



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

## (06) DNA viruses:

*Papillomaviridae* (HPV)

*Polyomaviridae* (Bk, JC, Merkel cell Polyomavirus)

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# Papillomaviridae

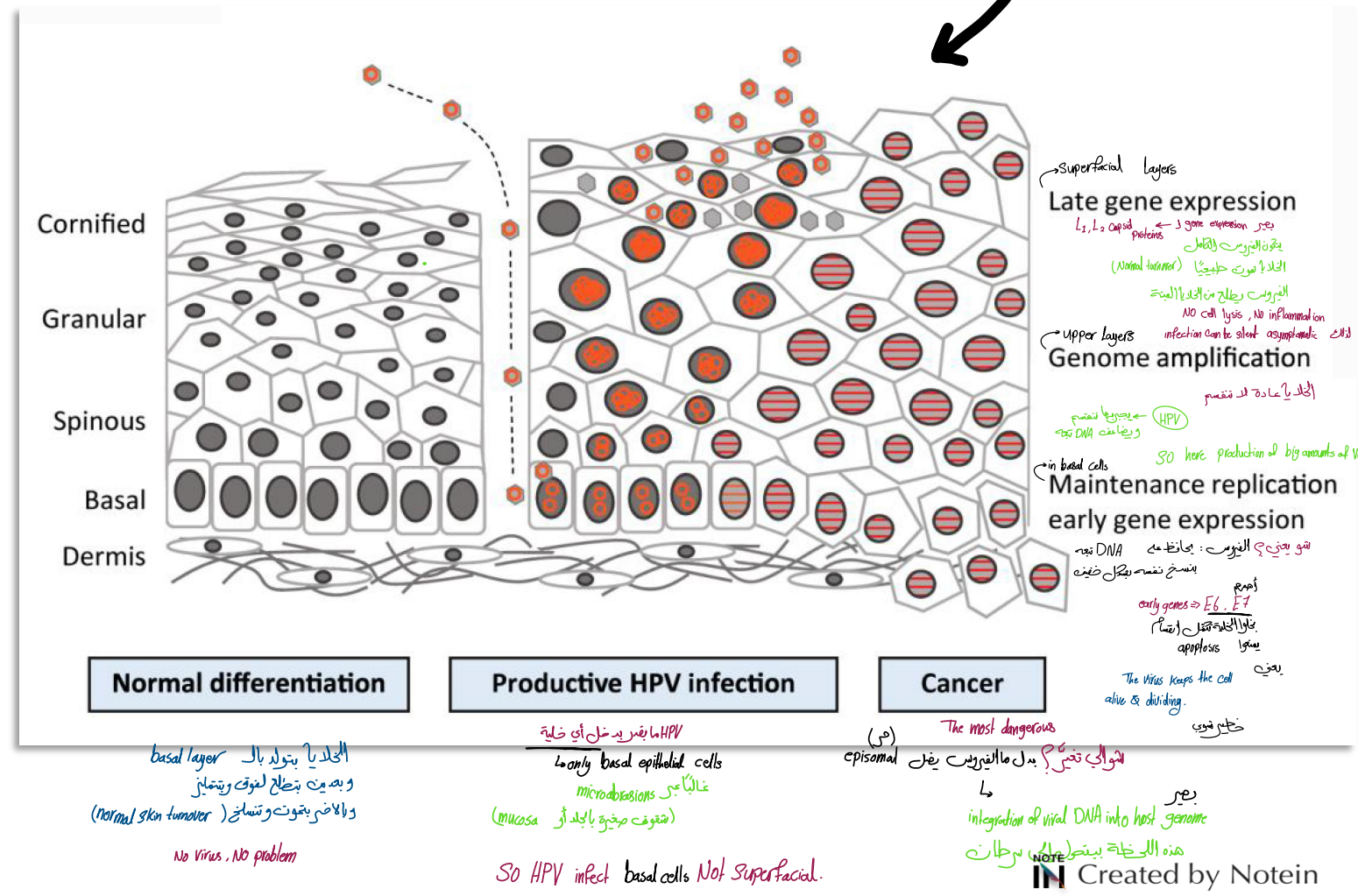
ممكن يكون شئج زياده بتذكرى الدكتور  
حتى عنها بس بدون  
المضغوت ن

Human papillomavirus (HPV)

dsDNA, non-enveloped viruses  
that replicate in the nucleus. The  
virus has many types (>200).

