

Product Information

MonoFIX[®]-VF

Australia

NAME OF THE MEDICINE

Human coagulation factor IX, powder for injection.

DESCRIPTION

MonoFIX[®]-VF is a sterile freeze-dried powder containing purified human coagulation factor IX. MonoFIX[®]-VF is manufactured from human plasma collected by the Australian Red Cross Blood Service. The factor IX in MonoFIX[®]-VF is purified using ion-exchange and heparin affinity chromatography to remove other vitamin K-dependent factors such as factors II, VII and X. The manufacturing process of MonoFIX[®]-VF includes a solvent detergent (tributyl phosphate and polysorbate 80) treatment and a nanofiltration step to reduce the possibility of virus transmission, particularly of hepatitis A virus.

MonoFIX[®]-VF is presented in two different concentrations (strengths): 50 IU/mL and 100 IU/mL, and in three different presentations as detailed in **Table 1**.

Table 1: MonoFIX[®]-VF composition*

	500 IU (50 IU factor IX/mL)	500 IU (100 IU factor IX/mL)	1000 IU (100 IU factor IX/mL)
Active ingredient IU/vial (nominal)			
Factor IX	500	500	1000
Excipients			
Heparin sodium, IU/mL	5–14	10–28	10–28
Antithrombin III, IU/mL	1.25	2.5	2.5
Plasma proteins, mg/mL	≤2	≤4	≤4
Sodium, mmol/L	120	240	240
Phosphate, mmol/L	20	40	40
Citrate, mmol/L	10	20	20
Chloride, mmol/L	50	100	100
Reconstitution volume (mL)	10	5	10

* Nominal concentrations when reconstituted as recommended.

PHARMACOLOGY

Human factor IX is a single chain glycoprotein with a molecular weight of 68 kilodalton. It is synthesised in the liver, like other vitamin K-dependent proteins, and participates in the intrinsic blood coagulation pathway. Factor XIa activates factor IX, which then, in the presence of factor VIIIa, activates factor X. This leads to the conversion of prothrombin to thrombin and the formation of a fibrin clot.

Haemophilia B (also known as Christmas disease) is an X-linked recessive blood coagulation disorder. It is caused by reduced factor IX activity through either insufficient or abnormal synthesis of the factor IX protein. Clinical symptoms of haemophilia B include skin bruising, excessive haemorrhage after trauma, and spontaneous haemorrhage into joints, muscles or internal organs. Excessive and severe haemorrhage can cause orthopaedic deformity, organ dysfunction or death.

Studies in animals indicate that the potential thrombogenicity of MonoFIX[®]-VF is lower than prothrombin complex concentrates (PCCs). In a study where the *in vivo* generation of rat fibrinopeptide A was used as a marker of thrombogenicity, MonoFIX[®]-VF administered at a dose of 300 IU factor IX per kg body weight did not elevate plasma fibrinopeptide A concentration 60 minutes post infusion and was equivalent to the negative control, 20% human albumin. In contrast, PCCs used as positive controls raised plasma fibrinopeptide A concentration by a factor of 30 to 70 times over pre-infusion values. In a modified Wessler rabbit stasis model of thrombogenicity MonoFIX[®]-VF showed no evidence of thrombogenicity in any of the experiments when tested at a dose of 200 IU factor IX per kg body weight. In comparison, activated factor IX concentrates used for positive control were thrombogenic in all experiments.

Pharmacokinetics

The pharmacokinetics of MonoFIX[®]-VF have been determined in an open multicentre study, following a single intravenous infusion of 50 IU/kg in 12 participants over the age of 12 years with haemophilia B. The estimated half-life and recovery of factor IX were approximately 24 hours and 60% respectively.

CLINICAL TRIALS

CSL has performed clinical trials with MonoFIX[®]-VF and MonoFIX[®]. MonoFIX[®]-VF includes a virus filtration step. This step is not included in the manufacturing process for MonoFIX[®]. MonoFIX[®]-VF has been the subject of extensive biochemical characterisation to demonstrate that the active ingredient is equivalent to MonoFIX[®].

