Viral Pathogenesis

-Important -Extra -Notes

-In boy's slides -In girl's slides

In this link, you will find any correction or notes unmentioned in the team's work. Please check the link below Frequently.
https://docs.google.com/document/d/1WvdeC1atp7J-ZKWOUSukSLsEcosjZ0AqV4z2VcH2TA0/edit?usp=sharing

Reviewed by: Razan AlRabah & Khalid Alkhani

MICROBIOLOGY TEAM 438

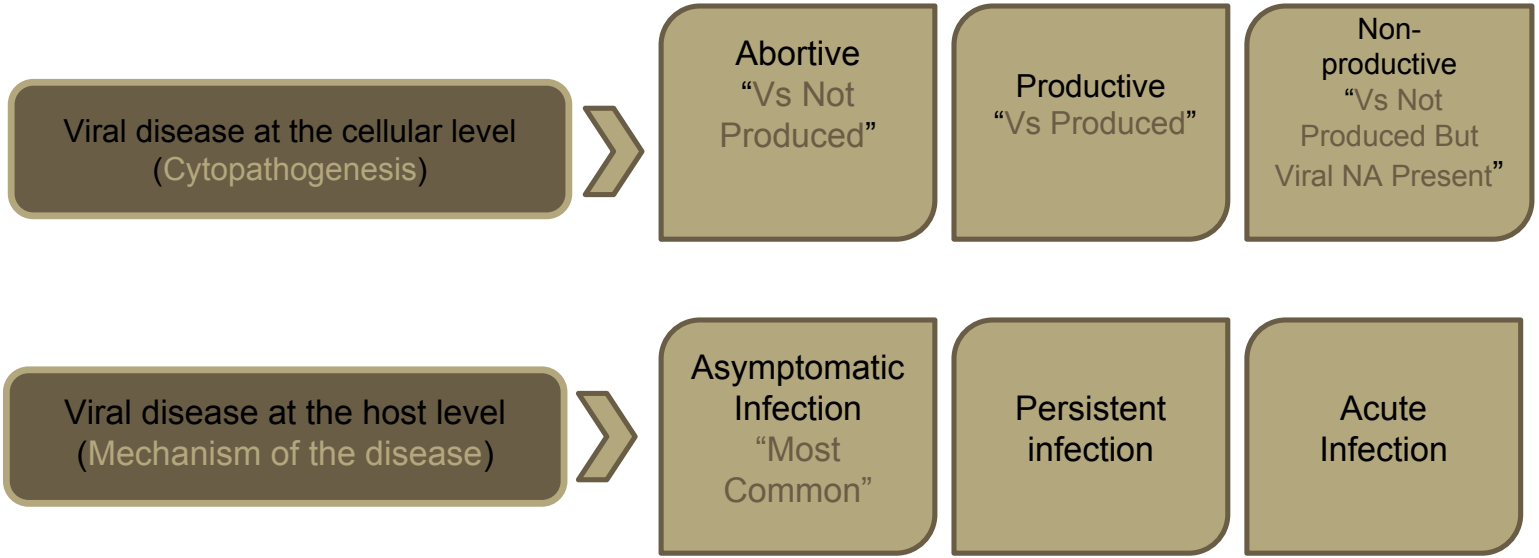
Objectives:

- ★ Definition and levels of viral pathogenesis.
- ★ Types of viral infections at cellular level.
- ★ Pathogenesis at host level.
- ★ The immune response to viral infection.
- ★ The stages of viral infection.
- ★ The types of viral infections at host level.

Abbreviations:

- ★ V(s): Virus(es).
- ★ NA: Nucleic Acid.
- ★ HTLV: human T-lymphotropic virus.
- ★ EBV: Epstein-Barr virus.
- ★ HAV: Hepatitis A virus.
- ★ HBV: Hepatitis B virus.
- ★ HCV: Hepatitis C virus.
- ★ HIV: Human immunodeficiency virus.
- ★ HSV: Herpes simplex virus.
- ★ RSV: Respiratory syncytial virus.
- ★ VZV: Varicella zoster virus.

