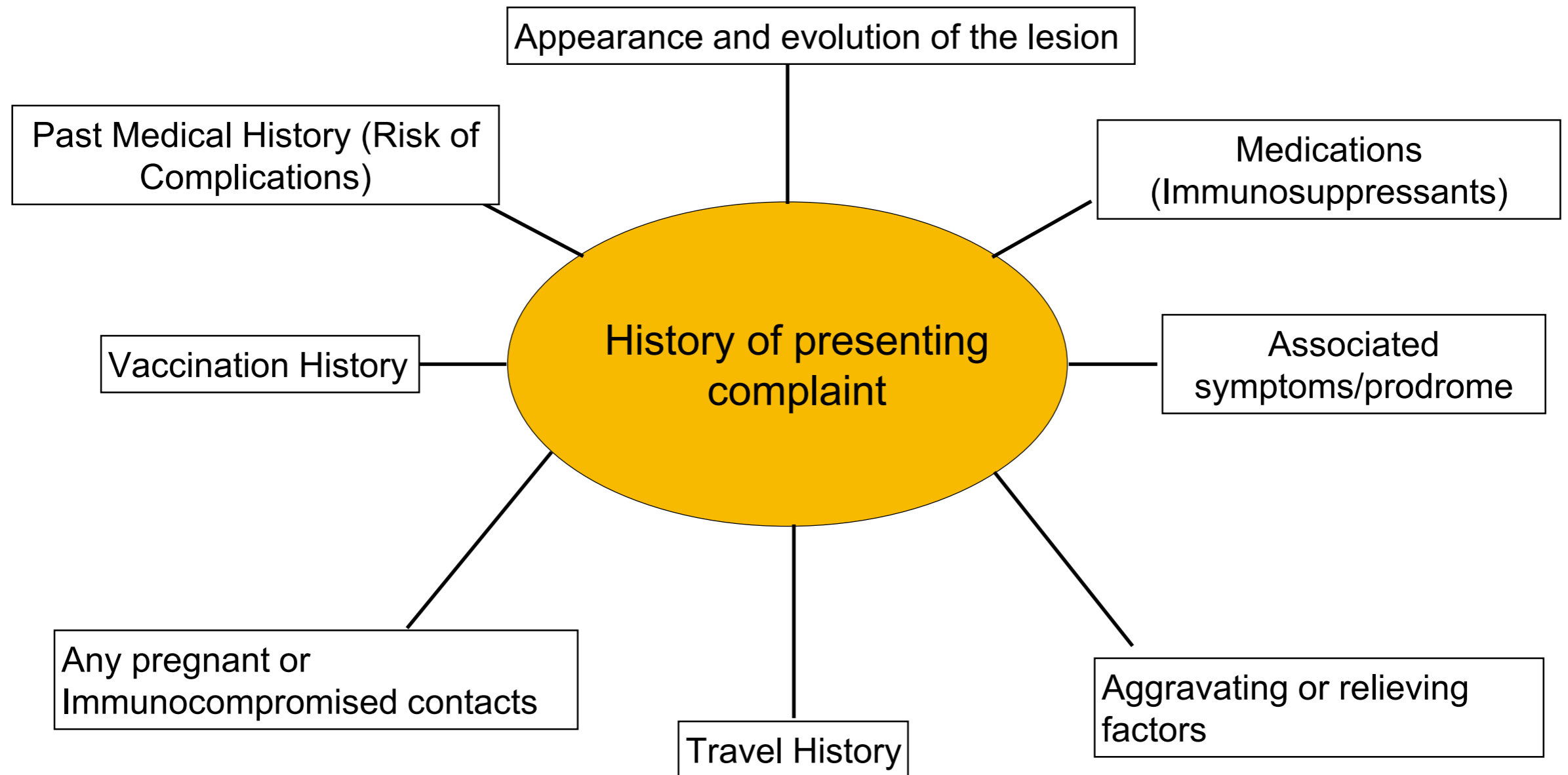
Exanthemata

Exanthem: An **exanthem** is a widespread [rash](#) occurring on the outside of the body and usually occurring in [children](#)

The term exanthem is from the [Greek](#) ἐξάνθημα, *exánthēma*, 'a breaking out'.

