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Do we need hepatitis B vaccine?

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VACCINES AND VACCINATION DURING AND POST COVID PANDEMICS "VAC&VAC 2022"

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•CoWeb Platform of the Riga Stradins University, Riga, Latvia

•-budged by the International Society for Vaccines ISV

Hepatitis B virus (HBV)

1965 – Baruch Blumberg discovered Australian antigen (HBsAg)

1967 – Australian antigen was associated with hepatitis B

1971 – First blood test for HBV

1969-1972 – Chronic hepatitis B linked to the development of liver cancer
HBV infection is estimated to be the cause of 30% of cirrhosis and 53% of liver cancer in the world (2006)

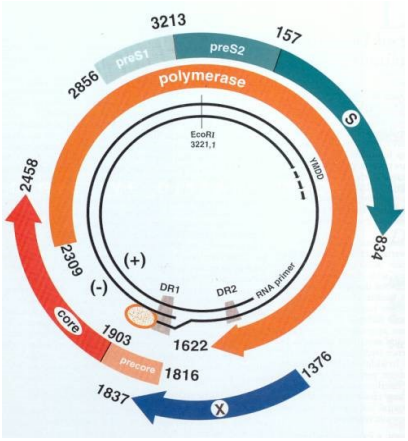
1976 - Nobel Prize in Physiology or Medicine was awarded jointly to Baruch Blumberg and Carleton Gajdusek "for their discoveries concerning new mechanisms for the origin and dissemination of infectious diseases”

Vaccine:
-1981 - First HBV plasma-derived vaccine
-1986 – Recombanant HBV vaccine – first genetically ingenered vaccine

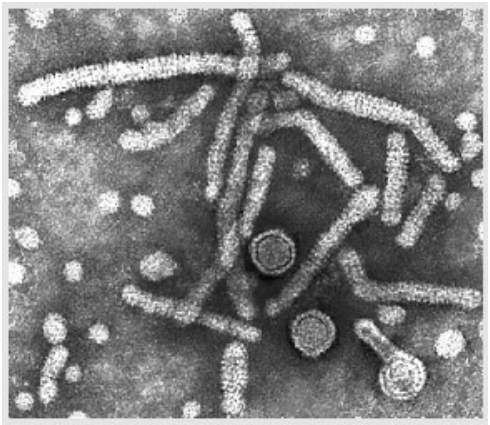
Hepatitis B virus, 3.2kb, partially double-stranded DNA, *Hepadnaviridae* family

(Hepatitis – causing DNA viruses)

Dane particles (Dane et al., Lancet 1970)



Genomic organization of HBV



Electron microscopy picture of 3 types of HBV particles in serum of infected patient

•Small S-gene ➡ HBsAg;
anti-HBs – protect against HBV infection

- Dane particles - 42-nm (HBV virion)
- Filamentous or tubular structures
- "Empty" spherical particles 22-nm

