



**HIV**

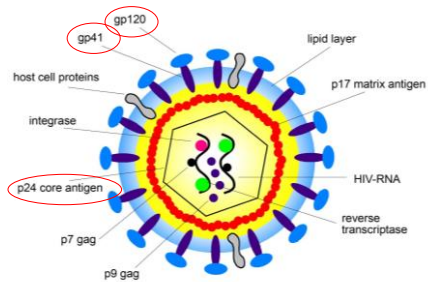
**and**

**hepatitis viruses**

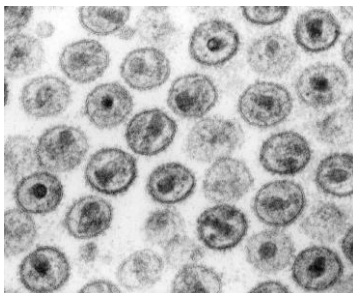


**HIV – Human Immunodeficiency virus**

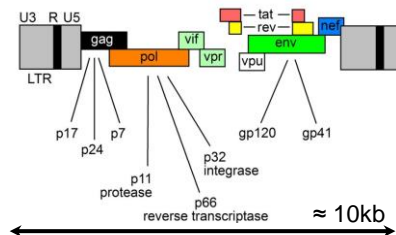
- Retrovirus
- coated ss RNA virus
- diameter 100 - 120 nm
- Not stable  
in the environment
- Huge genome variability  
- instability



<http://hivbook.files.wordpress.com/2011/11/figure-11.jpg?w=482&h=312>



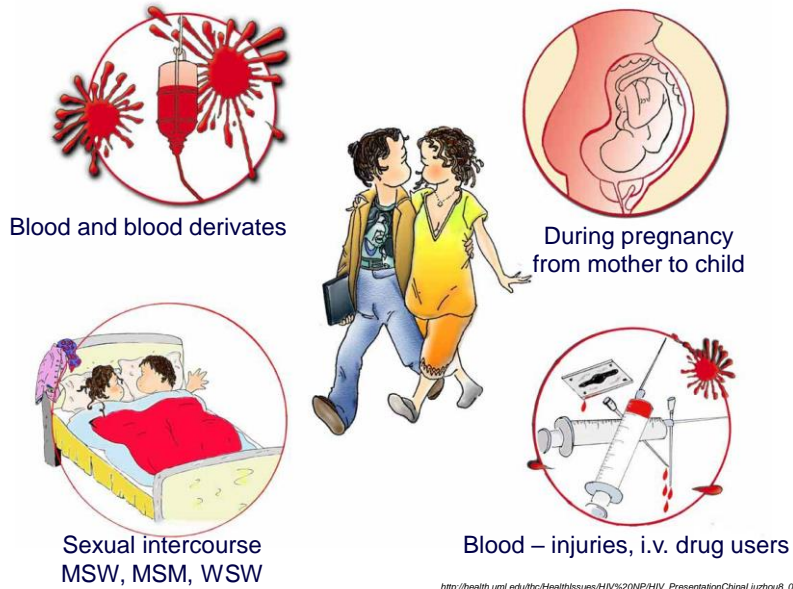
[http://upload.wikimedia.org/wikipedia/commons/4/4c/HIV-1\\_Transmission\\_electron\\_micrograph\\_AIDS02bbb\\_lores.jpg](http://upload.wikimedia.org/wikipedia/commons/4/4c/HIV-1_Transmission_electron_micrograph_AIDS02bbb_lores.jpg)



<http://hivbook.files.wordpress.com/2011/11/figure-2.jpg?w=435&h=262>



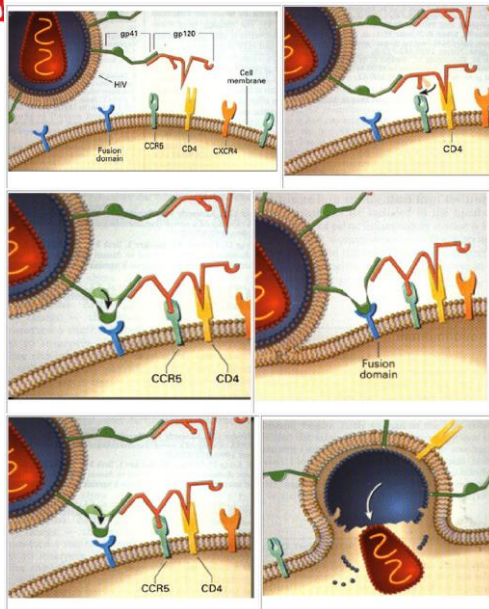
## Transmission of HIV



[http://health.umt.edu/theHealthIssues/HIV%20NPHIV\\_PresentationChinaLuzhou8\\_061906.jpg](http://health.umt.edu/theHealthIssues/HIV%20NPHIV_PresentationChinaLuzhou8_061906.jpg)

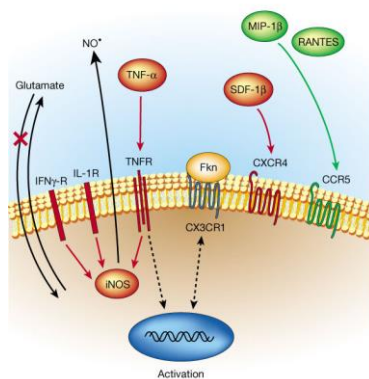


## HIV – cell receptor



[http://cdn.intechopen.com/pdfs/39816/InTech-Coreceptor\\_usage\\_in\\_hiv\\_infection.pdf](http://cdn.intechopen.com/pdfs/39816/InTech-Coreceptor_usage_in_hiv_infection.pdf)

Natural resistance to HIV-1 through delta 32 mutation in CCR5 (deletion of a part of gene). Homozygotes are resistant to M-tropic strains of HIV-1 infection

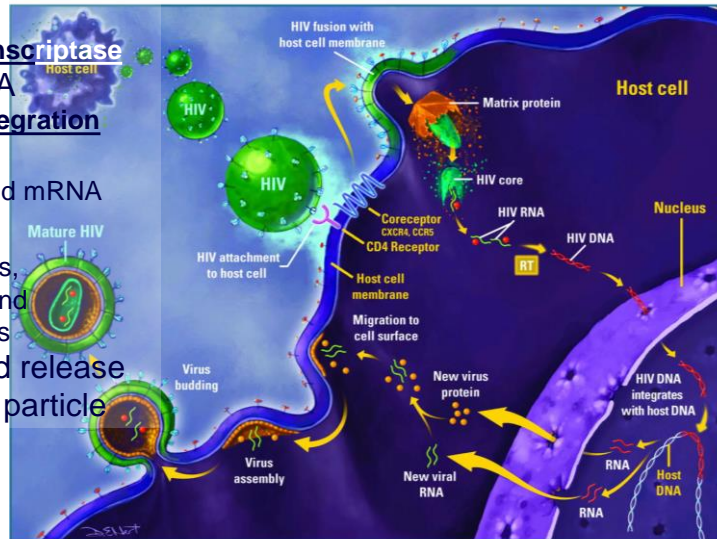


<http://www.nature.com/nature/journal/v410/n6831/images/410988ac-2.jpg>



## HIV replication

- viral RNA
- **reverse transcriptase**
- proviral DNA
- **genome integration**
- replication
- viral RNA and mRNA
- translation
- viral proteins, proteases and glycosidases
- Budding and release of new viral particle

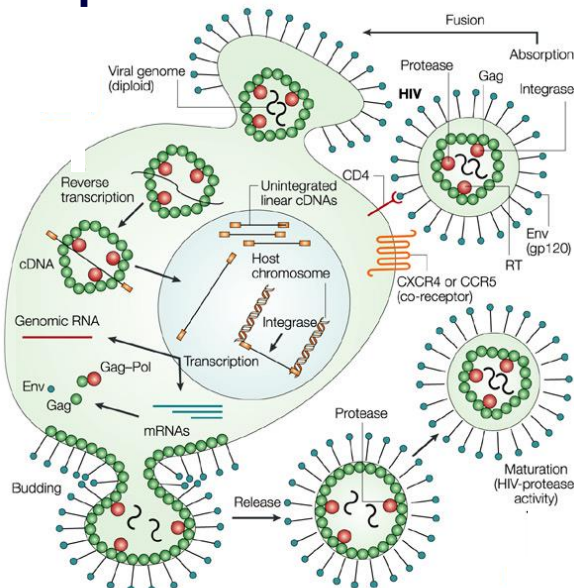


[http://home-hiv-tests.com/images/hiv\\_lifecycle.jpg](http://home-hiv-tests.com/images/hiv_lifecycle.jpg)



## HIV replication

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[http://www.nature.com/nrc/journal/v4/n11/box/nrc1479\\_BX1.html](http://www.nature.com/nrc/journal/v4/n11/box/nrc1479_BX1.html)

Nature Reviews | Cancer



## HIV – infected cells

- **helper T cells** (specifically CD4+)
- **macrophages**
- **dendritic cells**
- **1<sup>st</sup> proliferation in lymphatic tissue – viraemia**
- **Latency**
- **Impact on cells**
  - ↓ counts of CD4+ T cells by:
    - apoptosis of uninfected bystander cells
    - direct viral killing of infected cells
    - killing of infected CD4+ T cells by CD8+ cytotoxic lymphocytes that recognize infected cells



<http://www.topnews.in/health/files/hiv2.jpg>

**Observation of opportunistic infections**



## Types of HIV

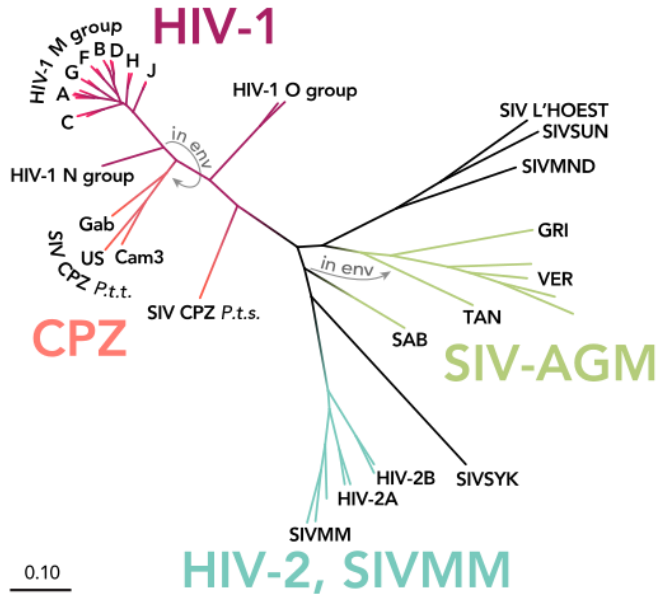
- **HIV -1**

<b>M</b> <sub>(major)</sub>	A	West and Central Africa
	B	Europe, North America, Thailand
	<b>C</b>	<b>South Africa, India</b>
	D	Central Africa
	E	Central Africa, Thailand, India
	F	Zaire, Brazil, Romania
	G	Gabun, Zaire
	H	Cameroon, Gabun
	I	complex recombination CRF04_cpx
	J	North, Central and West Africa, Caribbean
	K	Democratic Republic of Congo, Cameroon
	<b>N</b> <sub>(non M, non O)</sub>	Cameroon
	<b>O</b> <sub>(outlier)</sub>	Central Africa
	<b>P</b> <sub>(pending)</sub>	Cameroonian woman from France (similar to SIV (gorillas and chimpanzees))
- **HIV 2** groups A-H Central Africa

Not only human – FIV, SIV, ...



