



Virology for 2<sup>nd</sup> Year MD Students

# **(03) Principles of Diagnosis of Virus Infections**

**University of Jordan**

**Malik Sallam, M.D., Ph.D.**

**School of Medicine**

**Department of Pathology, Microbiology and Forensic Medicine**



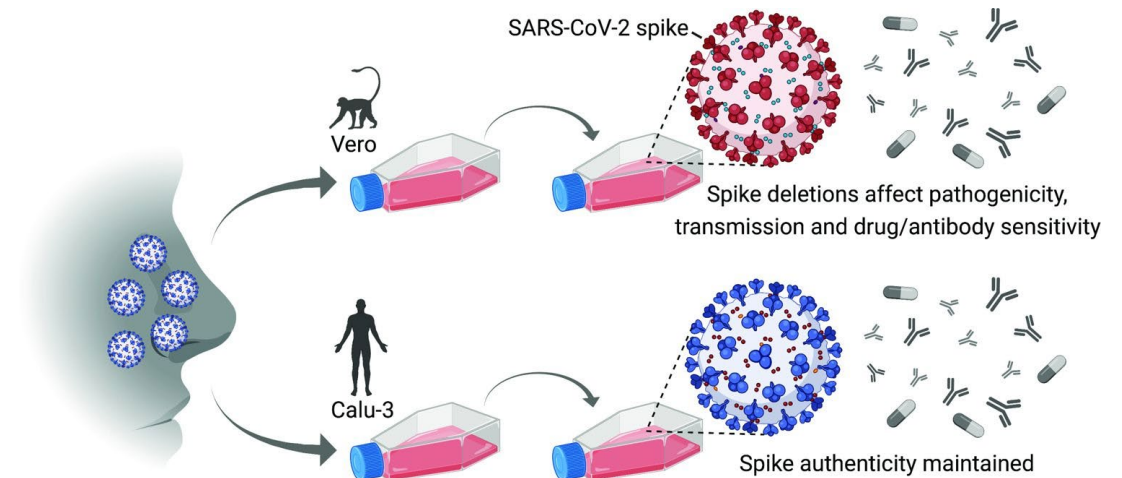
# How to diagnose virus infections?

## 1. Virus culture

**The gold-standard, reference method.**

However, it is not used routinely in clinical practice because:

- A. Many viruses are difficult to grow in culture.
- B. Virus culture is often difficult and complex process.
- C. Slow.