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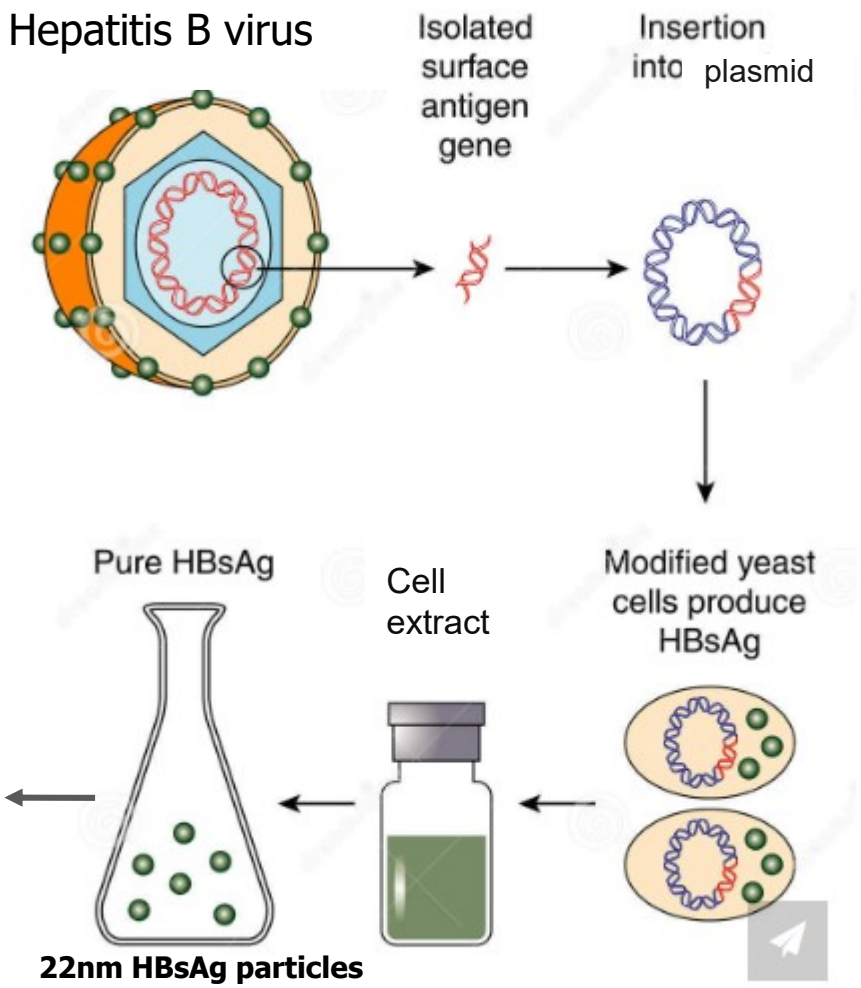
Recombinant HBV vaccine

First genetically ingenered vaccine



HBV vaccine

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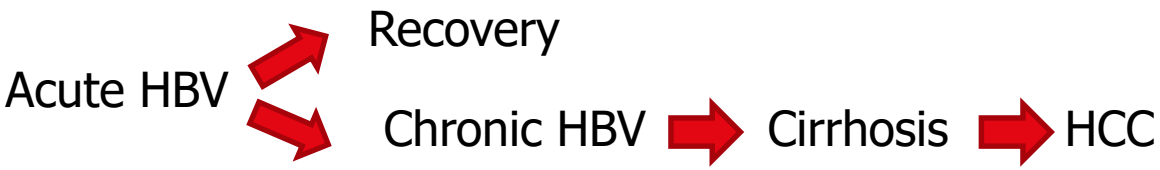
HBV vaccines

Vaccine	**Variant**	**Manufacturer**
Engerix-B	*Adw2 (genotype A) sLys122, sPro127, sLys160*	SmithKline Beecham
Recombivax HB	*Adw (genotype A)*	Merck

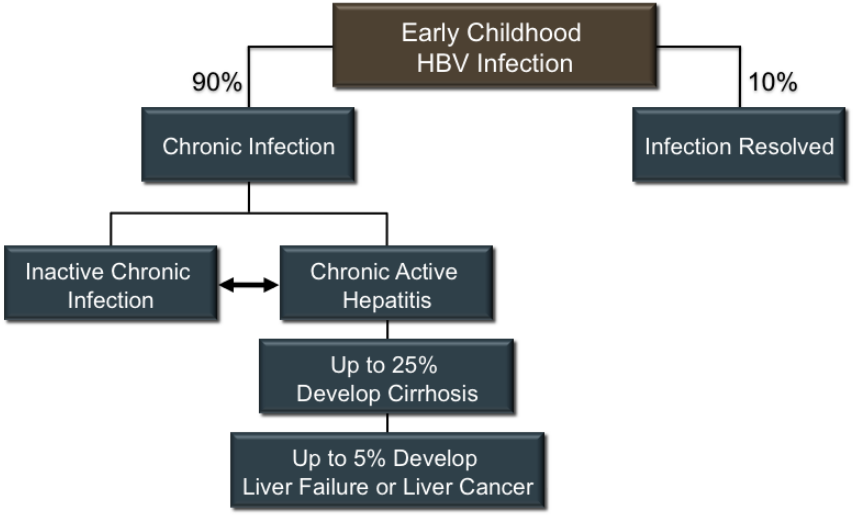
- Cross subtypes/genotypes efficient vaccine
- A series of 3 doses given on a 0-, 1-, 6-month schedule
- Highly effective

