

جامعة الانبار

كلية: الصيدلة

قسم: العلوم المختبرية السريرية

اسم المادة باللغة العربية: الاحياء المجهرية

اسم المادة باللغة الإنكليزية: **microbiology**

المرحلة: الثانية

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عنوان المحاضرة باللغة العربية: طرق تشخيص الفيروسات

عنوان المحاضرة باللغة الإنكليزية: **DIAGNOSTIC METHODS IN VIROLOGY**

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محتوى المحاضرة

## **DIAGNOSTIC METHODS IN VIROLOGY**

### ***Definition of a Virus***

- ❖ A virus is an obligate intracellular parasite containing genetic material surrounded by protein •
- ❖ They depend on the host machinery for their growth and survival as they lack the machinery necessary for protein and nucleic acid synthesis.
- ❖ They infect every form of live cells include human, animal, plant, insect, fungus, & bacteria.

### ***How Do Viruses Differ From Living Organisms?***

- Viruses are not living organisms because they are incapable of carrying out all life processes.
- **Viruses**
  - \* are not made of cells
  - \* cannot reproduce on their own
  - \* do not grow or undergo division
  - \* do not transform energy

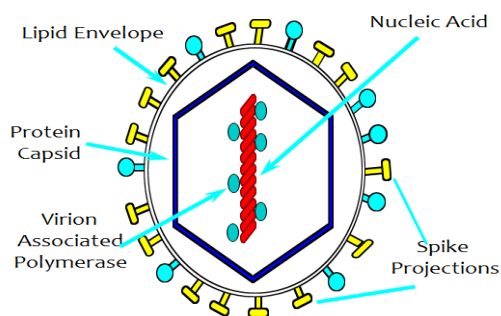
\* lack machinery for protein synthesis

***The difference between Viruses & bacteria included:***

<u>Properties</u>	<u>Viruses</u>	<u>Bacteria</u>
Size	10-300nm	1000nm
Genome	DNA or RNA but not both of them	Both DNA and RNA
multiplication	Depend totally on host cell for multiplication	Binary fission
ribosome	-	+
Cell wall	-	+
sensitivity to antibiotic	-	+
Growth in culture media	-	+

***Virion Structure***

- Nucleic acid, can be \_\_\_\_\_ or \_\_\_\_\_; never both.
- Nucleic acid surrounded by a protective protein coat, called a \_\_\_\_\_.
- An outer membranous layer, called an \_\_\_\_\_, made of lipid and protein, surrounds the capsid in some viruses.

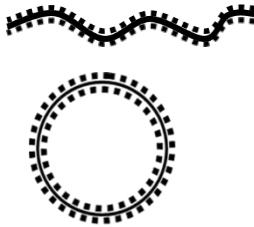


## ***Types of symmetry of viruses***

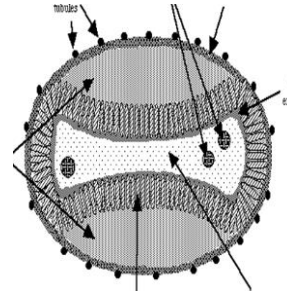
There are three types of symmetry according to capsid shape:



