

PRODUCT MONOGRAPH

RECOMBIVAX HB[®]

(hepatitis B vaccine [recombinant])

Suspension for Injection

Vaccine for immunization against infection
caused by hepatitis B virus including
all known subtypes

MERCK FROSST CANADA LTD.
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Date of Revision:

Global Trade Identification No.:

Pediatric: 0 67055 04523 3 (1 x 0.5 mL)
Adult: 0 67055 04569 1 (1 x 1 mL); 0 67055 04633 9 (10 x 1 mL)
Adult: 0 67055 03811 2 (1 x 3 mL); 0 67055 04302 4 (1 x 10 mL)
Adult Dialysis: 0 67055 04569 1 (1 x 1 mL)

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RECOMBIVAX HB[®]

(hepatitis B vaccine [recombinant])

PART I: HEALTH PROFESSIONAL INFORMATION

SUMMARY PRODUCT INFORMATION

Route of Administration	Dosage Form/Strength	Clinically Relevant Nonmedicinal Ingredients
Intramuscular injection	Suspension for injection Pediatric: single-dose vial containing 5 µg hepatitis B surface antigen (HBsAg)/0.5 mL dose Adult: single-dose and multi-dose vials containing 10 µg HBsAg/1.0 mL dose Adult dialysis: single-dose vial containing 40 µg HBsAg/1.0 mL dose	Aluminum hydroxyphosphate, thimerosal (adult multi-dose vial only) <i>For a complete listing see DOSAGE FORMS, COMPOSITION AND PACKAGING section.</i>

DESCRIPTION

RECOMBIVAX HB[®] (hepatitis B vaccine [recombinant]) is a non-infectious subunit viral vaccine consisting of surface antigen (HBsAg or Australia antigen) of hepatitis B virus produced in yeast cells. A portion of the hepatitis B virus gene, coding for HBsAg, is cloned into yeast and the vaccine for hepatitis B is produced from cultures of this recombinant yeast strain according to methods developed in the Merck Research Laboratories.

INDICATIONS AND CLINICAL USE

RECOMBIVAX HB[®] (hepatitis B vaccine [recombinant]) is indicated for immunization against infection caused by all known subtypes of hepatitis B virus.

RECOMBIVAX HB[®] will not prevent hepatitis caused by other agents, such as hepatitis A virus, non-A, non-B hepatitis viruses, or other viruses known to infect the liver.

Vaccination with RECOMBIVAX HB[®] is recommended in persons of all ages, especially those who are or will be at increased risk of infection with hepatitis B virus. In areas with low prevalence like Canada, universal immunization before adolescence is recommended.¹ Special efforts should also target the high-risk populations.¹

A. Infants Born to HBsAg-Positive Mothers

B. Children < 7 years of age whose families have immigrated to Canada from areas where there is a high prevalence of hepatitis B, and who are exposed to hepatitis B virus carriers through their extended families.

C. Adolescents (see CLINICAL TRIALS)

D. Health-Care Personnel

Dentists and oral surgeons

Physicians and surgeons

Nurses

Paramedical personnel and custodial staff who may be exposed to the virus via blood or other patient specimens (i.e., body fluids and tissues)

Dental hygienists and dental nurses

Laboratory personnel handling blood, blood products and other patient specimens (i.e., body fluids and tissues)

Dental, medical and nursing students, preferably soon after acceptance in the university

E. Selected Patients and Patient Contacts

Patients and staff in hemodialysis units and hematology/oncology units

Patients requiring frequent and/or large-volume blood transfusions or clotting factor concentrates (e.g., persons with hemophilia, thalassemia)

Patients (residents) and staff of institutions for the mentally handicapped

Classroom contacts of deinstitutionalized mentally handicapped persons who have persistent hepatitis B antigenemia and who show aggressive behavior

Household and other intimate contacts of persons with persistent hepatitis B antigenemia

Children in child-care settings in which there is a hepatitis B virus-infected child. These children should receive serious consideration for immunization against hepatitis B virus.

F. Travellers to Hepatitis B Endemic Areas

G. Military Personnel Identified as Being at Increased Risk

H. Emergency Service Workers (police, firefighters)

- I. Morticians and Embalmers**
- J. Blood Bank and Plasma Fractionation Workers**
- K. Persons at Increased Risk of the Disease Due to Their Sexual Practices²** such as:
 - Persons who have heterosexual activity with multiple partners
 - Persons who repeatedly contract sexually transmitted diseases
 - Homosexually active males
 - Female prostitutes
- L. Prisoners**
- M. Users of Illicit Injectable Drugs**

CONTRAINDICATIONS

Patients who are hypersensitive to this drug or to any ingredient in the formulation or component of the container. For a complete listing, see the DOSAGE FORMS, COMPOSITION AND PACKAGING section.

WARNINGS AND PRECAUTIONS

Because of the long incubation period for hepatitis B, it is possible for unrecognized infection to be present at the time RECOMBIVAX HB[®] (hepatitis B vaccine [recombinant]) is given. RECOMBIVAX HB[®] may not prevent hepatitis B in such patients.

Patients who develop symptoms suggestive of hypersensitivity after an injection should not receive further injections of RECOMBIVAX HB[®] (see CONTRAINDICATIONS).

General

Persons with immunodeficiency or those receiving immunosuppressive therapy require larger vaccine doses and respond less well than healthy individuals.

