

**AUSTRALIAN PRODUCT INFORMATION**  
**ADYNOVATE® (RURIOCTOCOG ALFA PEGOL)**

**1 NAME OF THE MEDICINE**

Rurioctocog alfa pegol

**2 QUALITATIVE AND QUANTITATIVE COMPOSITION**

ADYNOVATE 250, 500, 750, 1000, 1500, 2000 and 3000 International Units (IU).

ADYNOVATE [rurioctocog alfa pegol, Recombinant Coagulation Factor VIII (rch), PEGylated] is supplied in single-use vials containing nominal potencies of 250, 500, 750, 1000, 1500, 2000 or 3000 IU per vial with a diluent vial containing sterile water for injections for reconstitution to 2 mL or 5 mL.

The 5 mL diluent of water for injections is available for ADYNOVATE 250, 500, 750, 1000, 1500, 2000 or 3000 IU.

The 2 mL diluent of water for injections is available for ADYNOVATE 250, 500, 750, 1000 or 1500 IU.

The amounts of the inactive ingredients are constant in all strengths.

Excipient(s) with known effect

Each vial of ADYNOVATE contains 0.45 mmol (10 mg) sodium, see section 4.4 SPECIAL WARNINGS AND PRECAUTIONS FOR USE.

For the full list of excipients, see section 6.1 LIST OF EXCIPIENTS.

**3 PHARMACEUTICAL FORM**

Powder for injection with diluent.

ADYNOVATE is formulated as a sterile, non-pyrogenic, white to off-white, lyophilised powder for intravenous injection after reconstitution with water for injections.

**4 CLINICAL PARTICULARS**

**4.1 THERAPEUTIC INDICATIONS**

ADYNOVATE is a long-acting antihæmophilic factor (recombinant) indicated in hæmophilia A (congenital factor VIII deficiency) patients for:

- Control and prevention of bleeding episodes
- Routine prophylaxis to prevent or reduce the frequency of bleeding episodes
- Perioperative management (surgical prophylaxis)

ADYNOVATE is not indicated for the treatment of von Willebrand disease.

## 4.2 DOSE AND METHOD OF ADMINISTRATION

Treatment with ADYNOVATE should be under the supervision of a physician experienced in the treatment of haemophilia.

### **Treatment monitoring**

During the course of treatment, appropriate determination of factor VIII levels (by one-stage clotting or chromogenic assays) is advised to guide the dose to be administered and the frequency of repeated infusions. Individual patients may vary in their response to factor VIII, demonstrating different half-lives and recoveries. Dose based on bodyweight may require adjustment in underweight or overweight patients. In the case of major surgical interventions in particular, precise monitoring of the substitution therapy by means of coagulation analysis (plasma factor VIII activity) is indispensable.

### **Dosage**

The dose and duration of the substitution therapy depend on the severity of the factor VIII deficiency, on the location and extent of the bleeding and on the patient's clinical condition.

The number of units of factor VIII administered is expressed in IU, which is related to the current WHO concentrate standard for factor VIII products. Factor VIII activity in plasma is expressed either as a percentage (relative to normal human plasma) or preferably in IU (relative to an International Standard for factor VIII in plasma).

One IU of factor VIII activity is equivalent to that quantity of factor VIII in one mL of normal human plasma.

### On demand treatment

The calculation of the required dose of factor VIII is based on the empirical finding that 1 IU factor VIII per kg body weight raises the plasma factor VIII activity by 2 IU/dL. The required dose is determined using the following formula:

$$\text{Required units (IU)} = \text{body weight (kg)} \times \text{desired factor VIII rise (\%)} \times 0.5$$

The amount to be administered and the frequency of administration should always be oriented to the clinical effectiveness in the individual case.

In the case of the following haemorrhagic events, the factor VIII activity should not fall below the given plasma activity level (in % of normal or IU/dL) in the corresponding period.

The following Table 1 can be used to guide dosing in bleeding episodes and surgery:

**Table 1 Guide for dosing in bleeding episodes and surgery**

Degree of haemorrhage/ type of surgical procedure	Factor VIII level required (% or IU/dL)	Frequency of doses (hours)/ duration of therapy (days)
<b>Haemorrhage</b> Early haemarthrosis, muscle bleeding or oral bleeding	20 – 40	Repeat injections every 12 to 24 hours for at least 1 day, until the bleeding episode, as indicated by pain, is resolved or healing is achieved.
More extensive haemarthrosis, muscle bleeding or haematoma	30 – 60	Repeat injections every 12 to 24 hours for 3 – 4 days or more until pain and acute disability are resolved.
Life threatening haemorrhages	60 – 100	Repeat injections every 8 to 24 hours until threat is resolved.
<b>Surgery</b> <i>Minor</i> Including tooth extraction	30 – 60	Every 24 hours (12 to 24 hours for patients under the age of 6), at least 1 day, until healing is achieved.
<i>Major</i>	80 – 100 (pre- and postoperative)	Repeat injections every 8 to 24 hours (6 to 24 hours for patients under the age of 6) until adequate wound healing then continue therapy for at least another 7 days to maintain a factor VIII activity of 30% to 60% (IU/dl).

### Prophylaxis

For long term prophylaxis, the recommended dose is 40 to 50 IU per kg bodyweight of ADYNOVATE twice weekly in 3 to 4 day intervals. Dose and/or frequency should be adjusted to provide the necessary coverage to prevent bleeding. In some cases, doses up to 60 IU per kg can be used.

### Paediatric population

On demand treatment dosing in paediatric patients (<12 years of age) does not differ from adult patients. Higher doses or more frequent dosing may be required in some children.

For prophylactic therapy in patients under the age of 12, the recommended dose is 40 to 60 IU per kg bodyweight of ADYNOVATE twice weekly in 3 to 4 day intervals. In some cases, doses up to 80 IU per kg can be used.