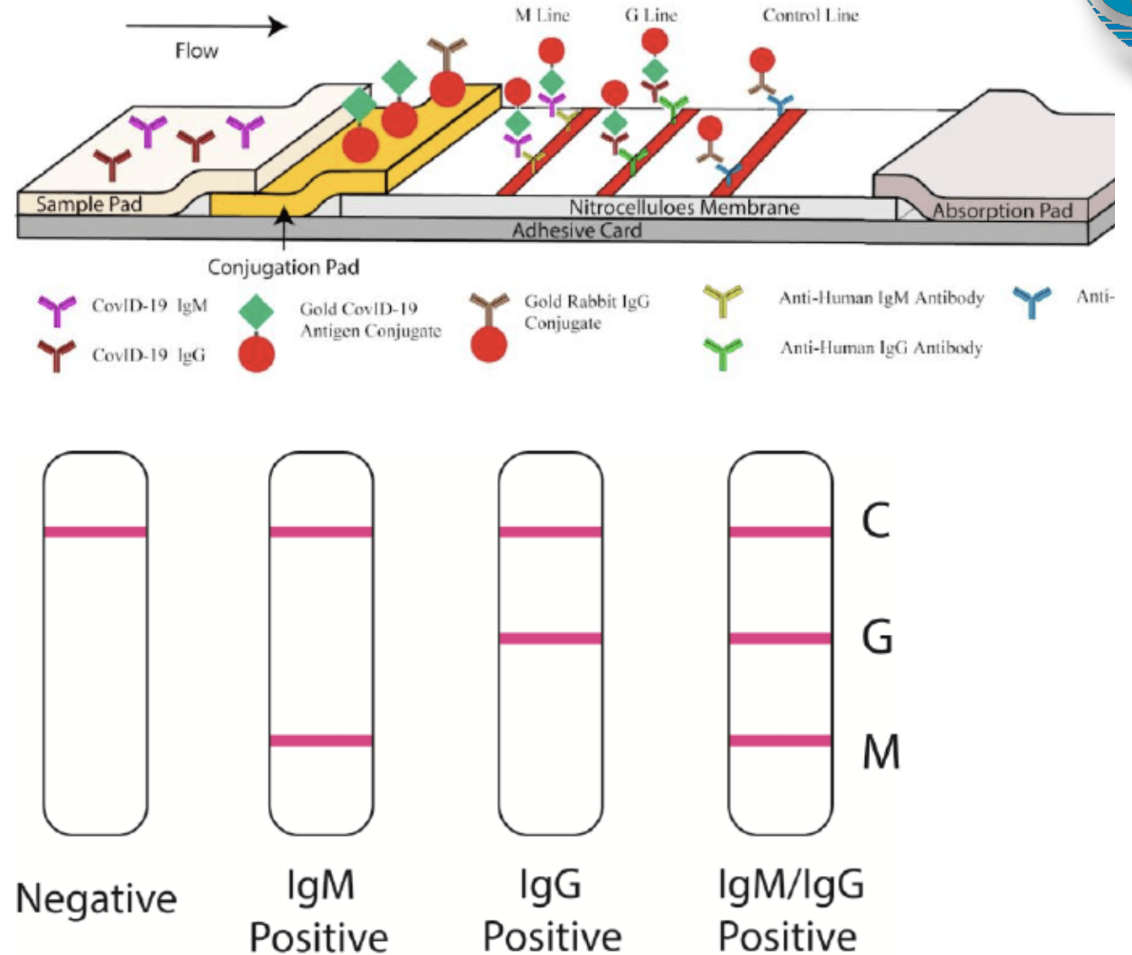
# How to diagnose virus infections?



