



Hepatitis B – Lab Diagnosis

Hepatitis B Surface Antigen (**HBSAg**) is the serologic hallmark of HBV infection

It appears 1-10 weeks after an acute exposure to HBV

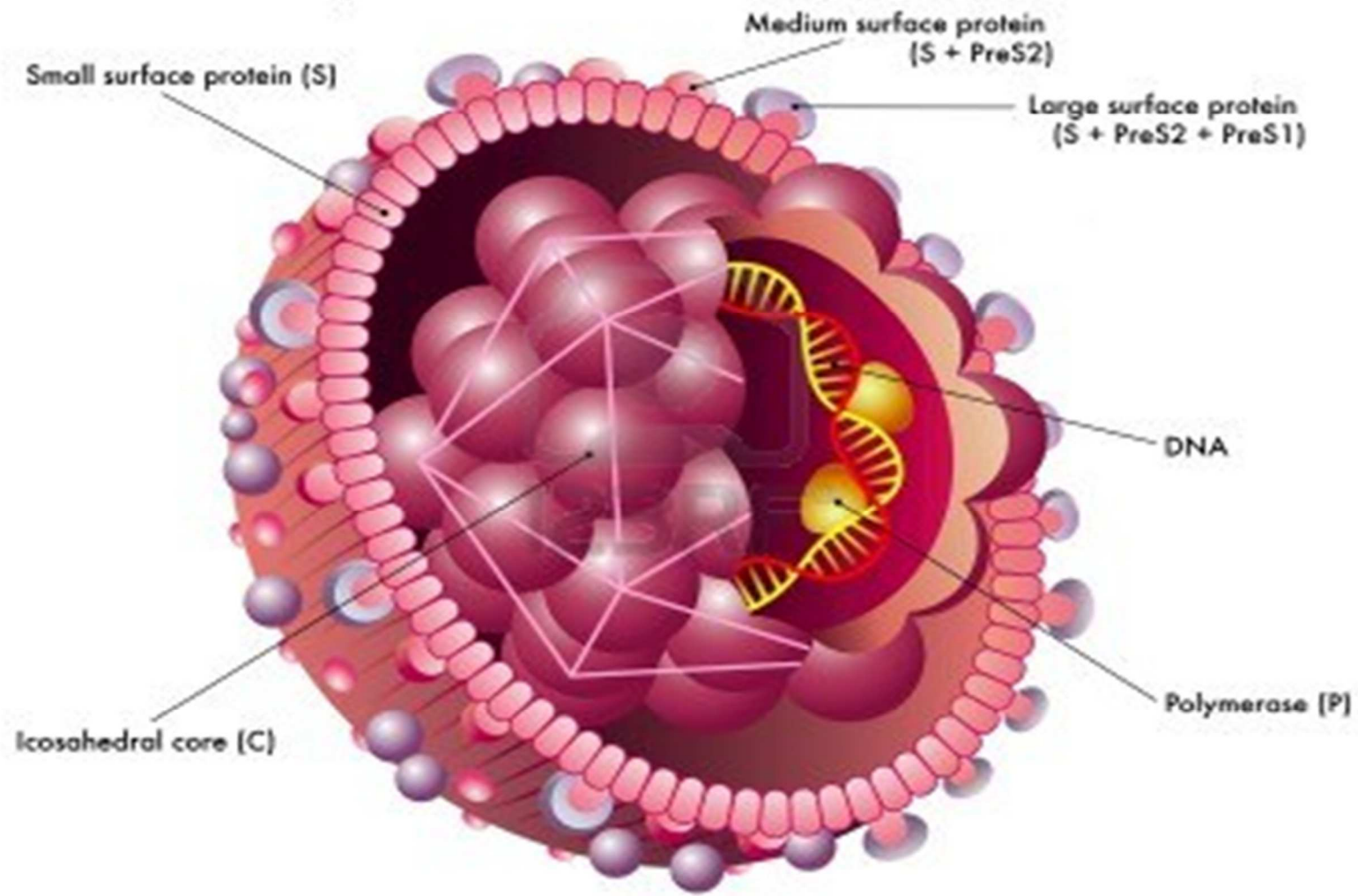
In patients who recover, the HBSAg becomes undetectable after 4-6 months.