As with any parenteral vaccine, epinephrine should be available for immediate use should an anaphylactoid reaction occur.

Any serious active infection is reason for delaying use of RECOMBIVAX HB[®], except when, in the opinion of the physician, withholding the vaccine entails a greater risk.

Caution and appropriate care should be exercised in administering RECOMBIVAX HB[®] to

individuals with severely compromised cardiopulmonary status or to others in whom a febrile or systemic reaction could pose a significant risk.

Special Populations

Pregnant Women:

Animal reproduction studies have not been conducted with RECOMBIVAX HB[®]. It is also not known whether RECOMBIVAX HB[®] can cause fetal harm when administered to a pregnant woman or can affect reproductive capacity. RECOMBIVAX HB[®] should be given to a pregnant woman only if clearly needed.

Nursing Women:

It is not known whether RECOMBIVAX HB[®] is excreted in human milk. However, studies with RECOMBIVAX HB[®] in 12 lactating women have failed to reveal evidence of this vaccine being secreted.

Pediatrics:

RECOMBIVAX HB[®] has been shown to be generally well-tolerated and highly immunogenic in infants and children of all ages. Newborns have responded well; maternally transferred antibodies did not interfere with the active immune response to the vaccine. See DOSAGE AND ADMINISTRATION for recommended pediatric dosage and recommended dosage for infants born to HBsAg-positive mothers. The safety profile and effectiveness of the dialysis formulation in children have not been established.

ADVERSE REACTIONS

Adverse Drug Reaction Overview

RECOMBIVAX HB[®] (hepatitis B vaccine [recombinant]) is generally well-tolerated. No adverse reactions were reported during clinical trials which could be related to changes in the titers of antibodies to yeast. As with any vaccine, there is the possibility that broad use of the vaccine could reveal rare adverse reactions not observed in clinical trials.

Clinical Trial Adverse Drug Reactions

Because clinical trials are conducted under very specific conditions the adverse reaction rates observed in the clinical trials may not reflect the rates observed in practice and should not be compared to the rates in the clinical trials of another vaccine. Adverse drug reaction information from clinical trials is useful for identifying vaccine-related adverse events and for approximating rates.

In a group of studies, 3258 doses of RECOMBIVAX HB[®], 10 µg, were administered to 1252 healthy adults. Vaccine recipients were monitored for 5 days after each dose, and the following adverse reactions were reported:

Incidence Equal to or Greater Than 10% of Injections

Local Reactions at Injection Site

Injection site reactions (consisting principally of local pain, soreness and tenderness and including pruritus, erythema, ecchymoses, swelling, warmth and nodule formation).

Incidence Equal to or Greater Than 1% and Less Than 10% of Injections

Body as a Whole

Fatigue/asthenia

Malaise

Fever $\geq 38^{\circ}\text{C}$

Digestive System

Nausea

Diarrhea

Nervous System

Headache

Respiratory System

Pharyngitis

Upper respiratory infection (NOS)

Incidence Less Than 1% of Injections

Body as a Whole

Sweating

Chills

Flushing

Aching

Sensation of warmth

Integumentary System

Pruritus

Rash

Urticaria

Angioedema

Digestive System

Vomiting

Abdominal pains/cramps

Dyspepsia

Diminished appetite

Musculoskeletal System

Myalgia
Arthralgia
Back pain
Neck pain
Shoulder pain
Neck stiffness

Nervous System

Lightheadedness
Vertigo/dizziness
Paresthesia

Respiratory System

Rhinitis
Cough
Influenza

Special Senses

Earache

Hemic/Lymphatic System

Lymphadenopathy

Psychiatric/Behavioral

Insomnia/Disturbed sleep

Urogenital System

Dysuria

Cardiovascular System

Hypotension

In a study that compared the three-dose regimen (5 µg) with the two-dose regimen (10 µg) of RECOMBIVAX HB[®] in adolescents, the overall frequency of adverse reactions was generally similar.

Post-Market Adverse Drug Reactions

The following additional adverse reactions have been reported with use of the marketed vaccine; however, in many instances a causal relationship to the vaccine has not been established.

Hematologic

Increased erythrocyte sedimentation rate.

Hypersensitivity

Anaphylaxis and symptoms of immediate hypersensitivity reactions including edema, dyspnea, chest discomfort, bronchial spasm, or palpitation have been reported within the first few hours after vaccination. An apparent hypersensitivity syndrome (serum-sickness-like) of delayed onset has been reported days to weeks after vaccination, including: arthritis (usually transient), and dermatologic reactions such as erythema multiforme, ecchymoses and erythema nodosum (see WARNINGS AND PRECAUTIONS).

Immune System

Vasculitis
Polyarteritis nodosa

Integumentary System

Alopecia
Eczema

Musculoskeletal System

Arthritis
Pain in extremity

Nervous System

Peripheral neuropathy including Bell's Palsy, Guillain-Barré syndrome, exacerbation of multiple sclerosis, multiple sclerosis, optic neuritis, seizure, febrile seizure, encephalitis, vasovagal syncope.

Special Senses

Tinnitus

DRUG INTERACTIONS

Use With Other Vaccines

According to the National Advisory Committee on Immunization (NACI), RECOMBIVAX HB[®] (hepatitis B vaccine [recombinant]) may be administered simultaneously with other vaccines at different sites. A separate needle and syringe should be used for each vaccine.