History Taking

Important aspects in a patient presenting with an infectious exanthem



Terminology

Descriptive terms for examthemata

Term	Meaning
Lesion	An area of altered skin
Discrete	Individual lesions separated from each other
Confluent	Lesions merging together
Linear	In a line
Target	Concentric rings
Annular	Circle or ring
Discoid	Round lesion
Erythema	Redness
Purpura	Red or purple colour (due to bleeding into the skin or mucous membrane)

Morphology

The structure of the lesion

Term	Meaning
Macule	A flat area of altered colour
Patch	Later area of altered colour or texture
Papule	Solid raised lesion <0.5 cm in diameter
Nodule	Solid raised lesion >0.5 cm in diameter
Plaque	Palpable scaling raised lesion >0.5 cm in diameter
Vesicle	Raised clear fluid-filled lesion <0.5cm in diameter
Bulla	Raised, clear fluid filled lesion >0.5 cm in diameter
Pustule	Pus-containing lesion <0.5 cm in diameter
Wheal	Transient raised lesion due to dermal oedema

Examples



Confluent target lesions

Examples



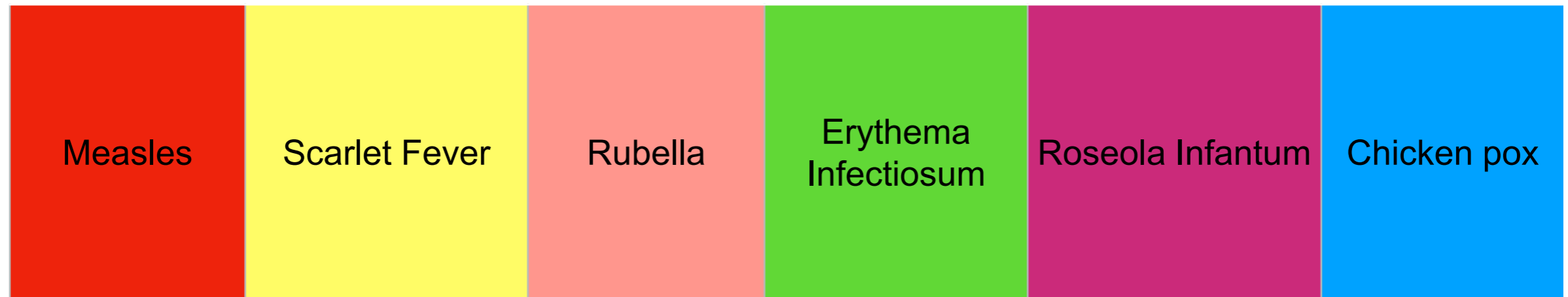
Three discrete post auricular vesicles

Examples



Widespread maculopapular rash

Major Infectious Exanthemata



Initial Understanding

You will be asked these question again at the end where you will receive the correct answer

1. Which virus causes Chickenpox?

- a. Varicella Zoster virus
- b. Herpes Simplex Virus
- c. Morbillivirus
- d. Parvovirus B19

Initial Understanding

2. Which type of virus causes Measles?

a. Erythrovirus

b. Herpes virus

c. Paramyxovirus

d. Togavirus

Initial Understanding

3. Which clinical syndrome is Human Herpes 6 responsible for?

a. Roseola Infantum

b. Erythema Infectiosum

c. Chicken Pox

d. Scarlet Fever

Initial Understanding

4. Which of the following clinical syndromes is Parvovirus B19 responsible for

- a. Chicken Pox
- b. Rubella
- c. Erythema Infectiosum
- d. Roseola Infantum

Initial Understanding

5. What is the infectious period for measles?

- a. 7 days before the rash to 4 days post the rash
- b. At the beginning of the prodrome to 4 days post the rash
- c. At the beginning of the prodrome until the rash develops
- d. 7 days before the rash develops to 10 days post rash

Assessment of Initial Understanding

6. You are called by a general practitioner. A 26 year old female patient who is 13 weeks pregnant, and works at a nursery states one of the children has been diagnosed with parvovirus B19. She was looking after the child after he developed a rash. What is the infectious period for Parvovirus B19?