Pathogenesis of viral infection

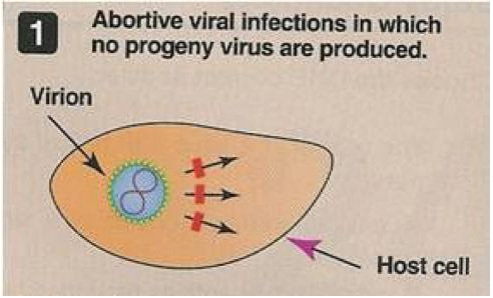


The types of viral infections at cellular level

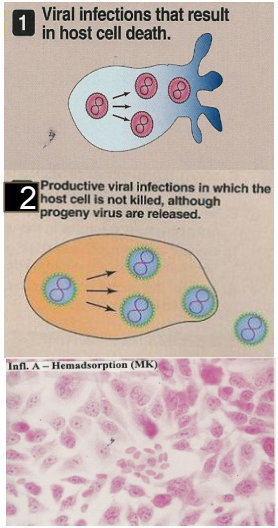
★ a) Abortive Infections:

➢ Viruses don't complete the replication cycle.

➢ Due to mutation,defective interfering particles & the action of IFNs.



★ b) Productive Infections:



1) Cytolytic Infections:

Viruses replicate & produce progeny

Cause Of Cell Death & Cytopathic Effects .causes morphologic changes

inhibition of cellular protein & NA synthesis

2) Non-Cytolytic Infections:

Viruses replicate & produce progeny

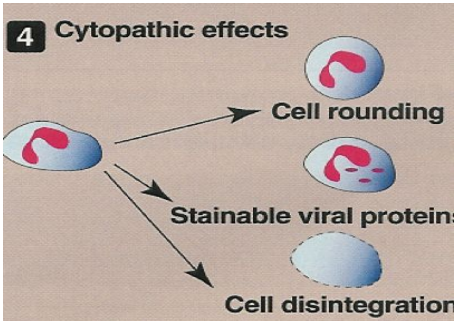
Vs released by cell budding & little or no CPE

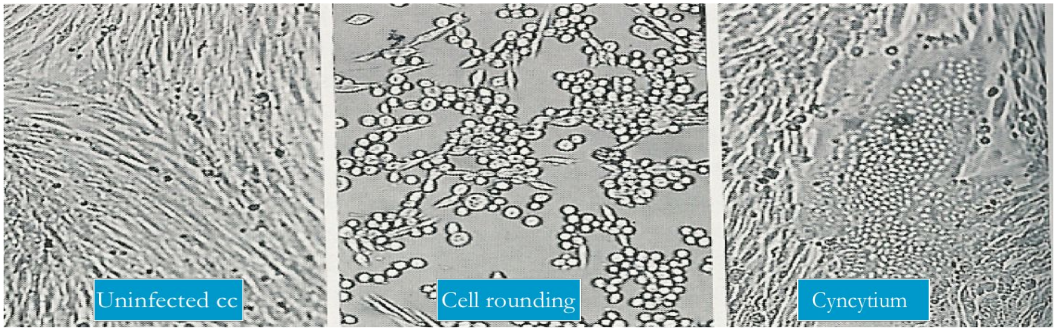
Identified by hemadsorption & direct IF

Cytopathic Effects:

★ CPE can take several forms:

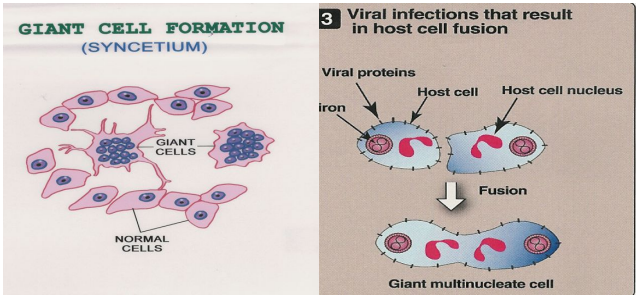
1. Cell lysis.	2. Cell rounding.
3. Syncytium formation.	**4. Inclusion bodies formation.**