Icosahedral (cubic)  
*Adeno V.*



Helical  
*Influenza*

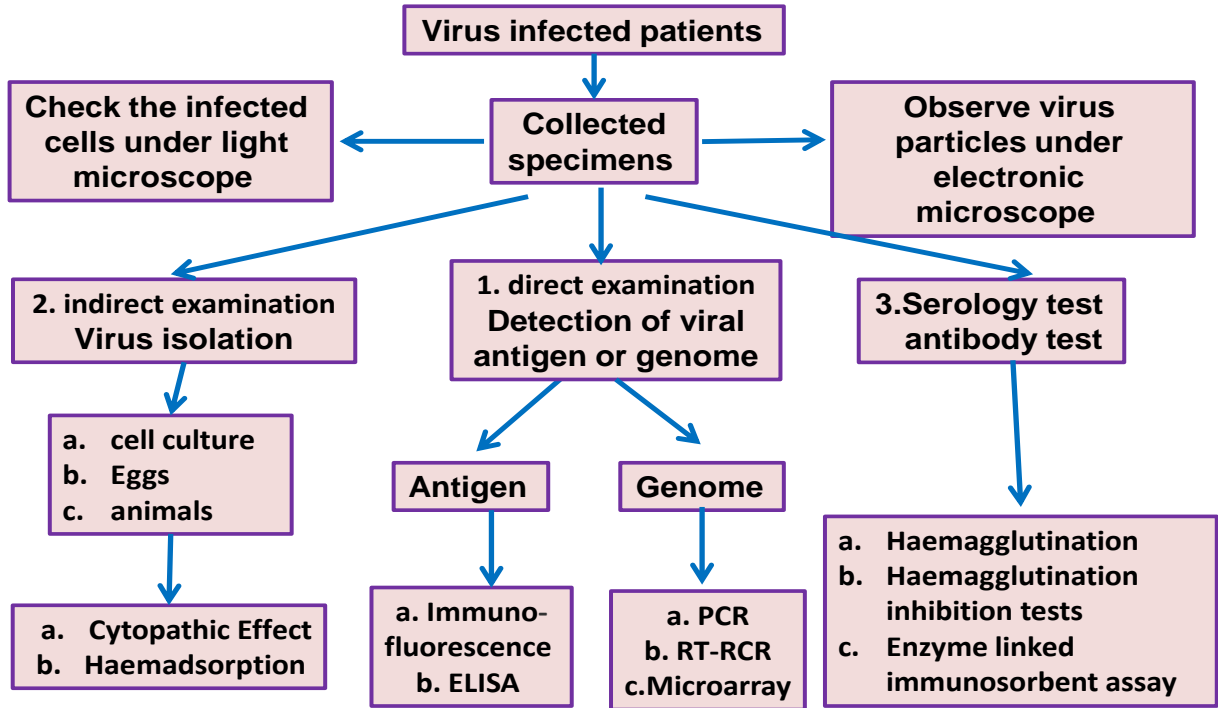


Complex  
*Pox virus*

## ***Virology Specimen Collection***

- **Blood**
- **CSF**
- **Cervical or vaginal swab**
- **Urethral swab**
- **Conjunctiva swab**
- **Feces**
- **Urine**
- **Nasal swab**
- **Oral swab**
- **Throat swab**
- **Tissue**

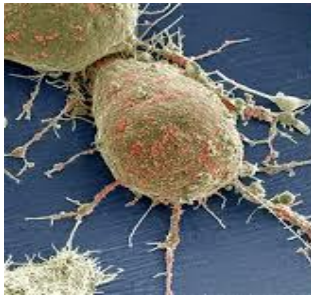
## Procedures for laboratory viral diagnosis



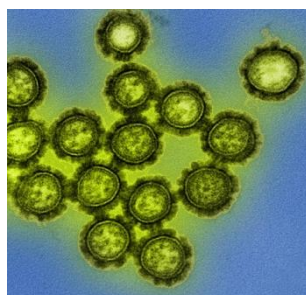
## Examination of Specimen

### Virus particles

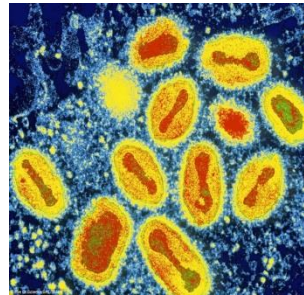
❖ Electron Microscopy morphology



*HIV*



*Adenovirus*

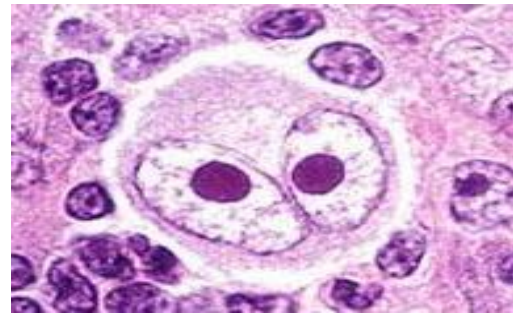
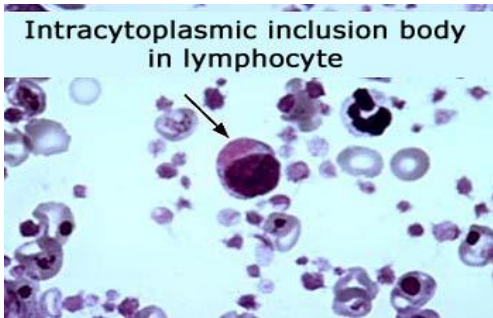