- a. 4 days before the onset of the rash
- b. 4 days before the onset of the rash until 4 days after
- c. 7 days before the onset of the rash
- d. 7 days before the onset of the rash until 7 days after

Definitions

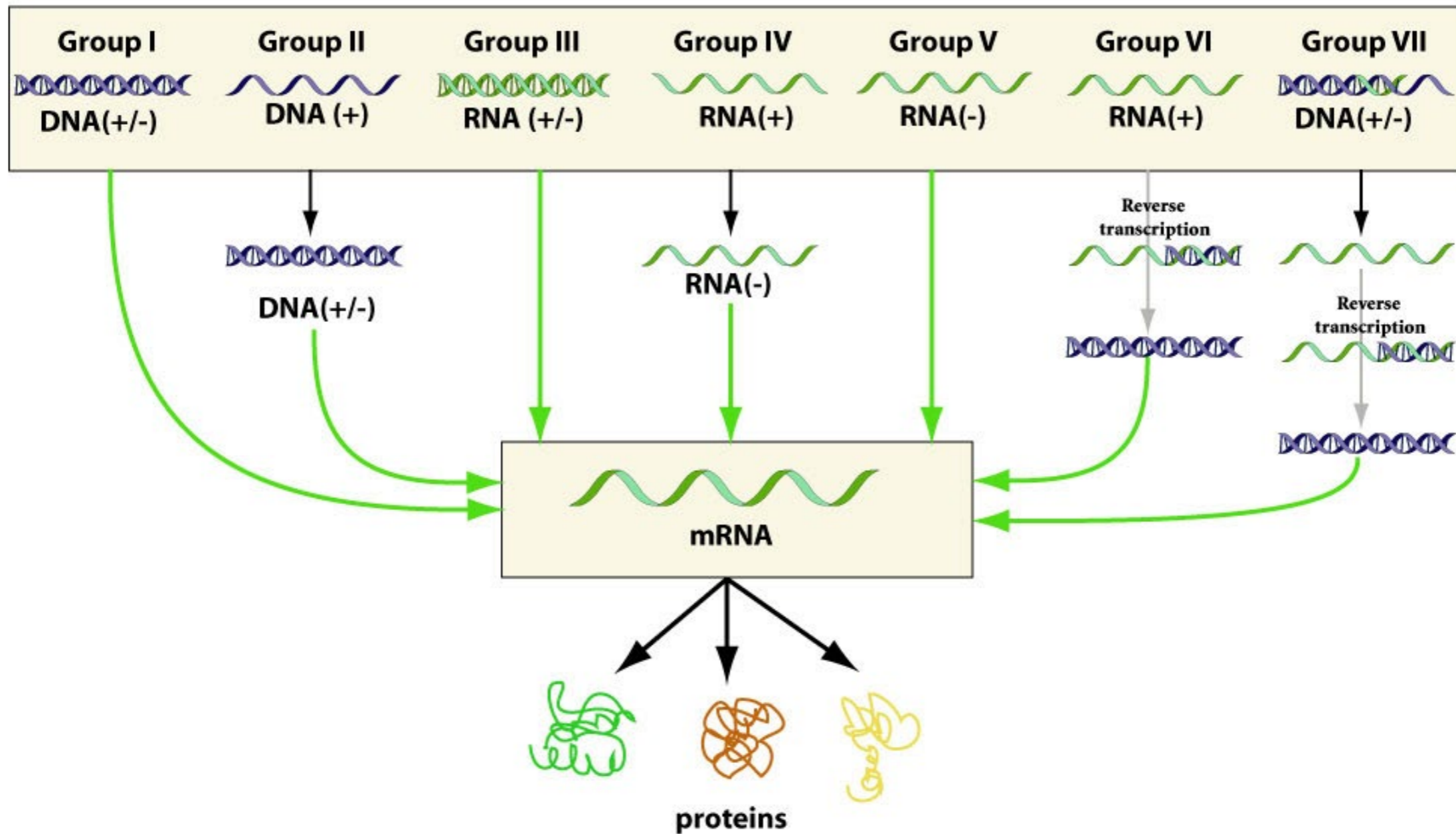
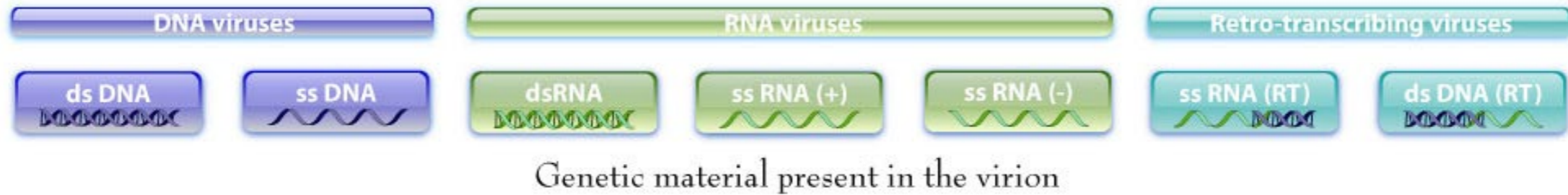
- Incubation period: The time between exposure to the virus and the development of symptoms
- Period of infectivity: Is the time during which an infectious agent may be transferred directly or indirectly to another person
- R_0 : The basic reproductive number which reflects the average number of secondary cases that would arise when an infectious agent is introduced into a completely susceptible population.