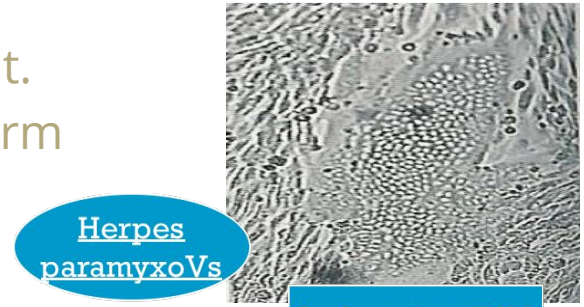


Syncytium Formation:

-This is due to insertion of viral protein in the surface membrane.



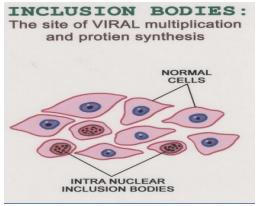
-This occurs in the membrane of adjacent. infected cells that will fuse together to form large cell (giant cell) with multi nuclei .



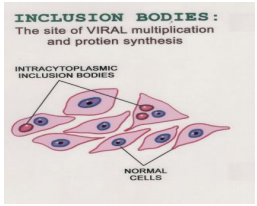
Inclusion bodies formation

★ **Site**:

1) Intranuclear [Herpes]



2) Intracytoplasmic [Rabies]

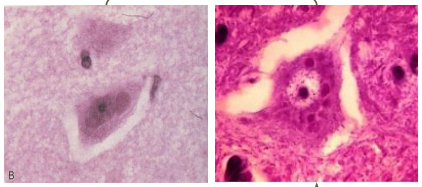


★ **Take several forms:**

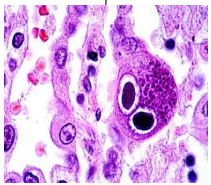
1. Single/multiple
2. Small/large
3. Round/irregular

Inclusion body: a collection of viral proteins and particles.

Negri bodies caused by Rabies virus



Owl's eye inclusions caused by CMV

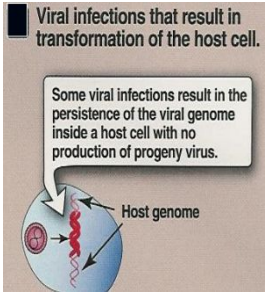


This picture from microbiology 437

The types of viral infections at cellular level cont.

C) Non-productive Infections:

- Vs infect cells that restrict or lack the machinery for transcribing viral genes.
- Viral genome is found either integrated into cell DNA or as a circular episome or both.



Non-productive Infections:

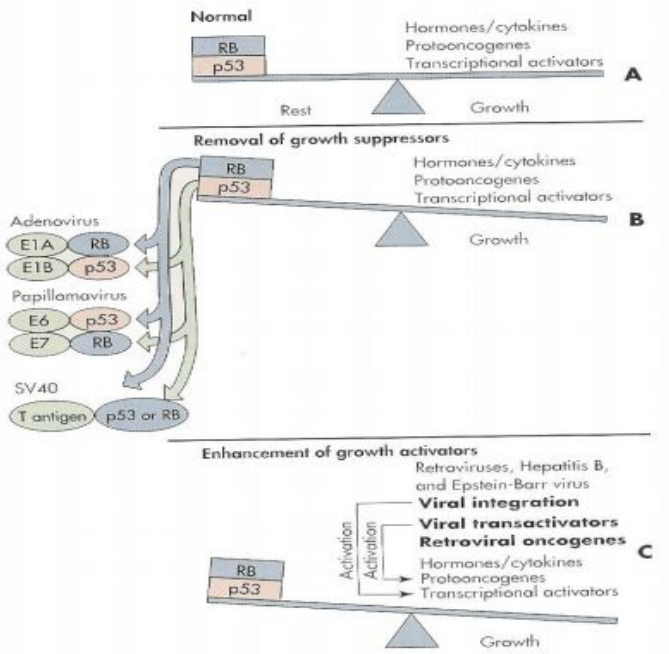
★ **Latent Infection:**

- Persistent infection b/c
- there is limited expression of viral genes.
- The cell retains its normal properties Ex: HSV