*Pox virus*



*Influenza viruses*

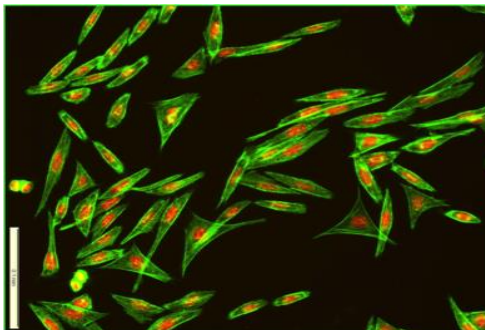
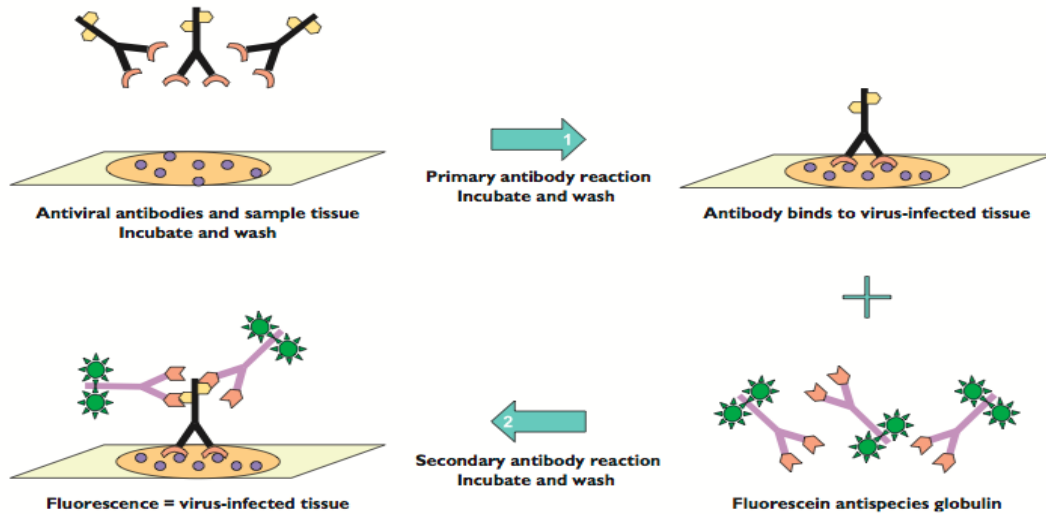
❖ Light microscopy histological appearance - e.g. inclusion bodies



## 1. Direct Examination of Specimen

### a. Antigène détection

❖ immunofluorescence, ELISA etc



## b. Viral nucleic acids

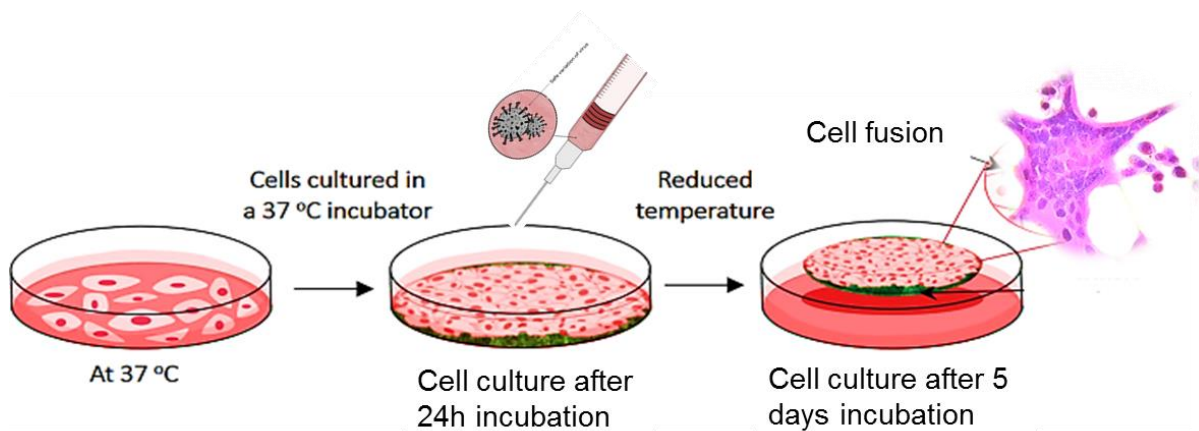
Molecular techniques (PCR, RT-PCR) for the direct detection of viral genomes