The safety and immunogenicity of co-administration of RECOMBIVAX HB[®] with GARDASIL[®] (quadrivalent human papillomavirus [types 6, 11, 16, 18] recombinant vaccine) (same visit, injections at separate sites) were evaluated in a randomized study of 1,871 women aged 16 to 24 years at enrolment. Immune response and safety profile to both RECOMBIVAX HB[®] and GARDASIL[®] were similar whether they were administered at the same visit or at a different visit.

Results from published clinical studies^{3,4} indicate that RECOMBIVAX HB[®] can be administered concomitantly with DTaP-IPV-Hib (diphtheria, tetanus, acellular pertussis, inactivated poliomyelitis, and *Haemophilus influenzae* type b conjugate vaccine), or M-M-R[®] II (measles, mumps and rubella virus vaccine, live, attenuated, Merck Frosst Std.), using separate syringes and injection sites for each vaccine. No impairment of immune response to individually tested vaccine antigens was seen in these studies.

In addition, an HBsAg-containing product, COMVAX[™] (*Haemophilus b* conjugate vaccine [meningococcal protein conjugate] and hepatitis B [recombinant] vaccine) was given concomitantly with M-M-R[®] II and VARIVAX[®] III (varicella virus vaccine, live, attenuated [Oka/Merck]), using separate syringes and injection sites for each vaccine⁵. No impairment of immune response to these individually tested vaccine antigens was demonstrated.

Another randomized study conducted in 1993 with COMVAX[™], administered concurrently with routine pediatric vaccines (DTP, OPV/IPV, M-M-R[®] II, booster dose of DTaP) in 94 infants who completed the study, showed an acceptable response rate for most antigens but a lower response than pre-specified to polio antigens type 1 and type 3, pertussis antigens and rubella. However, the assays, endpoints and time points used differ from currently used criteria. The response to polio was assessed on sera at week-12 (instead of week-4) post-dose 2 and not after the third dose.

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DOSAGE AND ADMINISTRATION

Recommended Dose and Dosage Adjustment

Three-Dose Regimen

The vaccination regimen consists of three doses of vaccine given according to the following schedule:

First injection: at elected date

Second injection: ≥ 1 month after first injection

Third injection: ≥ 1 month after second injection

Within limits, the timing of successive injections may be adjusted to accommodate a variety of needs, such as coadministration with other vaccines.

For infants born of mothers who are HbsAg positive or mothers of unknown HBsAg status, treatment recommendations are described in the subsections titled: **Dosage for Infants Born to HBsAg-Positive Mothers.**

A minimum of one month should separate successive injections of vaccine. Accelerated three-dose regimens (e.g., 0, 1, 2 months; 0, 2, 4 months) may induce protective antibody earlier in a slightly larger proportion of vaccinees. However, regimens that extend the time interval between the second and third injections (e.g., 0, 1, 6 months; 0, 1, 12 months) will ultimately seroconvert a similar proportion of vaccinees while inducing substantially higher antibody titers than accelerated regimens.

The dose of vaccine to be given on each occasion is as follows:

GROUP	REGIMEN
INFANTS*/CHILDREN (birth to 10 years of age)	3 X 2.5 μ g
ADOLESCENTS (11 – 19 years of age)	3 X 5 μ g
ADULTS (≥ 20 years)	3 X 10 μ g

* Infants born of HBsAg-negative mothers.

Two-Dose Regimen - Adolescents (11 to 15 years of age)

An alternate two-dose regimen is available for routine vaccination of adolescents (11 to 15 years of age). The regimen consists of two doses of vaccine (10 μ g) given according to the following schedule:

1st dose: at elected date

2nd dose: 4 to 6 months after the first dose

GROUP	INITIAL	4-6 MONTHS
ADOLESCENTS** (11 - 15 years of age)	10 µg	10 µg

** Adolescents (11 to 15 years of age) may receive either regimen, the 3 X 5 µg or the 2 X 10 µg (see DOSAGE AND ADMINISTRATION, Three-Dose and Two-Dose Regimens).

RECOMBIVAX HB[®] Dialysis 40 µg/mL Formulation

RECOMBIVAX HB[®] DIALYSIS FORMULATION (40 µg/mL) IS INTENDED ONLY FOR ADULT PREDIALYSIS/DIALYSIS PATIENTS.

The recommended vaccination regimen for predialysis/dialysis patients is as follows:

GROUP	INITIAL	1 MONTH	6 MONTHS
PREDIALYSIS/DIALYSIS Adult dialysis presentation 40 µg/1.0 mL	40 µg	40 µg	40 µg

RECOMBIVAX HB[®] Preservative-free (thimerosal-free) Formulations

RECOMBIVAX HB[®] Preservative-free formulations are available for use in individuals for whom a thimerosal-free vaccine may be desired. These formulations are intended for single-use only.

Revaccination of Nonresponders

When persons who do not respond (anti-HBs < 10 IU/L) to the primary vaccine series are revaccinated, 15-25% produce an adequate antibody response after one additional dose and 30-50% after three additional doses.^{6,7} However, because data are insufficient concerning the safety of hepatitis B vaccine when additional doses in excess of the recommended two- or three-dose series are administered, revaccination following completion of the primary series is not routinely recommended. Revaccination should only be considered for high-risk individuals, after weighing the benefits of vaccination against the potential risk of experiencing increased local or systemic adverse reactions.