## 2. Serology

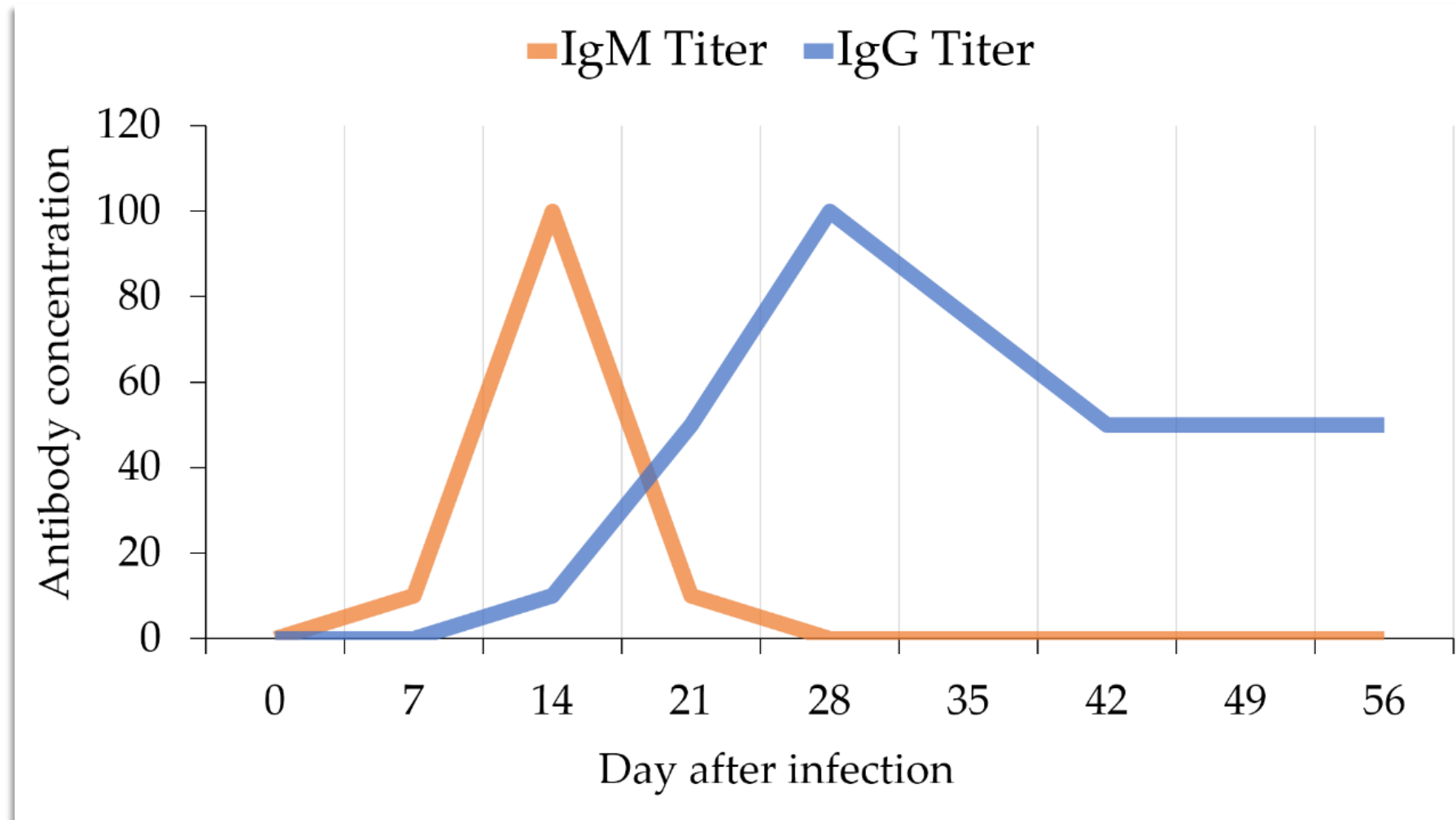
The study of serum that contains **antibodies**. Blood is two parts (cells + fluid that have proteins). The fluid part is called serum. Antibodies are part of these serum proteins. Antibody is also called immunoglobulin.

Specific virus infections will cause specific antibody production. So, if these specific antibodies are present, it means that the infection by that specific virus occurred.