# Types of HIV



Not only human – FIV, SIV, ...

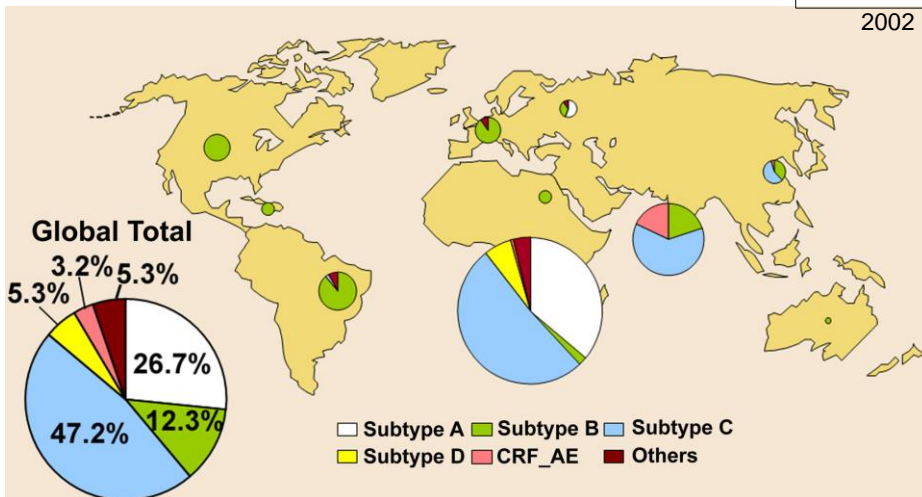
[https://upload.wikimedia.org/wikipedia/commons/thumb/f/fb/HIV-SIV-phylogenetic-tree\\_straight.svg/180px-HIV-SIV-phylogenetic-tree\\_straight.svg.png](https://upload.wikimedia.org/wikipedia/commons/thumb/f/fb/HIV-SIV-phylogenetic-tree_straight.svg/180px-HIV-SIV-phylogenetic-tree_straight.svg.png)



# Types of HIV



2002



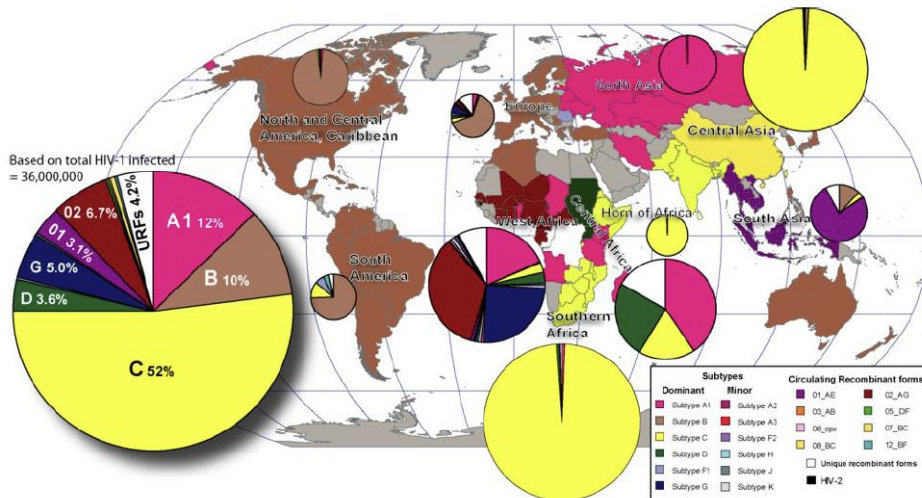
[http://en.wikipedia.org/wiki/File:HIV-1\\_subtype\\_prevalence\\_in\\_2002.png](http://en.wikipedia.org/wiki/File:HIV-1_subtype_prevalence_in_2002.png)



## Types of HIV

Subtype C is dominating the epidemic

2008



[http://www.hiviralload.com/storage/Hiv%20subtype%20image.png?\\_\\_SQUARESPACE\\_CACHEVERSION=1334260611148](http://www.hiviralload.com/storage/Hiv%20subtype%20image.png?__SQUARESPACE_CACHEVERSION=1334260611148)



## HIV pathogenesis

### • Clinical stages

*Depends on infectious dose and genetic background of the patient*

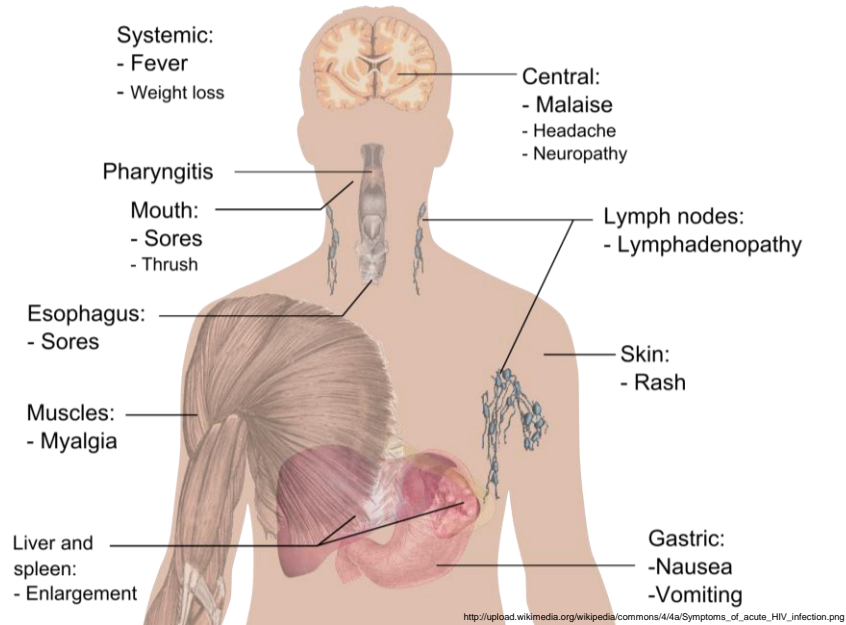
- **A - asymptomatic (CD4+ > 500/μl)**  
(acute infection, benign lymphadenopathy)
- **B – light opportunistic infections (CD4+ 200-500/μl)**  
(oropharyngeal or vulvovaginal candidiasis, diarrhea, „hairy“leucoplaky, peripheral neuropathy)
- **C - severe opportunistic infections (CD4+ < 200/μl)**  
(CMV retinitis, pneumocystis pneumonia, toxoplasmosis or HIV encephalitis, tuberculosis, Kaposhi sarkoma, lymphoma, cryptococcus infection..)



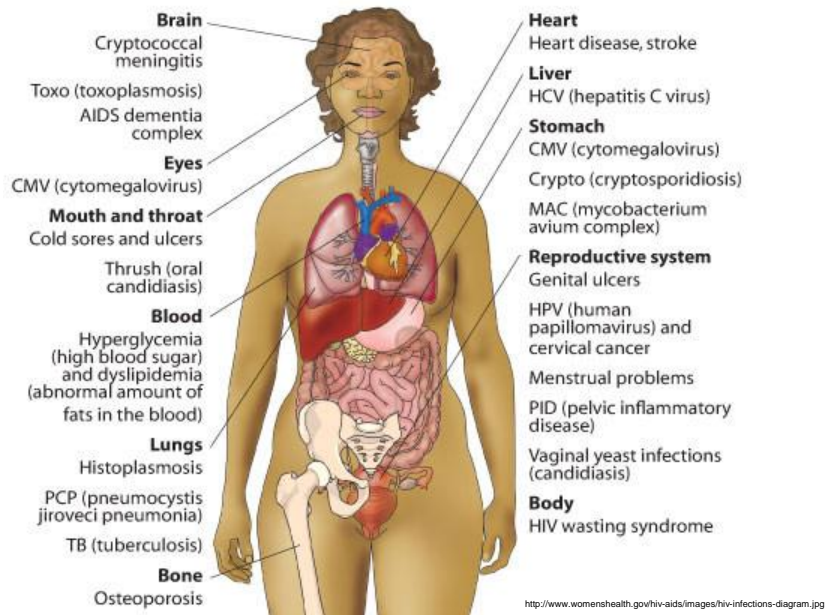
**AIDS – Acquired Immunodeficiency Syndrome**



## Symptoms of acute HIV infection



## Symptoms of opportunistic infections





## Laboratory diagnostics

### general

- Antigen detection – antigen p24/25
  - In acute phase
  - During active viral proliferation
- Antibody detection
  - Basic screening technique – anti p24/25
- RNA (quantitative) detection
  - Quantification of viral load
- Detection of proviral integrated DNA



## Laboratory diagnostics

### detail

- Antibody detection
  - Mainly ELISA tests
  - Screening – necessity of confirmation
  - Positive at about 20 days post infection
- Antibody + antigen detection
  - Screening – necessity of confirmation
  - Positive at about 16-18 days post infection
- All test have to be confirmed





## HIV epidemiology

- 1<sup>st</sup> „wave“
  - Blood transmission, MSM
  - 70-80 % of infected were men
  - North America and Europe
- 2<sup>nd</sup> „wave“
  - Infection mainly by MSW
  - Ratio of infected men and women 1:1
  - Africa, Asia and spread to other countries



## Summary of global HIV epidemic

2018  
**Globally**  
**37.9 million**  
 People living with HIV



**+20%**  
 Relative to 2010

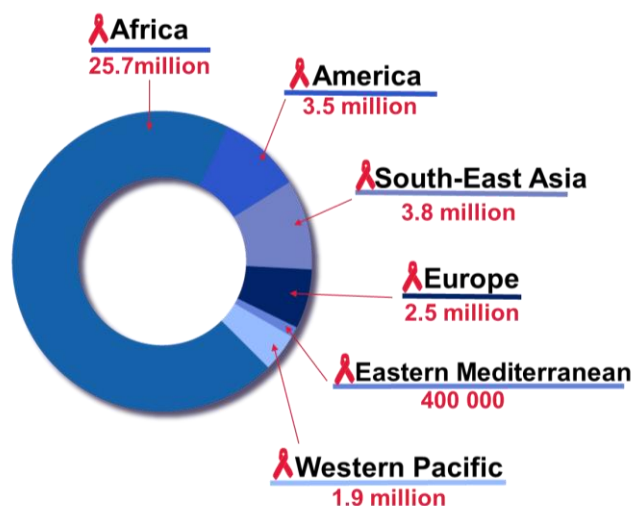


World Health  
 Organization



## People living with HIV by WHO region (2018)

**37.9 million**  
people living  
with HIV globally



World Health  
Organization

Source: UNAIDS/WHO estimates



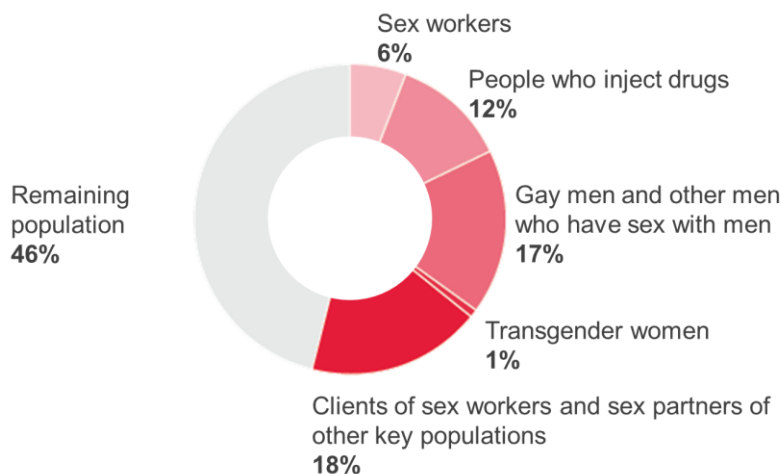
World Health  
Organization

## Summary of global HIV epidemic (2018)

	People living with HIV in 2018	People newly infected with HIV in 2018	HIV-related deaths 2018
<b>Σ</b> Total	<b>37.9 million</b> [32.7 million – 44.0 million]	<b>1.7 million</b> [1.4 million – 2.3 million]	<b>770 000</b> [570 000 – 1.1 million]
 Adults	<b>36.2 million</b> [31.3 million – 42.0 million]	<b>1.6 million</b> [1.2 million – 2.1 million]	<b>670 000</b> [500 000 – 920 000]
 Women	<b>18.8 million</b> [16.4 million – 21.7 million]	–	–
 Men	<b>17.4 million</b> [14.8 million – 20.5 million]	–	–
 Children (<15 years)	<b>1.7 million</b> [1.3 million – 2.2 million]	<b>160 000</b> [110 000 – 260 000]	<b>100 000</b> [64 000 – 160 000]