Persistence of a positive HBSAg after 6 months = chronic infection

Less than 1 % of the general adult patient population progress to chronic status.

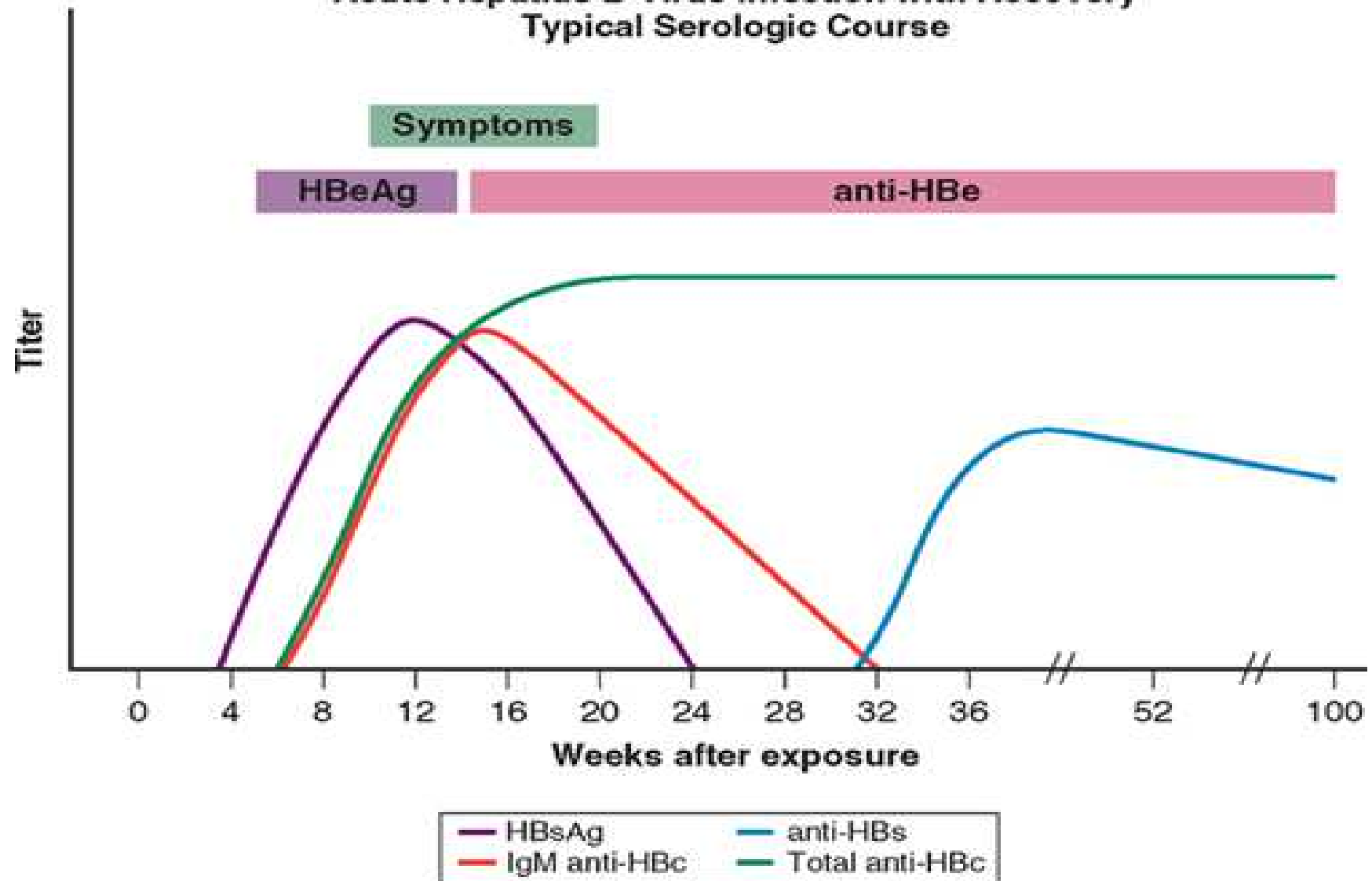


Hepatitis B virus





Acute Hepatitis B Virus Infection with Recovery Typical Serologic Course

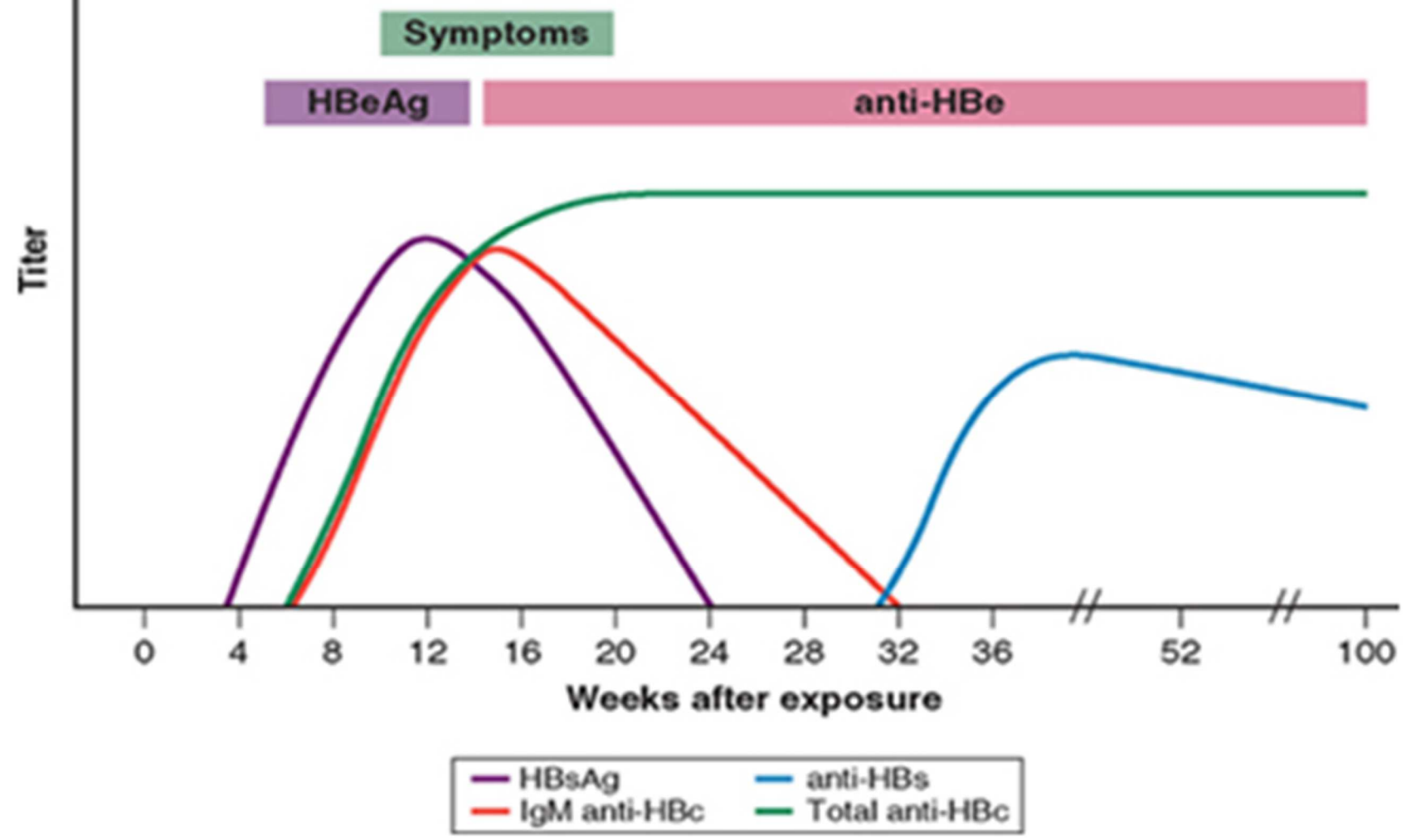




- The disappearance of HBsAg is followed by the appearance of **HBsAb** (Hepatitis B surface antibody)
- In most patients this persists for life
- In some patients however HBsAb may not be detectable during a “**window period**” of weeks to months at which time NEITHER HBsAg or HBsAb is present.
- For these instances the IgM antibodies against hepatitis B core antigen (**IgM anti-HBc**)