### **Method of administration**

ADYNOVATE should be administered via the intravenous route.

ADYNOVATE should be administered at room temperature not more than 3 hours after reconstitution.

Reconstituted products should be visually inspected for particulate matter and discolouration prior to administration. The solution should be clear to colourless. Do not administer if particulate matter or discolouration or cloudiness is found.

ADYNOVATE does not contain antimicrobial preservative. It is for single use in one patient only. Discard any residue.

The rate of administration should be determined to ensure the comfort of the patient up to a maximum of 10 mL/min.

After reconstitution, the solution is clear, colourless, free from foreign particles and has a pH of 6.7 to 7.3. The osmolality is  $\geq 380$  mOsmol/kg.

### Preparation and reconstitution

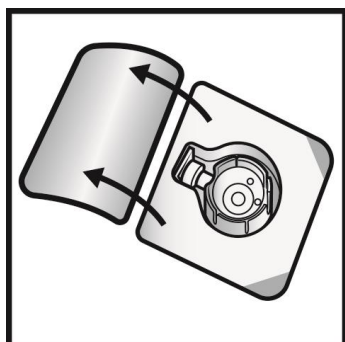
Use aseptic technique.

### **Using the BAXJECT II Hi-Flow Device**

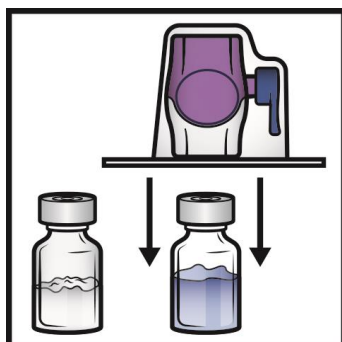
For reconstitution use only with the water for injections and the reconstitution device provided in the pack.

1. Use aseptic technique (clean and germ free) and a flat work surface during the reconstitution procedure.
2. Allow the vials of ADYNOVATE and diluent to reach room temperature before use.
3. Remove plastic caps from the ADYNOVATE and diluent vials.
4. Cleanse rubber stoppers with an alcohol wipe and allow to dry prior to use.
5. Open the BAXJECT II Hi-Flow device package by peeling away the lid, without touching the inside (Figure A). Do not remove the device from the package.
6. Turn the package over. Press straight down to fully insert the clear plastic spike through the diluent vial stopper (Figure B).
7. Grip the BAXJECT II Hi-Flow package at its edge and pull the package off the device (Figure C). Do not remove the blue cap from the BAXJECT II Hi-Flow device. Do not touch the exposed purple plastic spike.
8. Turn the system over so that the diluent vial is on top. Quickly insert the purple plastic spike fully into the ADYNOVATE vial stopper by pushing straight down (Figure D). The vacuum will draw the diluent into the ADYNOVATE vial.
9. Swirl gently until ADYNOVATE is completely dissolved. Do not refrigerate after reconstitution.

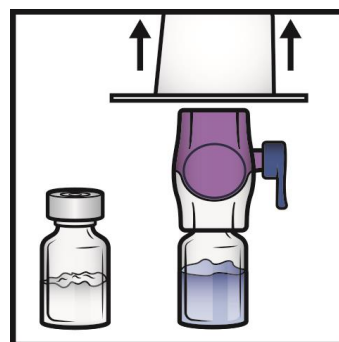
**Figure A**



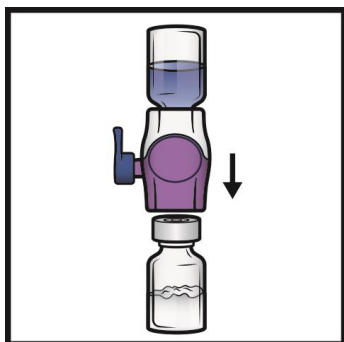
**Figure B**



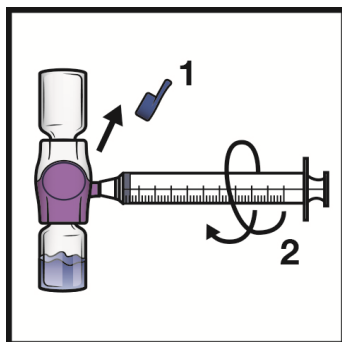
**Figure C**



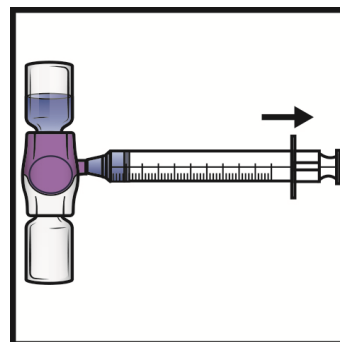
**Figure D**



**Figure E**



**Figure F**

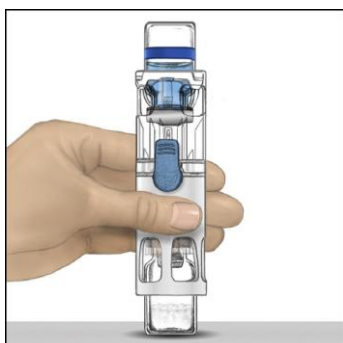


### Using the BAXJECT III system

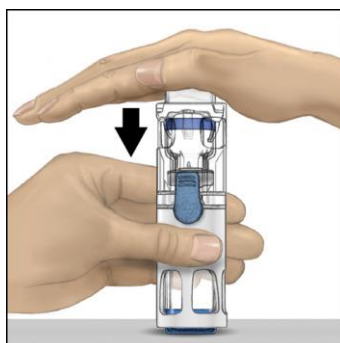
Do not use if the lid is not completely sealed on the blister.