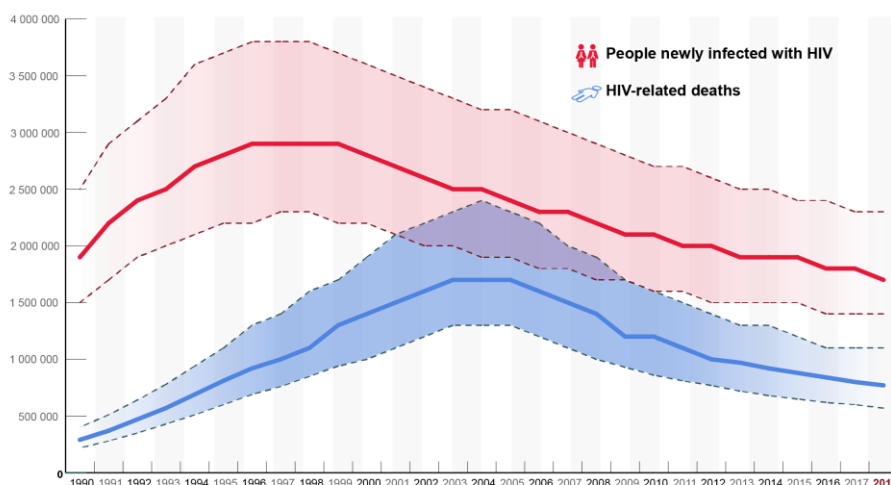
Source: UNAIDS/WHO estimates.

## Distribution of new HIV infections by key population, global (2018)



Source: UNAIDS special analysis, 2019

## Decline in HIV incidence and mortality over time

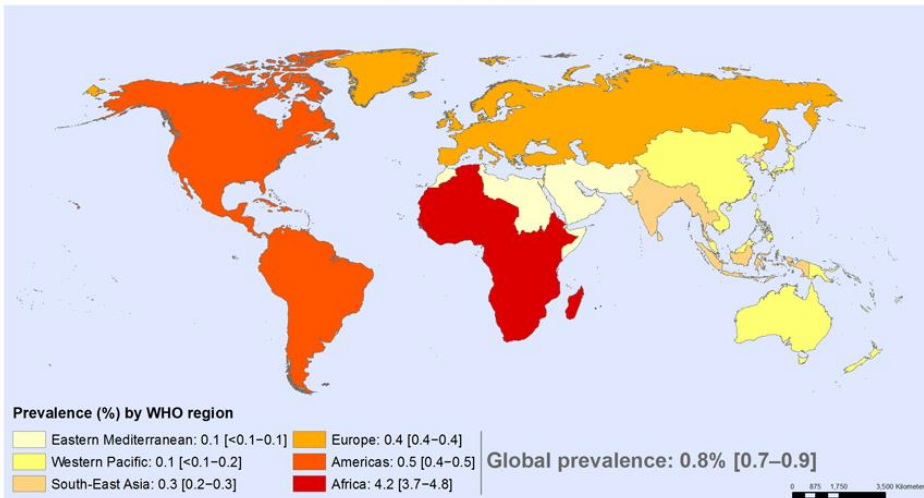


Source: UNAIDS/WHO estimates.



# HIV prevalence

Prevalence of HIV among adults aged 15 to 49, 2016  
By WHO region



The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted and dashed lines on maps represent approximate border lines for which there may not yet be full agreement.

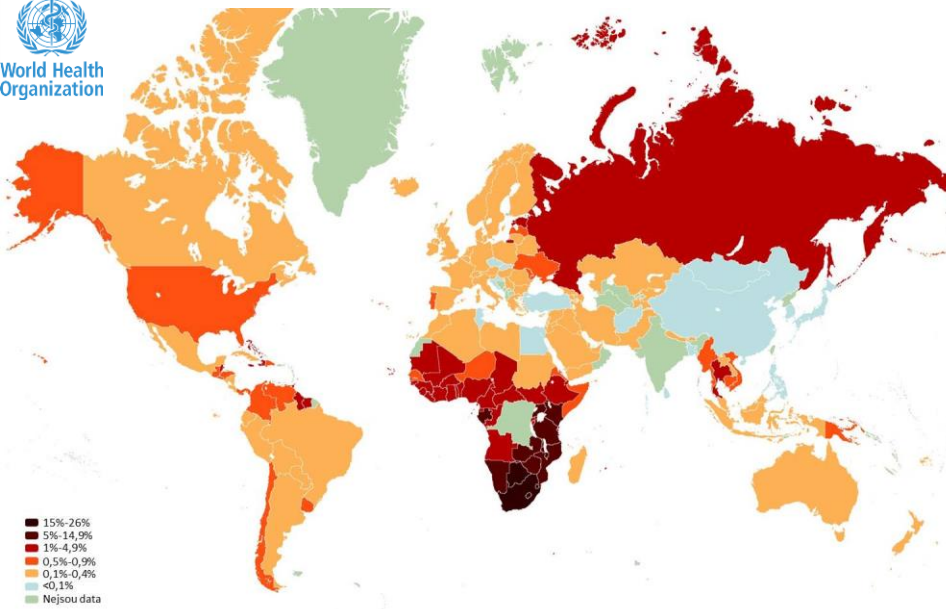
Data Source: World Health Organization  
Map Production: Information Evidence and Research (IER)  
World Health Organization



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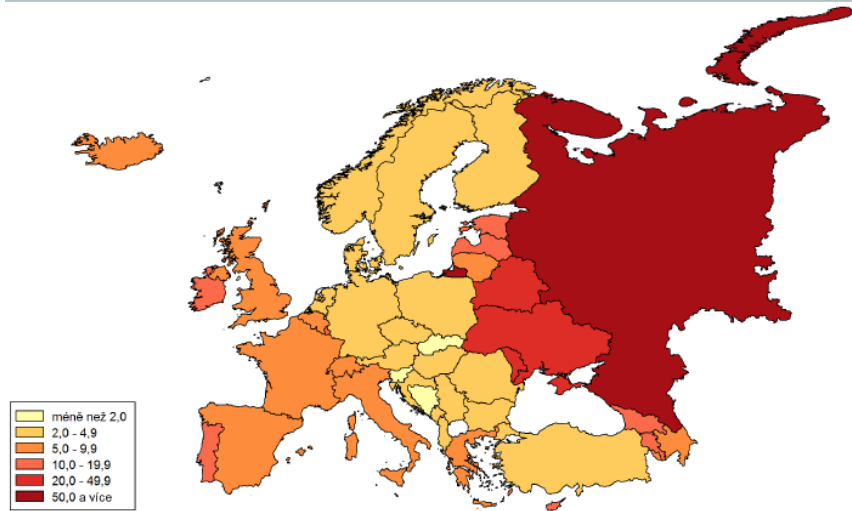
# HIV prevalence (2014)





## New cases of HIV infection 2017

Nové případy infekce HIV v roce 2017 v Evropě  
Relativní údaje na 100 000 obyvatel



NRL AIDS

Zdroj: ECDC, RKI



Němeček HVD2019



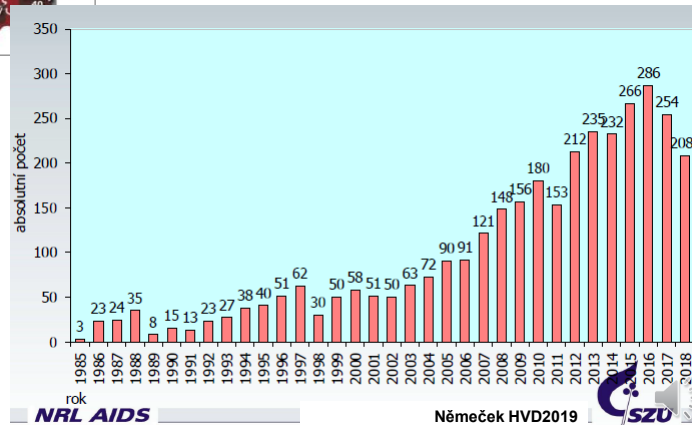
## Epidemiological HIV data CR



INFEKCE V ČESKÉ REPUBLICE  
1985 - 2015



Cumulative data f new HIV+  
cases up to 31.8.2019



NRL AIDS

Němeček HVD2019





## Epidemiological HIV data CR HIV/AIDS 1985-31.8.2019



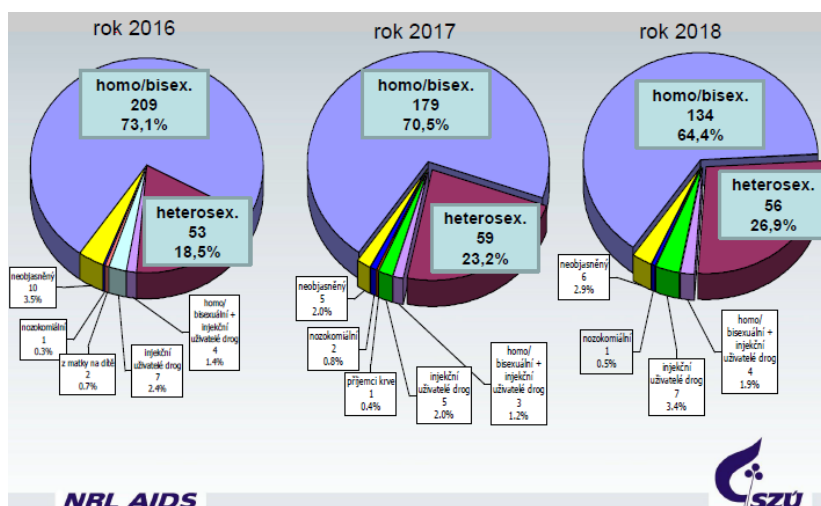
<b>Total No. of HIV+</b>	<b>3536</b>	
	M	3056 (86.4%)
	F	480 (13.6%)
<b>AIDS (658)</b>	M	538 (81.8%)
	F	120 (18.2%)
<b>Deceased with AIDS (308)</b>	M	251 (81.5%)
	F	57 (18.5%)
<b>Deceased from another reason (147)</b>	M	130 (88.4%)
	F	17 (11.6%)