**Transmission:** direct contact,  
sexual.

**Tropism:** epithelial cells of the  
skin and mucous membranes.





# HPV Important features

1. HPV is the **most common cause of sexually transmitted infections** worldwide.
2. Most HPV infections **resolve spontaneously** within **2-3 years**.
3. Many infections are **totally asymptomatic**, so the patient can have HPV without knowing
4. Some HPV types are **benign**, some have **low-risk** of causing cancer and some are **high-risk** types that can cause the following cancers: **cervical, penile, anal, oropharyngeal, and vulvar cancers**.
5. **High-risk HPV** types have **transforming proteins** that are **related to cancer development**.

بسيط خفيفة  
الانتعاش العكورة  
في العلامات الحادة  
+ asymptomatic  
انتعاش ملامت  
وبالتالي الناس ممكن أن يكون معاه دون أن يعرف =

The immune system can get rid of it without treatment.  
بمخيف خصوصاً على  
low-risk types

does it mean harmless.  
ليس؟ لأنه الأستمر معاً يعود للخطر

لا أرفف، لا ألم، لا تآليل أحياناً  
المريض Carrier ينقل الفيروس

مش كل  
HPV  
يؤدي إلى  
سرطان

له هي الأساس الجزيئي للسرطان

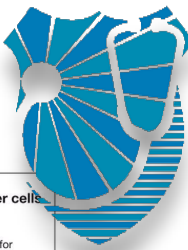
E6 → p53 off (No apoptosis)  
E7 → Rb off (cell cycle on) } result malignant transformation.



# HPV Clinical Features

\* Warts, Not Cancer = HPV-6, HPV-11

\* High-risk Oncogenic types = HPV-18, HPV-16



## Common warts

**Condyloma acuminata** (genital warts) caused mainly by HPV-6 and HPV-11

*Popillomas in the larynx*  
**Laryngeal papilloma**. (benign) often linked 6, 11

**Cervical cancer** caused mainly by HPV-16 and HPV-18

Other cancers: **penile, anal, oropharyngeal, and vulvar cancers.**

Caused by high-risk HPV types (e.g., HPV-16 and HPV-18)

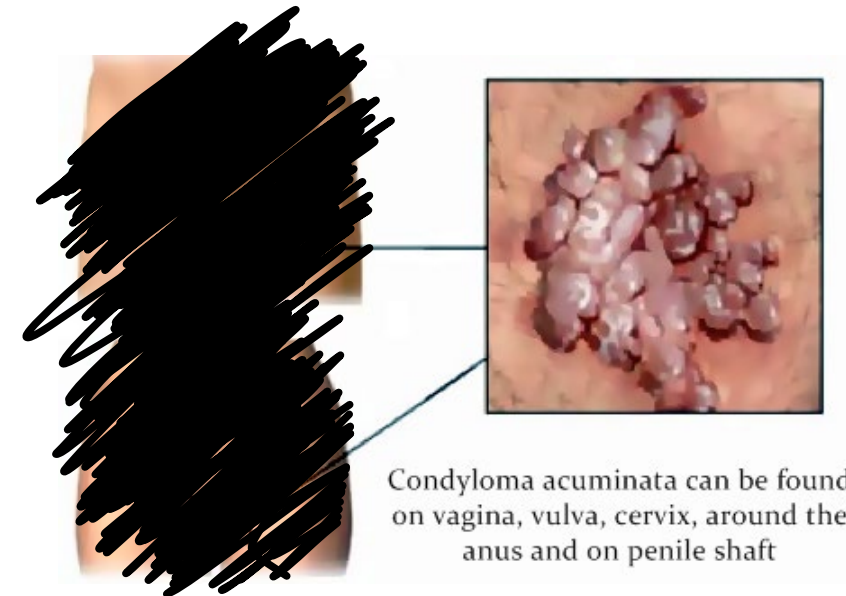
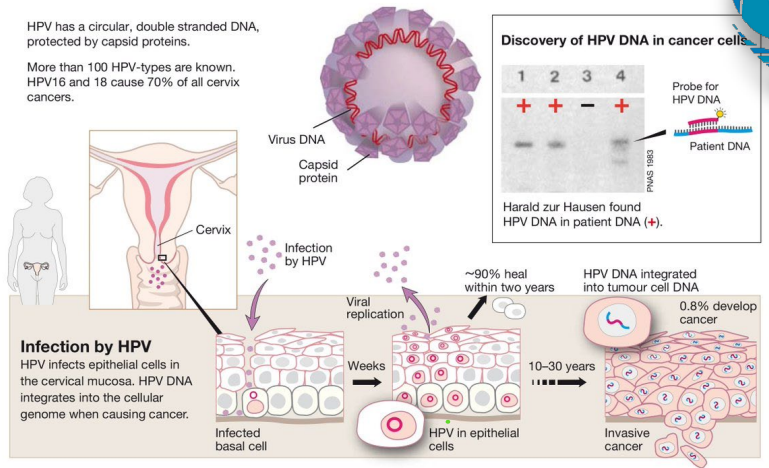
→ Low-risk

