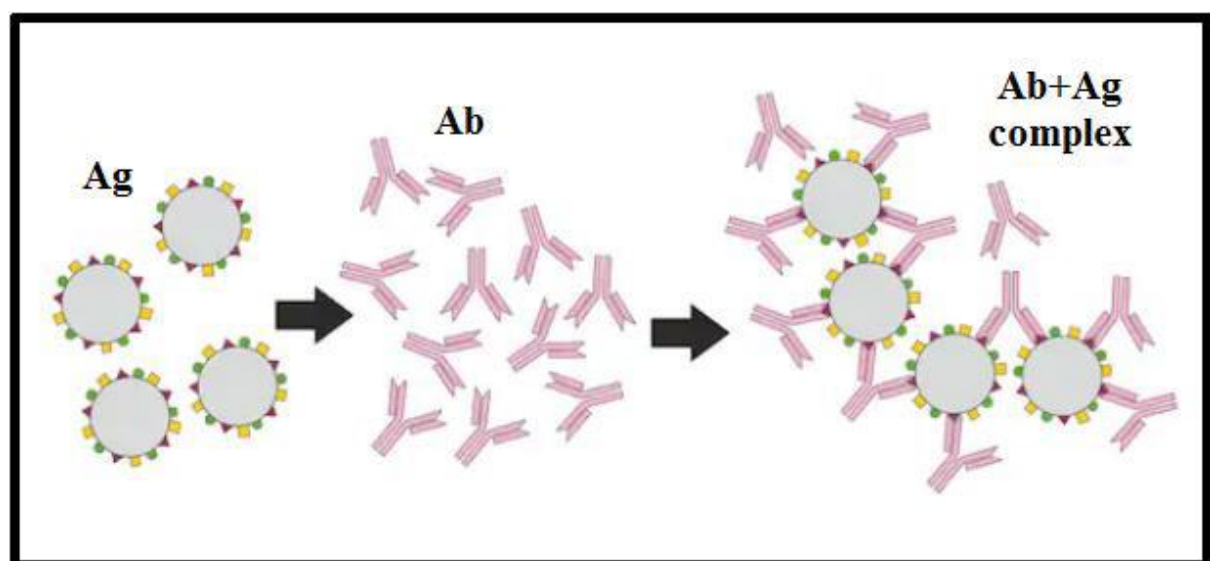


## Serological tests

A serology blood test is performed to detect and measure the levels of antibodies as result of exposure to a particular bacteria or viruses (antigens), the immune system produces specific antibodies against these organism. Antibody levels (antibody titer) help physicians determine whether an infection occurred recently (Acute) or years ago (chronic). Serological testing is particularly helpful in the diagnosis of rickettsial and viral diseases such as Rocky Mountain spotted fever, influenza, measles, poliomyelitis, and yellow fever, as well as of infectious mononucleosis and rheumatoid arthritis. As a practical mass-screening diagnostic tool, it has proved valuable in the detection of such conditions as syphilis. Antigens are substances that provoke a response from the immune system. They can enter the human body through the mouth, through broken skin, or through the nasal passages. Antigens that commonly affect people include the following:

- Bacteria
- Fungi
- Viruses
- Parasites



### **Rose Bengal plate test (RBT) for Brucella**

The Rose Bengal test (RBT) is a simple, rapid slide-type agglutination assay performed with a stained *Brucella abortus* suspension at pH 3.6–3.7 and plain serum.

It is often used as a screening test in human brucellosis and would be optimal for small laboratories with limited means. False-negative reactions occur especially in the early stages of acute infection.



### **Widal Test**

- Widal Test is an agglutination test which detects the presence of serum agglutinins (H and O) in patients serum with typhoid and paratyphoid fever.

When facilities for culturing are not available, the Widal test is the reliable and can be of value in the diagnosis of typhoid fevers in endemic areas.