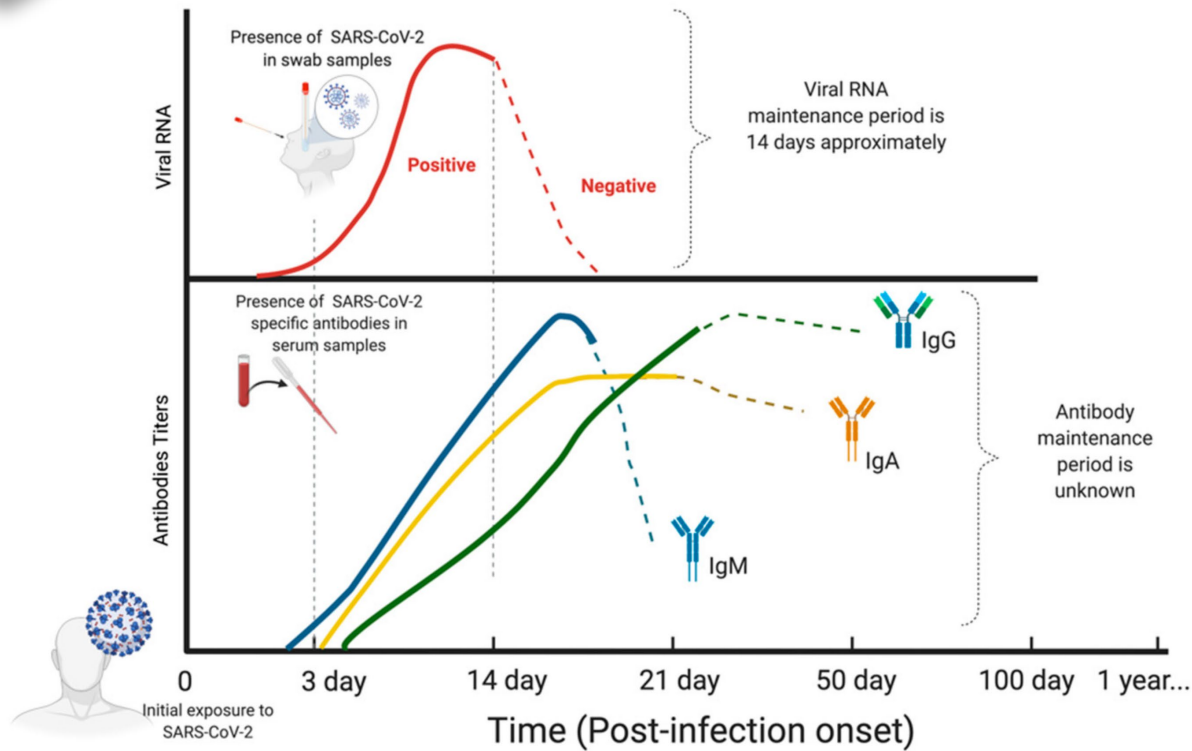


# How to diagnose virus infections?





# How to diagnose virus infections?



Source: Guevara-Hoyer K, Fuentes-Antrás J, De la Fuente-Muñoz E, Rodríguez de la Peña A, Viñuela M, Cabello-Clotet N, Estrada V, Culebras E, Delgado-Iribarren A, Martínez-Novillo M, et al. Serological Tests in the Detection of SARS-CoV-2 Antibodies. *Diagnostics*. 2021; 11(4):678. <https://doi.org/10.3390/diagnostics11040678>

- Antibodies are produced in the following order: immunoglobulin M (IgM) in the first 1-2 weeks. Immunoglobulin G (IgG) in the first two months. IgM will disappear in a few weeks. IgG will stay in the blood for long time. So, IgM=recent infection and IgG=past infection
- Disadvantage of serology: the body will take 1-2 weeks for antibody production. So, serology is not helpful for very early diagnosis.



# How to diagnose virus infections?

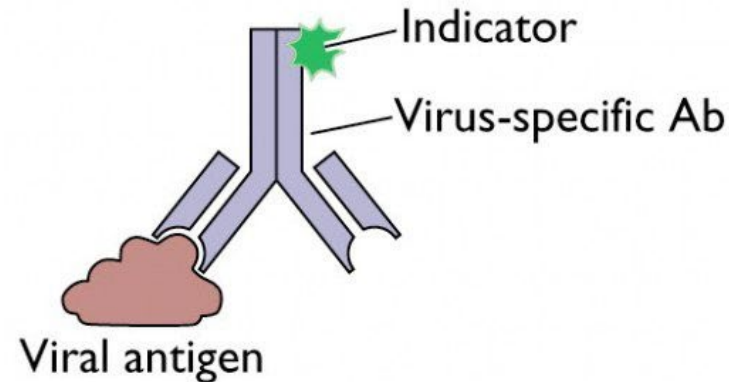
## 3. Antigen detection

We look for the specific virus proteins.

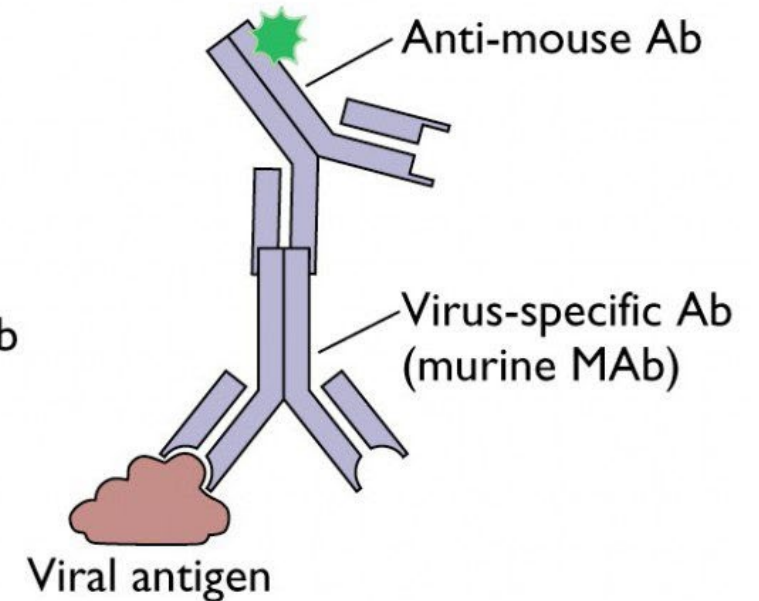
For example, virus A have antigen A, virus B have antigen B and virus C have antigen C.