→ Lesions  
نمشة القريبط

### HPV - human papilloma virus

HPV has a circular, double stranded DNA, protected by capsid proteins.

More than 100 HPV-types are known. HPV16 and 18 cause 70% of all cervix cancers.







# HPV Clinical Features





# HPV diagnosis and management

## Diagnosis:

A. **Clinical** <sup>Visual</sup>

B. **Pap smear** (Papanicolaou smear is a cytology method of cervical screening to look for precancerous lesions in the cervix). *Screening ≠ Viral detection*

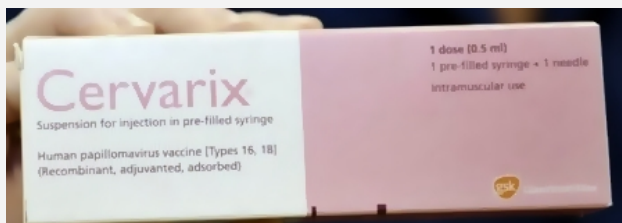
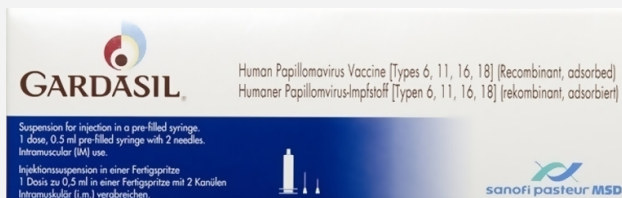
C. **PCR**. Detects HPV DNA  
Identifies the type (*risk stratification*)

**Treatment:** Most do not require treatment. Other methods: surgical excision, laser therapy, chemical agents (e.g., <sup>Safer than</sup> podophyllotoxin and podophyllin, imiquimod).  
*Wart die & goes up ← من خلافت إبقاء الانقسام الخلوي*

*The treatment removes the lesion Not the virus itself*



# HPV epidemiology and prevention



part of the virus

## Prevention: Subunit vaccines:

1. **Cervarix** (bivalent vaccine for HPV-16 and 18).   
 *means 2*   
 *يعني تصني ضد شغلتي HPV-16 و HPV-18*   
 *→ only Cancer*

2. **Gardasil** (quadrivalent vaccine for HPV-6, HPV-11, HPV-16, and HPV-18).   
 *means 4*   
 *HPV-6, 11 (genital warts)*   
 *HPV-16, 18 (Cancers)*   
 *→ Cancer & warts*