S. Typhi O antigen suspension

S. Typhi H antigen suspension

S. Paratyphi A antigen suspension

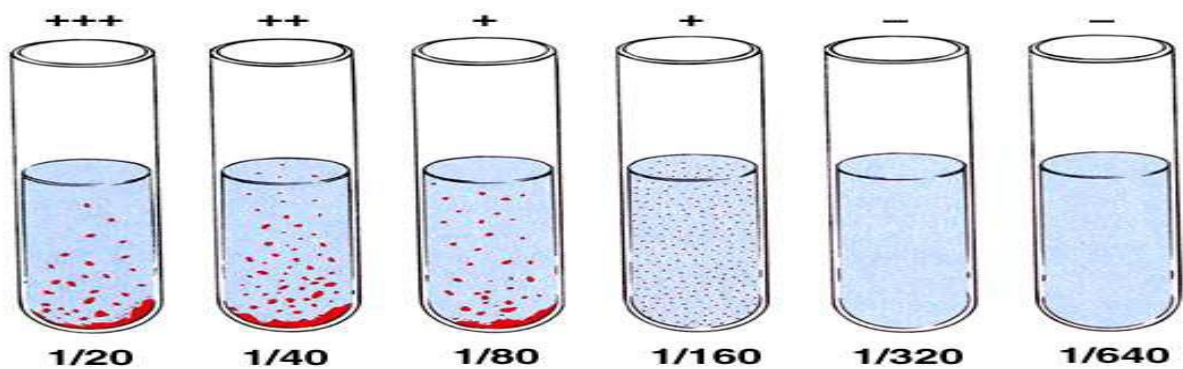
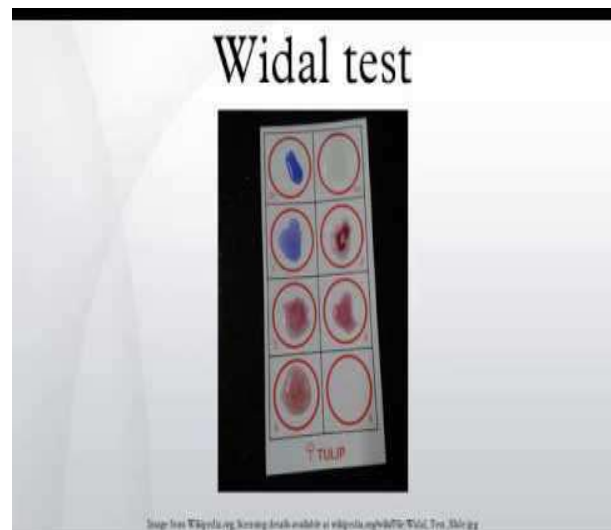
S. Paratyphi A H antigen suspension

S. Paratyphi B O antigen suspension

S. Paratyphi B H antigen suspension

Salmonella antibody starts appearing in serum at the end of first week and rise sharply during the 3rd week of endemic fever. In acute typhoid fever, O agglutinins can usually be detected 6–8 days after the onset of fever and H agglutinins after 10–12 days.

- It is preferable to test two specimens of sera at an interval of 7 to 10 days to demonstrate a rising antibody titer.
- Salmonella antigen suspensions can be used as slide and tube techniques.



### **Typhoid Strip Test**

Also there is rapid test for the qualitative detection of IgG and IgM antibodies to *Salmonella typhi* (*S. typhi*) in human blood (serum), is Typhoid strip test.



### **VDRL Test**

The venereal disease research laboratory (VDRL) test is designed to assess whether or not you have syphilis, a sexually transmitted infection (STI). Syphilis is caused by the bacteria *Treponema pallidum*. The bacteria infects by penetrating into the lining of the mouth or genital area. The VDRL test doesn't look for the bacteria that causes syphilis. Instead, it checks for the antibodies your body makes in response to antigens produced by cells damaged by the bacteria. Antibodies are a type of protein produced by your immune system to fight off invaders like bacteria or toxins. Testing for these antibodies can let doctors know whether you have syphilis, because it checks for antibodies produced as a result of a syphilis infection, the VDRL test can be used whether or not have any symptoms. The VDRL test isn't always accurate. For example, it may give false-negative results if syphilis test was done less than three months, as the body might take this long time to make antibodies. The test is also unreliable in late-stage syphilis. On the other hand, the following can cause false-positive results:

- HIV
- Lyme disease
- Malaria
- pneumonia (certain types only)
- systemic lupus erythematosus
- IV drug use
- tuberculosis

In some cases, the body may not produce antibodies even if it has been infected with syphilis. This means the VDRL test will be inaccurate. The antibodies produced as a result of a syphilis infection can stay in the body even after syphilis has been treated. This means you might always have positive results on this test.



### **Rheumatoid arthritis**

Rheumatoid arthritis can be difficult to diagnose because many conditions cause joint stiffness and inflammation and there is no definitive test for the condition. There is no singular test for diagnosing rheumatoid arthritis. The diagnosis is based on the clinical presentation. Ultimately, rheumatoid arthritis is diagnosed based on a combination of the presentation of the joints involved, characteristic joint swelling and stiffness in the morning, the presence of blood rheumatoid factor and citrulline antibody, as well as findings of rheumatoid nodules and

radiographic changes (X-ray testing). It is important to understand that there are many forms of joint disease that can mimic rheumatoid arthritis. Abnormal antibodies can be found in the blood of people with rheumatoid arthritis with simple blood testing. An antibody called "rheumatoid factor" (RF) can be found in 80% of patients with rheumatoid arthritis. Patients who are felt to have rheumatoid arthritis and do not have positive rheumatoid factor testing are referred to as having "seronegative rheumatoid arthritis."



### **C-Reactive Protein Test**

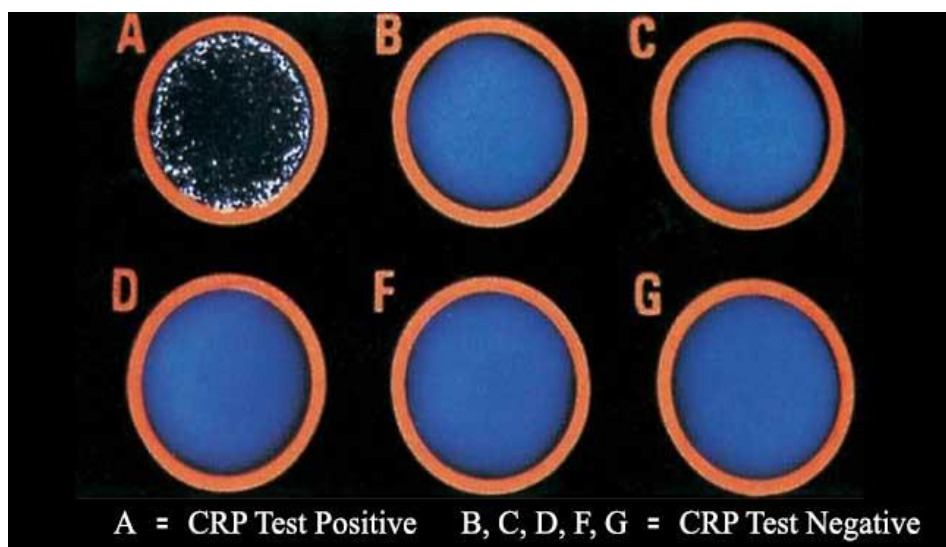
C-reactive protein (CRP) is a substance produced by the liver in response to inflammation. Other names for CRP are high-sensitivity C-reactive protein (HSCRIP), or ultra-sensitive C-reactive protein (US-CRP). A high level of CRP in the blood is a sign that there may be an inflammatory process occurring in the body. Inflammation itself isn't typically a problem, but it can indicate a host of other health concerns, including infection, arthritis, kidney failure, and pancreatitis. High CRP levels may put patients at increased risk for coronary artery disease, which can cause a heart attack. A CRP test is a blood test designed to measure the amount of CRP in the blood. A CRP test only needs a blood sample. Your doctor can administer a CRP test along with a cholesterol screening or other routine blood work. Usually, doctors order the test to determine a person's risk for heart disease or stroke. Doctors may also order a CRP test after

surgery to check for signs of postsurgical infection. They also might use it to monitor inflammatory diseases, including:

- pelvic inflammatory disease
- inflammatory bowel disease
- arthritis
- autoimmune diseases, such as lupus

C-reactive protein is measured in milligrams of CRP per liter of blood (mg/L). In general, a low C-reactive protein level is better than a high one, because it indicates less inflammation in the body. An especially high CRP reading (greater than 10 mg/L) may indicate:

- a bone infection, or osteomyelitis
- an arthritis flare-up
- inflammatory bowel disease
- Tuberculosis
- lupus or another connective tissue disease or autoimmune disease
- cancer, especially lymphoma
- Pneumonia



### **Anti-Streptolysin O (ASOT)**

Anti-Streptolysin O (ASO or ASLO) is the antibody made against streptolysin O, an immunogenic, oxygen-labile hemolytic toxin produced by most strains of group A and many strains of groups C and G streptococci. The ASO titer test is a blood test that checks for a strep infection. When you come into contact with harmful bacteria, your body produces antibodies to defend itself against these bacteria and produces antibodies specific to the bacteria they fight. Usually, when you have a strep infection like strep throat, you receive antibiotics that kill the strep bacteria. But some people don't have any symptoms during a strep infection and may not know they need treatment. When this happens, an untreated infection can lead to future complications. These complications are known as post-streptococcal complications. The letter O" indicates that this toxin is oxygen labile. The SLO toxin has direct toxic effects on heart tissue. In the course of a streptococcal infection, SLO stimulates the production of specific anti streptolysin (ASO) antibodies, which in-vitro; neutralize the hemolytic properties of the antigen.



**ASO Positive**



**ASO Negative**



**ASO Negative**



## **Hepatitis**

Hepatitis is an inflammation of the liver that is most commonly caused by viruses but may also be due to chemicals, drugs, alcohol, inherited diseases, or autoimmune disease. The inflammation can be acute, flaring up and then resolving within a few weeks to months, or chronic, enduring over many years. Chronic hepatitis may persist for 20 years or more before causing significant symptoms related to progressive liver damage such as cirrhosis, liver cancer, or death. The liver is a vital organ located in the upper right-hand side of the abdomen. It performs many functions in the body, including processing the body's nutrients, manufacturing bile to help digest fats, synthesizing many important proteins, regulating blood clotting, and breaking down potentially toxic substances into harmless ones that the body can use or excrete. Inflammation may (in severe cases) interfere with these processes and allow potentially toxic substances to accumulate.

## **Signs and Symptoms**

The signs and symptoms of hepatitis are the same, regardless of the cause, but vary from person to person and may vary over time. Most people with chronic hepatitis have no symptoms at all. Some people with acute hepatitis have not symptoms, but many have mild and/or vague symptoms that may be mistaken for the flu. Some of the more common signs and symptoms include:

- Fatigue
- Nausea
- Abdominal pain
- Joint aches
- Itching
- Yellowing of the eyes and skin (jaundice, the one symptom strongly suggesting liver damage as the cause of other symptoms).

## **HIV Antibody Tests**

Serologic diagnosis of HIV infection is based on a multi-test algorithm for detecting antibodies to HIV by using screening and confirmatory tests. Screening tests provide presumptive identification of specimens that contain antibody to HIV. An HIV test kit is a good screening test when it can rule out all the people who do not have HIV. Tests like EIAs or simple/rapid immunodiagnosics are selected for their high sensitivity of detecting antibodies to HIV for screening.