Clinical efficacy and safety were studied in a clinical trial using MonoFIX[®]. The trial included 11 immunocompetent male patients with moderate to severe haemophilia B. All patients had been previously treated with factor IX concentrates and were aged from 2 to 52. Patients used MonoFIX[®] on an as required basis for a period of 6 months. No patients undergoing surgery were included in the trial. There is some evidence that recovery of factor IX in patients undergoing surgery may be reduced.

During the 6 months of the trial, there were a total of 233 administrations of MonoFIX[®] of which 218 were assessed for effectiveness. Treatment was considered to be effective by the patient or his guardian in 98% of administrations. For safety data from this trial, see **ADVERSE EFFECTS**.

No inhibitor studies have been carried out in humans using MonoFIX[®]-VF. However, in the clinical trial of MonoFIX[®], one patient had evidence of transient inhibitor development in the post study period. Repeat pharmacokinetic studies were not performed.

INDICATIONS

MonoFIX[®]-VF is indicated for the treatment of haemorrhages, for use in surgery, and as prophylaxis in patients with haemophilia B. MonoFIX[®]-VF is not indicated for the treatment of factor II, VII or X deficiencies because it does not contain therapeutic levels of these coagulation factors. MonoFIX[®]-VF is not indicated for the treatment of haemophilia A patients with factor VIII inhibitors.

CONTRAINDICATIONS

None known.

PRECAUTIONS

MonoFIX[®]-VF should be used with caution in patients with a previous or known severe allergy to factor IX concentrates.

High doses of PCCs have been associated with disseminated intravascular coagulation (DIC). Although MonoFIX[®]-VF contains purified factor IX, the potential risk of thrombosis and DIC should be recognised. The use of products containing factor IX could be hazardous in patients with a history of fibrinolysis, myocardial infarction, DIC or liver disease.

The reported prevalence for the formation of neutralising antibodies (inhibitors) in patients receiving plasma derived factor IX is approximately 4%. Patients should be monitored for the development of factor IX inhibitors. If the expected factor IX activity plasma levels are not

attained, or if bleeding is not controlled with an appropriate dose, an assay should be performed to determine if a factor IX inhibitor is present. In patients with high levels of inhibitor, factor IX replacement therapy may not be effective and other therapeutic options should be considered. Management of such patients should be directed by physicians with experience in the care of patients with haemophilia.

There has been no clinical experience with MonoFIX[®]-VF with respect to inhibitor development in previously untreated patients.

Pathogen safety

This product is made from human plasma. Products made from human plasma may contain infectious agents, such as viruses and theoretically Creutzfeldt-Jakob Disease (CJD) agents, that can cause disease. The risk that such products will transmit an infectious agent has been reduced by screening plasma donors for prior exposure to certain infectious agents and by testing for the presence of certain viral markers.

In addition, virus removal and inactivation procedures are included in the manufacturing process. The current procedures applied in the manufacture of this product are effective against enveloped viruses such as human immunodeficiency virus (HIV), hepatitis B (HBV) and hepatitis C (HCV) viruses, and the non-enveloped virus hepatitis A (HAV). They are also known to have some effect on the removal of the non-enveloped virus, parvovirus B19.

Despite these measures, such products may still potentially transmit disease. There is also the possibility that other known or unknown infectious agents may be present in such products.

Vaccination for patients in receipt of medicinal products from human plasma should be considered where appropriate.

Check the following before use

Prior to using MonoFIX[®]-VF for the first time, the hepatitis A and hepatitis B antibody status of recipients should be tested. Immunisation with hepatitis A and hepatitis B vaccine is recommended for patients with no antibodies to these viruses.

MonoFIX[®]-VF contains 50–140 IU heparin sodium in each 500 IU vial and 100–280 IU in each 1000 IU vial. Heparin is known to cause thrombocytopenia and this possibility should be considered if thrombocytopenia develops during treatment. Consideration should be given to the clinical effect of heparin if high doses of MonoFIX[®]-VF are required.