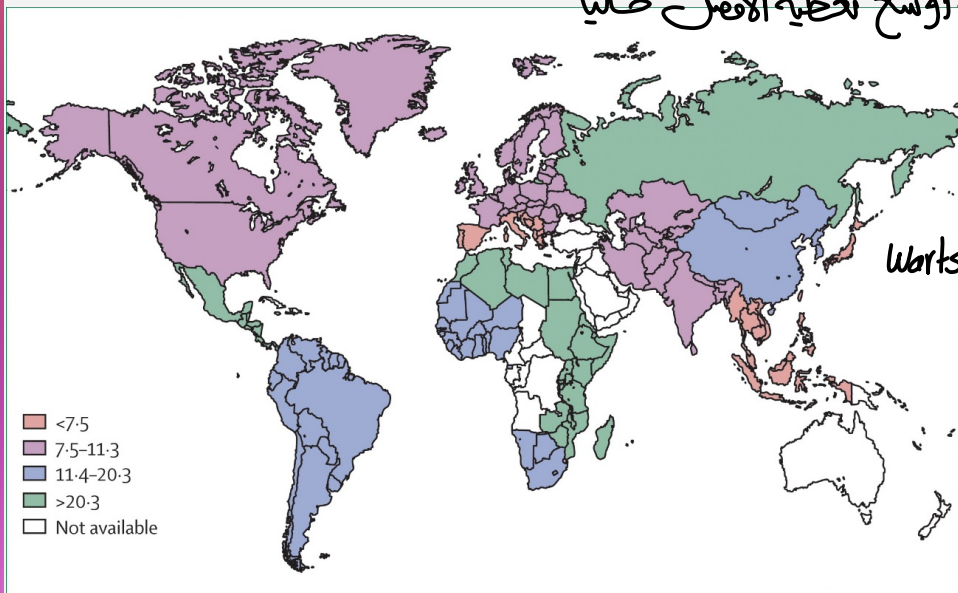
3. **Nonavalent vaccine** (for the following types: 6, 11, 16, 18, 31, 33, 45, 52, 58).   
 *9 types*   
 *Cancers*   
 *أشملهم*