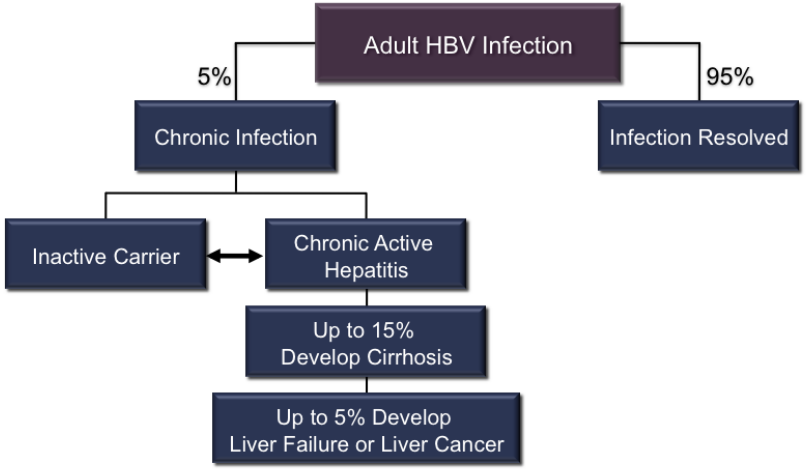
In 1992, the WHO recommended the inclusion of HBV vaccination in all national vaccination programs

Vaccination strategy: Who and When?



The risk to become a chronic carrier is age-associated:





The majority of infants who become infected with hepatitis B from their mothers go on to develop the chronic form of the infection.

Only 1 to 5% of adults will go on to chronic hepatitis B when exposed to the virus.

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Universal hepatitis B immunization: 3 strategies

1. Hepatitis B vaccination with 3 or four doses for all infants

2. Hepatitis B vaccine for all infants, and hepatitis B immunoglobulin (HBIG) for infants of HBsAg+/HBeAg+ mothers

3. Hepatitis B vaccine for all infants and HBIG for all infants of HBsAg+/HBeAg+ and HBsAg+/HBeAg- mothers

Impact of Worldwide vaccination Programs

2006 - 81 of 193 countries (42%) reported using a vaccination schedule with a birth dose

2019 – 189 (97%) countries had incorporated HBV vaccination in their national immunization schedule

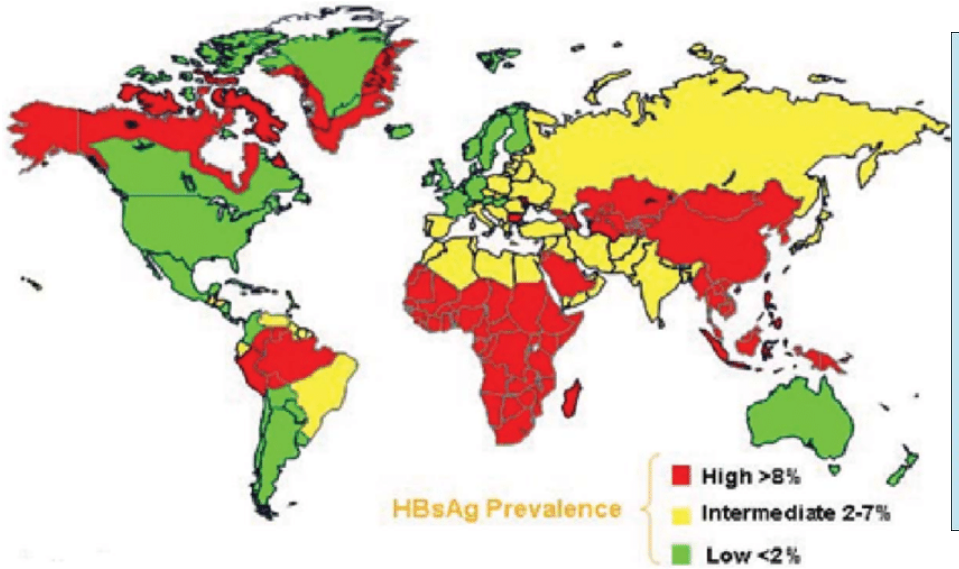
HBV carriers in children, Asian-Pacific region (Chang, 2006)