## **Serology of Hepatitis Viruses**

Viral hepatitis is the most common liver disease in the world. Although the target organ for each of these viruses is the liver, they differ greatly in their structure, mode of replication mode of transmission and in the course of the diseases they cause. There are six types of hepatitis viruses: Hepatitis A virus (HAV), Hepatitis B virus (HBV), Hepatitis C virus (HCV), Serology Hepatitis D virus (HDV), Hepatitis E virus (HEV) and Hepatitis G virus (HGV).

### **Hepatitis A virus (HAV)**

Which was formerly known as infectious hepatitis is caused by a picornavirus and spread by the feco-oral route. It has an incubation period of approximately 1 month after which icteric symptoms start abruptly and does not cause chronic liver disease, but rarely causes fatal disease. Hepatitis A virus (HAV), is ingested

and probably enters the blood stream through the oropharynx or the epithelial lining of the intestines to reach its target, the parenchymal cell of the liver.



### Hepatitis B virus (HBV)

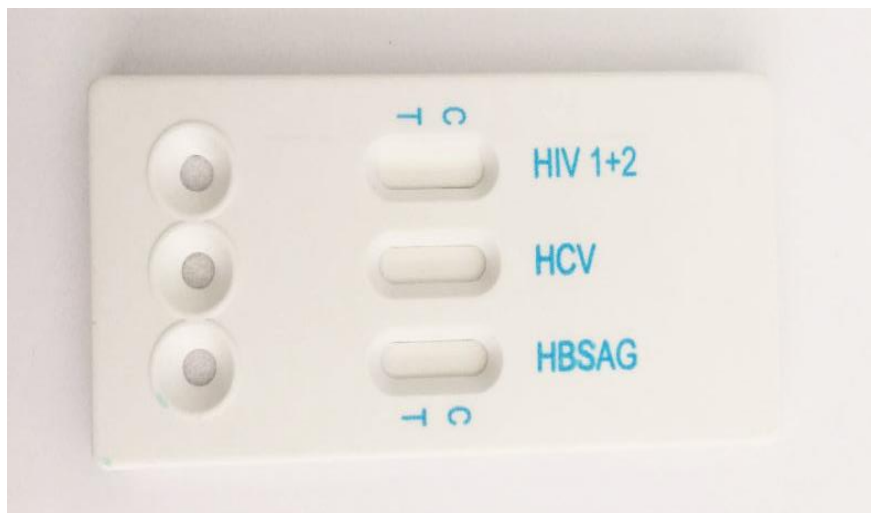
This was previously known as serum hepatitis. It is a member of hepadnavirus with a DNA genome and can be spread parenterally by blood or needles, by sexual contact and perinatally. It has a median incubation period of approximately 3 months after which icteric symptoms start insidiously. HBV can cause acute or chronic symptomatic or asymptomatic disease. Detection of both the hepatitis B surface antigen (HBs Ag) and the hepatitis B e antigen (HBe Ag) components of the virion in the blood indicates the existence of an ongoing active infection.



### Hepatitis C virus (HCV)

Also called non A non B virus. It is a flavivirus with an RNA genome, spread by the same routes as HBV, but usually causes chronic liver disease. The chronic hepatitis often leads to cirrhosis and potentially to hepatocellular carcinoma

Antibody to HC is not protective and findings yielded by experimental infection of chimpanzees indicate that immunity to HCV may not be life long.



### **Hepatitis G virus (HGV)**

HGV resembles HCV in many ways. HGV is a flavivirus, is transmitted in blood and has a tendency for chronic hepatitis disease. HGV is identified by detection of the genome by reverse transcriptase PCR or other RNA detection methods.

### **Hepatitis D virus (HDV)**

It is also called delta virus that requires the presence of HBV for its complete life cycle. It occurs only in patients who have active HBV infection. HBV provides an envelope for HDV RNA and its antigen. Delta agent exacerbates the symptoms

caused by HBV. Like HBV, the delta agent is spread in blood, semen and vaginal secretions. Although antibodies are elicited against the delta agent, protection probably stems from the immune response to HBs Ag.