★ **Transformation:**

- Ex ; EBV, HPV and HTLV.
- Cause tumor in animals & H and can transform cell culture

Non-productive Infections cont

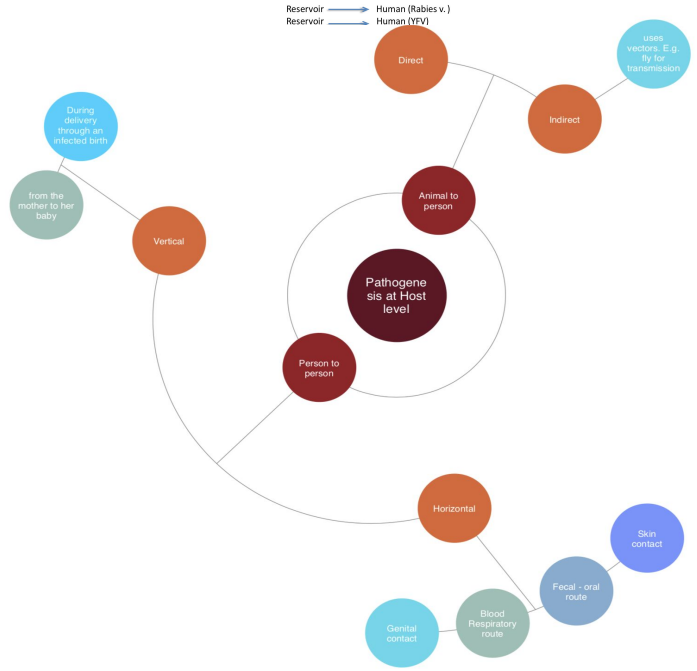


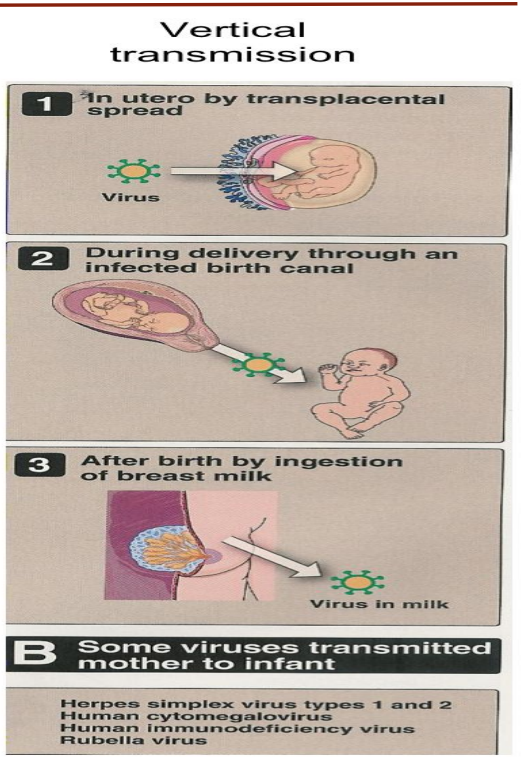
- Vs can stimulate uncontrolled cell growth causing Tf by alternating the balance between growth activators & growth suppressors gene products

Pathogenesis at Host Level

1- Transmission of the virus & its entry into the host.
2- Replication of the virus & damage to cells.
3- Vs remain localized or spread to other organs.
4. Viral shedding. (transmission)
5. The immune response as: - Host defense - Immunopathogenesis