NRL AIDS

Němeček  
HVD2019

## Epidemiological HIV data CR

New cases according to the transmission 2016-2019



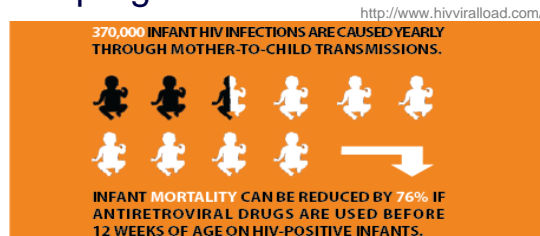
NRL AIDS

Němeček  
HVD2019



## HIV prevention

- Prevention of exposition
  - Health education for people
  - Control of blood and blood derivatives
  - Babies of the HIV+ mothers
- Stop of spreading of the infection in the body
  - Vaccines (so far in development)
  - Limitation of Mother to child transmission
- Decrease of the illness progression
  - Virostatic treatment



## Possible HIV vaccines

- Typ of vaccine
  - Surface antigen (subunit)
  - Control of blood and blood derivatives
- Attenuated virus
- Poxvirus expressing the HIV antigens
- Possible problems
  - Virus variability
  - Long time for development of immunity
  - Risky for children





## HIV treatment

- Receptor neutralisation                      Solution of anti-CD4  
Neutralizing antibody  
CD4+ imunoadhesins
- Reverse transcriptase inhibitors AZT(Retrovir), ddI(Videx)  
(RTIs)    3TC(Epivir)...
- Inhibitors of integrase
- Inhibitors of transcription                      Ribavirine
- Protease inhibitors (PI)                      Saquinavir, Ritonavir...
- Antiglycosidase

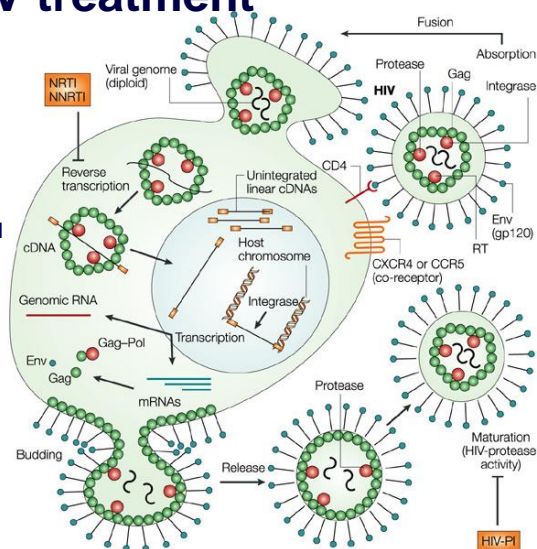
## HAART – Highly Active AntiRetroviral Therapy

usual HAART regimen combines 3 or more different drugs such as 2 nucleoside RTIs and PI, 2 nucleoside RTIs and a non-nucleoside reverse transcriptase inhibitor (NNRTI) or other such combinations



## HIV treatment

- Receptor neutralisation
- Reverse transcriptase inhibitors (RTIs) – **NRTI a NNRTI**
- Inhibitors of integrase
- Inhibitors of transcription
- Protease inhibitors (PI)
- Antiglycosidase



## HAART

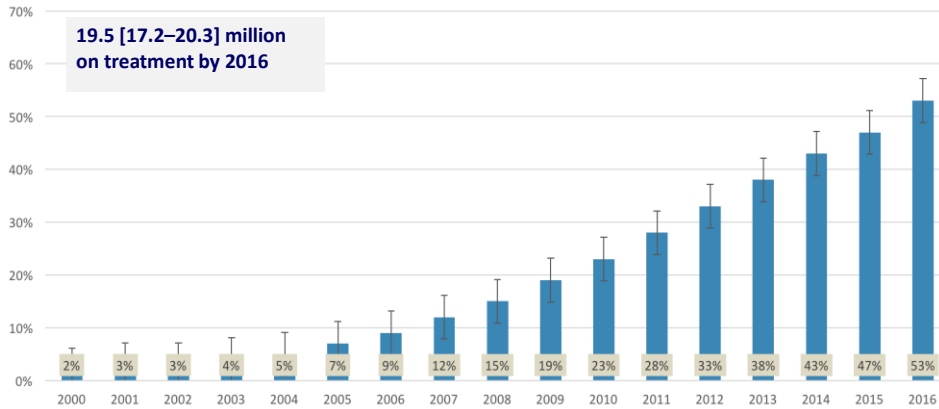
usual HAART regimen combines 3 or more different drugs such as 2 nucleoside RTIs and PI, 2 nucleoside RTIs and a non-nucleoside reverse transcriptase inhibitor (NNRTI) or other such combinations

Nature Reviews | Cancer





## ART coverage over time



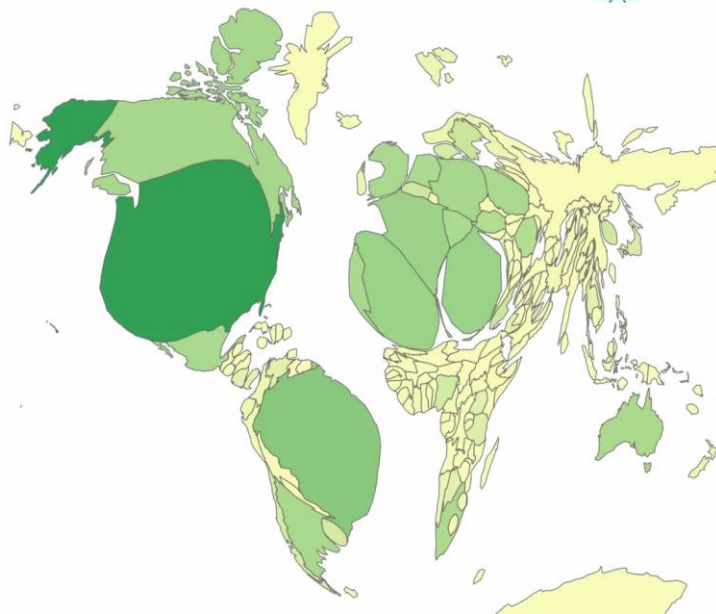
Source: UNAIDS/WHO estimates.

19.5 millions (17 in 2015) of people had access to antiretroviral therapy

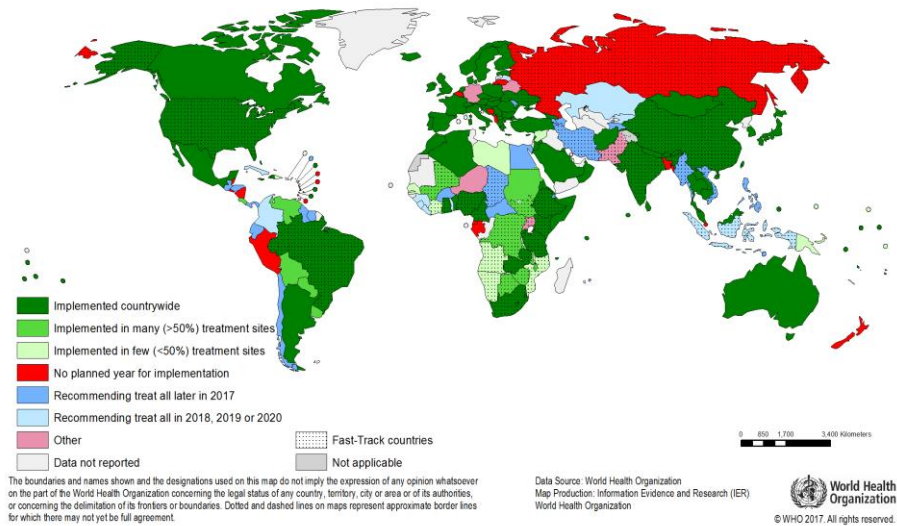
### HAART

- 2 nucleoside RTIs and PI
- 2 nucleoside RTIs and a NNRTI
- ...

Countries with size proportional to people on ART, 2000-2016



### Implementation of Treat All recommendation among adults and adolescent living with HIV (situation as of July 2017)



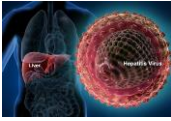
## Factors influencing the survival

- ↓ of viral load – primoinfection therapy
- Treatment of the opportunistic infections
- Careful use of common vaccines
- Treatment during decrease of CD4 lymphocyte count

**After HAART**

**IRIS –  
Immune Reconstitution  
Inflammatory Syndrome  
can be observed.**





## Viral hepatitis

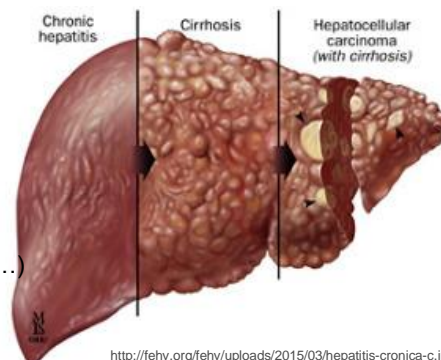
- **A** RNA virus Picornaviridae /Heparnavirus
- **B** DNA virus Hepadnaviridae/Hepadnavirus
- **C** RNA virus Flaviviridae/Flavivirus
- **D** RNA virus HBV dependent/Deltavirus
- **E** RNA virus Hepeviridae
- **G** RNA virus Flaviviridae
- **TTV** DNA virus Anelloviridae

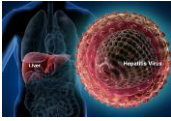


## Hepatitis

Hepatitis is a disease of the liver characterized by the presence of inflammatory cells in the tissue of the organ. Hepatitis may occur without symptoms, but can lead to jaundice (a yellow discoloration of the skin, mucous membranes, and conjunctiva of the eyes), poor appetite, and fatigue. (Wikipedia)

- acute – chronic
- cirrhosis – fibrosis
- potentially lethal
- treatment
  - hepatoprotective drugs
  - liver-protective food (no/low fat...)