1. If the product is still stored in a refrigerator, take the sealed blister (contains powder and diluent vials preassembled with the system for reconstitution) from the refrigerator and let it reach room temperature.
2. Wash your hands thoroughly using soap and warm water.
3. Open the ADYNOVATE package by peeling away the lid. Remove the BAXJECT III system from the blister.
4. Place ADYNOVATE on a flat surface with the diluent vial on top (Figure 1). The diluent vial has a blue stripe. Do not remove the blue cap until instructed in a later step.
5. With one hand holding ADYNOVATE in the BAXJECT III system, press down firmly on the diluent vial with the other hand until the system is fully collapsed and the diluent flows down into the ADYNOVATE vial (Figure 2). Do not tilt the system until the transfer is complete.
6. Verify that the diluent transfer is complete. Swirl gently until all material is dissolved (Figure 3). Be sure that the ADYNOVATE powder is completely dissolved, otherwise not all reconstituted solution will pass through the device filter. The product dissolves rapidly (usually in less than 1 minute). After reconstitution the solution should be clear, colourless and free from foreign particles.

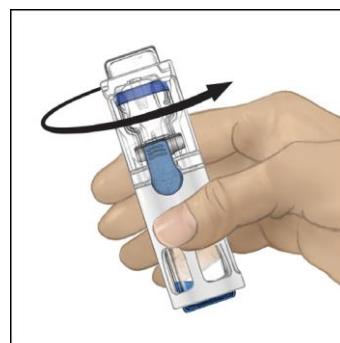
**Figure 1**



**Figure 2**



**Figure 3**



### Administration

- Remove the blue cap from the BAXJECT II Hi-Flow / BAXJECT III device. Connect the syringe to the BAXJECT II Hi-Flow (Figure E) / BAXJECT III device. Use of a Luer-lock syringe is recommended. Do not inject air.
- Turn the system upside down (ADYNOVATE vial now on top). Draw the factor concentrate into the syringe by pulling the plunger back slowly (Figure F for BAXJECT II Hi-Flow).
- Disconnect the syringe; attach a suitable needle and inject intravenously. If a patient is to receive more than one vial of ADYNOVATE, the contents of multiple vials may be drawn into the same syringe.
- A separate BAXJECT II Hi-Flow device is required to reconstitute each vial of ADYNOVATE with the diluent.
- Administer ADYNOVATE over a period of less than or equal to 5 minutes (maximum infusion rate 10 mL per min).

### **4.3 CONTRAINDICATIONS**

Known life-threatening hypersensitivity reaction, including anaphylaxis, to the parent molecule ADVATE (octocog alfa), mouse or hamster protein, or other constituents of ADYNOVATE.

### **4.4 SPECIAL WARNINGS AND PRECAUTIONS FOR USE**

#### **Hypersensitivity**

Hypersensitivity reactions can occur following administration of ADYNOVATE. Allergic-type hypersensitivity reactions including anaphylaxis have been reported with factor VIII concentrates. Immediately discontinue administration and initiate treatment as clinically appropriate if hypersensitivity reactions occur.

#### **Inhibitor formation**

The formation of neutralising antibodies (inhibitors) to factor VIII is a known complication in the management of individuals with haemophilia A. These inhibitors are usually IgG immunoglobulins directed against the factor VIII procoagulant activity, which are quantified in Bethesda Units (BU) per mL of plasma using the modified assay. The risk of developing inhibitors is correlated to the exposure to factor VIII, this risk being highest within the first 20 exposure days. Rarely, inhibitors may develop after the first 100 exposure days.

Cases of recurrent inhibitor (low titre) have been observed after switching from one factor VIII product to another in previously treated patients with more than 100 exposure days who have a previous history of inhibitor development. Therefore, it is recommended to monitor all patients carefully for inhibitor occurrence following any product switch.

In general, all patients treated with coagulation factor VIII products should be carefully monitored for the development of inhibitors by appropriate clinical observations and laboratory tests. If the expected factor VIII activity plasma levels are not attained, or if bleeding is not controlled with an appropriate dose, testing for factor VIII inhibitor presence should be performed. In patients with high levels of inhibitor, factor VIII 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 haemophilia and factor VIII inhibitors.

### **Cardiovascular events**

In patients with existing cardiovascular risk factors, substitution therapy with factor VIII may increase the cardiovascular risk.

### **Catheter-related complications in treatment**

If a central venous access device (CVAD) is required, risk of CVAD-related complications including local infections, bacteraemia and catheter site thrombosis should be considered.

### **Excipient related considerations**

After reconstitution this medicinal product contains 0.45 mmol sodium (10 mg) per vial. To be taken into consideration by patients on a controlled sodium diet.

It is strongly recommended that every time ADYNOVATE is administered to a patient, the name and batch number of the product are recorded in order to maintain a link between the patient and the batch of the medicinal product.

### **Use in the elderly**

Clinical studies of ADYNOVATE did not include subjects aged 65 and over.

### **Paediatric use**

The listed precautions apply both to adults and children.

### **Effects on laboratory tests**

No data available.

## **4.5 INTERACTIONS WITH OTHER MEDICINES AND OTHER FORMS OF INTERACTIONS**

No interactions of human coagulation factor VIII (rDNA) products with other medicinal products have been reported.

## **4.6 FERTILITY, PREGNANCY AND LACTATION**

### **Effects on fertility**

The effects of ADYNOVATE on fertility have not been established.

### **Use in pregnancy (Category B2)**

The safety of ADYNOVATE for use in pregnant women has not been established. Animal reproduction studies with recombinant factor VIII, including ADYNOVATE, have not been conducted. Healthcare professionals should balance the potential risks and only prescribe ADYNOVATE if clearly needed.