Transmission





Common Routes of Human Infection by Viruses

Route of Entry	Virus	Disease (L/G)
Skin		
Mild Trauma	HPV	Warts (L)
Injection (Blood)	HBV,HCV, HIV	Hepatitis B, Hepatitis C ,AIDS (G)
Bite of insect animal	Yellow fever virus Rabies virus (YFV)	Yellow fever (G) Rabies (G)
Respiratory tract	HSV-1 Rhinovirus RSV Adenovirus VZV Measles virus	Gingivostomatitis (L) (URT) Common cold (L) (URT) Bronchiolitis (L) (LRT) Pneumonia (L) (LRT) Chickenpox (G) Measles (G)
GIT	Rotavirus HAV Poliovirus	Diarrhea (L) Hepatitis A (G) Poliomyelitis (G)
Genital tract	HSV-2 HBV HIV	Genital herpes (L) Meningitis (G) Encephalitis (G) Hepatitis B (G) AIDS(G)

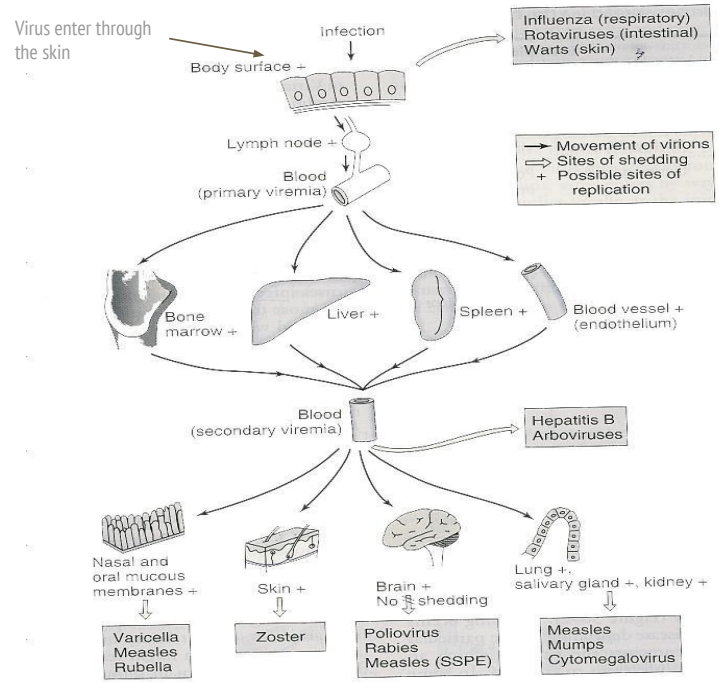
note

L : viral don't reach the blood

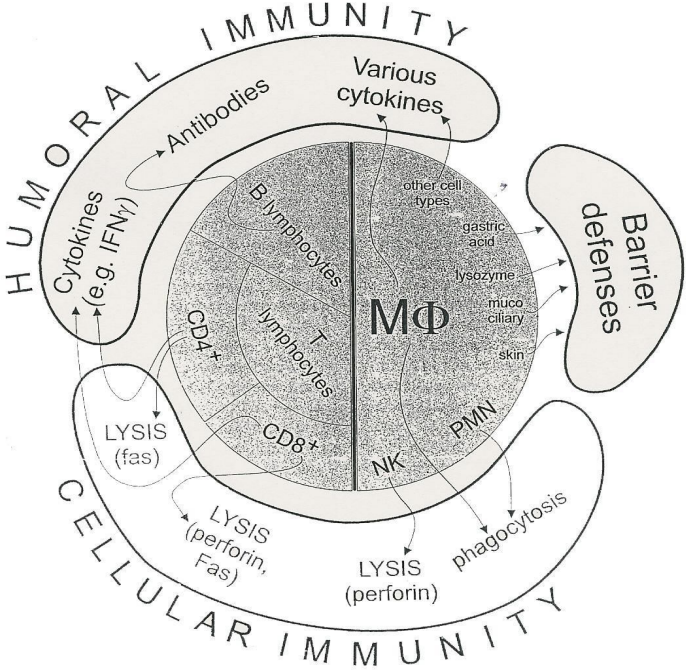
G : reach the blood

This slide was only found in the boy's slides.