Effects on fertility

No fertility studies have been conducted with MonoFIX[®]-VF.

Use in pregnancy

Pregnancy Category C. MonoFIX[®]-VF contains heparin sodium. An increased incidence of foetal loss and prematurity may be associated with heparin-induced maternal haemorrhage. The safe use of MonoFIX[®]-VF during human pregnancy has not been established in appropriate studies.

Use in lactation

The safe use of MonoFIX[®]-VF during lactation has not been established in appropriate studies.

Paediatric use

The safe use of MonoFIX[®]-VF in the paediatric population has not been established in appropriate studies.

Use in the elderly

The safe use of MonoFIX[®]-VF in the elderly population has not been established in appropriate studies.

Genotoxicity

No genotoxicity studies have been conducted with MonoFIX[®]-VF.

Carcinogenicity

No carcinogenicity studies have been conducted with MonoFIX[®]-VF.

Effect on laboratory tests

MonoFIX[®]-VF is formulated with heparin sodium and antithrombin III. Therefore, the results of coagulation tests should be interpreted with care.

INTERACTIONS WITH OTHER MEDICINES

The interaction of MonoFIX[®]-VF with other medicines has not been established in appropriate studies.

ADVERSE EFFECTS

Allergic, anaphylactic reactions or fever are rarely observed in patients receiving factor IX preparations. If any adverse event occurs while MonoFIX[®]-VF is being administered, the rate of injection should be slowed or stopped to alleviate symptoms.

Heparin is known to cause thrombocytopenia and this possibility should be considered if thrombocytopenia develops during treatment.

Adverse events were monitored in a pharmacokinetic study with MonoFIX[®]-VF, however none were reported.

Adverse events were also monitored during a two-part safety, efficacy and tolerability clinical trial for MonoFIX[®] in 11 patients with moderate to severe haemophilia B. In the second part of the trial where MonoFIX[®] was administered on an as required basis for a period of 6 months, 31 adverse events were recorded from a total of 233 administrations. These events occurred in 9 of the 11 patients and have been presented in **Table 2**.

Table 2: Adverse events reported in MonoFIX[®] safety, efficacy & tolerability clinical trial

Adverse event	MonoFIX [®] clinical trial (n = No. of patients)	
	Related events (n)	Non related events (n)
Infections and infestations		
Cold/Flu (influenza-like symptoms)	-	6 (4)
Tonsillitis (pharyngitis)	-	3 (2)
Septic arthritis	-	3 (1)
Psychiatric disorders		
Depression	-	1 (1)
Insomnia	-	2 (1)
Depression/insomnia	-	1 (1)
Gastrointestinal disorders		
Diarrhoea	-	1 (1)
Respiratory, thoracic and mediastinal disorders		
Nose congestion	-	1 (1)
Nervous system disorders		
Headache	-	5 (4)
Blood and lymphatic system disorders		
Anaemia	-	1 (1)
Skin and subcutaneous tissue disorders		
Rash	-	2 (1)
General disorders and administration site conditions		
Clinical flare reaction	1 (1)	-
Surgical and medical procedures		
Hospitalisation related to previous history of inhibitor to Factor IX and patient's non-compliance with prescribed inhibitor tolerance therapy.	2 (1)	-
Hospitalisation required for treatment of traumatic haematoma with MonoFIX [®] due to patient's inability to administer home therapy.	-	1 (1)
Hospitalisation required for endoscopy to investigate iron deficiency anaemia.	1 (1)	-

During post-marketing surveillance of MonoFIX[®]-VF the following adverse events also have been reported; injection site reactions, cold clammy skin, nausea, dizziness and taste disturbances.

DOSAGE AND ADMINISTRATION

Dosage

The dosage recommendations in **Table 3** are a general guideline for therapy. The exact loading and maintenance doses and dosing intervals should be based on the patient's clinical condition and response to therapy. Laboratory tests should be performed to ensure that the desired plasma factor IX concentrations are achieved.

