Immunization

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Hepatitis B vaccine joins the fight against pandemic disease

The properties of hepatitis B vaccine and its incorporation into the Expanded Programme on Immunization are outlined in this article.

Of the more than two billion people alive today who have been infected with hepatitis B virus, some 280 million are chronic carriers, harbouring it in the liver. About two million of these carriers die each year as a direct result of cirrhosis or primary liver cancer induced by the virus. The virus is responsible for up to 80% of all cases of primary liver cancer, which is one of the three main causes of cancer deaths in East and South-East Asia and in Africa.

Some 5–10% of infected adults become chronic carriers. The remainder eliminate the virus from the body and suffer no long-term effects. Those most at risk from the virus are the very young, who are more likely than older people to become chronic carriers and to develop fatal complications in adulthood. Between 70% and 90% of infants infected at birth become chronic carriers.

Transmission

Where the disease is common, most infections occur during childhood. The virus is transmitted through body fluids, especially blood. Transmission may take place perinatally between mother and infant, or the virus may be passed between children. There is considerable variation between areas, countries and continents in the age at which most transmission takes place. In any immunization programme using hepatitis B vaccine, it is therefore important to know the local situation so that the maximum possible impact can be obtained.

Vaccines

Immunization is the most effective tool for preventing transmission of hepatitis B virus infection. Vaccines contain the surface antigen of the hepatitis B virus (HBsAG) and are either plasma-derived or produced by a method using recombinant DNA. The type of vaccine selected for national programmes is largely determined by cost. When administered properly, hepatitis B vaccine induces protection in about 95% of recipients.
The plasma-derived vaccine is made from the blood of chronically infected individuals which has been treated to destroy any live virus. It is safe and effective. Over 30 million doses have been given over a number of years. It was initially feared that this vaccine might transmit the human immunodeficiency virus, which, however, cannot survive the production process. The recombinant DNA vaccine is also safe and effective. It appears to be equal to the plasma-derived vaccine in every way.

One important asset of hepatitis B vaccine is that it is stable over a wide temperature range. This makes it less dependent on the cold chain than some other vaccines in use. It must not, however, be frozen, as this destroys its potency.

The full recommended dose for infants, which may vary from one manufacturer to another, should be given intramuscularly. A complete course of three doses produces excellent seroconversion rates. Administration should coincide with that of other vaccines so as to avoid unnecessary visits. Four weeks is the minimum interval between doses, although longer is preferred between the second and third.

Timing is important. Immunization schedules should be such that the first dose of hepatitis B vaccine is given as early as possible, consistent with the epidemiology of the disease and the capacity of the delivery system (see table). Where perinatal transmission is common, the first dose should be given as soon after birth as possible, the second within two months, and the third within the first year. If early transmission is not a problem, the first dose may be given at six weeks or later, with the...
Timing of doses of hepatitis B and other vaccines

<table>
<thead>
<tr>
<th>Age</th>
<th>Example 1</th>
<th>Example 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth</td>
<td>BCG/OPV/HBV</td>
<td>BCG/OPV</td>
</tr>
<tr>
<td>6 weeks</td>
<td>DPT/OPV/HBV</td>
<td>DPT/OPV/HBV</td>
</tr>
<tr>
<td>10 weeks</td>
<td>DPT/OPV</td>
<td>DPT/OPV/HBV</td>
</tr>
<tr>
<td>14 weeks</td>
<td>DPT/OPV</td>
<td>DPT/OPV</td>
</tr>
<tr>
<td>6–12 months</td>
<td>Measles/HBV</td>
<td>Measles/HBV</td>
</tr>
</tbody>
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BCG = antituberculosis vaccine  
OPV = oral polio vaccine  
DPT = diphtheria-pertussis-tetanus vaccine  
HBV = hepatitis B vaccine

The first dose of diphtheria-pertussis-tetanus vaccine. The second and third doses should be timed to coincide with visits required for other immunizations.

Hepatitis B vaccine can be given simultaneously with measles, diphtheria-pertussis-tetanus, oral polio, and BCG (antituberculosis) vaccines. Additional protection may be provided against perinatal transmission if hepatitis B immune globulin is given at birth. However, because of the high cost, this is not a realistic option for most countries.

Epidemiological considerations

The epidemiology of hepatitis B in most areas of the world is well known. In certain cases it may be necessary to demonstrate the seriousness of the problem, using data on the age-specific prevalence of infection, possibly obtainable by consulting previous studies or examining blood bank specimens. If there are no reliable data a special survey may have to be undertaken. The proportion of pregnant mothers who are highly infectious carriers (positive for the hepatitis B virus e antigen) should be ascertained, perhaps in various social or geographical groups whose risk levels may differ widely.

The same data source may reveal whether a significant proportion of transmission is perinatal, indicating the need for immunization as soon after birth as possible. If most transmission occurs later, it may be possible to delay giving the first dose of vaccine until infants are a few weeks old.

Hepatitis B immunization programmes should aim primarily at the prevention of chronic carriage of the virus and should be considered in all population groups with chronic carrier rates of over 2%; where the rate exceeds 8–10%, such programmes become a major public health priority.

Cost

At present the lowest price for complete immunization with three doses of hepatitis B vaccine is about US$ 2.80. Over the next few years the cost is expected to fall. Large orders could help to reduce the price. Even so, the vaccine is an expensive addition to

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the Expanded Programme on Immunization. However, if the vaccine is carefully integrated into the existing programme there should be few additional costs above that of vaccine procurement.

Whether the vaccine is funded by a ministry of health or a donor organization, it is
important to budget for all costs associated with its introduction and continued delivery.

**Introduction of vaccine**

The high cost of the vaccine will limit the number of developing countries that can consider it as a routine component of national immunization programmes. Introduction could be phased, beginning in well-defined areas where operational problems can be recognized and solved before a national programme is established. Phased introduction and selective immunization may help to get the vaccine into programmes, but only universal immunization of newborns is likely to control the disease in the long term.

The vaccine should be introduced with minimal disruption of established immunization schedules. It may be necessary to improve procedures for birth notification and to strengthen immunization services so that they can be provided soon after birth. Health staff should be trained in reaching newborns and administering appropriate antigens, including hepatitis B, oral polio, and BCG vaccines.

More information can be found in
"Hepatitis B information strategies"
(document WHO/EPI/GEN/88.5) available free of charge from

Expanded Programme on Immunization,
World Health Organization,
1211 Geneva 27,
Switzerland.

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**Poor people in cities**

*By the end of the twentieth century, the urban poor may represent a quarter of humanity. While accounts of their plight have done much in recent years to create a greater general awareness of a truly dreadful situation, repeated descriptions of it are unfortunately losing the power to shock. The pattern is the same: in the underprivileged sections of the urban population, infant and child mortality rates (when they are accurately known) may be three or four times higher than the city average and there is a comparable intra-urban differential in all other aspects of health, education, and social well-being.*