## Use in lactation

The safety of ADYNOVATE for use in lactating women has not been established. It is not known if ADYNOVATE or its metabolites are excreted in human milk. Healthcare professionals should balance the potential risks and only prescribe ADYNOVATE to a breastfeeding woman if clearly needed.

## 4.7 EFFECTS ON ABILITY TO DRIVE AND USE MACHINES

ADYNOVATE has no influence on the ability to drive and use machines.

## 4.8 ADVERSE EFFECTS (UNDESIRABLE EFFECTS)

### Summary of the safety profile

Hypersensitivity or allergic reactions (which may include angioedema, burning and stinging at the injection site, chills, flushing, generalised urticaria, headache, hives, hypotension, lethargy, nausea, restlessness, tachycardia, tightness of the chest, tingling, vomiting, wheezing) have been observed rarely after treatment with factor VIII and may in some cases progress to severe anaphylaxis (including shock).

Patients with haemophilia A may develop neutralising antibodies (inhibitors) to factor VIII. If such inhibitors occur, the condition will manifest itself as an insufficient clinical response. In such cases, it is recommended that a specialised haemophilia centre be contacted.

### Tabulated list of adverse reactions

The safety of ADYNOVATE has been evaluated in 3 multi-centre, prospective, open label clinical trials and 4 ongoing studies in 243 previously treated and untreated patients with severe haemophilia A (factor VIII < 1% of normal), who received at least one dose of ADYNOVATE.

**Table 2 Adverse reaction reported for ADYNOVATE**

MedDRA System Organ Class	Preferred MedDRA Term (Version 19.0)	Number and Rate by Subject <sup>a</sup> (N=243) n (%)	Frequency Category	Number and Rate by Infusion <sup>b</sup> (N=30,865) n (%)	Frequency Category
<b>BLOOD AND LYMPHATIC DISORDERS</b>	Factor VIII inhibition	1 <sup>d</sup>	Unknown <sup>d</sup>	Unknown <sup>d</sup>	Unknown <sup>d</sup>
<b>GASTROINTESTINAL DISORDERS</b>	Diarrhea	16 (6.58)	Common	18 (0.06)	Rare
	Nausea	7 (2.88)	Common	10 (0.03)	Rare
<b>IMMUNE SYSTEM DISORDERS</b>	Hypersensitivity <sup>c</sup>	1 (0.41)	Uncommon	1 (<0.01)	Very Rare
<b>NERVOUS SYSTEM DISORDERS</b>	Headache	24 (9.88)	Common	42 (0.14)	Uncommon
<b>SKIN AND SUBCUTANEOUS TISSUE DISORDERS</b>	Rash	4 (1.65)	Common	4 (0.01)	Rare



MedDRA System Organ Class	Preferred MedDRA Term (Version 19.0)	Number and Rate by Subject <sup>a</sup> (N=243) n (%)	Frequency Category	Number and Rate by Infusion <sup>b</sup> (N=30,865) n (%)	Frequency Category
<b>VASCULAR DISORDERS</b>	Flushing	1 (0.43)	Uncommon	1 (<0.01)	Very Rare

Legend: ADR frequency is based upon the following scale: Very Common ( $\geq 1/10$ ); Common ( $\geq 1/100 - < 1/10$ ), Uncommon ( $\geq 1/1,000 - < 1/100$ ), Rare ( $\geq 1/10,000 - < 1/1,000$ ), Very Rare ( $< 1/10,000$ ).

<sup>a</sup> Rate by subject = total number of subjects experiencing the AE (related and unrelated) divided by total number of subjects (N) and multiplied by 100.

<sup>b</sup> Rate by infusions = total number of adverse events (related and unrelated) divided by total number of infusions (N) and multiplied by 100.

<sup>c</sup> The event of Hypersensitivity was a mild transient nonserious rash, occurring in one 2-year-old patient who had developed a previous rash while on BAX 855.

<sup>d</sup> The frequencies are noted to be "Unknown" since this case report with ADR was reported in an ongoing study with previously untreated patients.

## Description of selected adverse reactions

### Inhibitor Development

Formation of neutralising antibodies (inhibitors) to factor VIII can occur following administration of factor VIII products. One PUP subject from an ongoing study (study 261203), who received at least one infusion of ADYNOVATE, developed neutralising antibodies to factor VIII (Table 2).

### Hypersensitivity

Hypersensitivity reactions are possible with ADYNOVATE (Table 2). Allergic-type hypersensitivity reactions, including anaphylaxis, are rare complications of treatment with recombinant factor VIII, including the parent molecule, ADVATE.

### Paediatric population

Frequency, type and severity of adverse reactions in children are expected to be the same as in adults.

### Class Reactions

Adverse reactions include: Anaphylactic reaction, Hypersensitivity, Factor VIII inhibition.

## Post-marketing Adverse Reactions

No additional adverse reactions, other than those from clinical trials, have been reported from post-marketing sources.

## Reporting suspected adverse effects

Reporting suspected adverse reactions after registration of the medicinal product is important. It allows continued monitoring of the benefit-risk balance of the medicinal product.

Healthcare professionals are asked to report any suspected adverse reactions at [www.tga.gov.au/reporting-problems](http://www.tga.gov.au/reporting-problems).

## 4.9 OVERDOSE

There has been no reported clinical adverse experience that could be associated with overdosage.

For information on the management of overdose, contact the Poisons Information Centre on 131126 (Australia).

## 5 PHARMACOLOGICAL PROPERTIES

### 5.1 PHARMACODYNAMIC PROPERTIES

#### Mechanism of action

ADYNOVATE is a full-length recombinant human coagulation factor VIII with an extended half-life. The therapeutic activity of ADYNOVATE is derived from its parent molecule, octocog alfa (ADVATE), which is produced by recombinant DNA technology from a Chinese hamster ovary cell line. The octocog alfa molecule is then covalently conjugated with the PEG reagent, which targets lysine residues. The PEG moiety is conjugated to the octocog alfa molecule to increase the plasma half-life through the reduction of the LRP-1 receptor-mediated clearance of the factor VIII molecule.