Let's assume that viruses A, B, and C cause influenza-like disease (fever, cough, fatigue). We want to reach a specific diagnosis. We take a sample through the nose or throat. We test the sample for antigens. We find antigen C. Then, we can reach a specific diagnosis. VIRUS C caused this influenza-like disease.

**Direct**



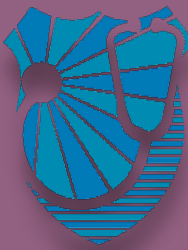
**Indirect**







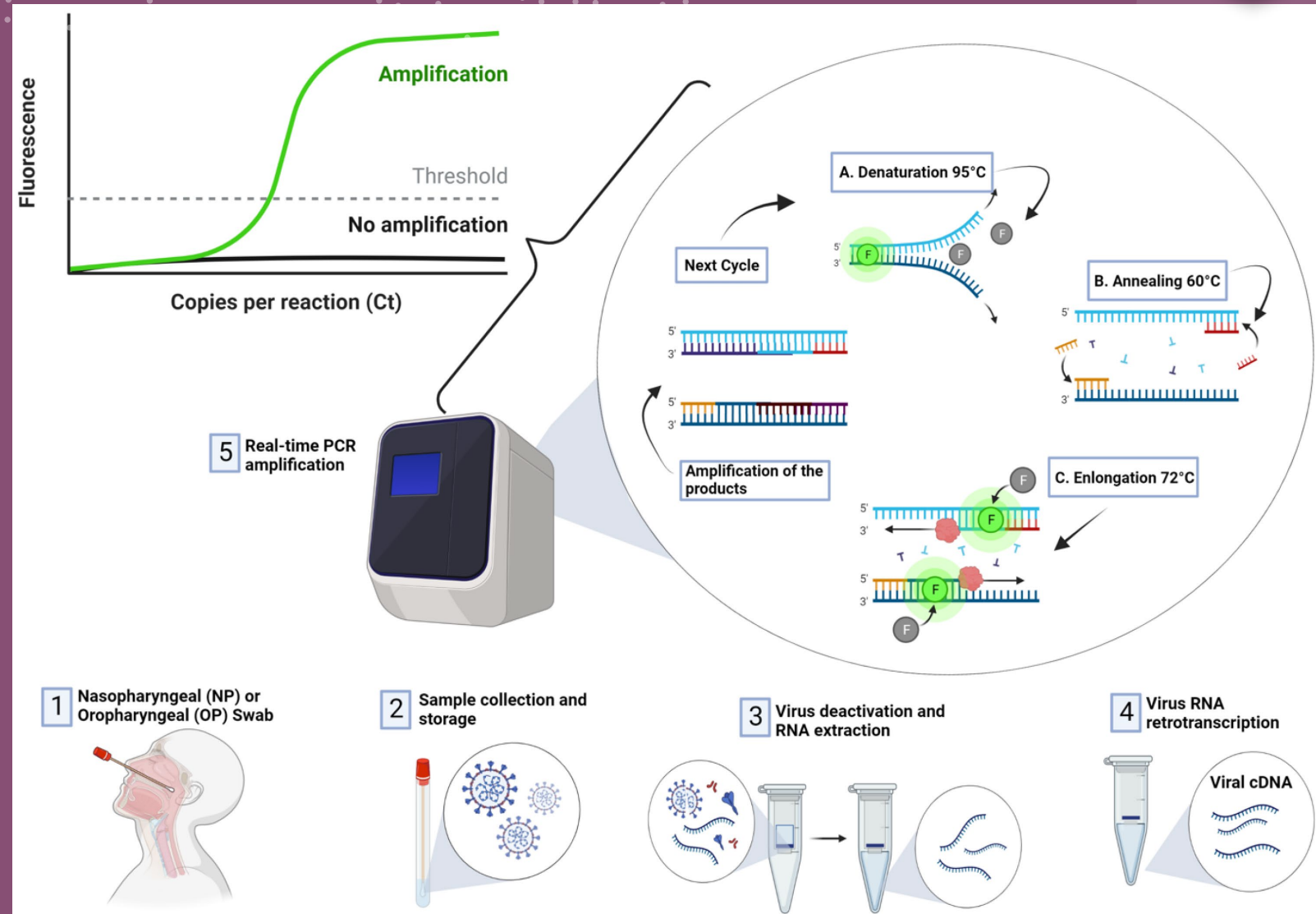
# How to diagnose virus infections?