Dosage for Infants Born to HBsAg-positive Mothers

Infants born to HBsAg-positive mothers are at high risk of becoming chronic carriers of hepatitis B virus and of developing the chronic sequelae of hepatitis B virus infection. Well-controlled studies have shown that administration of three 0.5 mL doses of hepatitis B immune globulin starting at birth is 75% effective in preventing establishment of the chronic carrier state in these infants during the first year of life.⁸ Protection is transient under these circumstances and the effectiveness of the passively administered hepatitis B immune globulin declines thereafter. Results from clinical studies indicate that administration of one 0.5 mL dose of hepatitis B immune globulin at birth and three 5 µg (0.5 mL) doses of RECOMBIVAX HB[®], the first dose given within one week after birth, was 96% effective in preventing establishment of the chronic carrier state in infants born to HBsAg- and HBeAg-positive mothers. Testing for HBsAg and

anti-HBs is recommended at 12-15 months to monitor the final success or failure of therapy. If HBsAg is not detectable, and anti-HBs is present, the child has been protected.

The recommended dosage for infants born to HBsAg-positive mothers is as follows:

TREATMENT	BIRTH	1 MONTH	6 MONTHS
RECOMBIVAX HB [®]	5 µg***	5 µg	5 µg
Hepatitis B immune globulin	0.5 mL		

***The first dose of RECOMBIVAX HB[®] (5 µg) may be given at birth at the same time as hepatitis B immune globulin, but should be administered in the opposite anterolateral thigh. This procedure may be preferable to ensure absorption of the vaccine.

Acute Exposure to Blood Containing HBsAg

There are no prospective studies directly testing the efficacy of a combination of hepatitis B immune globulin and RECOMBIVAX HB[®] in preventing clinical hepatitis B following percutaneous, ocular or mucous membrane exposure to hepatitis B virus. However, recent studies have established the relative efficacies of immune globulins and/or hepatitis B vaccine in various exposure situations. Since most persons with such exposures (e.g., health-care workers) are candidates for the hepatitis B vaccine and since combined hepatitis B immune globulin plus vaccine is more efficacious than hepatitis B immune globulin alone in perinatal exposures, the following guidelines are recommended for persons who have been exposed to hepatitis B virus such as through (1) percutaneous (needlestick), ocular, mucous membrane exposure to blood known or presumed to contain HBsAg, (2) human bites by known or presumed HBsAg carriers, that penetrate the skin, or (3) following intimate sexual contact with known or presumed HBsAg carriers.

Hepatitis B immune globulin (0.06 mL/kg) should be given as soon as possible after exposure and within 24 hours if possible. Hepatitis B vaccine should be given intramuscularly within 7 days of exposure and second and third doses given one and six months, respectively, after the first dose.

Administration

The deltoid muscle is the preferred site for intramuscular injection in adults. The anterolateral thigh is the recommended site for intramuscular injection in infants and children. Data suggest that injections given in the buttocks are given frequently into fatty tissue instead of into muscle. Such injections may result in a lower seroconversion rate than is expected⁹

The vaccine should be used as supplied. No dilution or reconstitution is necessary. The full recommended dose of the vaccine should be used.

It is recommended to record lot numbers when the vaccine is administered to a recipient.

FOR INTRAMUSCULAR USE

Do not inject intravenously or intradermally.

RECOMBIVAX HB[®] (hepatitis B vaccine [recombinant]) is for intramuscular injection. It may, however, be administered subcutaneously to persons at risk of hemorrhage following intramuscular injections. However, when other aluminum-adsorbed vaccines have been administered subcutaneously, an increased incidence of local reactions including subcutaneous nodules has been observed. Therefore, subcutaneous administration should be used only in persons (e.g., hemophiliacs) at risk of hemorrhage following intramuscular injections.

Shake well before withdrawal and use.

Thorough agitation at the time of administration is necessary to maintain suspension of the vaccine. Parenteral drug products should be inspected visually for particulate matter and discoloration prior to administration. After thorough agitation, RECOMBIVAX HB[®] is a slightly opaque, white suspension.

It is important to use a separate sterile syringe and needle for each individual patient to prevent transmission of hepatitis and other infectious agents from one person to another.

For the preservative-free (thimerosal-free) formulations: Once the single-dose vial has been penetrated, the withdrawn vaccine should be used promptly, and the vial must be discarded.

For Syringe Use Only: Withdraw the recommended dose from the vial using a sterile needle and syringe free of preservatives, antiseptics, and detergents.

OVERDOSAGE

There are no data with regard to overdose.

ACTION AND CLINICAL PHARMACOLOGY

Hepatitis B virus is one of at least five hepatitis viruses that cause a systemic infection, with major pathology in the liver. The others are hepatitis A, hepatitis C, hepatitis D, and hepatitis E viruses.