Table 3: Dosage guidelines

Indication	Desired plasma concentration of factor IX (IU/dL)	Dose (IU/kg)	Frequency of dosing (per day)	Duration of treatment (days)
Minor haemorrhage	20 to 30	20 to 30	1	1 to 2
Moderate to severe haemorrhage e.g. haemarthroses	30 to 50	30 to 50	1 to 2	1 to 5
Minor surgery: ^a				
Loading dose	40 to 60	40 to 60	-	-
Maintenance ^b	20 to 50	15 to 40	1 to 2 ^c	7 to 10
Major surgery:				
Loading dose	70 to 100	70 to 100	-	-
Maintenance	20 to 90	20 to 90	1 to 2 ^c	10 to 12
Prophylaxis ^d	1 (trough)	25 to 40	twice weekly	continuous

a Includes dental extraction.

b Initially (days 1 to 3) aim for levels at the higher end of this range. Gradually reduce to lower level during subsequent days.

c An alternative is to use a continuous infusion.

d This refers to prophylaxis in children according to the protocol developed in Sweden by Nilsson's group.

Continuous infusion

No studies using continuous infusion were carried out in patients. However, based on 24 hour stability studies conducted in the laboratory, it is suggested that this method is suitable for covering surgical procedures. The product required should be reconstituted to the same volume and in the same diluent as for bolus infusion, and infused using an infusion pump

suitable for this volume. Reconstitution should be done under aseptic conditions, and sterile integrity of the delivery device should be maintained.

Monitoring

It is recommended that plasma factor IX concentrations be monitored during treatment for more severe haemorrhage. Monitoring of plasma factor IX concentrations is also recommended for patients undergoing surgery.

Reconstitution

1. Before reconstitution allow the vials of MonoFIX[®]-VF and Water for Injections to reach a temperature between 20°C and 30°C.
2. Remove the caps from the tops of the MonoFIX[®]-VF and Water for Injections vials.
3. Apply a suitable antiseptic to the exposed part of the rubber stoppers of both MonoFIX[®]-VF and Water for Injections and allow to dry.
4. Open the outer package of the Mix2Vial[™] filter transfer set by peeling away the lid. **If the seal of the lid is not intact or there are any concerns about the integrity of the Mix2Vial[™], do not use it but return it to the Australian Red Cross Blood Service.** Place the Water for Injections on a level surface and hold the vial firmly. Take the Mix2Vial[™] together with its outer package and invert it. Push the blue plastic cannula of the Mix2Vial[™] firmly through the rubber stopper of the Water for Injections.
5. While holding onto the vial of Water for Injections, carefully remove the outer package from the Mix2Vial[™], being careful to leave the Mix2Vial[™] attached firmly to the Water for Injections vial. Ensure that only the package and not the Mix2Vial[™] is removed.
6. With the MonoFIX[®]-VF vial held firmly on a level surface, invert the Water for Injections with the Mix2Vial[™] attached and push the transparent plastic cannula end of the Mix2Vial[™] firmly through the MonoFIX[®]-VF stopper. The water will be drawn into the vial by the vacuum within. **In the unlikely event that the vial does not contain a vacuum, do not use the product, but return it to the Australian Red Cross Blood Service.**
7. With the Water for Injections and MonoFIX[®]-VF vials still attached, gently swirl the product vial to ensure the product is fully dissolved. Avoid excessive frothing. A clear or slightly opalescent solution is usually obtained in 10 minutes or less. The solution should be used immediately as described under **Administration**.

8. Once the contents of the MonoFIX[®]-VF vial are completely dissolved, firmly hold both the transparent and blue parts of the Mix2Vial[™]. Unscrew the Mix2Vial[™] into two separate pieces, and discard the empty Water for Injections vial and the blue part of the Mix2Vial[™] in an appropriate waste container.