	Japan	Korea	Singapore	Taiwan	Thailand
Before vaccination	0.3%	3,4%	5-10%	10-20%	2.5%
After establishment of vaccination	0.03%	0.9%	<1%	0.8-1.7%	0.7%

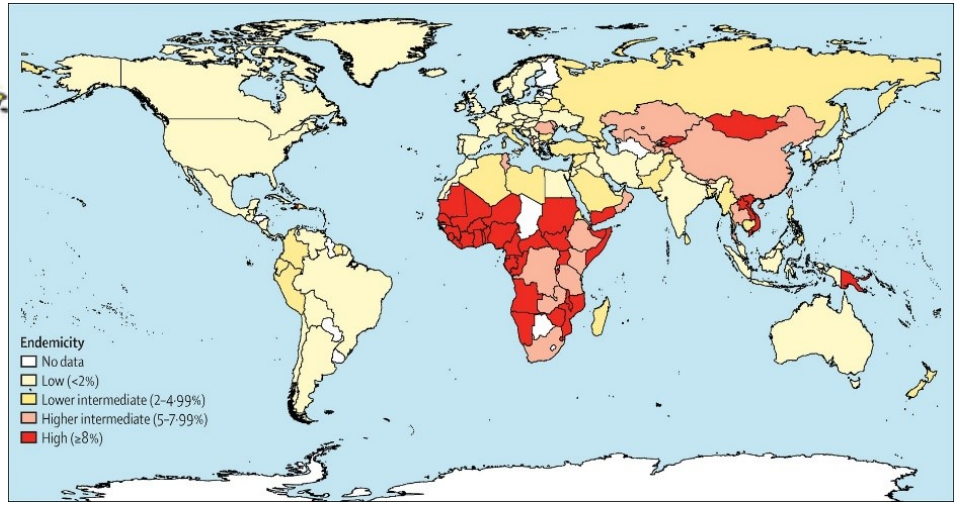
HCC in children declined 4-fold from 0.52 to 0.13 per 1000 000 in Taiwan.

Prevention of HBV is the best way to control HCC!

Impact of Worldwide vaccination Programs



1995



Lancet 2015

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WHO strategy for Hepatitis B immunization:

1. Universal vaccination of infants within 24 hours of birth
2. Full immunization of infants by routine immunization program
3. Catch-up vaccination of unimmunized cohorts
4. Monitoring progress and assessing the impact of immunization

Challenges

- Universal vaccination of infants within 24 hours of birth:

In low-resource settings:

- vaccine availability/storage/transportation of vaccine in a cold chain (2-8^{o}C)
- high rates of births outside health facilities
- lack of information/understanding by parents, healthcare providers and or policymakers of benefits of administration of hepatitis B vaccine at birth/vaccine hesitancy

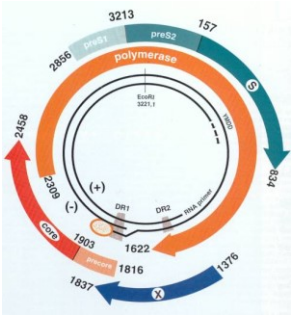
-Production/formulation of heat-stable and freez-stable HBV vaccine

-Health promotion efforts are needed

Challenges (continuation)

- Full immunization of infants by routine immunization programs and catch-up vaccination of unimmunized cohorts

- **Some low-endemic coutries** eg Danmark, Finland, Iceland and Sweden adopted risk-group-targeted vaccination only.