**Epidemiology:** The global HPV prevalence is about 10%.

يعني حوالي 10%  
عندهم HPV

أوسع تغطية الأفضل حاليًا

warts



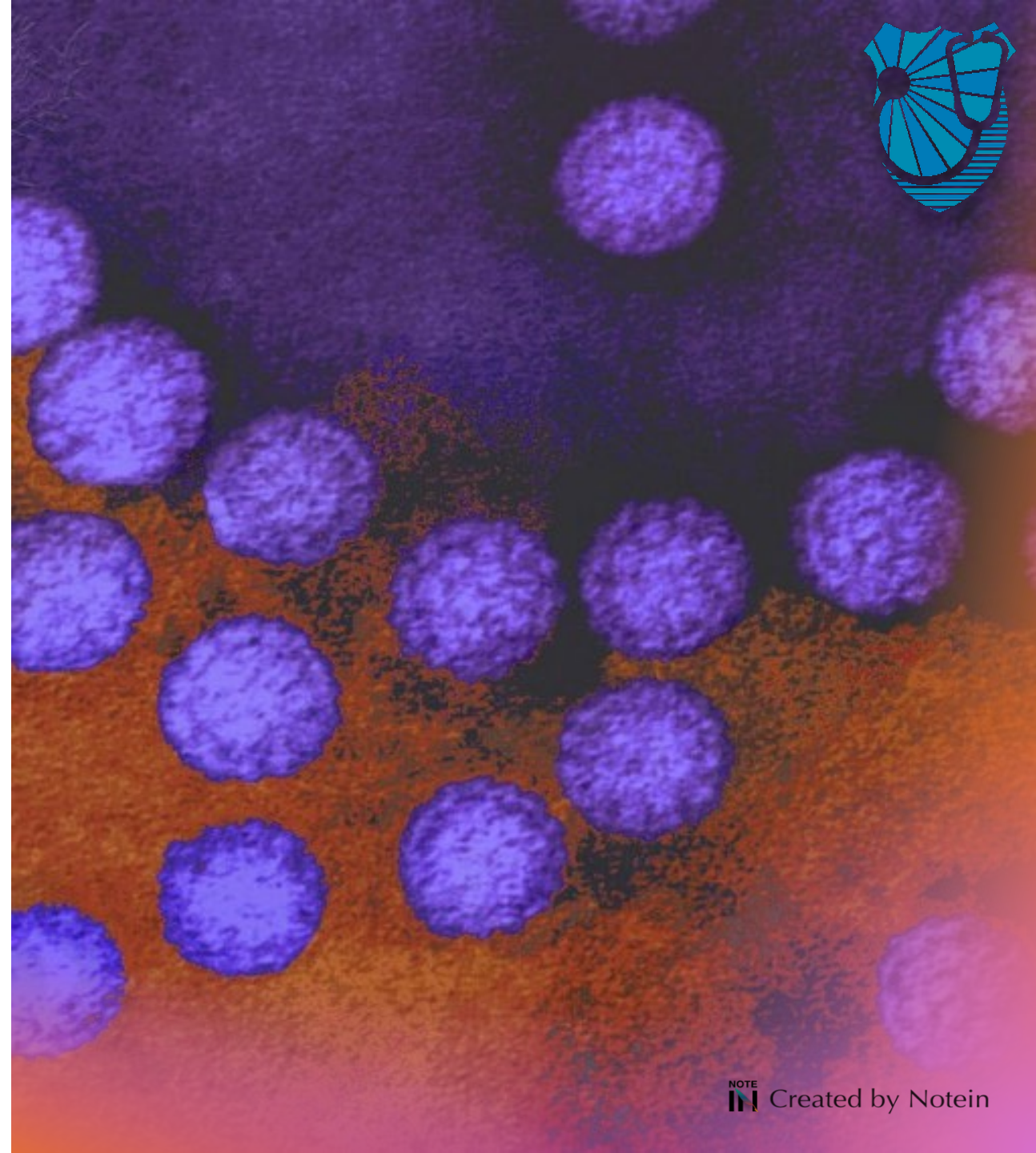




# *Polyomaviridae*



- Double-stranded DNA, non-enveloped viruses that replicate in the nucleus  
*Relatively resistant*  
نفس التركيب والتكاثر لـ HPV بس أمراض مختلفة
- JC virus, BK virus and Merkel cell polyomavirus
- Most of these infection remain latent in the body without symptoms.  
*The virus present but silent*  
*asymptomatic*  
طبيب و من مشكله  
\*AIDS, Transplant  
شو يعني؟ يعني مشكله لما يكون في نقص مناعة
- Transmission: not established







# Polyomaviridae

## Clinical features:

Bladder (cystitis) ← التهاب المثانة المزمن  
A. **BK virus**: cystitis in bone marrow transplant patients Why? or renal transplant

سبب إعادة تنشيط  
Latent Virus  
with immunosuppression.

ATIDS نادر (PML) ← مرض عصبي خطير  
B. **JC virus**: progressive multifocal leukoencephalopathy  
(PML) in AIDS patients. ← ديميلينيشن