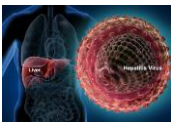


## Hepatitis A Virus (HAV)

- small RNA virus (27-30 nm)
- non-enveloped - Picornavirus
- genetically homogenous
- resistant to environment
- Transmission fecal-oral route through GIT
- release in stool
- human restricted pathogen

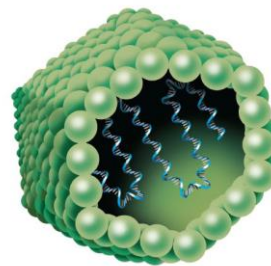


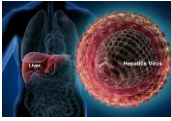
<http://www.healthsyn.com/wp-content/uploads/2013/01/JAUNDICE.jpg>



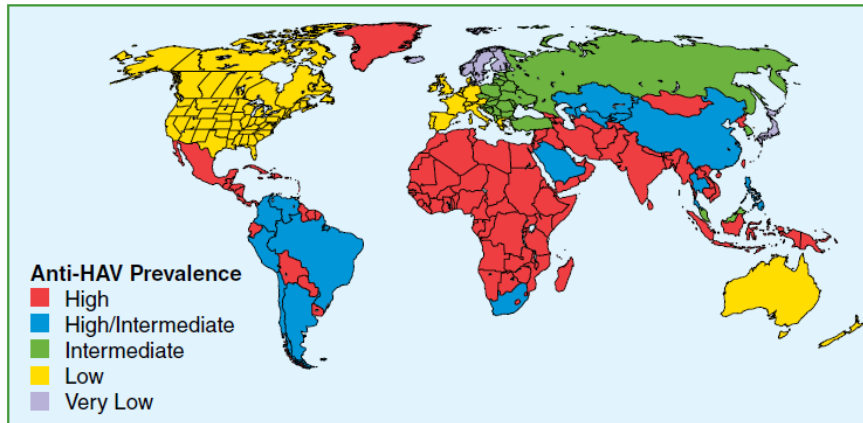
## Hepatitis A Virus (HAV) Pathogenesis

- Incubation period 15-45 days
- Primary proliferation in enterocytes
- Short viremia
- Subsequently infects hepatocytes and release to the stool through bile
- No ability to chronic infection





## Hepatitis A Virus (HAV) Geographic distribution

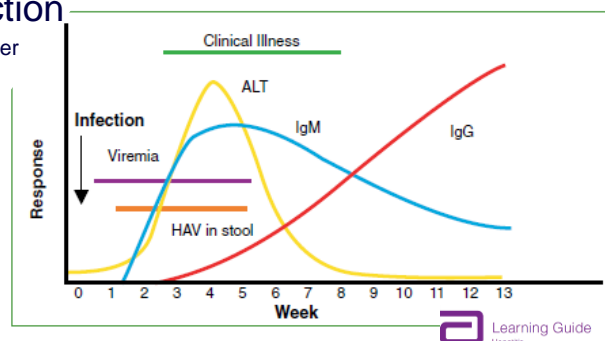


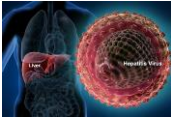
*\*Note: This map has been generalized from available data.*



## Hepatitis A Virus (HAV) Diagnostics

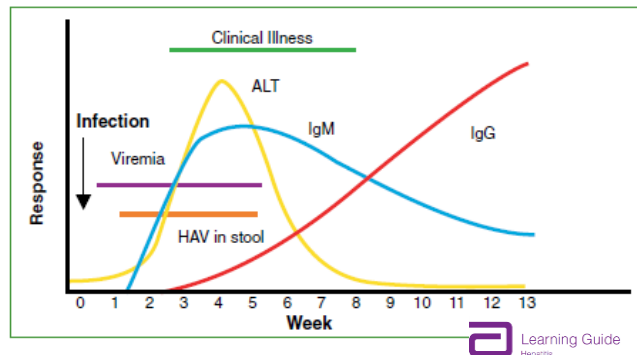
- Electronmicroscopy in stool
  - In the 2<sup>nd</sup> part of incubation period, shortly after start of the clinical symptoms
- Antigen and RNA detection
  - In stool, similar to EM
- Antibody detection
  - Main diagnostic marker





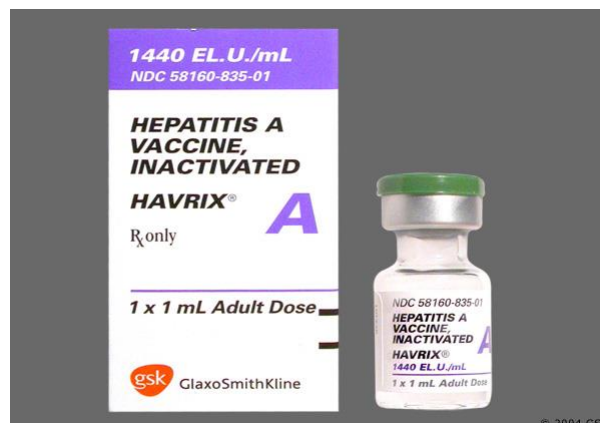
## Hepatitis A Virus (HAV) Diagnostics - antibody

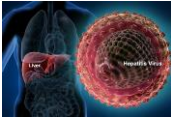
- Total Immunoglobuline (Ig)
  - Acute infection
  - Post infection immunity
  - Post vaccination immunity
- Specific IgM
  - Acute infection
  - Convalescence (even > 1 yr)



## Hepatitis A Virus (HAV) Therapy and prevention

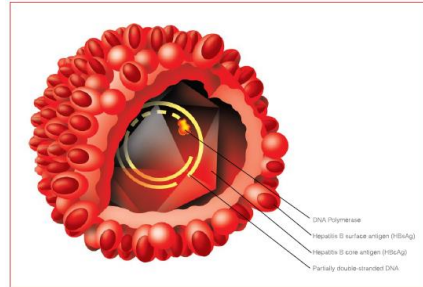
- No specific treatment
- Prophylaxis with human immunoglobuline
- Vaccination
  - (Havrix..)



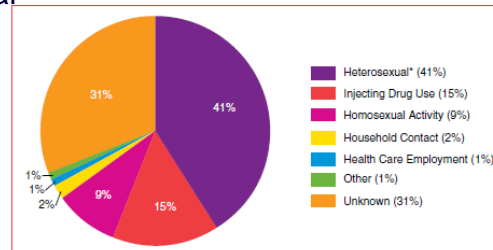


## Hepatitis B Virus (HBV)

- DNA virus with complicated life cycle
- enveloped
- genus – Hepadnavirus
- Antigen structures important for diagnostics
- HBV subtypes without clinical importance
- Sensitive to environmental conditions
- Blood and sexually transmitted
- human restricted pathogen



Risk Factors for Acute Hepatitis B in the U.S., 1992 – 93 Learning Guide

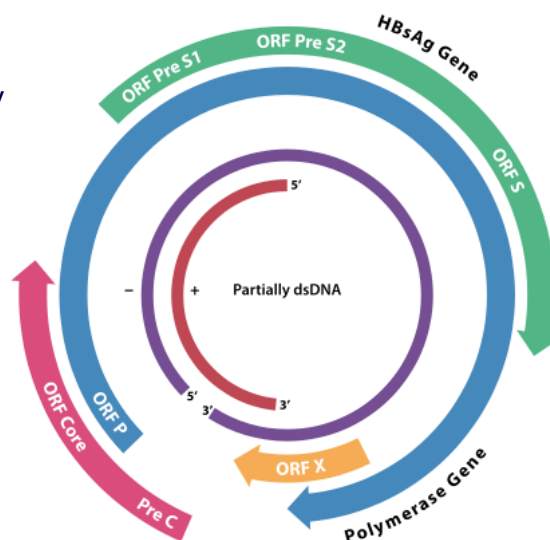


Source: Centers for Disease Control and Prevention Sentinel Counties Study of Viral Hepatitis  
\*Includes sexual contact with acute cases, carriers, and multiple partners

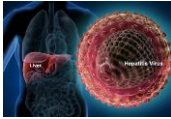


## Hepatitis B Virus (HBV) Genome structure

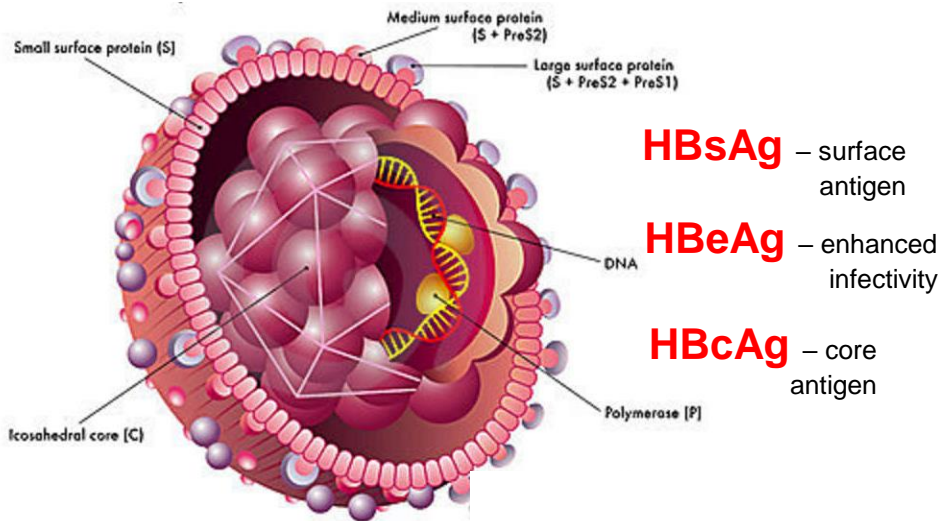
- circular DNA, not fully double-stranded
- one end of the full length strand linked to the viral DNA polymerase
- genome 3020–3320 nucleotides long (full-length strand) and 1700–2800 nucleotides long (short length-strand)



[http://upload.wikimedia.org/wikipedia/commons/thumb/0/00/HBV\\_Genome.svg/425px-HBV\\_Genome.svg.png](http://upload.wikimedia.org/wikipedia/commons/thumb/0/00/HBV_Genome.svg/425px-HBV_Genome.svg.png)



## Hepatitis B Virus (HBV) Viral structure



<http://thumbs.dreamstime.com/z/hepatitis-b-virus-22144156.jpg>



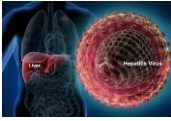
## Hepatitis B Virus (HBV) Clinical symptoms

- acute illness
- history of blood administration
- incubation period 2-6 months
- long lasting infection
- switch to chronicity in 5-10%
  - Hepatic fibrosis



[http://www.google.cz/url?sa=i&rc=1&q=&esrc=s&source=images&cd=&cad=rja&docid=rOwLNq81W11SaM&img=STc4TtPRLbqMYM&ved=4url=http%3A%2F%2Faqulitp.blogspot.com%2F2013%2F08%2Fchrosis.html&as\\_n\\_zwVkgpLc55A1TqY1Covw&vm=3v.53899372.z1bGE&pg=AFQjQNG75wAjskUy5GPlU0YNHCVYq40&ust=1381519543876090](http://www.google.cz/url?sa=i&rc=1&q=&esrc=s&source=images&cd=&cad=rja&docid=rOwLNq81W11SaM&img=STc4TtPRLbqMYM&ved=4url=http%3A%2F%2Faqulitp.blogspot.com%2F2013%2F08%2Fchrosis.html&as_n_zwVkgpLc55A1TqY1Covw&vm=3v.53899372.z1bGE&pg=AFQjQNG75wAjskUy5GPlU0YNHCVYq40&ust=1381519543876090)

