Position statement of the Central Biosafety Commission (ZKBS) on the risk assessment of human hepatitis B virus (HBV) as a donor or recipient organism in genetic engineering operations according to § 5 paragraph 1 of the Genetic Engineering Safety Regulations

Human hepatitis B virus (HBV) belongs to the Hepadnaviridae family of viruses. The human population is its natural host. The virus multiplies primarily in liver tissue (1), but HBV DNA has also been demonstrated in blood cells (2). The virus is widespread. According to a report released by World Health Organization, up to 2 billion people worldwide are seropositive, 360 million (18%) of whom are chronically infected (1).

HBV infection can take a subclinical course. However, it can also cause acute, self-limiting or – in rare cases – fulminant hepatitis (1, 3, 4). The mortality rate for acute infections is 0.5 - 1% (4). The likelihood of an infected person developing chronic hepatitis depends on their age at the time of infection (1, 3, 4). 15 - 25% of chronically infected individuals die of cirrhosis or hepatocellular carcinoma (1).

The hepatitis B virus is transmitted horizontally (parenterally or through sexual contact) and vertically (perinatal transmission). It is not transmitted via the respiratory tract, or through food or water (1, 3, 4).

HBV is stable. It retains infectivity outside the host organism for up to seven days (3).

A vaccine containing the HBV surface protein - the HBs antigen – is available. It is genetically engineered using Saccharomyces cerevisiae. This vaccine normally provides effective protection against HBV infection over many years. Only adults over the age of 40 sometimes fail to develop an adequate antibody titre against the HBV envelope protein following immunisation (1).

The treatment of acute HBV infection is supportive (4). A number of different antiviral drugs are available for the treatment of chronic infections (3, 4). In accordance with the Genetic Engineering Safety Regulations (GenTSV) of 24 October 1990, HBV was allocated to risk group 2. According to Annex III to the European Council Directive 93/88/EEC (12.10.93) HBV was assigned to risk group 3**. In the Guidelines for Research Involving Recombinant DNA Molecules of April 2002 (NIH Guidelines), HBV is allocated to risk group 2 (Appendix B-II-D).

Recommendation

As a donor or recipient organism in genetic engineering operations human hepatitis B virus is allocated to risk group 2 in accordance with § 5 paragraph 1 in conjunction with Appendix I no. 1 of the Genetic Engineering Safety Regulations (GenTSV).

Reasons

An effective prophylactic vaccine is available for hepatitis B. With expert handling by trained personnel, the risk of infection in the laboratory is assessed as low. Protection against infection
requires monitoring of all potential infection sources and transmission routes. One possible source of infection is through injury while handling contaminated instruments. This should be avoided by implementing additional precautionary measures. In the event of accidental transmission, a hepatitis B immunoglobulin and/or the hepatitis B vaccine is available for post-exposure prophylaxis. HBV is not transmitted by air, food or water.

For these reasons, level 2 safety measures provide adequate protection against infection and safeguard the goods and interests listed in § 1 of the German Genetic Engineering Act (GenTG).

Additional recommendations

The ZKBS strongly recommends that persons conducting genetic engineering operations with HBV are vaccinated against the virus and that their immune status be monitored.

Note

For the safety classification of genetic engineering operations please refer to the position statement of the ZKBS on genetic engineering operations with human hepatitis B virus (HBV) from October 1995, Ref. No. 6790-10-39. No new scientific evidence has emerged that calls into question the classification performed in the aforementioned position statement.

References