C. **Merkel cell polyomavirus**: Merkel cell carcinoma (rare skin cancer). So, Merkel cell polyomavirus is an oncovirus

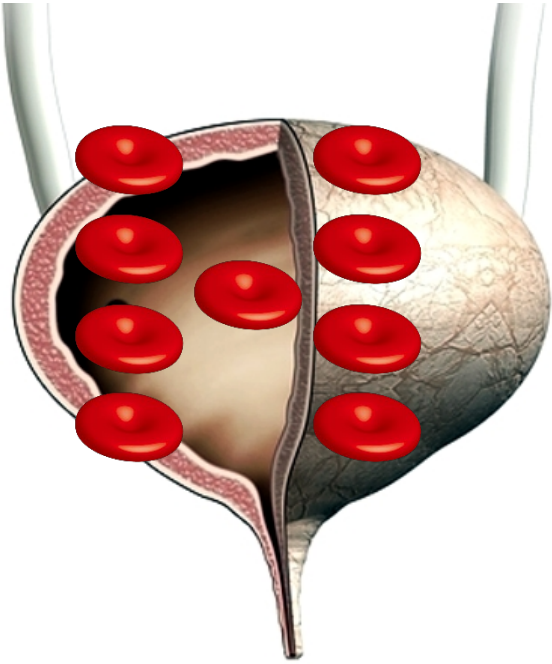
Pictures next  
Slide ٣

HPV (oncogenic) → Cervical Cancer

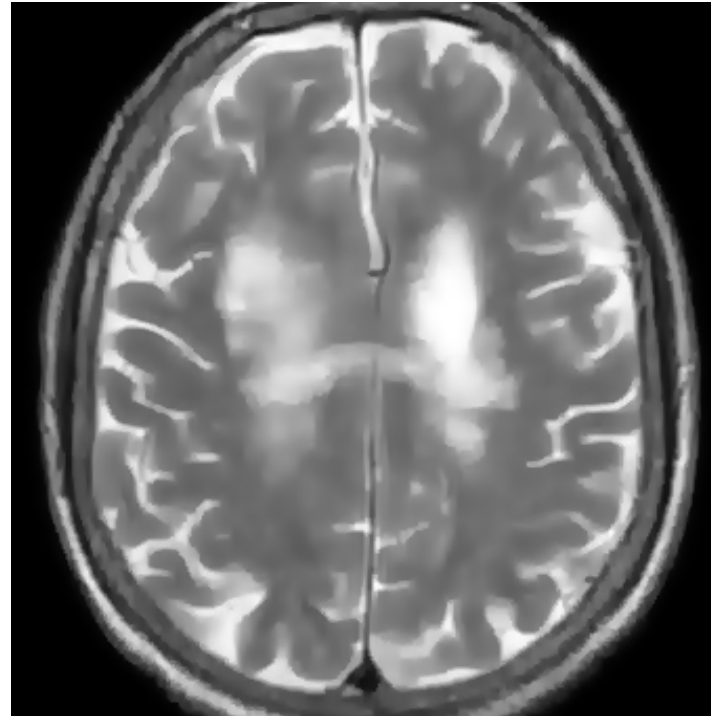
MCPyV (oncogenic) → Merkel cell Carcinoma



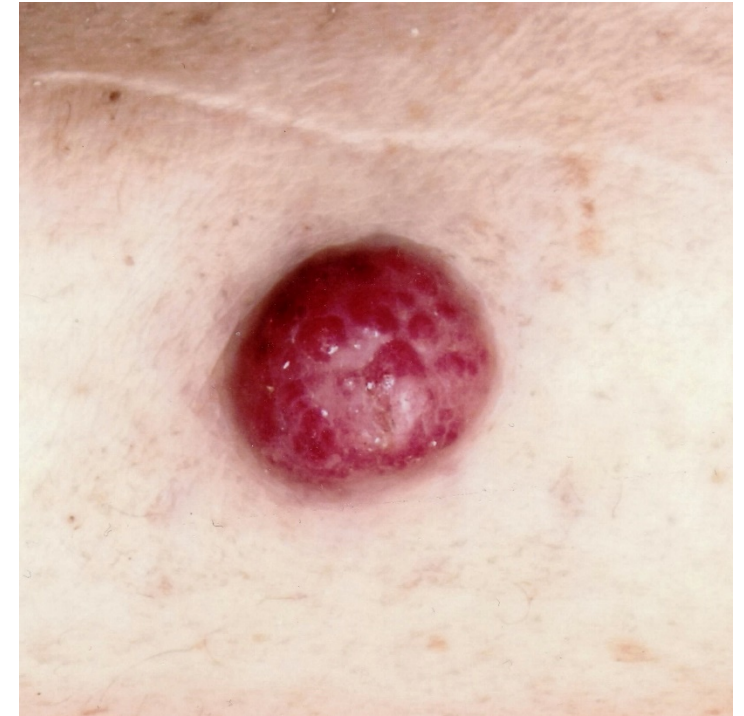
# *Polyomaviridae*



BK virus: Hemorrhagic  
cystitis



JC virus: Progressive  
multifocal  
leukoencephalopathy  
(PML)