### **Hepatitis E virus (HEV)**

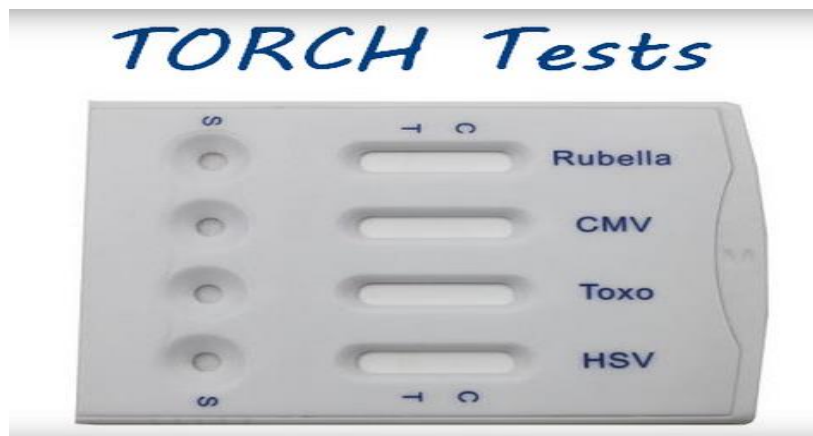
The E stands for enteric or epidemic. It is predominantly spread by the feco-oral route especially in contaminated water. The symptoms and course of HEV disease are similar to those of HAV disease. It causes only acute disease. However, the symptoms for HEV may occur later than those of HAV disease. Specific test for IgM and IgG anti hepatitis E virus antibodies are diagnostic of HEV.

### **Serology of Human Chorionic Gonadotrophin (hCG) Hormone**

From the earliest stage of development (9 days old), the placenta produces hormones, either on its own or in conjunction with the fetus. The very young placenta trophoblast produces appreciable amounts of a hormone, human chorionic gonadotropin (HCG) that is excreted in the urine. Human chorionic gonadotropin is not found in the urine of normal, young, nonpregnant woman.

### **TORCH Test**

Toxoplasma gondii, rubella, cytomegalovirus (CMV) and herpes simplex virus (HSV) have in common that they can cause congenital infection, leading to fetal and neonatal morbidity and mortality.



### **Toxoplasmosis**

The protozoan parasite *Toxoplasma gondii* can cause infection when its oocysts or tissue cysts are ingested.<sup>9 10</sup> Primary infection in pregnancy has been associated with spontaneous abortion and stillbirth.

### **Rubella**

The exact pathogenesis of rubella infection is not fully understood, though it is clear that structural damage to the fetus is caused by defective organogenesis. The virus has been isolated from all organs following congenital infection in the first trimester of pregnancy.

### **Cytomegalovirus**

Humans are the only known reservoir of CMV and viral transmission occurs by close contact with infected secretions, including urine, saliva, cervical and vaginal secretions, semen and breast milk. After mucosal infection and local replication, the virus spreads to lymphoid tissue and visceral organs, especially liver and spleen, after which the viral load increases and the infection spreads to distal organs and sites of persistence.

### **Herpes simplex virus**

This pathogen is 'the odd one out' in the TORCH acronym because although HSV can be vertically transmitted during pregnancy, this is extremely rare. Neonatal disease is the result of perinatal transmission (usually during birth).

### **Coronavirus disease (COVID-19) :**

Serology testing for SARS-CoV-2 is at increased demand in order to better quantify the number of cases of COVID-19, including those that may be asymptomatic or have recovered. Serology tests are blood-based tests that can be used to identify whether people have been exposed to a particular pathogen by looking at their immune response. A COVID-19 antibody strip test, also known

as a serology test, is a blood test that can detect if a person has antibodies to SARS-CoV-2, the virus that causes COVID-19. Rapid diagnostic strip tests for COVID-19 viruses are often similar to pregnancy tests, in that the test shows the user colored lines to indicate positive or negative results. These tests most frequently test for patient antibodies (IgG and IgM).