Mechanisms of spread of virus through the body



The immune response to virus



Important features of Acute Viral Diseases

	Local Infections	Generalized (systemic) infections
Example of disease	Rhinovirus	Measles الحصبى
Site of Pathology	Portal of entry	Distant site
IP (incubation period)	Relatively short	Relatively long
Viremia (presence in the blood)	Absent	Present
Duration of immunity	Variable- may be short	Usually life long
Role of secretory AB (antibodies) [IgA] in resistance	Usually important	Usually not important

The immune response to virus

Interleukins were only mentioned in the boy's slide.

1-Macrophages:

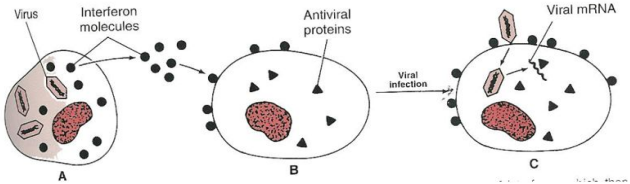
- Antigen Presenting Cell (APCs) , Phagocytosis, Cytokines production.

2- Natural killer (NK) cells:

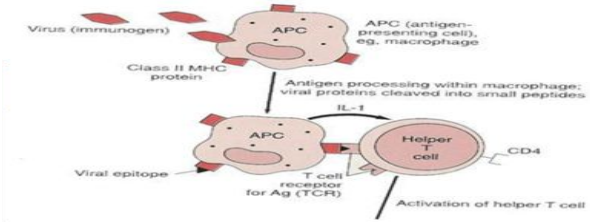
- lysis of VICs (viral infected cells).

3- Cytokines:

- (release from virus infected cell).



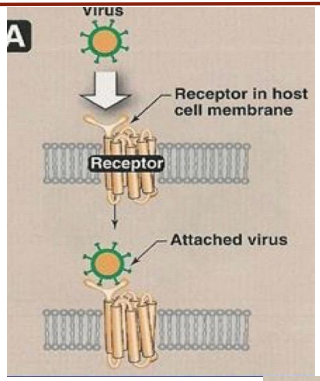
Interferons "INF“:	Interleukin "IL":
A- α, β IFN: inhibit the viral and the host cell mRNA translation. B- γ IFN: stimulate phagocytosis and killing by macrophages and NK cell.s	SAS: A- Stimulate Ab production B- Activate T cells & CMI C- Suppress the IR

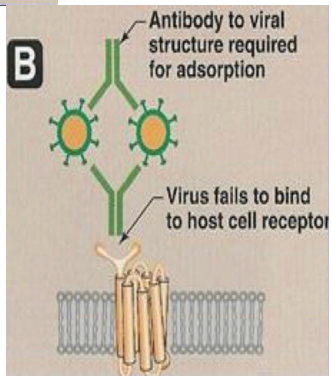


The immune response to virus

Adaptive immunity:

Cell mediated immunity (CMI):	★ Effective against intracellular viruses . ★ Lysis of virally infected cells by CTCs [CD8]. ★ Faster than humoral immunity ★ Recognise and kill VIC
Humoral immunity:	★ Effective on extracellular viruses [viremia]. ★ Neutralization. ★ The antibodies will prevent the replication of the free (extracellular) virus and prevent it from binding to the host's cell receptors



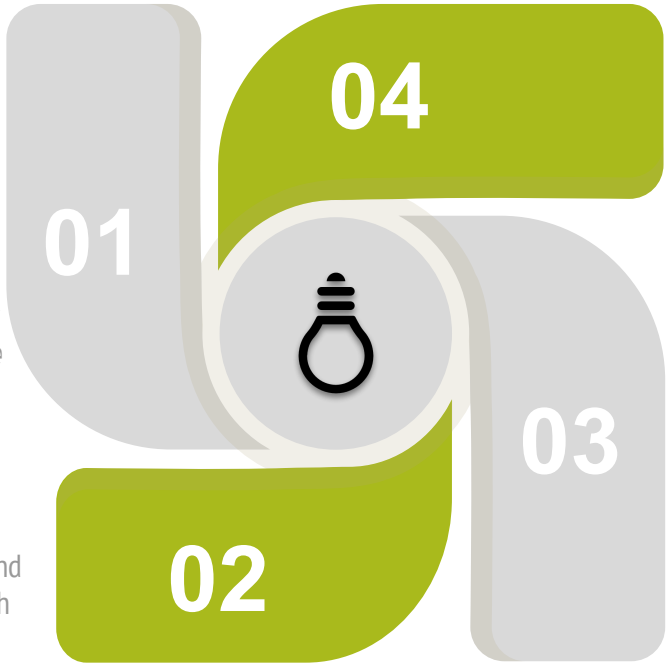


The stages of a typical viral infection:

The incubation period

The time before the symptoms of a viral infection appear.