## 2. Indirect Examination (Virus isolation)

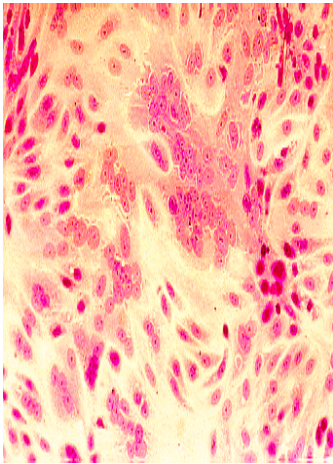
- Since the viruses are obligate intracellular parasites, they cannot be grown on any ordinary culture medium.
- Viruses can be cultivated within suitable hosts, such as a living cell.
- Viruses not only need living cells to grow in but also they are specific about the type of cell they infect and grow in.
- There is no universal cell that will support all viruses

### a. cell culture



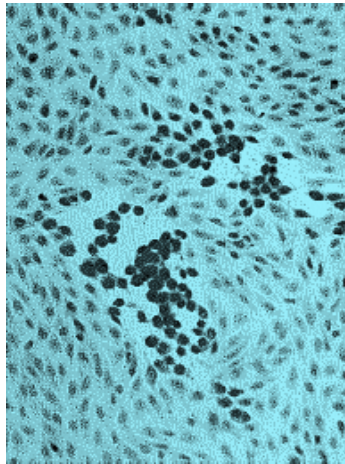


## Cytopathic effect of viruses



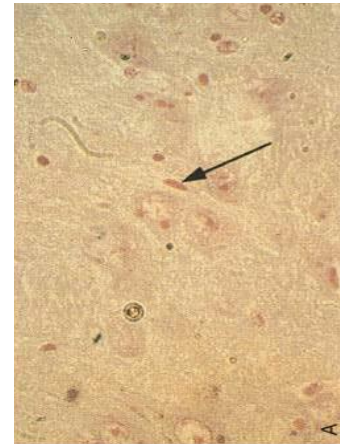
### Cell lyses

*Adeno virus*



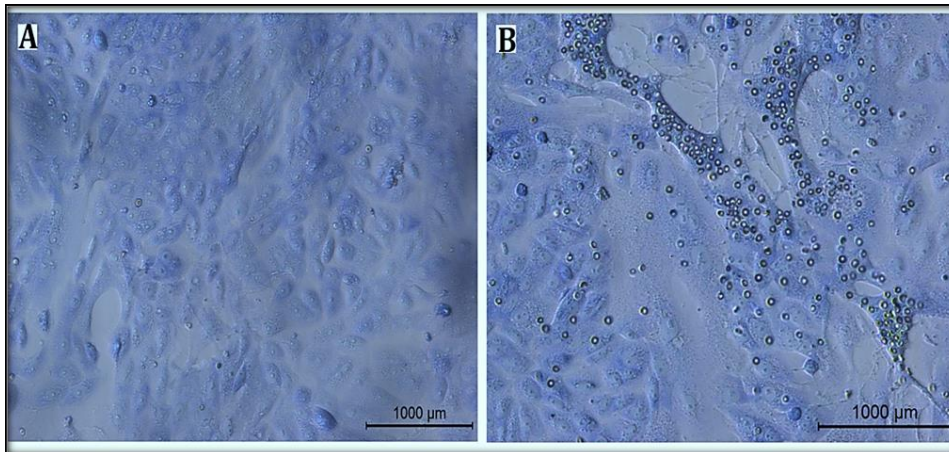
### Cell fusion

Formation of multinuclear giant cells (e.g. Measles, H S V)