#### Pharmacodynamic effects

The factor VIII/von Willebrand factor complex consists of two molecules (factor VIII and von Willebrand factor) with different physiological functions. When infused into a haemophilic patient, factor VIII binds to von Willebrand factor in the patient's circulation. Activated factor VIII acts as a cofactor for activated factor IX, accelerating the conversion of factor X to activated factor X. Activated factor X converts prothrombin into thrombin. Thrombin then converts fibrinogen into fibrin and a clot can be formed. Haemophilia A is a X-chromosomal linked hereditary disorder of blood coagulation due to decreased levels of factor VIII:C and results in profuse bleeding into joints, muscles or internal organs, either spontaneously or as results of accidental or surgical trauma. By replacement therapy the plasma levels of factor VIII are increased, thereby enabling a temporary correction of the factor deficiency and correction of the bleeding tendencies.

#### Clinical trials

The safety, efficacy, and PK of ADYNOVATE were evaluated in a multicentre, open-label, prospective, non-randomised, two-arm clinical trial that compared the efficacy of a twice weekly prophylactic treatment regimen to on-demand treatment and determined haemostatic efficacy in the treatment of bleeding episodes. A total of 137 male PTPs (12 to 65 years of age) with severe haemophilia A received at least one infusion with ADYNOVATE. Twenty-five of the 137 subjects were adolescents (12 to less than 18 years of age).

Subjects received either prophylactic treatment (n = 120) with ADYNOVATE at a dose of 40-50 IU per kg twice weekly or on-demand treatment (n = 17) with ADYNOVATE at a dose of 10-60 IU per kg for a 6-month period. The mean (SD) dose per prophylaxis infusion was 44.4 (3.9) IU per kg with a median dosing interval of 3.6 days. There were 91 out of 98 (93%) subjects previously treated prophylactically prior to enrolment, who experienced a reduction in dosing frequency during routine prophylaxis in the study, with a median reduction of 33.7% (approximately one more day between doses). One hundred eighteen (118) of 120

(98%) prophylaxis subjects remained on the starting recommended regimen without dose adjustment, and 2 subjects increased their dose to 60 IU/kg during prophylaxis due to bleeding in target joints.

### On-demand Treatment and Control of Bleeding Episodes

A total of 518 bleeding episodes were treated with ADYNOVATE in the per-protocol population, i.e. dosed according to the protocol specific dosing requirements. Of these, 361 bleeding episodes (n=17 subjects) occurred in the on-demand arm and 157 (n=61 subjects) occurred in the prophylaxis arm. The median total dose to treat all bleeding episodes in the per-protocol population was 30.9 (Q1: 21.6; Q3: 45.3) IU per kg. The median dose per infusion to treat all bleeding episodes in the per-protocol population was 29 (Q1: 20.0; Q3: 39.2) IU per kg. The median dose per infusion to treat a minor, moderate, or severe/major bleeding episode in the per-protocol population was 25.5 (Q1: 16.9; Q3: 37.6) IU/kg, 30.9 (Q1: 23.0; Q3: 43.1) IU/kg, or 36.4 (Q1: 29.0; Q3: 44.5) IU/kg, respectively.

A total of 591 bleeding episodes were treated with ADYNOVATE in the treated population, which was identical to the safety analysis set of subjects assigned to routine prophylaxis or on-demand treatment with ADYNOVATE and who received at least one dose of the product. Of these, 361 bleeding episodes (n=17 subjects) occurred in the on-demand arm and 230 bleeding episodes (n=75 subjects) occurred in the routine prophylaxis arm. Efficacy in control of bleeding episodes is summarised in Table 3.

**Table 3 Summary of Efficacy in Control of Bleeding (Treated Population)**

Bleeding Episode Etiology		All	Joint	Non-joint
Number of bleeds treated		591	455	136
Number of infusions to treat bleeding episodes	1 infusions:	85.4%	85.9%	83.8%
	2 infusions:	10.8%	10.8%	11.0%
	Total (1 or 2 infusions):	96.2%	96.7%	94.8%
Rate of success to treat bleeding episodes*	Excellent or good	95.3%	95.8%	93.4%

\* Excellent defined as full relief of pain and objective signs of bleeding cessation; Good defined as definite pain relief and/or improvement in signs of bleeding; Fair defined as probable and/or slight relief of pain and slight improvement in signs of bleeding after a single infusion. Required more than 1 infusion for complete resolution; None defined as no improvement or condition worsened.

### Routine Prophylaxis

A total of 120 subjects (treated population) received a twice a week regimen in the prophylaxis arm, and an additional 17 subjects were treated episodically in the on-demand arm. In the treated population, the median [mean] annualised bleed rate (ABR) in the on-demand treatment arm was 41.5 [40.8] compared to 1.9 [4.7] while on a twice a week prophylaxis regimen (Table 4). In the per-protocol population, the median [mean] annualised bleed rate (ABR) in the on-demand treatment arm was 41.5 [40.8] compared to 1.9 [3.7] while on a twice a week prophylaxis regimen. Using a negative binomial model to estimate the ABR, there was a significant reduction in the ABR ( $p < 0.0001$ ) for subjects in the prophylaxis arm compared to the on-demand arm.

