What Is HBV DNA and How Is It Measured?

HBV DNA is the genetic material that carries the blueprint of the virus. How much HBV DNA is in your blood indicates how rapidly the virus is replicating in your liver. Laboratories measure how much HBV DNA is found in a milliliter (about one drop) of blood. This test measures your “viral load.”

High levels of HBV-DNA particles or “copies,” ranging from 100,000 to a billion viral copies per milliliter, indicate rapid viral replication in your liver. Low or undetectable levels, about 300 copies per milliliter, indicate an “inactive” infection.

The World Health Organization created a standard for measuring HBV DNA, it established the international unit (IU) or copies per milliliter (mL), written as IU/mL or copies/mL. But not all labs in the United States use this standard. If your lab doesn’t use that measurement, it should be able to convert your results into copies/mL or IU/mL.

The National Institutes of Health have suggested that viral loads that exceed 100,000 copies/mL be considered “clinically significant.” When children are in the immune tolerant stage of HBV infection, their HBV DNA levels can reach billions of copies/mL because their immune systems haven’t noticed the infection, or created antibodies to fight the HBV antigens.

HBV DNA levels can fluctuate. Annual or semi-annual HBV DNA tests capture only a snapshot of your viral load at the time the test is taken. While researchers know high viral loads are not healthy, especially in adults, they don’t know the specific HBV DNA level or threshold that indicates liver damage is occurring.

How HBV DNA Is Reported

Because there are so many HBV DNA copies in a drop of blood, your lab uses a mathematical equation to describe viral load. Instead of writing 100,000 copies/mL, labs may report it as one to the fifth power or \(10^5\) or 5 log. In mathematical jargon, a “log” equals a number multiplied by 10. If you have a viral load of \(10^5\) copies/mL, it is actually, \(10 \times 10 \times 10 \times 10 \times 10 = 100,000\).

When you read a medical report that describes a patient with a high viral load as having HBV DNA that is greater than 100,000 copies/mL, it may be written HBV DNA > \(10^5\) log copies/mL or \(10^5\) copies/mL.

Every log rise or fall is equivalent to a ten-fold increase or decrease. A change from 10 to 100 is a 1-log increase; a change from 1,000,000 to 10,000 is a 2-log decrease.

Someone with a viral load of 300,000 copies/mL who experiences a one-log decrease achieves a viral load of 30,000 copies/mL.

When someone is treated, doctors monitor HBV DNA levels carefully. A one- or two-log decrease in viral load means an antiviral is working. A one- or two-log increase means an antiviral has stopped working and that viral resistance has developed.

- An undetectable viral load (which means fewer HBV DNA than a lab’s equipment can identify) generally is lower than about 300 copies/mL.
- Moderate levels of HBV DNA begin at about 10,000 to copies/mL.
- High levels of HBV DNA can exceed 100,000 copies/mL. It is not unusual for someone with the hepatitis B “e” antigen (HBeAg) to have millions of HBV DNA.