- Nonresponders

- Older adults and immunocompromised individuals

-Modification of HBV vaccines containing, for example HBsAg, preS1 and preS2 antigens, changing of adjuvant

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Challenges (continuation)

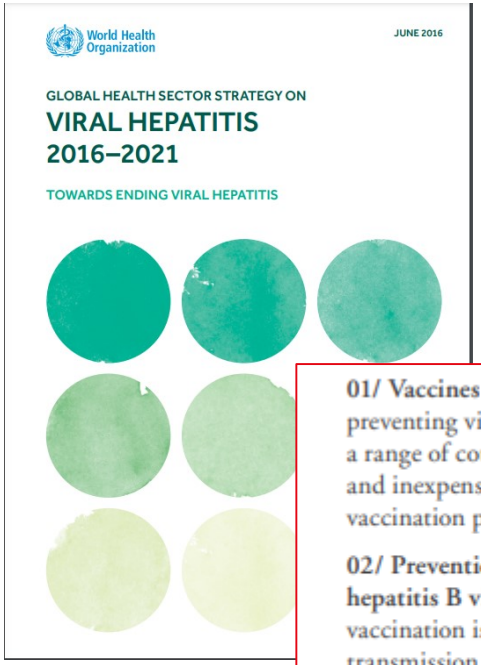
- Duration of protection after hepatit B vaccination

- Is not exactly known yet

-Additional long-term follow-up studies are needed

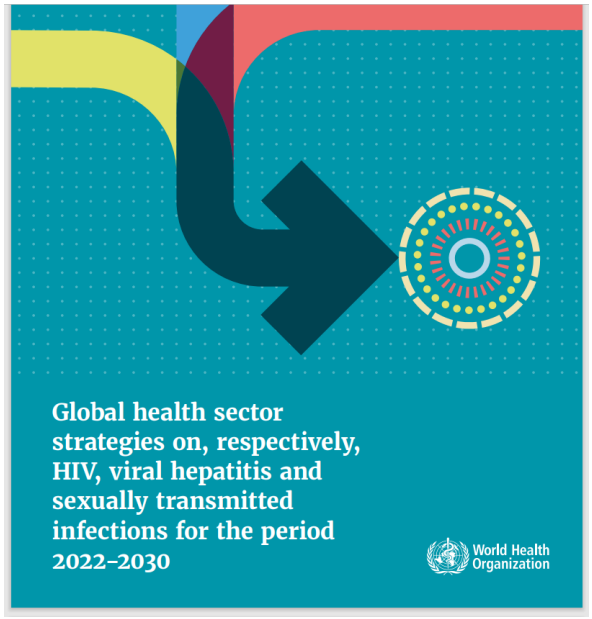
Do we need hepatitis B vaccine?

Yes, we do!



01/ Vaccines – Effective vaccines are available for preventing viral hepatitis A, B and E infections, with a range of countries already implementing large-scale and inexpensive hepatitis B virus childhood vaccination programmes;

02/ Prevention of mother-to-child transmission of hepatitis B virus – Timely hepatitis B virus birth-dose vaccination is a key intervention for preventing the transmission of the virus from mother to infant at birth, which could be enhanced through antenatal testing and the use of antiviral drugs;



https://apps.who.int/iris/bitstream/handle/10665/246177/WHO-HIV-2016.06-eng.pdf?sequence=1&isAllowed=y

Global health sector 2022-2030_report.pdf

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