هنا يصير حامل للمرض بس ما تبين عليه الأعراض، يعني ممكن ينقل العدوى بدون ما يدري عن نفسه



Prodromal period

Non-specific symptoms start to appear during this period,e.g headache,fever and loss of appetite which is associated with the viremic stage due to early immune response to the virus (IL-1)

The recovery period

The specific-illness period

The signs & symptoms of viral diseases are the result of Cell killing by :

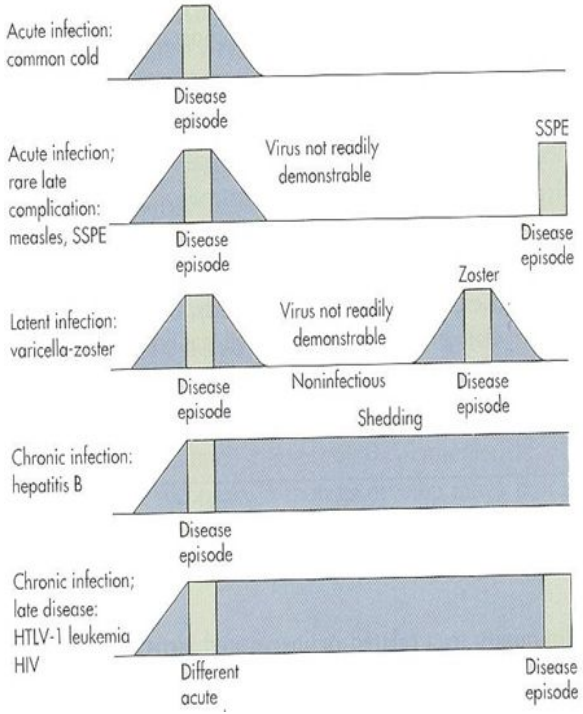
A) Inhibition of cellular macromolecular synthesis

B) Immunologic attack (Immunopathogenesis)