Major causes of Infectious Exanthemata

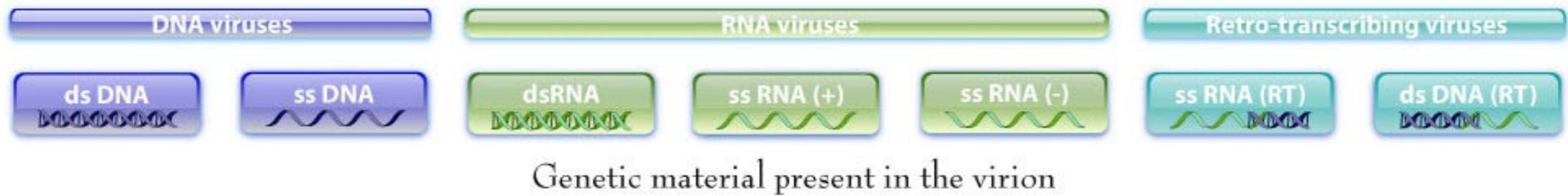
	Measles	Scarlet Fever	Rubella	Erythema Infectiosum	Roseola Infantum	Chicken pox
Aetiology	Measles Virus	Group A Streptococcus	Rubella virus	Parvovirus B19	Human Herpes 6B Virus (HHV6B)	Varicella Zoster Virus (VZV)
Prodrome (Symptoms)	Fever, coryza, conjunctivitis, cough (2-4 days pre rash)	Fever, sore throat, swollen neck glands, headache, nausea, vomiting, swollen and red strawberry tongue abdominal pain, myalgia	Low grade fever, coryza, mild conjunctivitis, lymphadenopathy	Children -red cheeks Adults asymptomatic or rash and/or arthralgia	Fever, coryzal symptoms , palpebral oedema and lethargy	Fever, malaise, headache, loss of appetite and abdominal pain (1-2 days pre rash)
Rash	Erythematous and maculopapular (spreads from the head caudally)	Tiny pinkish-red spots appears 12–48 hours after the fever. Usually starting below the ears, neck, chest, armpits and groin before becoming widespread over 24 hours	Transitory, erythematous, usually behind the ears and on the face/neck	Characteristic 'slapped cheek' red rash or purpuric gloves and stocking syndrome	Appears day 3-5 of the fever Rose pink or red spots(blanching) surrounded by a halo of pale skin Mainly affects the trunk	Vesicles usually start on the face and trunk then spread caudally
Incubation Period (range)	10 Days (7-18)	1-4 Days	14-17 Days	4-20 Days	9-10 Days	7-21 Days
Infectivity	Beginning of prodrome to four days post onset of the rash	Can be asymptomatic carriage Until 24 hours after starting antibiotics	1 week before symptom onset to four days post onset of the rash	4 days before the onset of the rash	Unknown	48 hours before the onset of the rash until the vesicles are dry