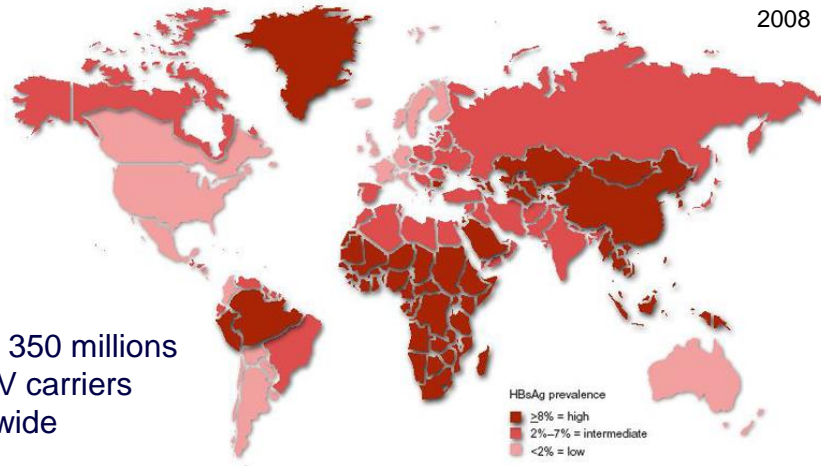




# Hepatitis B Virus (HBV) Geographic distribution

2008

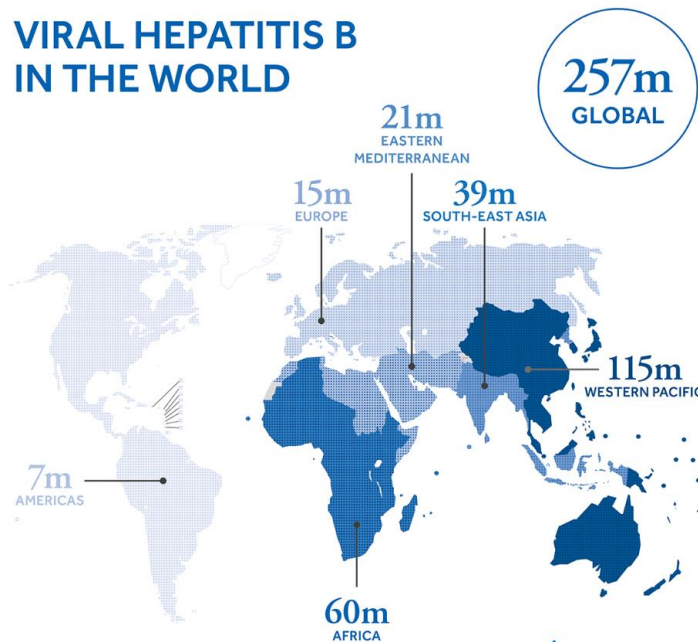
About 350 millions  
of HBV carriers  
worldwide



\* For multiple countries, estimates of prevalence of hepatitis B surface antigen (HBsAg), a marker of chronic HBV infection, are based on limited data and might not reflect current prevalence in countries that have implemented childhood hepatitis B vaccination. In addition, HBsAg prevalence might vary within countries by subpopulation and locality.  
Source: CDC. Travelers' health; yellow book. Atlanta, GA: US Department of Health and Human Services, CDC; 2008. Available at <http://www.cdc.gov/travel/yellowbookch4-HepB.aspx>.  
<http://img.medscape.com/fullsize/migrated/editorial/casecm/2008/17750/figure.png>



## VIRAL HEPATITIS B IN THE WORLD



2017



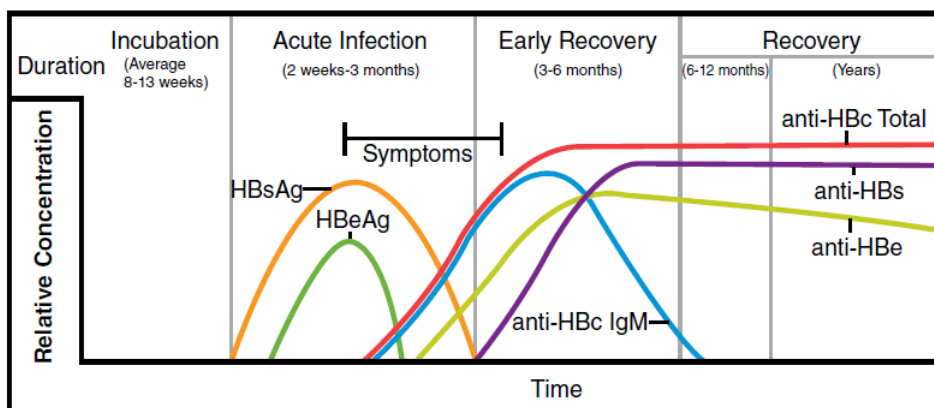
## Hepatitis B Virus (HBV) Diagnostic markers

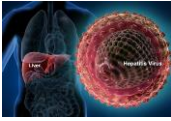
- Antigenes
  - HBs Ag
    - high amounts
    - in acute and chronic
    - sign of carrier
  - HBe Ag
    - marker of acute and active infection
  - DNA
    - Qualitative
    - Quantitative  
(treatment monitoring)
- Antibodies
  - anti HBs
    - in convalescence
    - after vaccination
  - anti HBe
    - in convalescence
  - anti HBc
    - lifelong evidence of infection



## Hepatitis B Virus (HBV) Antibody response

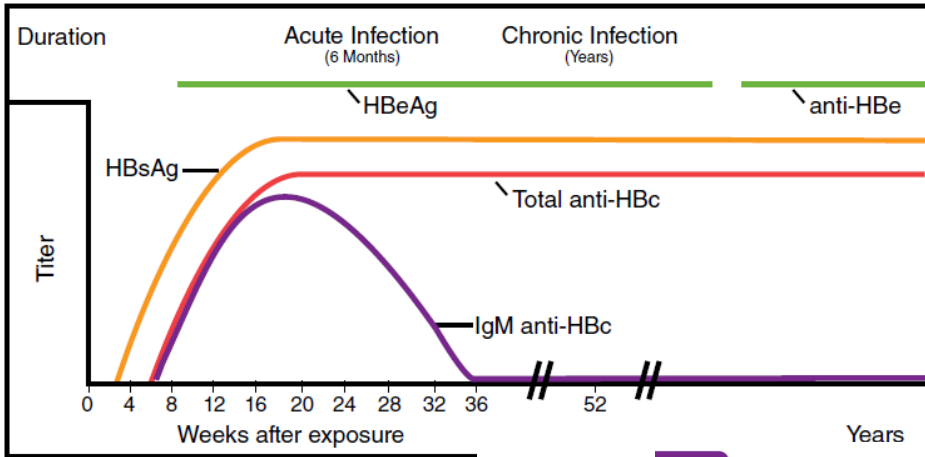
### Acute Hepatitis B Diagnostic Profile





## Hepatitis B Virus (HBV) Antibody response

Progression to Chronic HBV Infection Typical Serologic Course



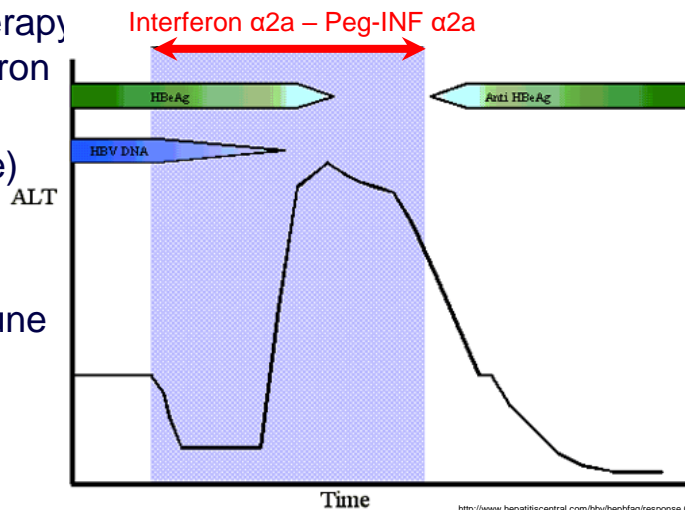
Learning Guide  
Hepatitis



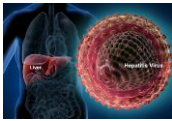
## Hepatitis B Virus (HBV) Therapy and prevention

- Immunotherapy with interferon
- Virostatics (lamivudine)
- Vaccine – Enderix..
- Hyperimmune globuline (HBIG)

**BUT...**



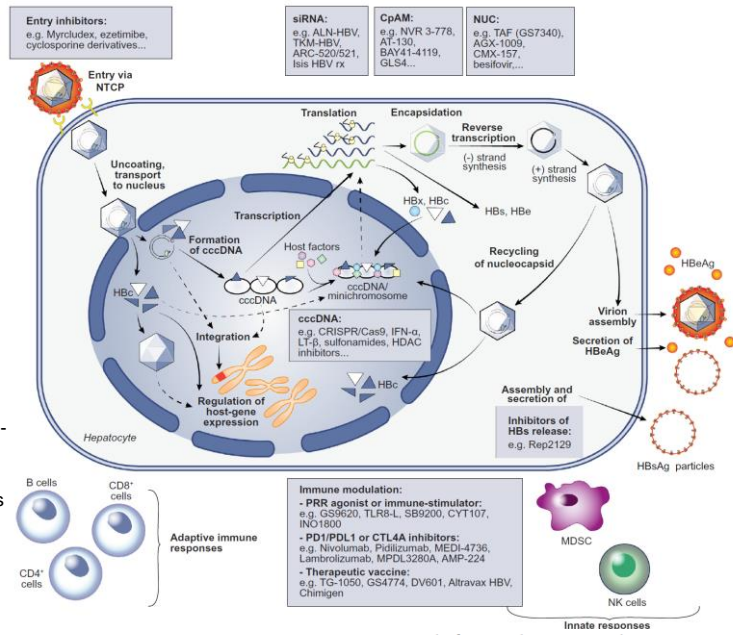
<http://www.hepatitiscentral.com/hbv/hepbfaq/response.GIF>



## Hepatitis B Virus (HBV) New therapy

### DAA

inhibitors of viral entry  
 new polymerase inhibitors  
 capsid and assembly inhibitors  
 virus release blockers  
 disruptors of cccDNA formation and transcription  
 Agents enhancing anti-HBV specific immune responses  
 including TLR agonists  
 checkpoint inhibitors  
 therapeutic vaccines



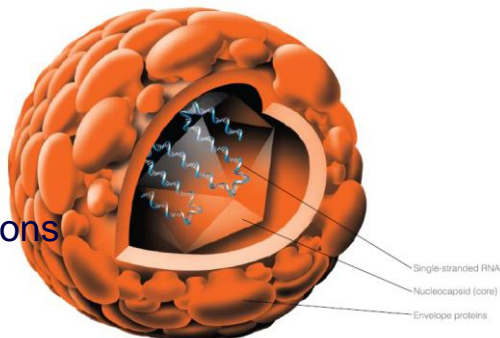
. 2. HBV life cycle and main classes of antivirals in development.