Acute Hepatitis B Virus Infection with Recovery Typical Serologic Course





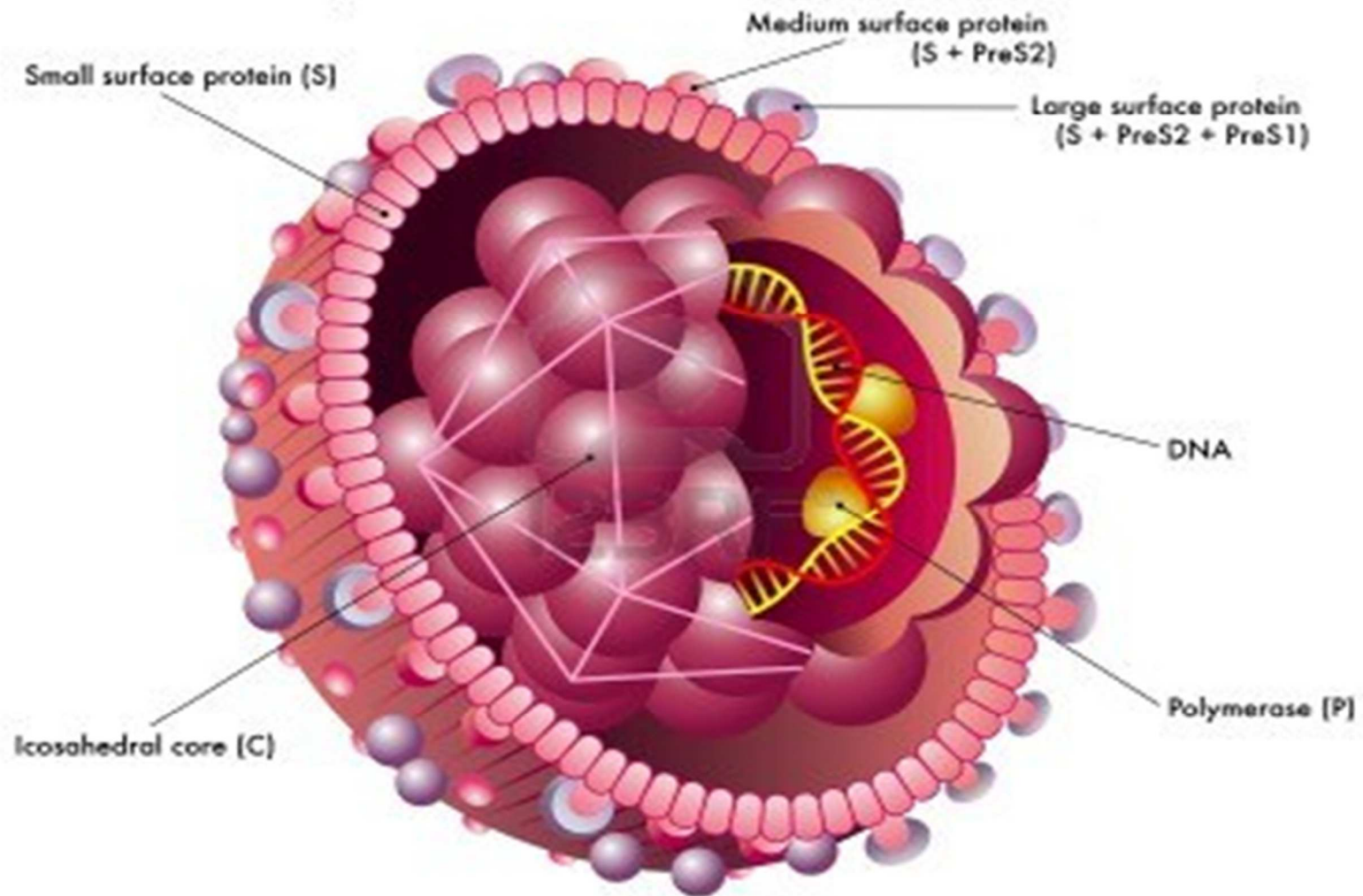
In 24% of HBSAg positive patients BOTH HBSAb and HBSAg are present. The antibodies are unable to neutralize the circulating virions. THESE ARE DESIGNATED AS CHRONIC CARRIERS AS WELL.