**Table 4 Annualised Bleed Rate by Treatment for ≥ 12 years of age (Treated Population)**

Bleeding Episode Etiology	On-Demand Treatment		Routine Prophylaxis Treatment	
	Median	Mean (SD)	Median	Mean (SD)
Overall	41.5	40.8 (16.3)	1.9	4.7 (8.6)
Joint	38.1	34.7 (15.1)	0.0	2.9 (8.0)
Non-Joint	3.7	6.1 (6.7)	0.0	1.8 (3.0)
Spontaneous	21.6	26.0 (19.6)	0.0	2.9 (7.1)
Traumatic	9.3	14.9 (15.3)	0.0	1.8 (3.1)

In the treated population, the median [mean] ABR for the 23 adolescent subjects age 12 to <18 years of age on routine prophylaxis was 2.1 [5.2] compared to a median [mean] ABR of 1.9 [4.6] for the 97 subjects 18 years and older. Reduction in ABR between the treatment arms was observed regardless of baseline subgroups examined, including age, presence or absence of target joints, and pre-study treatment regimen. The majority of the bleeding episodes during prophylaxis (95%) were of minor/moderate severity. Forty-five out of 120 subjects (38%) experienced no bleeding episodes and 68 out of 120 subjects (57%) experienced no joint bleeding episodes in the prophylaxis arm. Of those subjects who were compliant to regimen (per-protocol population), 40 out of 101 subjects (40%) experienced no bleeding episodes. All subjects in the on-demand arm experienced a bleeding episode, including a joint bleeding episode.

#### Routine Prophylaxis Study in Paediatric Subjects (<12 years of age)

The safety and efficacy of ADYNOVATE was evaluated in a total of 73 paediatric PTPs with severe haemophilia A, of which 66 subjects were dosed (32 subjects aged <6 years and 34 subjects aged 6 to <12 years) in a separate paediatric study. The prophylactic regimen was 40 to 60 IU/kg of ADYNOVATE twice a week. The median [mean] overall ABR was 2.0 [3.61] for the 66 subjects in the treated population and the median [mean] ABRs for spontaneous and joint bleeding episodes were both 0 [1.18 and 1.12, respectively]. Of the 66 subjects treated prophylactically, 25 (38%) experienced no bleeding episodes, 44 (67%) experienced no spontaneous bleeding episodes, and 48 (73%) experienced no joint bleeding episodes.

Of the 70 bleeding episodes observed during the paediatric study, 82.9% were controlled with 1 infusion and 91.4% were controlled with 1 or 2 infusions. Control of bleeding was rated excellent or good in 63 out of 70 (90%) bleeding episodes. The definitions of excellent or good in the paediatric study were unchanged as compared to the previously conducted prophylaxis study in adolescent and adult subjects.

#### Perioperative Management Study

Eleven major surgical procedures (3 knee replacements, 2 arthroscopic synovectomies, 1 cyst extirpation, 1 port placement, 1 gastric band placement, and 3 multiple tooth extractions including 1 radicular cyst removal) and 4 additional minor surgeries (1 synoviorthesis, 1 radiosynovectomy, 1 tooth extraction, 1 dermatological surgery) were performed in 15 subjects. The preoperative loading dose ranged from 36 IU/kg to 99 IU/kg (median: 65 IU/kg) and the total postoperative dose ranged from 177 IU/kg to 769 IU/kg (median: 305 IU/kg). The median total dose for major surgeries was 362 IU/kg (range: 237-863 IU/kg) and the median total dose for minor surgeries was 97 IU/kg (range: 73-119 IU/kg).

Perioperative haemostatic efficacy was rated as excellent (blood loss less than or equal to that expected for the same type of procedure performed in a non-haemophilic patient, and required blood components for transfusions less than or similar to that expected in non-haemophilic population) for all 15 (11 major, 4 minor) procedures. The median (QR) observed intraoperative blood loss (n=10) was 10.0 (Q1: 5.0, Q3: 50.0) mL compared to the predicted average blood loss (n=11) of 50.0 (Q1: 6.0, Q3: 150.0) mL for major surgeries.

## 5.2 PHARMACOKINETIC PROPERTIES

The pharmacokinetics (PK) of ADYNOVATE was evaluated in a crossover study with ADVATE in 26 subjects (18 adults and 8 adolescents) and in 22 subjects (16 adults and 6 adolescents) after 6 months of treatment with ADYNOVATE. A single dose of  $45 \pm 5$  IU/kg was utilised for both products. In the paediatric study, a single dose of  $60 \pm 5$  IU/kg was utilised for both ADVATE and ADYNOVATE to evaluate PK in 31 paediatrics subjects (< 6 years and 6 to < 12 years of age). Plasma factor VIII activity was measured by the one-stage clotting assay and chromogenic assay as shown in Table 5 to Table 8.

ADYNOVATE has an extended half-life of 1.4 to 1.5-fold compared to recombinant full-length human coagulation factor VIII (ADVATE) in the adolescent and adult population, as determined based on one-stage clotting and chromogenic assays, respectively. The half-life extension in the paediatric population was 1.3 to 1.5-fold using both the one stage clotting and chromogenic assays. An increase in AUC and a decrease in clearance as compared to the parent molecule, ADVATE, were also observed. Incremental recovery was comparable with both products. The change in PK parameters was similar in both the adult and adolescent populations and between one-stage clotting and chromogenic substrate assays.