## 4. Molecular detection

We look for specific DNA or RNA sequence in the virus genome. This can be done using different methods.

The most common method used for molecular detection is Polymerase Chain Reaction (PCR).



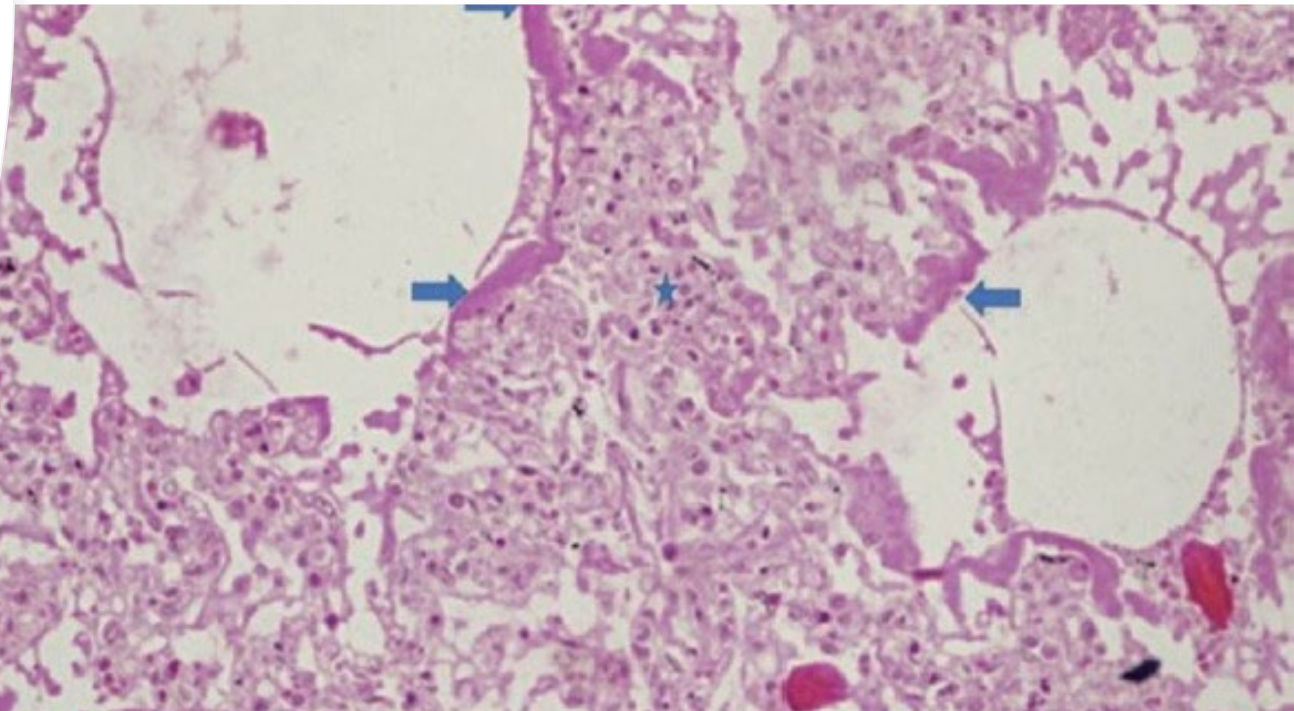
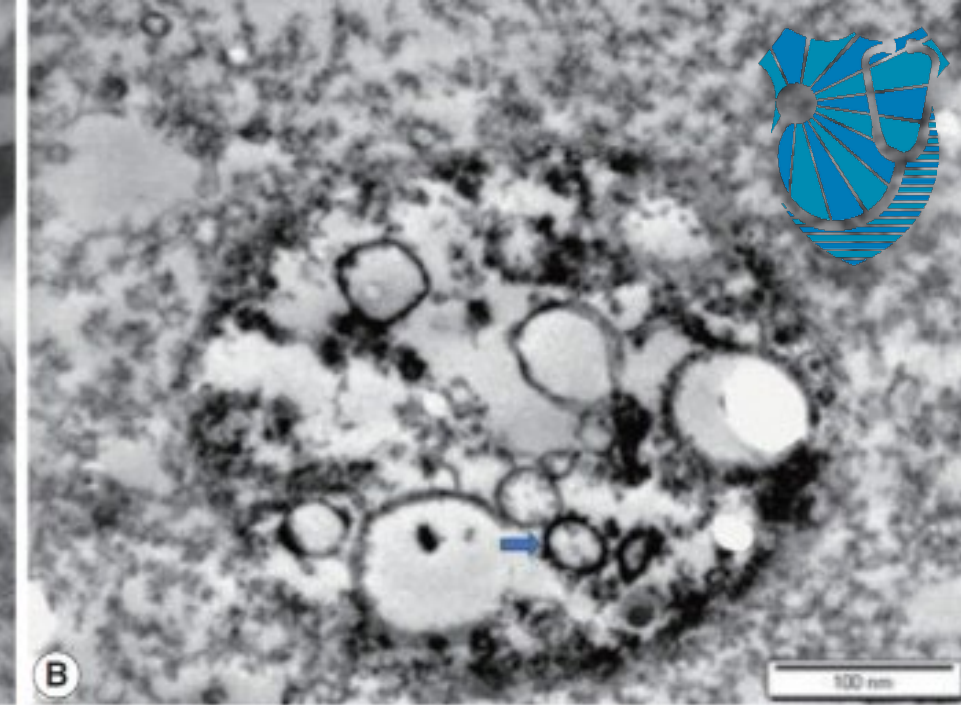
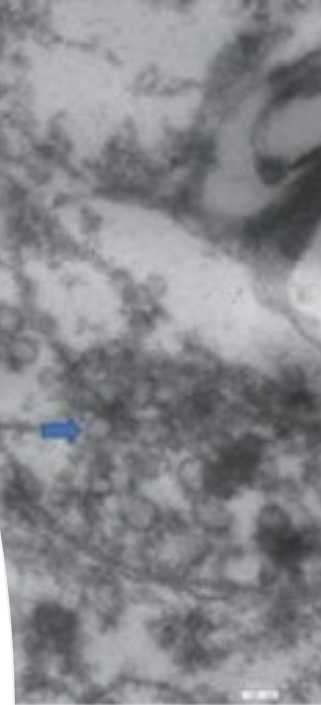


# How to diagnose virus infections?

## 5. Histopathologic examination of cells or tissue infected by the virus.

Specific changes in the cells can give an idea about the virus that caused the infection.

The use of immunohistochemistry can also confirm the presence of viral antigens in infected tissues.







## How to diagnose virus infections?

### 6. Clinical diagnosis

Sometimes, certain signs and symptoms can help to reach the diagnosis of virus infection.



## Another Example of Koplik Spots



12

American Academy of Dermatology  
In Dermatology

## DEW DROP ON ROSE PETAL



## COLD or FLU?



FLU SYMPTOMS



heat



weakness



headache



drowsiness



increased sweating



muscle aches



sore nose



sore throat



**Thank You...**  
**Wishing you all the**  
**best!**