- Hepatitis B **core** Antigen and Antibody –
- HBcAg is an intracellular antigen that is found in infected hepatocytes and can be seen throughout the course of infection.
- During ACUTE infection, the anti-HBc (HBcAb) is mainly of the IgM type and is the marker of infection during the WINDOW period between the disappearance of HBSAg and the appearance of HBSAb.
- It is usually seen as an indication of acute HBV infection



Hepatitis B virus





- IgG **anti-HBc** (HBcAb) remains with HBsAb in patients who recover from the hepatitis B infection (**it is not present in those who acquire immunity through vaccination**)
- **HBeAg**- is considered to be a marker of infectivity and high levels of HBV DNA in the serum
- Quantitative testing for HBV DNA use PCR techniques and recovery from acute hepatitis B is accompanied by the disappearance of HBV DNA



What is a PCR?

- It is the basis of modern molecular biology
- In just a few hours PCR can amplify a single DNA molecule a million-fold
- This allows for rapid and specific amplification of DNA fragments
- The amplified DNA to be analyzed by other techniques
- PCR of RNA isolated from blood is the standard tool for monitoring viral load



Natural History of HBV Infection

- 70% of patients with acute HBV have subclinical hepatitis
- 30% develop icteric hepatitis
- Fulminant hepatitis with hepatic failure is very unusual- occurs in 0.1-0.5% of patients
- The incubation period generally lasts one to four months with a serum sickness-like syndrome (anorexia, nausea, etc.) that disappears after 1-3 months.