Hepatitis B virus is an important cause of viral hepatitis. There is no specific treatment for this disease. The incubation period for type B hepatitis is relatively long; six weeks to six months may elapse between exposure and the onset of clinical symptoms. The prognosis following infection with hepatitis B virus is variable and dependent on at least three factors: (1) Age - Infants and younger children usually experience milder initial disease than older persons;¹⁰ (2) Dose of Virus - The higher the dose, the more likely acute icteric hepatitis B will result;¹⁰ and, (3) Severity of associated underlying disease - Underlying malignancy or pre-existing hepatic disease predisposes to increased morbidity and mortality.¹⁰

Persistence of viral infection (the chronic hepatitis B virus carrier state) occurs in 5-10% of persons following acute hepatitis B, and occurs more frequently after initial anicteric hepatitis B than after initial icteric disease. Consequently, carriers of hepatitis B surface antigen (HBsAg) frequently give no history of recognized acute hepatitis. The World Health Organization estimated that more than 2 billion people worldwide have evidence of past or current hepatitis B virus infection, and 350 million are chronic carriers of the virus.¹¹ The Centers for Disease Control (CDC) estimate that there are approximately 0.5 to 1.0 million chronic carriers of hepatitis B virus in the USA and that this pool of carriers grows by 2-3% (8000 to 16,000 individuals) annually.¹² Chronic carriers represent the largest human reservoir of hepatitis B virus.

The serious complications and sequelae of hepatitis B virus infection include massive hepatic necrosis, cirrhosis of the liver, chronic active hepatitis, and hepatocellular carcinoma.¹³ Chronic carriers of HBsAg appear to be at increased risk of developing hepatocellular carcinoma, which accounts for 80 to 90% of primary liver carcinomas.¹⁴ Although a number of etiologic factors are associated with development of hepatocellular carcinoma, the single most important etiologic factor appears to be active infection with the hepatitis B virus.¹¹ Globally, approximately one million individuals die each year as a direct result of HBV-induced cirrhosis or liver cancer.¹⁵ Based on death certificates, about 100 Canadians died in 1995 due to hepatitis B associated acute or chronic liver disease.¹⁶

There is also evidence that several diseases other than hepatitis have been associated with hepatitis B virus infection through an immunologic mechanism involving antigen-antibody complexes. Such diseases include a syndrome with rash, urticaria and arthralgia resembling serum sickness; polyarteritis nodosa; membranous glomerulonephritis; and infantile papular acrodermatitis.¹¹

Although the vehicles for transmission of the virus are predominantly blood and blood products, viral antigen has also been found in tears, saliva, breast milk, urine, semen and vaginal secretions. Hepatitis B virus is capable of surviving for days on environmental surfaces. Infection may occur when hepatitis B virus, transmitted by infected body fluids, is implanted via mucous surfaces or percutaneously introduced through accidental or deliberate breaks in the skin.

Transmission of hepatitis B virus infection is often associated with close interpersonal contact with an infected individual and with crowded living conditions. In such circumstances, transmission by inoculation via routes other than overt parenteral ones may be quite common.¹⁷ Perinatal transmission of hepatitis B infection from infected mother to child, at, or shortly after birth, can occur if the mother is an HBsAg carrier or if the mother has an acute hepatitis B infection in the third trimester.¹⁸ Infection in infancy by the hepatitis B virus usually leads to the chronic carrier state. Among infants born to women whose sera are positive for both the hepatitis B surface antigen and the e antigen, 85-90% are infected and become chronic carriers.^{18,19}

Hepatitis B is endemic throughout the world, and is a serious medical problem in population groups at increased risk (see INDICATIONS AND CLINICAL USE). The prevalence of HBsAg in the general population varies between less than 0.5% in the U.S., Canada and Western Europe, 1 to 2% in South America and Southern Europe, 3 to 5% in North Africa and in many parts of the Federation of Russia (formally known as USSR) and 9 to 10% and higher in sub-Saharan Africa, Southeast Asia and Alaska.^{20,21} The overall prevalence of serologic markers of infection varies between 7 and 10% in the U.S. and 60 and 80% in Southeast Asia or Africa.²⁰ Even in countries like those in Northern and Western Europe and other highly developed countries with a relatively low prevalence of hepatitis B, certain populations are at high risk of acquiring the disease and have cumulative infection rates of up to 70% (see INDICATIONS AND CLINICAL USE).²⁰ In countries or areas with a high prevalence rate, the entire population is at risk and infection tends to occur during childhood.

Numerous epidemiological studies have shown that persons who develop anti-HBs following active infection with the hepatitis B virus are protected against the disease on re-exposure to the virus.

Reports in the literature describe a more virulent form of hepatitis B associated with superinfections or coinfections by delta virus, an incomplete RNA virus. Delta virus can only infect and cause illness in persons infected with hepatitis B virus since the delta agent requires a coat of HBsAg in order to become infectious. Therefore, persons immune to hepatitis B virus infection should also be immune to delta virus infection.^{8,22}

STORAGE AND STABILITY

Store unopened and opened vials at 2°C - 8°C. Storage above or below the recommended temperature may reduce potency.

Do not freeze because freezing destroys potency.

Do not use vaccine after the expiration date

DOSAGE FORMS, COMPOSITION AND PACKAGING

Dosage Forms

RECOMBIVAX HB[®] (hepatitis B vaccine [recombinant]) is supplied as a sterile, slightly opaque, white suspension for injection in a single-dose vial or a multi-dose vial containing three doses (adult presentation only).

The vaccine is used directly as supplied. No dilution or reconstitution is necessary.