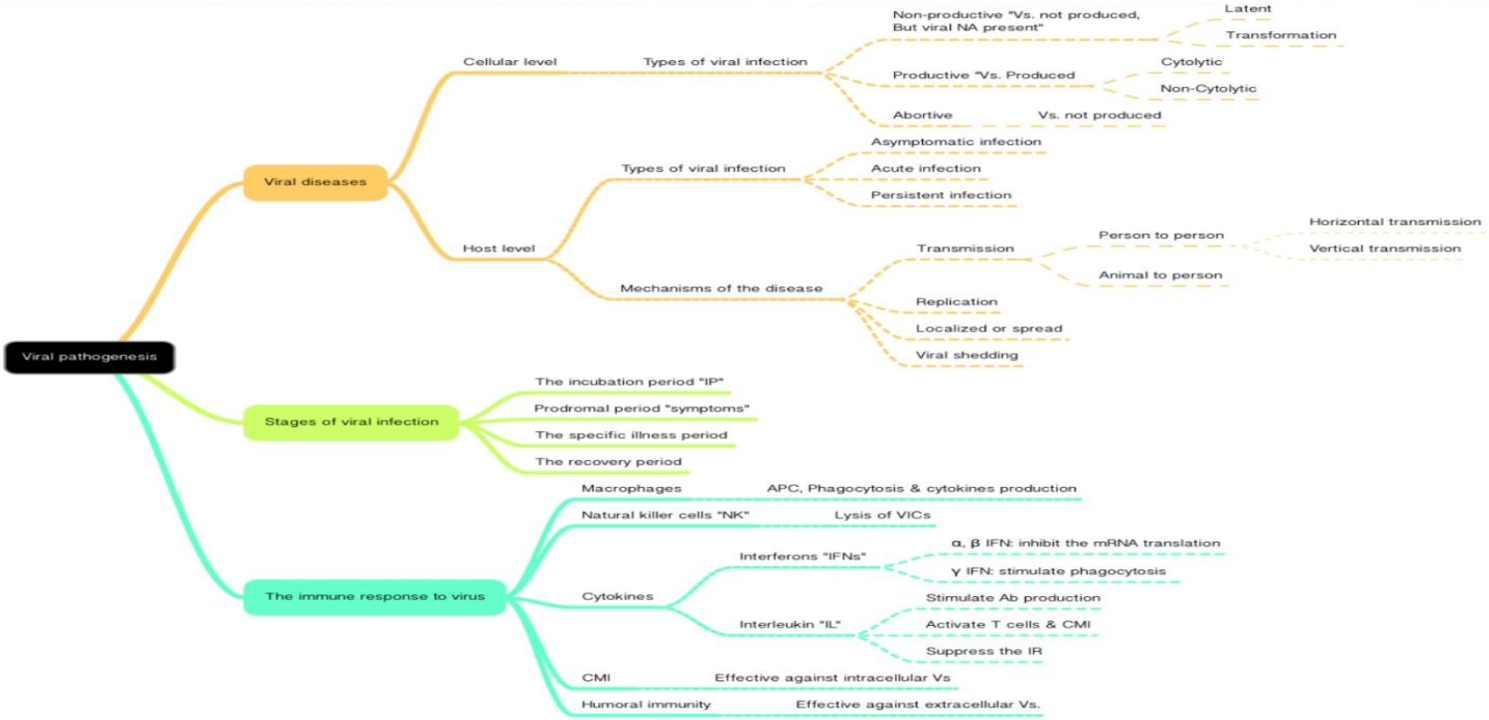
Cytotoxic T cells
e.g. Hepatitis (HAV, HBV,HCV)

Types Of viral infections:

★ 1. Asymptomatic infection (The Most Common)
★ 2. Acute infection (Like The common cold)
★ 3. Persistent infection
- Late complication of acute infection
(Associated With Symptoms)
- Latent infection
(no symptoms until AFTER activation)
- Chronic infection



Summary from MicroTeam 435



MCQs :

01 The type of infection which the viruses don't complete their replication cycle ?

A) Abortive B) Latent non-productive
C) Productive D) Transformation non-productive

02 Owl's eyes is an example of :

A) Cell lysis. B) Syncytium formation
C) Cell rounding D) Inclusion bodies

03 Viral disease at Cellular level is ?

A) Cytopathogenesis B) Hypersensitivity
C) Mechanism of the disease D) infection

04 Enveloped viruses usually produced by ?

A) Cytolytic productive B) Non-cytolytic productive
C) Abortive D) Transformation non-productive

05 Transmit a virus from mother to her child called :

A) Horizontal transmission B) Hemolytic disease
C) Vertical transmission D) Infection

06 Role of secrete antibodies "IgA" is usually important during :

A) Type I Hypersensitivity. B) Local infections
C) Type II Hypersensitivity. D) Systemic infections

07 stimulate phagocytosis and killing by macrophage & NK cells ?

A) α IFN B) β IFN
C) γ IFN D) IL-12

08 A period during viral infection when there is an infection, but no symptoms

A) Incubation period B) Prodromal period
C) The specific-illness period D) Recovery period

Key answers : 1)A|| 2)D|| 3)A|| 4)B|| 5)C|| 6)B|| 7) C|| 8(A

SAQs :

Name one of the systemic infections

Measles

In Which type the viruses infect cells that restrict or lack the machinery for transcribing viral genes.

Non-productive Infection

Name a virus that form intranuclear inclusions

Herpes

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- ميسون آل تميم
- نورة المزروع
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- لينا العصيمي
- فيصل ع. الزهراني
- الوليد العازمي
- عبدالله الحوامدة
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