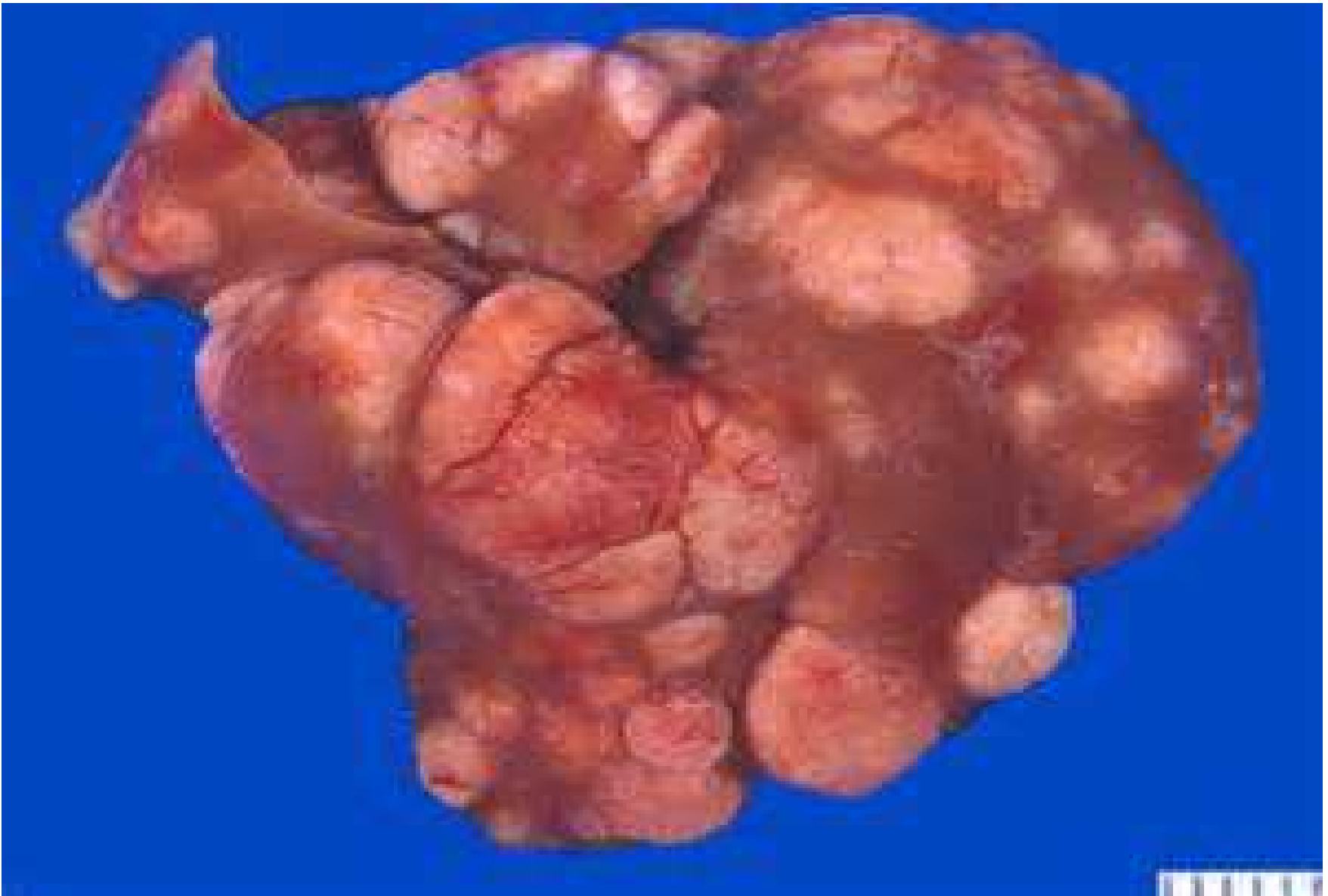




- In patients who recover from acute HBV infection it has been thought that the virus is cleared but traces of HBV are detectable by PCR for many years after clinical recovery.
- So this suggests that complete eradication of HBV rarely occurs and that latent infection can maintain a T Cell response for decades.
- Treatment for the acute infection is supportive.
- Many patients with chronic HBV are asymptomatic



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Dialysis Patients Specifically

- HBV infection in dialysis patients is a problem because of the immunosuppressive effect of renal failure and the risk of nosocomial transmission
- Dialysis patients are more prone to become chronic carriers
- The majority of newly HBV infected dialysis patients have a relatively mild clinical course and are often asymptomatic



- The incidence of HBV infection in dialysis has decreased significantly over the past few decades:
 - 1. Infection control measures
 - 2. Reduced transfusion
 - 3. Vaccination
- Generally 1 % of dialysis patients are HBsAg positive



Risk Factors of Transmission in the Unit

- Presence of HBsAg positive patients in the same unit
- **Non-segregation with dedicated HD machines**
- Less than 50% vaccination rate among patients in the same unit