**Table 5 Pharmacokinetic Parameters in Adults Using the One-stage Clotting Assay (Arithmetic mean  $\pm$  SD)**

PK Parameters	ADVATE N = 18	ADYNOVATE N = 18
Design	Individual PK with Full Sampling <sup>a</sup>	
Terminal half-life [h]	10.83 $\pm$ 2.08	14.69 $\pm$ 3.79
MRT [h]	13.41 $\pm$ 3.00	20.27 $\pm$ 5.23
CL [mL/(kg·h)]	3.88 $\pm$ 1.24	2.27 $\pm$ 0.84
Incremental Recovery [(IU/dL)/(IU/kg)]	2.57 $\pm$ 0.43	2.66 $\pm$ 0.68
AUC <sub>0-Inf</sub> [IU·h/dL]	1286 $\pm$ 390	2264 $\pm$ 729
V <sub>ss</sub> [dL/kg]	0.50 $\pm$ 0.11	0.43 $\pm$ 0.11
C <sub>max</sub> [IU/dL]	117 $\pm$ 20	122 $\pm$ 29
T <sub>max</sub> [h]	0.33 $\pm$ 0.19	0.46 $\pm$ 0.29

Abbreviations: CI: confidence interval; C<sub>max</sub>: maximum observed activity; AUC: area under the curve; MRT: mean residence time; CL: clearance; V<sub>ss</sub>: body weight adjusted volume of distribution at steady-state, T<sub>max</sub>: time to reach the maximum concentration

<sup>a</sup> Individual PK with 12 post-infusion samples.

**Table 6 Pharmacokinetic Parameters in Adults Using the Chromogenic Assay  
(Arithmetic mean  $\pm$  SD)**

PK Parameters	ADVATE N = 18	ADYNOVATE N = 18
Design	Individual PK with Full Sampling <sup>a</sup>	
Terminal half-life [h]	10.43 $\pm$ 3.41	15.01 $\pm$ 3.90
MRT [h]	13.00 $\pm$ 3.87	19.70 $\pm$ 5.05
CL [mL/(kg·h)]	3.95 $\pm$ 1.37	1.97 $\pm$ 0.70
Incremental Recovery [(IU/dL)/(IU/kg)]	2.74 $\pm$ 0.39	3.16 $\pm$ 0.68
AUC <sub>0</sub> -Inf [IU·h/dL]	1281 $\pm$ 424	2589 $\pm$ 849
V <sub>ss</sub> [dL/kg]	0.48 $\pm$ 0.14	0.37 $\pm$ 0.08
C <sub>max</sub> [IU/dL]	125 $\pm$ 17	145 $\pm$ 29
T <sub>max</sub> [h]	0.26 $\pm$ 0.12	0.32 $\pm$ 0.16

Abbreviations: CI: confidence interval; C<sub>max</sub>: maximum observed activity; AUC: area under the curve; MRT: mean residence time; CL: clearance; V<sub>ss</sub>: body weight adjusted volume of distribution at steady-state, T<sub>max</sub>: time to reach the maximum concentration

<sup>a</sup> Individual PK with 12 post-infusion samples.

### Paediatric Pharmacokinetics

Pharmacokinetic parameters calculated from 39 subjects less than 18 years of age (intent-to-treat analysis) are available for 14 children (1 to less than 5 years), 17 older children (6 to less than 12 years) and 8 adolescent subjects (12 to < 18 years of age), as shown in Table 7. The mean clearance (based on body weight) of ADYNOVATE was higher and the mean half-life was lower in children less than 12 years of age than adults.

A higher dose may be required in children less than 12 years of age.

**Table 7 Summary of Pharmacokinetic Parameters of ADYNOVATE for Paediatrics  
using the One-Stage Clotting Assay**

Parameter (mean $\pm$ standard deviation)	Paediatric Study		Pivotal Study in adolescents and adults
	< 6 years (n=14)	6 to < 12 years (n=17)	12 to < 18 years (n=8)
Design	Population PK with Sparse Sampling <sup>a</sup>		Individual PK with Full Sampling <sup>b</sup>
Terminal half-life [h]	11.8 $\pm$ 2.43	12.4 $\pm$ 1.67	13.43 $\pm$ 4.05
MRT [h]	17.0 $\pm$ 3.51	17.8 $\pm$ 2.40	17.96 $\pm$ 5.49
CL [mL/(kg·h)]	3.53 $\pm$ 1.29	3.11 $\pm$ 0.76	3.87 $\pm$ 3.31 (2.73 $\pm$ 0.93)*
Incremental Recovery [(IU/dL)/(IU/kg)]	NA <sup>c</sup> (1.88 $\pm$ 0.49)	NA <sup>c</sup> (1.93 $\pm$ 0.48)	2.12 $\pm$ 0.60
AUC <sub>0</sub> -Inf [IU·h/dL]	1950 $\pm$ 758	2010 $\pm$ 493	1642 $\pm$ 752
V <sub>ss</sub> [dL/kg]	0.97 $\pm$ 0.23	1.59 $\pm$ 0.34	0.56 $\pm$ 0.18
C <sub>max</sub> [IU/dL]	NA <sup>c</sup> (115 $\pm$ 30)	NA <sup>c</sup> (115 $\pm$ 33)	95 $\pm$ 25
T <sub>max</sub> [h]	-d	-d	0.26 $\pm$ 0.10

Abbreviations: CI: confidence interval; C<sub>max</sub>: maximum observed activity; AUC: area under the curve; MRT: mean residence time; CL: clearance; V<sub>ss</sub>: body weight adjusted volume of distribution at steady-state, T<sub>max</sub>: time to reach the maximum concentration

\* Estimated mean and SD calculated not including one subject whose clearance estimate was 11.8 mL/(kg·h). Median including all subjects is 2.78 mL/(kg·h).

<sup>a</sup> Population PK model with 3 post-infusion samples based on randomised drawing schedule.

<sup>b</sup> Individual PK with 12 post-infusion samples.

<sup>c</sup> NA, Not applicable, as Incremental Recovery and C<sub>max</sub> in children were determined by individual PK. Results for Incremental Recovery and C<sub>max</sub> determined by individual PK in parenthesis.