Composition

RECOMBIVAX HB[®] is available in four presentations, summarized below. Each single dose contains:

	Pediatric (single- dose vial)	Adult (single- dose vial)	Adult (multi- dose vial)	Adult Dialysis (single- dose vial)
Dose volume	0.5 mL	1.0 mL	1.0 mL	1.0 mL
Active Ingredient Hepatitis B surface antigen	5 µg	10 µg	10 µg	40 µg
Other Ingredients: <i>Excipients:</i> Aluminum (as amorphous aluminum hydroxyphosphate) Sodium chloride Sodium borate Thimerosal Water for injection	0.25 mg 4.5 mg 35.0 µg none to volume	0.5 mg 9.0 mg 70.0 µg none to volume	0.5 mg 9.0 mg 70.0 µg 50.0 µg to volume	0.5 mg 9.0 mg 70.0 µg none to volume

Manufacturing Process Residuals

The vaccine contains no detectable yeast DNA but may contain <1% yeast protein. The vaccine also contain < 15 µg/mL formaldehyde as all preparations have been treated with formaldehyde prior to adsorption onto amorphous aluminum hydroxyphosphate.

Packaging

Pediatric Presentation: RECOMBIVAX HB[®] is supplied in 3 mL, single-dose Type I glass vials containing one 0.5 mL dose (5 µg HBsAg). The vial stopper contains latex. It is available in packages of 1 single-dose vial.

Adult Presentation: RECOMBIVAX HB[®] is supplied in 3 mL, single-dose Type I glass vials containing one 1.0 mL dose (10 µg HBsAg) and in 4 mL multi-dose Type I glass vials containing three 1.0 mL doses (10 µg HBsAg/dose). The vial stoppers contain latex. Both the single-dose and multi-dose vials are available in packages of 1 and 10 vials.

Adult Dialysis Presentation: RECOMBIVAX HB[®] is supplied in 3 mL, single-dose Type I glass vials containing one 1.0 mL dose (40 µg HBsAg). The vial stopper contains latex. It is available in packages of 1 single-dose vial.

PART II: SCIENTIFIC INFORMATION

PHARMACEUTICAL INFORMATION

Drug Substance

Proper name: hepatitis B vaccine [recombinant]

Physicochemical properties:

RECOMBIVAX HB[®] (hepatitis B vaccine [recombinant]) is a non-infectious subunit viral vaccine consisting of surface antigen (HBsAg or Australia antigen) of hepatitis B virus produced in yeast cells. A portion of the hepatitis B virus gene, coding for HBsAg, is cloned into yeast and the vaccine for hepatitis B is produced from cultures of this recombinant yeast strain according to methods developed in the Merck Research Laboratories.

The antigen is harvested and purified from fermentation cultures of a recombinant strain of the yeast *Saccharomyces cerevisiae* containing the gene for the *adw* subtype of HBsAg. The HBsAg protein is released from the yeast cells by cell disruption and purified by a series of physical and chemical methods. The currently produced vaccine contains no detectable yeast DNA but may contain <1% yeast protein. The vaccine produced by the Merck method has been shown to be comparable to the plasma-derived vaccine in terms of protective efficacy (chimpanzee and human).

The vaccine against hepatitis B, prepared from recombinant yeast cultures, is free of association with human blood or blood products.

Each lot of hepatitis B vaccine is tested for sterility.

CLINICAL TRIALS

Clinical studies have established that RECOMBIVAX HB[®] (hepatitis B vaccine [recombinant]), when injected into the deltoid muscle, induced protective levels of antibody in greater than 90% of healthy individuals who received the recommended 3-dose regimen. Studies with hepatitis B vaccine derived from plasma have shown that a lower response rate (81%) to vaccine may be obtained if the vaccine is administered as a buttock injection.⁹ A protective antibody (anti-HBs) level has been defined as 10 or more sample ratio units (SRU) as determined by radioimmunoassay or a positive by enzyme immunoassay.²³

Responsiveness to the vaccine was age dependent. The seroprotection rate for children 1-10 years of age and adolescents 11-15 years of age were 100% and 99%, respectively. In contrast, the seroprotection rate for adults ranged from 95 to 98% for those from 20 to 39 years of age and 91% for those of 40 years of age or older.

The protective efficacy of three 5 µg doses of RECOMBIVAX HB[®] has been demonstrated in neonates born of mothers positive for both HBsAg and HBeAg. In a clinical study of infants who received one dose of Hepatitis B Immune Globulin at birth followed by the recommended three-dose regimen of RECOMBIVAX HB[®], efficacy in prevention of chronic hepatitis B infection was 96% in 47 infants at six months and 100% in 19 infants at nine months.

For adolescents (11 to 15 years of age), the immunogenicity of a two-dose regimen (10 µg at 0 and 4-6 months) was compared with that of the standard three-dose regimen (5 µg at 0, 1 and 6 months) in an open, randomized, multicenter study. The proportion of adolescents receiving the two-dose regimen who developed a protective level of antibody one month after the last dose (99% of 255 subjects) appears similar to that among adolescents who received the three-dose regimen (98% of 121 subjects). After adolescents (11 to 15 years of age) received the first 10 µg dose of the two-dose regimen, the proportion who developed a protective level of antibody was approximately 72%.