Prevention of Transmission

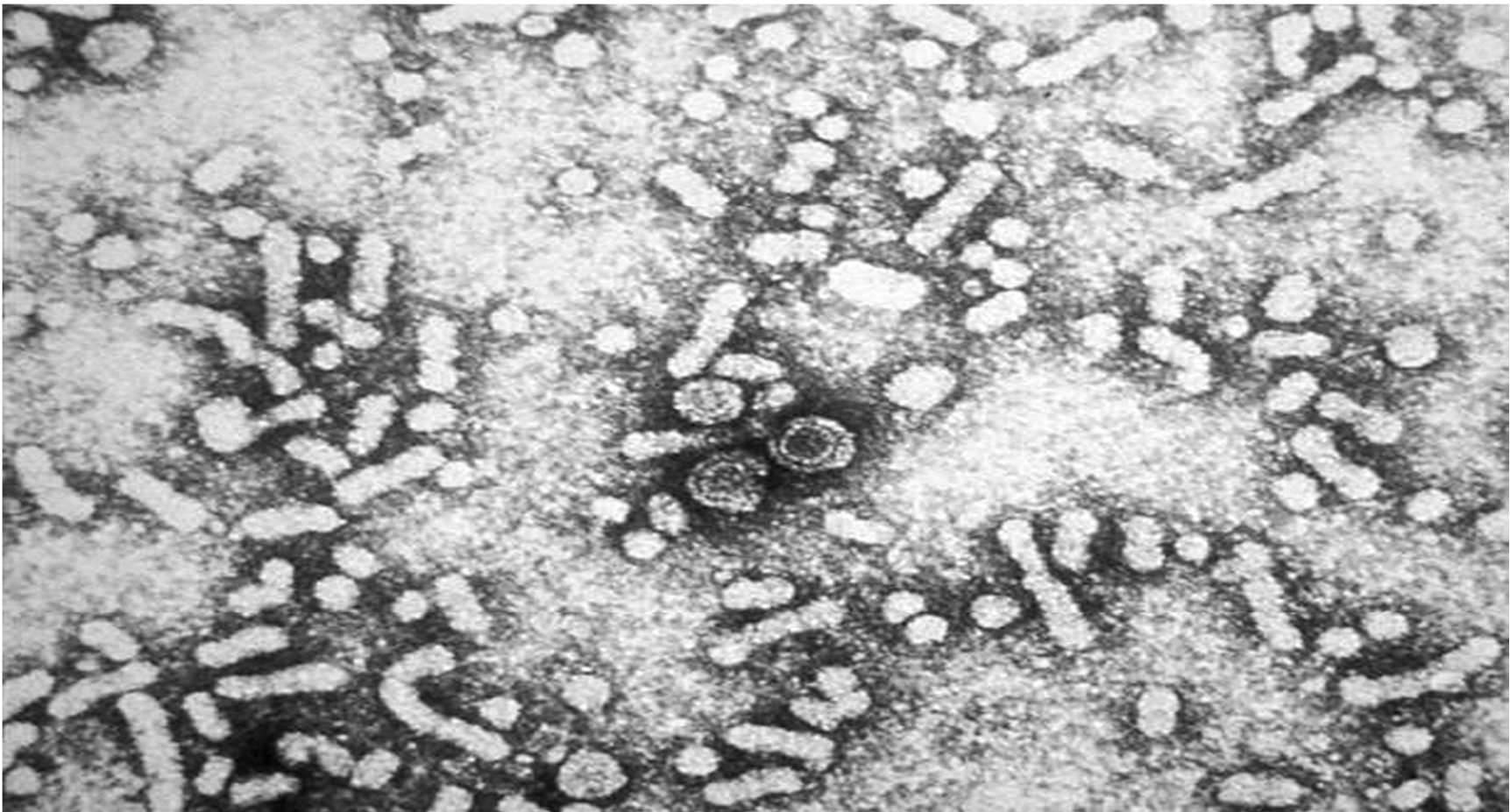
- **Rigorous adherence to standard precautions including**
 - 1. Washing hands/wearing gloves
 - **2. Dialyze positive patients in a private room**
 - 3. PPE use
 - 4. Routine cleaning and disinfection procedures
 - 5. Prohibition of shared instruments, equipment or medications



- 6. Prep and distribution of medications from a centralized area – no carts
- **7. REGULAR SCREENING of status**
- 8. Vaccination
- **9. Chemical/terminal disinfection of machines after use on hepatitis positive patients or those with “unknown” (labs pending) status**



- Remember that the virus can live on surfaces for 7 days





HBV Vaccination in Dialysis Patients

- Reduced efficacy of the vaccine in this population with only 50-60% developing antibodies
- **Because of the low response rate –**
 - Doubled the dose
 - Boosters are given if there is a fall in antibody titer
 - Begin the series when CKD is diagnosed



- Because spurious seropositivity for HBSAg may occur shortly after vaccination we **DO NOT TEST for HBSAg within 3-4 weeks of the dose.**

Serologic markers for the different phases of acute and chronic hepatitis B virus infection

HBsAg	HBeAg	IgM anti-HBc	IgG anti-HBc	Anti-HBs	Anti-HBe	HBV DNA	Interpretation
Acute HBV infection							
+	+	+				+++	Early phase
		+				+	Window phase
			+	+	+	±	Recovery phase
Chronic HBV infection							
+	+		+		-	+++	HBeAg+ high replicative phase (immune tolerance or immune clearance)
+	-		+		+	±	HBeAg- low replicative or inactive phase
+	±	±	+			+	Flare of chronic HBV
+	-		+		+	++	HBeAg- replicative phase (HBeAg- chronic hepatitis, precore/core promoter variants)
-	-		± (generally +)	±	±	+	Occult HBV

Anti-HBc: antibody to hepatitis B core antigen; anti-HBe: antibody to hepatitis B e antigen; anti-HBs: antibody to hepatitis B surface antigen; HBeAg: hepatitis B e antigen; HBsAg: hepatitis B surface antigen; HBV: hepatitis B virus.