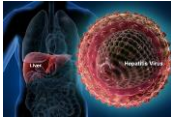
Journal of Hepatology 2016 vol. 64 | S117-S131



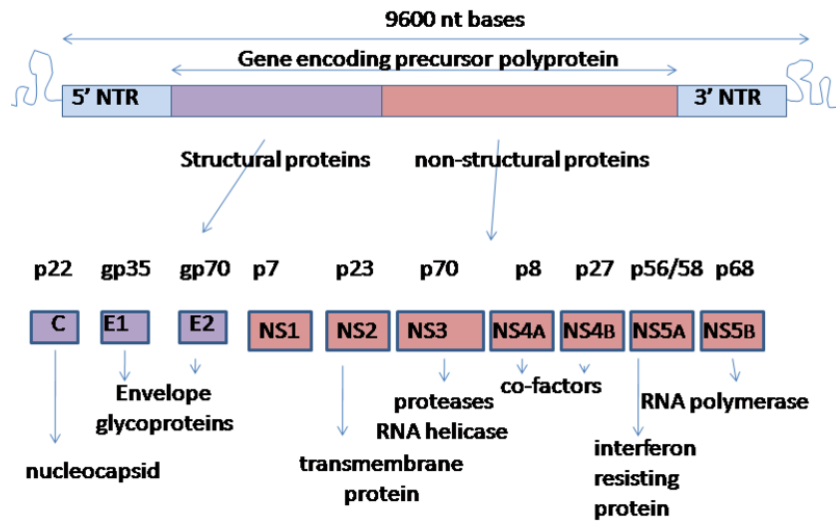
## Hepatitis C Virus (HCV)

- ss RNA virus (uncultivateable)
- Flavivirus
- 6 types and about 40 subtypes
- Sensitive to environmental conditions
- Blood and sexually transmitted
- Human restricted pathogen





## Hepatitis C Virus (HCV) Genome structure







[http://upload.wikimedia.org/wikipedia/commons/thumb/c/c0/HCV\\_genome.png/800px-HCV\\_genome.png](http://upload.wikimedia.org/wikipedia/commons/thumb/c/c0/HCV_genome.png/800px-HCV_genome.png)



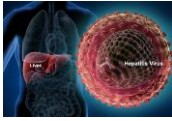
## Hepatitis C Virus (HCV) Clinical symptoms

- discreet start of illness
- often unicteric form 60-70%
- incubation period 2-7 wks (2-26 wks)
- long lasting infection
- switch to chronicity up to 80%
  - Hepatic fibrosis with progression to carcinoma

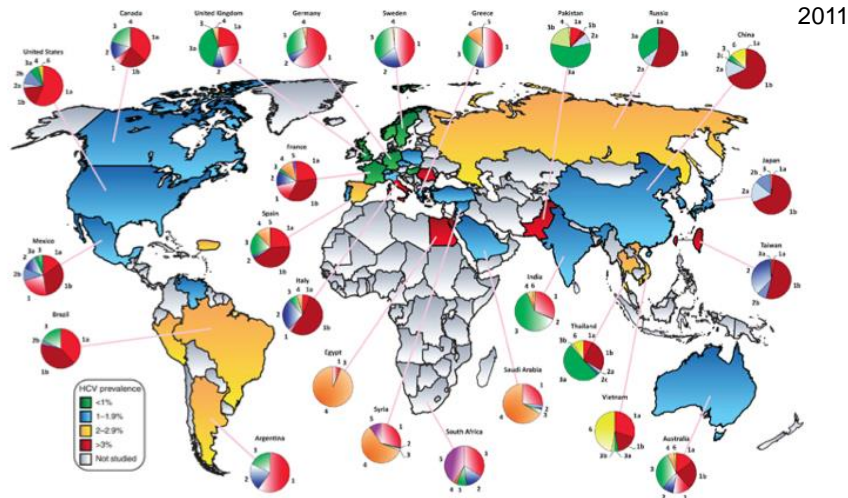


HEALTHY LIVER	FIBROTIC LIVER	CIRRHOTIC LIVER	LIVER CANCER
			
A healthy liver is able to perform its normal functions effectively, e.g. aiding digestion and breaking down harmful drugs and poisons.	Continuous inflammation of the liver caused by hepatitis C can lead to fibrosis – the formation of scar tissue within the liver.	Extensive scarring can block the flow of blood through the liver and cause liver function to deteriorate over time - this is called cirrhosis.	Hepatitis C is a leading cause of liver cancer – the formation of a malignant tumour in the liver.

<http://healthandlovepage.com/wp-content/uploads/2014/07/Progress-of-Liver-Damage.jpg>

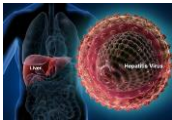


# Hepatitis C Virus (HCV) Geographic distribution

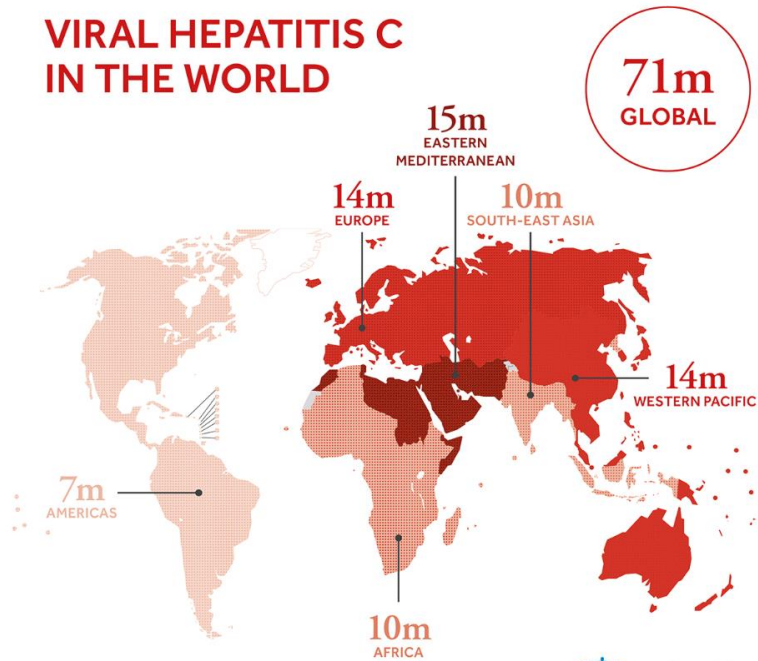


About 170 millions of HCV carriers worldwide

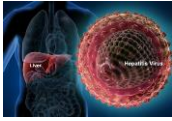
<http://loydbelcher.files.wordpress.com/2011/07/hcv-global-prevalence.png>



## VIRAL HEPATITIS C IN THE WORLD

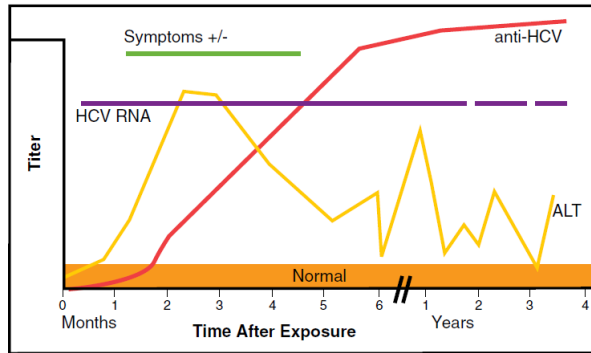


2017

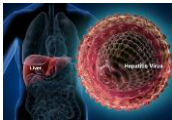


## Hepatitis B Virus (HBV) Diagnostics

- RNA
  - Qualitative or quantitative (treatment monitoring)
- Antibody detection anti-HCV (ELISA)
  - in infection and convalescence
  - < 3 months

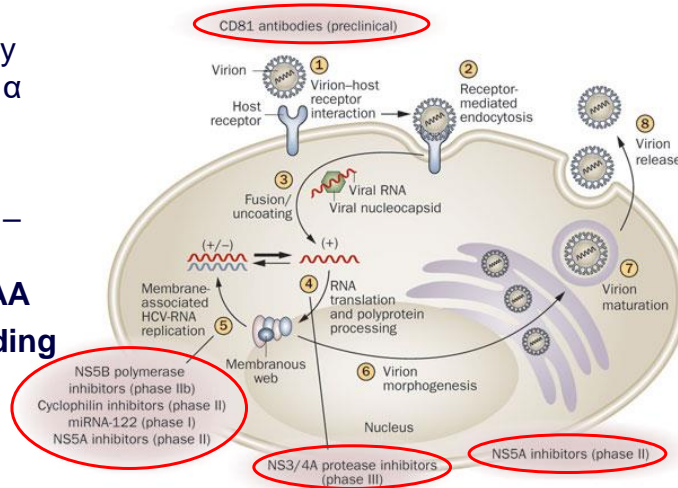


Serologic Pattern of Acute HCV Infection With Progression to Chronic Infection



## Hepatitis C Virus (HCV) Therapy and prevention

- Immunotherapy with interferon  $\alpha$
- Virostatics (ribavirine)
- Combined Th. – **Direct acting antivirals - DAA**
- **Differs according to the type of HCV**
- No Vaccine



<http://www.nature.com/nrgastrojournal/v6/n2/images/nrgastro.2010.219-f1.jpg>



## Hepatitis C Virus (HCV) Therapy and prevention

- **Direct acting antivirals**
  - **DAA**
    - nonstructural proteins 3/4A (NS3/4A) protease inhibitors (PIs)  
**telaprevir a boceprevir**
    - NS5B nucleoside polymerase inhibitors (NPIs)  
**grazoprevir, paritaprevir a simeprevir, sofosbuvir**
    - NS5B non-nucleoside polymerase inhibitors (NNPIs)  
**dasabuvir**
    - NS5A inhibitors  
**edipasvir, ombitasvir, elbasvir a daclatasvir**
  - **In some drugs, there are fixed combination of virostatics**

### STANDARDNÍ DIAGNOSTICKÝ

### A TERAPEUTICKÝ POSTUP

### CHRONICKÉ INFEKCE VIREM

### HEPATITIDY C (HCV)

Pracovní skupina pro virové hepatitidy České hepatologické společnosti České lékařské společnosti Jana Evangelisty Purkyně

Pracovní skupina pro virové hepatitidy Společnosti infekčního lékařství České lékařské společnosti Jana Evangelisty Purkyně

#### Autoři

Doc. MUDr. Petr Urbánek, CSc.

Prof. MUDr. Petr Husa, CSc.

MUDr. Jan Šperl, CSc.

Doc. MUDr. Stanislav Plíšek, Ph.D.

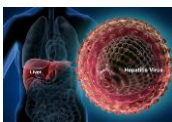
Doc. MUDr. Luděk Rožnovský, CSc.

MUDr. Petr Kitumpel

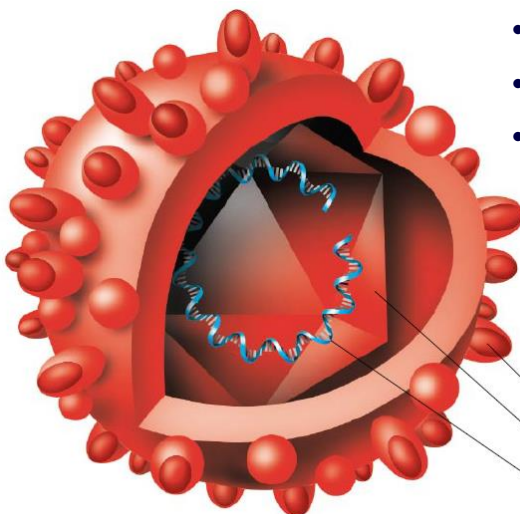
[www.ces-hep.cz](http://www.ces-hep.cz)

[www.infekce.cz](http://www.infekce.cz)

Datum: 29.10.2014



## Hepatitis D Virus (HDV)



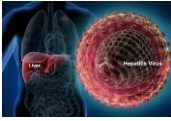
- ss RNA virus
- 36-43 nm
- HBV dependent virus (needs HBsAg)

Hepatitis B surface antigen (HBsAg)

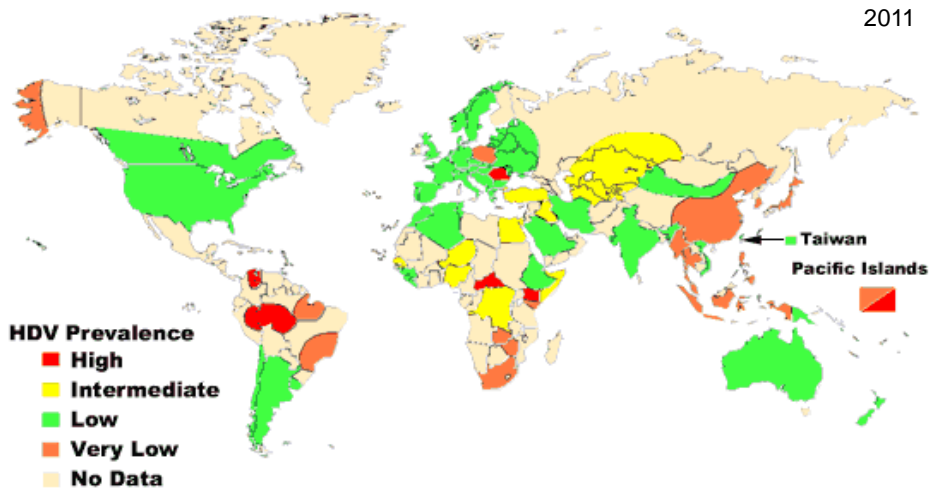
Hepatitis D antigen (HDAg)