Predialysis and Dialysis Patients

Immunocompromised persons respond less well to RECOMBIVAX HB[®] than do healthy individuals. Vaccine-induced levels of anti-HBs are lower in pre-dialysis and hemodialysis patients than are the levels in healthy individuals. Eighty-six percent (86%) of pre-dialysis and hemodialysis patients who received three 40 µg doses of RECOMBIVAX HB[®] developed protective levels of anti-HBs.

Duration of Protection

As with other hepatitis B vaccines, the duration of protective effect of RECOMBIVAX HB[®] is unknown at present, and the need for booster doses not defined. However, long-term follow-up (5 to 9 years) of approximately 3000 high-risk vaccinees (infants of carrier mothers, male homosexuals, Alaskan Natives) who developed an anti-HBs titer of ≥ 10 mIU/mL when given a similar plasma-derived vaccine at intervals of 0, 1, and 6 months showed that no subjects developed clinically apparent hepatitis B infection and that 5 subjects developed antigenemia, even though up to half of the subjects failed to maintain a titer at this level.²⁴⁻²⁷ Persistence of vaccine-induced immunologic memory among healthy vaccinees who responded to a primary course of plasma-derived or recombinant hepatitis B vaccine has been demonstrated by an anamnestic antibody response to a booster dose of RECOMBIVAX HB[®] given 5-12 years later.²⁸

Routine booster vaccinations in immunocompetent persons are not recommended since protection has been shown to last for at least 15 years. Studies of long-term protective efficacy, however, will determine whether booster doses of vaccine are ever needed. It is important to recognize that absence of detectable anti-HBs in a person who has been previously demonstrated to have anti-HBs does not mean lack of protection, because immune memory persists. Booster doses in this situation are not indicated.¹

Immunocompromised persons often respond suboptimally to the vaccine. Subsequent HBV exposures in these individuals can result in disease or the carrier state. Therefore, boosters may be necessary in this population. The optimal timing of booster doses for immunocompromised

individuals who are at continued risk of HBV exposure is not known and should be based on the severity of the compromised state and annual monitoring for the presence of anti-HBs.¹

Post-Exposure

Studies have established the relative efficacies of immune globulin and/or hepatitis B vaccine in accidental percutaneous or permucosal exposure to HBsAg-positive blood; or sexual exposure to HBsAg-positive persons (see DOSAGE AND ADMINISTRATION).

It has been demonstrated that doses of up to 5 mL of Hepatitis B Immune Globulin, when administered simultaneously with the first dose of RECOMBIVAX HB[®] at separate body sites, did not interfere with the induction of protective antibodies against hepatitis B virus elicited by the three-dose vaccine regimen.

Interchangeability

Hepatitis B vaccines produced by different manufacturers can be used interchangeably despite different doses and schedules. The dose used should be that recommended by the manufacturer.¹

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PART III: CONSUMER INFORMATION

RECOMBIVAX HB® (hepatitis B vaccine [recombinant])

This leaflet is part III of a three-part "Product Monograph" published when RECOMBIVAX HB® was approved for sale in Canada and is designed specifically for Consumers. This leaflet is a summary and will not tell you everything about RECOMBIVAX HB®. Contact your doctor or pharmacist if you have any questions about the vaccine.

ABOUT THIS VACCINE

What the vaccine is used for:

RECOMBIVAX HB® [hepatitis B vaccine (recombinant)] is an injectable vaccine that helps prevent infection of the liver caused by hepatitis B virus.

The vaccine can be administered to infants, children, adolescents, and adults.

What it does:

Your doctor has recommended or administered RECOMBIVAX HB® to help protect you or your child against hepatitis B, an infection of the liver caused by the hepatitis B virus (HBV).

You could catch this disease by coming into contact with an infected person's blood, semen, vaginal secretions, or other body fluids. For example, if these infected fluids enter your blood stream through a cut, you could become infected. Other circumstances that could lead to infection include:

- being born to a mother who carries the HBV
- living in the same household as someone who carries the HBV
- sexual/close contact with someone who is infected
- having a job that involves exposure to human blood or body fluids
- sharing needles for injecting drugs
- traveling to areas of high frequency of HBV disease

Individuals who have hepatitis B may not look or feel sick when infected. In fact, a person could be infected by the virus six weeks to six months before symptoms occur. Some individuals develop mild, flu-like symptoms. Others may become very ill and extremely tired, develop jaundice (yellow appearance of the skin, eyes, etc.), dark urine and other symptoms that require hospitalization.

Most people recover completely from HBV infection. However, there are some individuals, particularly children, who may not have symptoms but continue to carry the virus in their blood. They are called chronic carriers. These chronic carriers are infectious and can spread the disease to others throughout their lives. All chronic carriers run the risk of developing life threatening liver disease, cirrhosis, or liver cancer.

When it should not be used:

RECOMBIVAX HB® should not be used by anyone who: Patients who are hypersensitive to this drug or to any ingredient in the formulation or component of the container.

What the medicinal ingredient is:

Pediatric presentation: Each 0.5 mL dose contains 5 µg of hepatitis B surface antigen as the active ingredient.

Adult presentation: Each 1 mL dose contains 10 µg of hepatitis B surface antigen as the active ingredient.

Adult dialysis presentation: Each 1 mL dose contains 40 µg of hepatitis B surface antigen as the active ingredient.

What the important nonmedicinal ingredients are:

Thimerosal (only in the adult multi-dose vial), aluminum (as amorphous aluminum hydroxyphosphate), sodium chloride and sodium borate.