### Inclusion bodies

*Papova virus Reo virus*

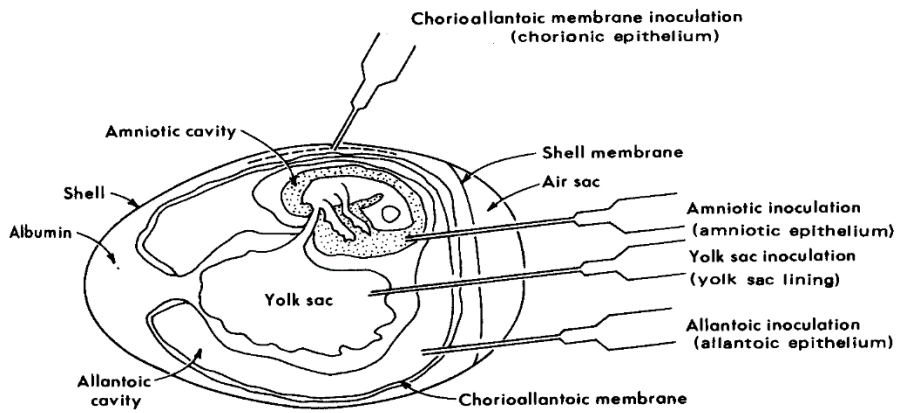


Hemadsorption of erythrocytes to infected cells

## b. Embryonated Hen's Egg

The embryonated chicken egg has long been widely used as a sensitive host for cultivation of influenza viruses

## Eggs Inoculation



### c. Animal Inoculation

Viral replication can be detecting by animal dead or animal disease



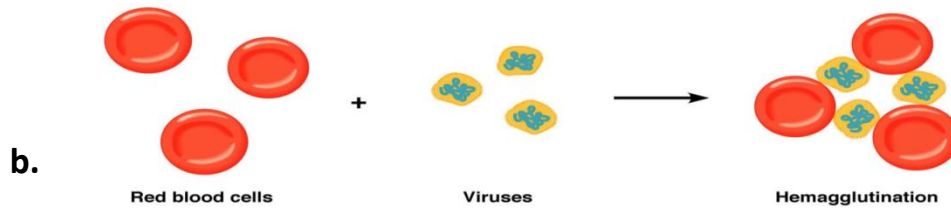


### 3. serology

Detection of rising titers of antibody between acute and convalescent stages of infection, or the detection of IgM in primary infection.

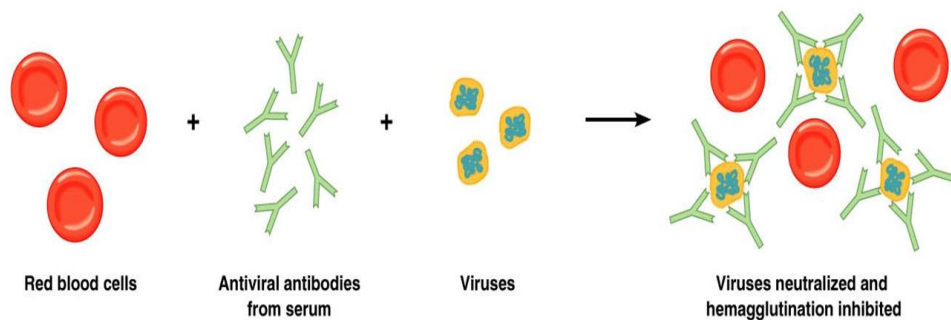
#### a. Haemagglutination tests

**Principle:** Some HA-bearing viruses agglutinate RBCs in vitro.



#### Haemagglutination inhibition tests

**Principle:** If a person is infected by HA-bearing virus, anti-HA Ab may appear in his serum. These antibodies can block hemagglutination and lead to the hemagglutination inhibition phenomenon.



#### c. Enzyme Linked Immunosorbent Assay

- Enzyme reacts with substrate to produce colored product
- Could detect viral antigens or antibodies