Single-stranded negative sense RNA



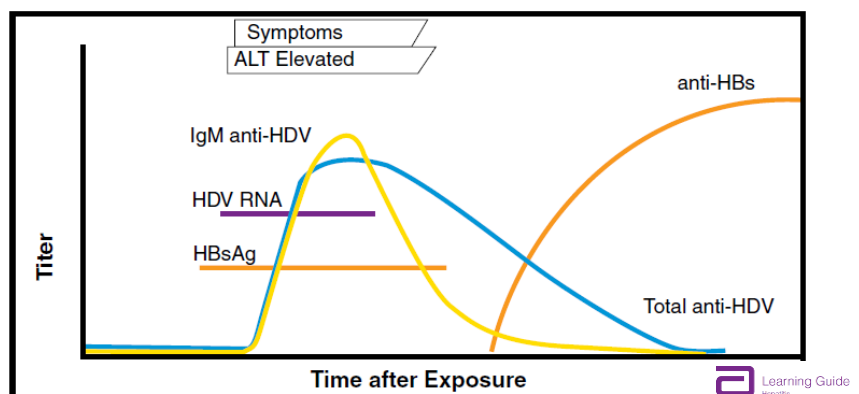


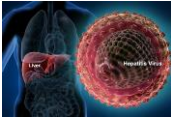
## Hepatitis D Virus (HDV) Geographic distribution



## Hepatitis D Virus (HDV) Clinical symptoms

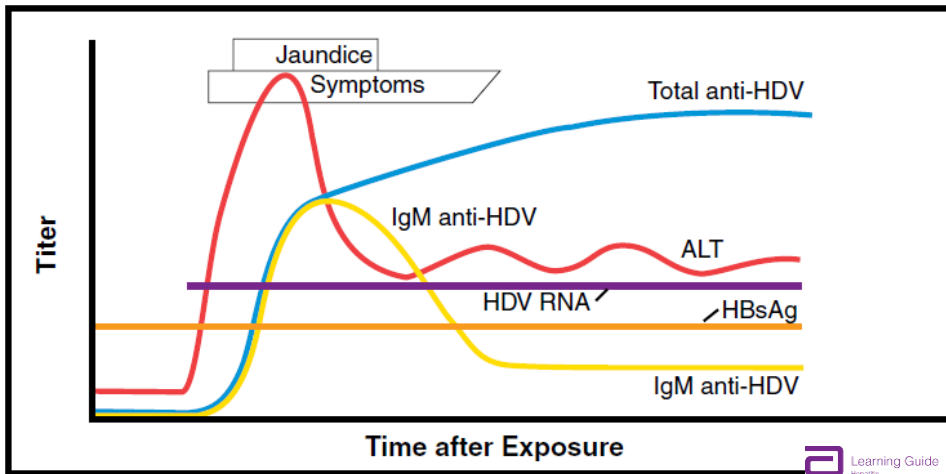
- **Co-infection** with HBV; transmission similar
- Incubation period 21-49 days; abrupt start
- More severe clinical course





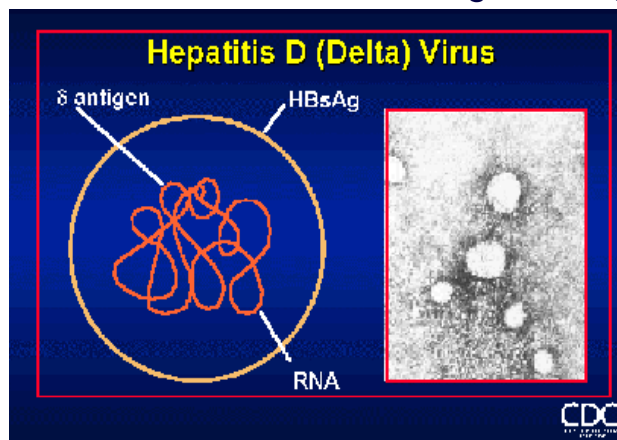
## Hepatitis D Virus (HDV) Clinical symptoms

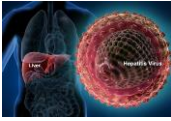
- Often chronic HBV **super-infection** (80%)



## Hepatitis D Virus (HDV) Diagnostics

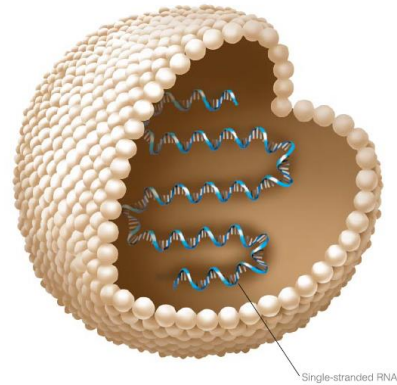
- RNA
- Antibody detection – IgM and IgG





## Hepatitis E Virus (HDV)

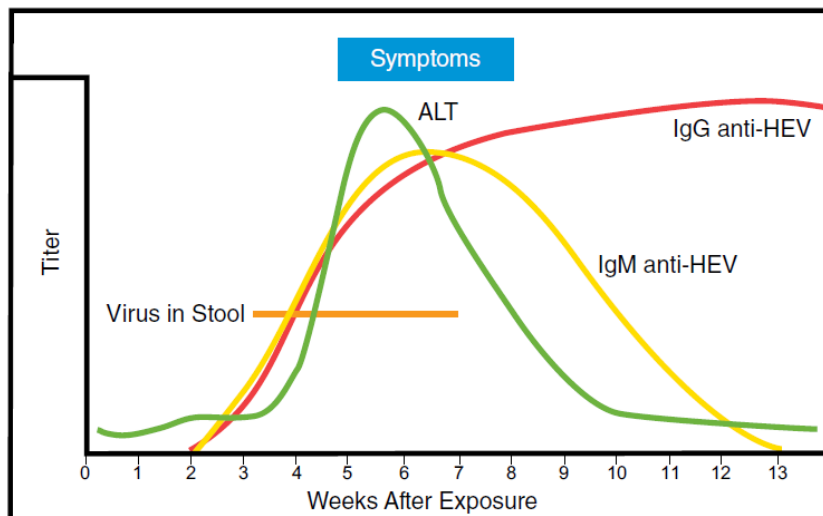
<b>Virus Family</b>	Hepeviridae
<b>Route of Transmission</b>	Fecal-oral (especially contaminated water)
<b>Onset</b>	Usually abrupt
<b>Incubation</b>	15 – 60 days, average 40 days
<b>Chronicity</b>	None reported
<b>Mortality</b>	About 1 – 3%, 15 – 25% in pregnant women



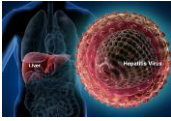
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hepatitis



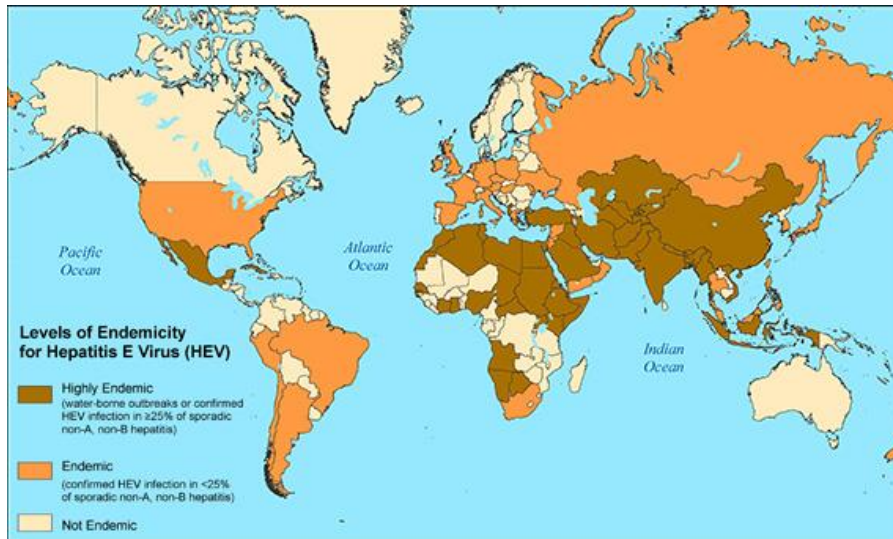
## Hepatitis E Virus (HEV) Diagnostics



 Learning Guide  
hepatitis



## Hepatitis E Virus (HEV) Geographic distribution

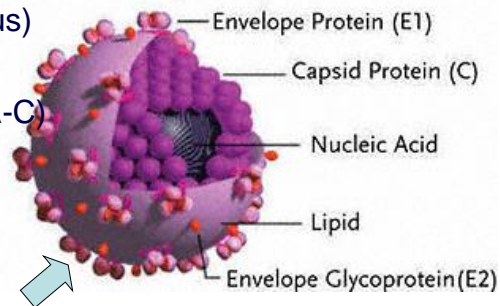


[http://www.cdc.gov/hepatitis/HEV/images/Map5\\_4\\_HepatitisE\\_sml.jpg](http://www.cdc.gov/hepatitis/HEV/images/Map5_4_HepatitisE_sml.jpg)

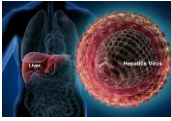


## Hepatitis G Virus (HGV)

- RNA virus similar to HCV (Flavivirus- genus Pegivirus)
- several types
- different HGV and GBV (A-C)
- Blood transmission
- Also in health population
- Pathogenic likely **GBV-C**
- **Diagnostics mainly PCR** (Antibody non reliable)

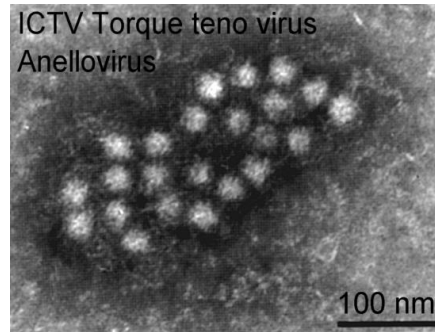


[http://www.prim.org/images/uploads/gbv-c\\_3d\\_high.jpg](http://www.prim.org/images/uploads/gbv-c_3d_high.jpg)



## Torque Teno Virus (TTV)

- DNA virus
- Uncertain pathogenity
- Blood transmission
- Also in health population
- **Diagnostics only PCR**



[http://ictvdb.bio-mirror.cn/Wintkey/Images/em\\_anell\\_ICTV.jpg](http://ictvdb.bio-mirror.cn/Wintkey/Images/em_anell_ICTV.jpg)



## Other viruses associated with hepatitis/hepatopathy

- **CMV**
- **EBV** (hepatopathy)
- **HSV**
- **adenovirus**
- **enterovirus**
- **Influenza**
- From exotic viruses – yellow fever virus, dengue fever virus and more...