What dosage forms it comes in:

RECOMBIVAX HB® is supplied as a slightly cloudy, white suspension for injection in glass vials. Four formats are available:

- Pediatric: single-dose vial containing 5 µg hepatitis B surface antigen in 0.5 mL (thimerosal-free)
- Adult: single-dose vial containing 10 µg hepatitis B surface antigen in 1.0 mL (thimerosal-free)
- Adult: multi-dose vial containing 30 µg hepatitis B surface antigen in 3.0 mL (contains thimerosal)
- Adult dialysis: single-dose vial containing 40 µg hepatitis B surface antigen in 1 mL (thimerosal-free).

WARNINGS AND PRECAUTIONS

Before you or your child receive RECOMBIVAX HB®, it is very important to tell your healthcare provider:

- if you or your child are allergic to any component of the vaccine; and
- about any medical problem you or your child have or have had, including any allergies
- if you are pregnant or intend to become pregnant

Use in children.

RECOMBIVAX HB® can be used in newborns, infants, and children of all ages.

Use in pregnancy and breast-feeding

It is not known whether the vaccine is harmful to an unborn baby when administered to a pregnant woman. If you are pregnant, you should be vaccinated with RECOMBIVAX HB® only if your doctor decides it is clearly needed.

Tell your doctor if you are breast feeding.

Can I drive or operate machinery after vaccination with RECOMBIVAX HB®?

RECOMBIVAX HB® should not ordinarily interfere with your ability to drive or operate machinery. However, as with any vaccination, it is advisable to wait in your doctor's office about 20 minutes after vaccination in case an immediate allergic reaction develops.

What should I know about the inactive ingredients in RECOMBIVAX HB®?

Thimerosal (a mercury-containing compound) is used as a preservative in some of the formulations. Tell your doctor if you have ever experienced an allergic reaction to thimerosal.

Other Considerations

Because hepatitis B infection can go undetected for a long period of time, it is possible that an individual may already be infected at the time the vaccine is given. The vaccine may not prevent hepatitis B in these individuals.

that suggest an allergic reaction after any dose in the vaccination series.

HOW TO STORE IT

Store refrigerated at 2-8°C. Do not freeze.

All vaccines must be discarded after the expiration date.

REPORTING SUSPECTED SIDE EFFECTS

To monitor vaccine safety, the Public Health Agency of Canada collects information on serious and unexpected effects of vaccines. If you suspect you have had a serious or unexpected reaction to this vaccine you should contact your physician or pharmacist. You may also notify:

**The Public Health Agency of Canada
Vaccine Safety Unit
130 Colonnade Road
Ottawa, ON K1A 0K9
A/L 6502A**

**Telephone: 613-954-5590
Toll-free telephone: 1-866-844-0018
Fax: 613-954-9874
Toll-free fax: 1-866-844-5931
E-mail: CAEFI@phac-aspc.gc.ca**

or Merck Frosst Canada Ltd. by:

**Toll-free telephone: 1-800-567-2594
Toll-free fax: 1-877-428-8675
By regular mail:
Merck Frosst Canada Ltd.
P.O. Box 1005
Pointe-Claire - Dorval, QC H9R 4P8**

NOTE: Before contacting Health Canada or Merck Frosst, you should contact your physician or pharmacist.

MORE INFORMATION

This document plus the full product monograph, prepared for health professionals can be found at:

<http://www.merckfrosst.com>

or by contacting the sponsor, Merck Frosst Canada Ltd., at: 1-800-567-2594.

This leaflet was prepared by Merck Frosst Canada Ltd.

Last revised:

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INTERACTIONS WITH THIS VACCINE

In general, simultaneous administration of certain childhood vaccines has not decreased their effectiveness or increased their side effects.

PROPER USE OF THIS VACCINE

Usual dose:

RECOMBIVAX HB® is given by injection. A three-dose series should be given according to the following schedule:

- First dose: at elected date
- Second dose: >1 month after first injection
- Third dose >1 month after second injection

For adolescents, 11 to 15 years of age, a two-dose series may be given according to the following schedule:

- First dose: at elected date
- Second dose: 4 to 6 months later

NOTE: For infants born to mothers infected with HBV, the first dose of the hepatitis B vaccination series should be given at birth, or as soon thereafter as possible, in addition to an injection of hepatitis B immune globulin.

At present, it is not known whether a booster dose will be necessary. See your doctor for more details.

Missed Dose:

Your doctor will decide when to give the missed dose

SIDE EFFECTS AND WHAT TO DO ABOUT THEM

Any vaccine may have unintended or undesirable effects, so-called side effects. RECOMBIVAX HB® is generally well tolerated. The side effects seen in children, adolescents, and adults include injection-site reactions such as soreness, redness, swelling, itching, bruising, warmth and a hard lump. Generalized reactions include fatigue, headache, fever, nausea, diarrhea, and vomiting. Serious side effects occur less frequently and can include allergic reactions, certain severe types of rash, joint pain, muscle disorders, and nerve disorders such as Guillain-Barré Syndrome, seizure, or convulsion accompanied by a high fever, and fainting.

Your doctor has a more complete list of side effects.

Tell your doctor promptly about these or any other unusual symptoms. If the condition persists or worsens, seek medical attention.

In addition, tell your doctor if you experienced any symptoms