Note: The Mix2Vial[™] is intended to filter the contents of a single vial of MonoFIX[®]-VF only.

If multiple vials of MonoFIX[®]-VF are to be administered, a separate Mix2Vial[™] must be used for each vial.

Do not refrigerate MonoFIX[®]-VF once it has been reconstituted.

NOTE: MonoFIX[®]-VF contains no antimicrobial preservative. It must therefore, be used immediately after reconstitution. Use in one patient on one occasion only. Any unused solution should be discarded appropriately. If a clot or gel forms, do not use the product but return it to the Australian Red Cross Blood Service.

Administration

1. With the MonoFIX[®]-VF vial upright, attach a plastic disposable syringe to the Mix2Vial[™] (transparent plastic part). Invert the system and draw the reconstituted MonoFIX[®]-VF into the syringe by pulling the plunger back slowly. One large syringe may be used to pool several vials of reconstituted MonoFIX[®]-VF.
2. Once the MonoFIX[®]-VF has been transferred into the syringe, firmly hold the barrel of the syringe (keeping the syringe plunger facing down) and detach the Mix2Vial[™] from the syringe. Discard the Mix2Vial[™] (transparent plastic part) and empty MonoFIX[®]-VF vial in an appropriate waste container. Fit the syringe to a suitable injection needle to administer the reconstituted MonoFIX[®]-VF. Do not use the Mix2Vial[™] for injection.
3. Give the dose slowly (approximately 3 mL per minute or as tolerated by the patient) by the intravenous route. Slow the rate of infusion or stop the infusion if any sign of intolerance is recognised. When the contents of more than one vial are to be given, it will be convenient to pool the total amount prior to administration in a large syringe or sterile bag. This must be done aseptically.
4. To reduce microbiological hazard, use as soon as practicable after reconstitution/preparation. The solution must not be stored and, unless reconstitution has been done under aseptic conditions and sterile integrity of the delivery device has been maintained, infusion should be completed within three hours of reconstitution in the case of routine use. For use in surgery, the conditions described under **Continuous infusion** can apply. Any unused portion remaining in the vial must be discarded appropriately.

5. The solution must not be added or mixed with any other fluids to be given, including whole blood.

Spillage or breakages

Should a break in the container or spillage occur, due precautions should be taken to avoid contamination of cuts and abrasions, as well as to avoid inhalation or swallowing of the spillage. Adequate disinfection can be obtained with the application of 1% sodium hypochlorite for 15 minutes. Commercial bleaches may be diluted appropriately to obtain this concentration.

OVERDOSAGE

High doses of products containing factor IX have been associated with instances of myocardial infarction, DIC, venous thrombosis and pulmonary embolism. Overdosage with MonoFIX[®]-VF may potentially enhance the risk of these complications.

PRESENTATION AND STORAGE CONDITIONS

MonoFIX[®]-VF powder for injection is packaged in latex free materials as:

- 500 IU vial of MonoFIX[®]-VF (50 IU factor IX per mL), 10 mL vial of Water for Injections, and one Mix2Vial[™] filter transfer set.
- 500 IU vial of MonoFIX[®]-VF (100 IU factor IX per mL), 5 mL vial of Water for Injections, and one Mix2Vial[™] filter transfer set.
- 1000 IU vial of MonoFIX[®]-VF (100 IU factor IX per mL), 10 mL vial of Water for Injections and one Mix2Vial[™] filter transfer set.

Store at 2°C to 8°C (Refrigerate. Do not freeze). Protect from light.

Do not use after the expiry date.

NAME AND ADDRESS OF THE SPONSOR

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Distributed by: Australian Red Cross Blood Service

POISON SCHEDULE OF THE MEDICINE

Unscheduled

DATE OF FIRST INCLUSION IN THE AUSTRALIAN REGISTER OF THERAPEUTIC GOODS (THE ARTG)

24 November 1998

DATE OF MOST RECENT AMENDMENT

30 July 2015

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