Viral classification system

Baltimore system



Viral classification system



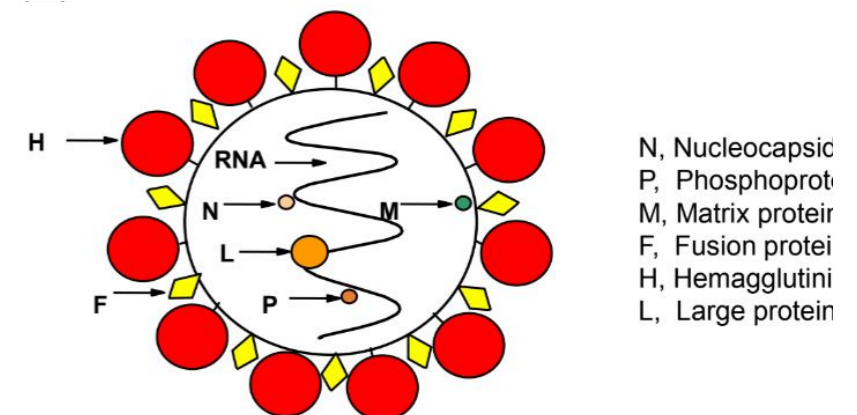
	Group I  DNA(+/-)	Group II  DNA (+)	Group III  RNA (+/-)	Group IV  RNA(+)	Group V  RNA(-)	Group VI  RNA(+)	Group VII  DNA(+/-)
Viral families	Adeno	Parvo	Reo	Picorna	Orthomyxo	Retro	Hepadna
	Herpes (VZV, HHV6)	(Parvovirus B19)		Toga (Rubella)	Paramyxo (Measles)		
	Pox			Flavi	Rhabdo		
	Papilloma			Corona	Filo		
			Calici	Arena			
			Hepe	Bunya			

Measles Virus

- Responsible for causing measles
- Spread by respiratory droplets and is highly contagious
- Released into the air as cell-free or cell-associated virus particles, predominantly by coughing.
- The virus is highly infectious: the estimated R_0 is 12 to 18
- The rash is immunologically mediated and coincides with the development of measles-specific antibodies.
- Recovery is followed by life long immunity
- Vaccine preventable
- Complications include diarrhoea 8%, pneumonia 6%, encephalitis 0.1 % (subacute sclerosing pan-encephalitis) and death 0.2%



The H protein of the measles virus binds to the cellular receptor CD150. Initial target cells are alveolar macrophages and dendritic cells which are infected via this receptor. The virus is transported to draining lymphoid tissues, seeding a systemic infection.



Group A Streptococcus

- Group A Streptococcus (mostly *Streptococcus pyogenes*) is a Gram-positive coccus that grows in chains
- Development of the scarlet fever rash requires prior exposure to *S. pyogenes* and occurs as a result of delayed-type skin reactivity to pyrogenic exotoxin (erythrogenic toxin, usually types A, B, or C) produced by the organism.
- The most common portals of entry for streptococcal infections are the skin, vagina, pharynx, and mucosa.

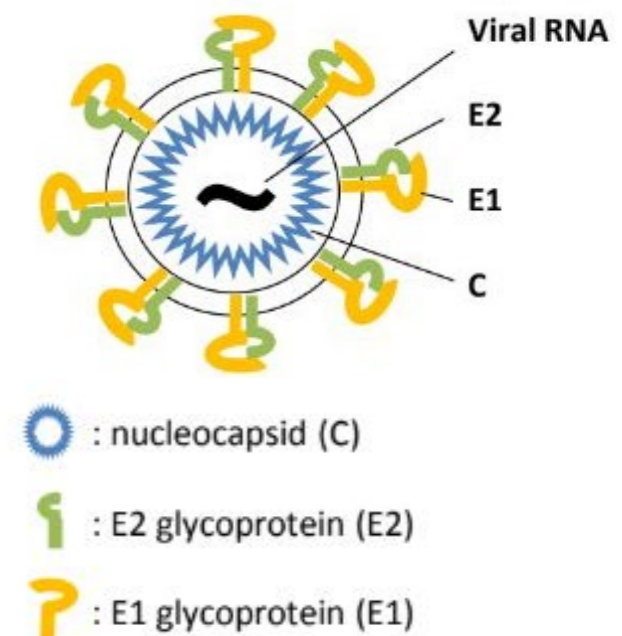


Complications

Suppurative	Non Suppurative
Necrotising Fasciitis	Acute Rheumatic Fever
Bacteraemia	Post Streptococcal Glomerulonephritis
Peritonsillar abscess	Paediatric Autoimmune neuropsychiatric disorders