MCPyV: Merkel cell  
carcinoma



# *Polyomaviridae*

## Diagnosis:

A. **PCR**  $\leadsto$  كشف DNA

B. **Radiology**  $\rightarrow$  PML (MRI brain) <sup>JC</sup> خصوصاً في

C. **Histopathologic examination** في الأورام (Merkel)

**Treatment:** No specific treatment.

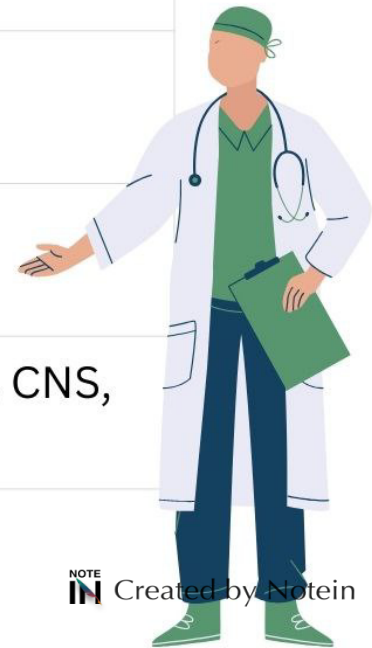
**Prevention:** Vaccines have not been approved for prevention so far.

**Epidemiology:** Widely spread. A majority of humans have the infection by BK and JC viruses.

$\rightarrow$  as latent.



Feature	<b>Papillomaviridae (HPV)</b>	<b>Polyomaviridae</b>
Genome	dsDNA	dsDNA
Envelope	✗ Non-enveloped	✗ Non-enveloped
Replication	In nucleus	In nucleus
Latency	✗ Not prominent	✓ Common
Transmission	Direct contact, sexual	Not established
Tropism	Epithelial cells (skin & mucosa)	Variable (urinary tract, CNS, skin)



HPV Type	Risk	Disease
6, 11	Low-risk	Genital warts, Laryngeal papilloma
16, 18	High-risk	Cervical cancer
16	High-risk	Penile, anal, oropharyngeal cancers

Condition	Caused by
Common warts	Low-risk HPV
Condyloma acuminata	HPV-6, 11
Laryngeal papilloma	HPV-6, 11 (benign)
Cervical cancer	HPV-16, 18
Other cancers	High-risk HPV (esp. 16)

Aspect	Details
Clinical	Visual diagnosis (warts)
Pap smear	Cervical <b>screening</b>
PCR	Detects HPV DNA (typing)
Treatment	Usually none
If needed	Excision, laser, podophyllin/podophyllotoxin, imiquimod
Important	Treats lesions <b>✗</b> not virus

# POLYOMAVIRIDAE

Virus	Disease	Patient Group
<b>BK virus</b>	Hemorrhagic cystitis	Transplant patients
<b>JC virus</b>	PML (demyelination)	AIDS / immunosuppressed
<b>Merkel cell polyomavirus</b>	Merkel cell carcinoma	Skin cancer (oncovirus)

Feature	Details
Latency	✅ Very common
Symptoms	Usually asymptomatic
Reactivation	With immunosuppression
Diagnosis	PCR, radiology, histopathology
Treatment	❌ No specific antiviral
Vaccine	❌ None approved
Epidemiology	Widely spread (BK & JC in most humans)

if anything hard to read  
or understand you can  
post on Facebook and I'll  
help

وَقَفِّرْ لَهُمُ اللَّهُ

🧠 Ultra-Fast Memory Map  
HPV  
6,11 → warts  
16,18 → cancer  
Pap smear → females only  
Vaccine → prevention  
Polyoma  
BK → bladder  
JC → brain (PML)  
Merkel → skin cancer  
Latent + immunosuppression





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

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