<sup>d</sup> T<sub>max</sub> could not be calculated for subjects in the paediatric study as only one sample was drawn (15-30 minutes post-infusion) within the first 3 hours of the infusion

**Table 8 Summary of Pharmacokinetic Parameters of ADYNOVATE for Paediatrics using the Chromogenic Assay**

Parameter (mean ± standard deviation)	Paediatric Study		Pivotal Study in adolescents and adults
	< 6 years (n=14) <sup>a</sup>	6 to < 12 years (n=17) <sup>a</sup>	12 to < 18 years (n=8) <sup>b</sup>
Design	Population PK with Sparse Sampling <sup>a</sup>		Individual PK with Full Sampling <sup>b</sup>
Terminal half-life [h]	13.0 ± 8.74	11.9 ± 2.58	13.80 ± 4.00
MRT [h]	18.7 ± 12.6	17.2 ± 3.72	17.73 ± 5.44
CL [mL/(kg·h)]			3.41 ± 3.14
Incremental Recovery [(IU/dL)/(IU/kg)]	NA <sup>c</sup> 1.90 ± 0.27	NA <sup>c</sup> 2.20 ± 0.38	2.60 ± 0.69
AUC <sub>0-Inf</sub> [IU·h/dL]	2190 ± 1590	2260 ± 514	1900 ± 841
V <sub>ss</sub> [dL/kg]	0.91 ± .12	1.33 ± 0.23	0.49 ± 0.20
C <sub>max</sub> [IU/dL]	NA <sup>c</sup> 117 ± 16	NA <sup>c</sup> 130 ± 24	117 ± 28
T <sub>max</sub> [h]	-d	-d	0.26 ± 0.14

Abbreviations: CI: confidence interval; C<sub>max</sub>: maximum observed activity; AUC: area under the curve; MRT: mean residence time; CL: clearance; V<sub>ss</sub>: body weight adjusted volume of distribution at steady-state, T<sub>max</sub>: time to reach the maximum concentration

<sup>a</sup> Population PK model with 3 post-infusion samples based on randomised drawing schedule.

<sup>b</sup> Individual PK with 12 post-infusion samples.

<sup>c</sup> NA, Not applicable, as Incremental Recovery and C<sub>max</sub> in children were determined by individual PK. Results for Incremental Recovery and C<sub>max</sub> determined by individual PK in parenthesis.

<sup>d</sup> T<sub>max</sub> could not be calculated for subjects in the paediatric study as only one sample was drawn (15-30 minutes post-infusion) within the first 3 hours of the infusion

The PK data demonstrates that ADYNOVATE has an extended circulating half-life.

### 5.3 PRECLINICAL SAFETY DATA

#### Genotoxicity

No studies on genotoxicity have been performed with ADYNOVATE.

#### Carcinogenicity

No studies on carcinogenicity have been performed with ADYNOVATE.

## **6 PHARMACEUTICAL PARTICULARS**

### **6.1 LIST OF EXCIPIENTS**

Calcium chloride dihydrate  
Glutathione  
Histidine  
Mannitol  
Polysorbate 80  
Sodium chloride  
Trehalose dihydrate  
Trometamol  
Water for injections (diluent)

### **6.2 INCOMPATIBILITIES**

Incompatibilities were not assessed as part of the registration of this medicine. ADYNOVATE must not be mixed with other medicinal products.

### **6.3 SHELF LIFE**

2 years

### **6.4 SPECIAL PRECAUTIONS FOR STORAGE**

- Store ADYNOVATE in powder form at 2°C to 8°C.
- Do not freeze.
- ADYNOVATE may be stored at room temperature not to exceed 30°C for a period of up to 3 months not to exceed the expiration date. If stored at room temperature, record the end date of the 3-month storage at room temperature on the carton when ADYNOVATE is removed from refrigeration.
- After storage at room temperature, do not return the product to the refrigerator.
- Do not use beyond expiration date printed on the carton or vial.
- Store vials in their original box and protect them from extreme exposure to light.
- After reconstitution, do not refrigerate the solution. Use the reconstituted solution immediately or within 3 hours after reconstitution. Discard any remaining solution.

### **6.5 NATURE AND CONTENTS OF CONTAINER**

Each pack contains a powder vial and a vial containing 2 mL or 5 mL diluent (both type I glass closed with chlorobutyl rubber stoppers). The product is supplied in either one of the following configurations:

- ADYNOVATE with BAXJECT II Hi-Flow device: Each pack contains a powder vial, a vial containing diluent and a device for reconstitution (BAXJECT II Hi-Flow).
- ADYNOVATE in BAXJECT III system: Each pack contains a ready to use BAXJECT III system in a sealed blister (the powder vial and the vial containing diluent are preassembled with the system for reconstitution).



## 6.6 SPECIAL PRECAUTIONS FOR DISPOSAL

In Australia, any unused medicine or waste material should be disposed of in accordance with local requirements.

## 6.7 PHYSICOCHEMICAL PROPERTIES

### Chemical structure

ADYNOVATE is comprised of 2,332 amino acids [molecular weight (MW) 280 kDa] covalently conjugated with a polyethylene glycol (PEG) reagent (MW 20 kDa).

### CAS number

1417412-83-9

## 7 MEDICINE SCHEDULE (POISONS STANDARD)

Unscheduled (Exempted)

## 8 SPONSOR

Shire Australia Pty Limited  
Level 39  
225 George Street  
Sydney NSW 2000  
Australia  
Telephone: 1800 012 612  
www.shireaustralia.com.au

## 9 DATE OF FIRST APPROVAL

21 March 2017

## 10 DATE OF REVISION

25 February 2019

### Summary table of changes

Section Changed	Summary of new information
All	Australian PI updated to new SPC format
2	Added new strengths 750 IU, 1500 IU and 3000 IU
1, 2, 3, 4.2, 4.4, 5.1, 5.2 6.1, 6.4, 7, 8	Minor editorial and/or formatting changes

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