Rubella Virus

- Rubella usually causes a mild illness
- Rare complications include:
 - Thrombocytopenia (1 in 3000)
 - Post infectious encephalitis (1 in 6000)
- After the rubella virus infects the nasopharynx, it multiplies in the lining of the respiratory tract and in local lymph nodes before passing into the bloodstream.
- Ro for rubella is 6-7,
- The rash is immunologically mediated and coincides with the development of rubella-specific antibodies.
- Although infection usually results in lifelong immunity there have been some exceptions to this
- Vaccine preventable (Live vaccine not to be given in pregnancy)
- Maternal infection before 18 weeks gestation can have serious complications for the foetus
 - A rubella infection during the first trimester of pregnancy can cause miscarriage, stillbirth, or the birth of a child with Congenital Rubella Syndrome.
- Common manifestations of Congenital Rubella Syndrome are:
 - Cataracts,
 - Deafness
 - Congenital heart disease
 - Developmental delay



Parvovirus B19

- Single-stranded DNA virus that targets red cells in the bone marrow.
- It spreads via respiratory droplets
- The rash is thought to be immunologically mediated, and by the time it appears, viraemia has resolved and the patient usually feels well.

Complications

- Transient Aplastic Crisis (usually in individually with underlying haematology abnormalities)
- Infection during pregnancy can result in miscarriage, intrauterine fetal death, and/or non-immune hydrops fetalis. The risk is greatest in the first 20 weeks of pregnancy
- Chronic Infection in the immunocompromised



Human Herpes 6B Virus

- Primary infection with HHV-6B causes roseola infantum a common childhood infection which spontaneously resolves.
- After primary infection, the virus replicates in the salivary glands and is shed in saliva, it remains latent in lymphocytes and monocytes and persists at low levels in cells and tissues.
- Complications of primary HHV-6 infections in immunocompetent individuals are uncommon and rarely fatal.
- In immunocompromised individuals (particularly transplant recipients) it can result in a severe multi system disease including:
 - Haemophagocytic syndrome
 - bone marrow suppression
 - pneumonitis
 - encephalitis,
 - hepatitis,
 - transplant rejection



Varicella Zoster Virus

- Primary infection with Varicella Zoster Virus causes chicken pox
- Primary infection which occurs as an adult is associated with more complicated infections including, pneumonia, secondary bacterial infection, disseminated primary varicella infection, Reye syndrome, Guillain-Barré syndrome, encephalitis, thrombocytopenia and purpura
- Infection in pregnancy: non-immune mothers who are infected during pregnancy are at risk of more severe disease and approximately 25% of foetuses will also become infected.
 - Congenital varicella syndrome occurs in up to 2% of fetuses exposed to varicella in the first 20 weeks of gestation.
- Infection usually confers lifelong immunity unless patients are or become immunocompromised
- Immunocompromised or pregnant individuals who are exposed to chicken pox need to be assessed to determine if they require immunoglobulin or antiviral prophylaxis.
- The varicella-zoster virus remains dormant in sensory ganglia after infection. It may reactivate after many years as shingles. Shingles presents with grouped vesicular lesions, which usually affect a single dermatome.
- Other complications occurring as a result of viral reactivation of include post-herpetic neuralgia, vasculopathy, myelopathy, retinal necrosis and cerebellitis.



QUIZ

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c. Morbillivirus

d. Parvovirus B19

Answer

a. Varicella Zoster virus

QUIZ

2. Which virus is causes Measles

a. Parvovirus B19

b. Varicella Zoster

c. Morbillivirus

d. Togavirus

Answer

c. Morbillivirus

QUIZ

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- b. Erythema Infectiosum
- c. Chicken Pox
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Answer

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QUIZ

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Answer

c. Erythema Infectiosum

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Answer

b. At the beginning of the prodrome to 4 days post the rash

QUIZ

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- b. 4 days before the onset of the rash until 4 days after
- c. 7 days before the onset of the rash
- d. 7 days before the onset of the rash until 7 days after

Answer

a. 4 days before the onset of the rash

References and Resources

- <https://dermnetnz.org>
- <https://www.who.int>
- <https://www.gov.uk/government/collections/immunisation-against-infectious-disease-the-green-book>