



# Life Blood Issue 9

Dear Lifeblood Reader

This 9th edition of Lifeblood focuses on the use of additives during transfusion as well as the role of anticoagulants and preservatives used in the preparation and storage of the components derived from whole blood donations. Particular attention is given to the wide range of plasma components and derivatives as a brief outline of their usage guidelines and recommended dosage schedules are included as a reference to assist clinicians in the appropriate transfusion of these products when clinically indicated. Clinicians should be aware that all these preparations from human plasma are antigenic and potentially capable of causing allergic or anaphylactic reactions. Furthermore, we provide an overview of blood component separation and quality control; address the question of whether blood should be warmed prior to transfusion, provide a description of the therapeutic phlebotomy programme and provide some quality assurance statistics. Current or potential blood donors may find the information on the new Blood Donor Centre particularly useful.

April 17, World Haemophilia Day, has heightened awareness of advances in the treatment of haemophilia as a result of the increased availability of FVIII concentrates as well as highlighting the enormous medical, social and psychological problems faced by these patients and their families. Considering the equal safety and efficacy of intermediate, pure and ultrapure concentrates being based on the cost, availability and convenience, it would be pertinent to bear in mind the words of Theodore Roosevelt when he said: "Do what you can, with what you have, where you are." Whereas freeze dried concentrates such as WPBTS Virally Inactivated Anti-Haemophilic Factor are indicated for the treatment of haemophilia, cryoprecipitate, due to its high fibrinogen content, is primarily indicated for the treatment of hypofibrinogenaemia. Cryoprecipitate is not virally inactivated.

Transfusion related acute lung injury (TRALI), categorized by the development of a clinical syndrome of respiratory distress with hypoxia, hypotension, tachycardia and fever as well as radiological evidence of pulmonary oedema is a often overlooked, underdiagnosed transfusion reaction. Typically manifesting within 4-6 hours of the transfusion, volumes as little as 60ml plasma products or 40-50ml platelet concentrates can be implicated. This reversible reaction is distinguishable from adult respiratory distress syndrome by the rapid (4-6 hrs) improvement of symptoms with the use of appropriate medication and prompt respiratory support.

Reference: Guidelines for the use of fresh frozen plasma, cryoprecipitate and cryosupernatant. Bjh 2004  
<http://www.bcshguidelines.com>

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# Life Blood Issue 9

## In this issue...

**New Blood Donor Centre opens at N1 City Mall** ..... Page 2

**Easy Reference Guide for Plasma/Plasma Derived Products** ..... Page 3

**The Role of Additives, Anticoagulants and Preservatives in Blood Transfusion** ..... Page 5

**Should blood be warmed prior to transfusion?** ..... Page 6

**Therapeutic Phlebotomy Programme** ..... Page 7

**Automatic Blood Component Extractor** ..... Page 7

**SANAS Accreditation 2009** ..... Page 9

**Technilaw 5 Star Rating** ..... Page 9

## New Blood Donor Centre opens at N1 City Mall



### Blood Donor Centre

A new fixed Blood Donor Centre situated at shop 40B in the N1 City Mall was officially launched on the 19th February. This popular venue was selected as part of the WPBTS strategy to make blood donation easier and more accessible for donors. Please pay the Centre a call should you wish to donate your blood.

#### Clinic hours:

Mondays-Fridays: 10h00-17h45

Saturdays: 09h00-14h45

Sundays and Public Holidays: 09h00-11h45

**Telephone:** 021 5950925/26



### Mobile Donor Clinic Bus

In addition, the WPBTS has also introduced a fully operational mobile clinic bus aptly named the 'Blood Buzz' in which donors can comfortably make their donation in air-conditioned facilities. 'Blood Buzz' can accommodate a maximum of 5 donors at a time and will travel to various venues throughout the year.

Both the new N1 City Mall Donor Centre and 'Blood Buzz' were made possible by the support of the International Centre for Disease Control (CDC) with funding from the United States President's Fund for Aids Relief.








# Life Blood Issue 9

## Easy Reference Guide for Plasma/ Plasma Derived Products

There is a wide range of plasma and plasma derived products available each with specific indications for use. Due to the extensive product profile these have been tabulated into a comprehensive guide for easy reference, as seen in the table below.







For purposes of clarity plasma components are derived generally from single donations, produced in component processing laboratories and rely on physical separation techniques whereas plasma derivatives are derived from plasma pools and subject to more complex physico-chemical fractionation procedures. These plasma derivatives are also subject to pathogen inactivation technologies.

Plasma products should preferably be ABO compatible, especially in the case of infants. However, low titre ABO incompatible plasma may be infused provided it is not significantly contaminated with red cells.

Product	Preparation	Volume	Composition	Indications
 Fresh Frozen Plasma (FFP)	Produced by the removal of plasma from a unit of centrifuged whole blood. The plasma is frozen at $\leq -23^{\circ}\text{C}$ within 18 hours of collection.	260 $\pm$ 60ml	<ul style="list-style-type: none"> <li>Fibrinogen 200mg per unit of FFP</li> <li>FII 1.03 IU/ml</li> <li>FV 0.64 IU/ml</li> <li>FVII 1.21 IU/ml</li> <li>FVIII 0.85 IU/ml</li> <li>FIX 0.95 IU/ml</li> <li>FX 1.25 IU/ml</li> <li>FXI 0.79 IU/ml Antithrombin III 104 IU/ml</li> <li>Plasma pseudo-cholinesterase 3000-10 000 IU/L</li> <li>Solutes: Glucose 24.8 mmol/l, Sodium 165mmol/l, Osmolarity 322mmol/l, Potassium 3.0mmol/l, Chloride 79mmol/l and pH 7.3</li> </ul> <p><b>CAUTION:</b> FFP is hyperosmolar due to the solutes listed, care should be taken not to precipitate pulmonary oedema if cardiopulmonary function is compromised and tissue oedema is present. Hypernatraemia and hypokalaemia may occur if large volumes are transfused.</p>	<ul style="list-style-type: none"> <li>Replacement of inherited single factor deficiencies (If single factor concentrate n/a)</li> <li>Multiple coagulation factor deficiencies in the presence of active bleeding and abnormal coagulation screening tests</li> <li>Thrombotic thrombocytopenic purpura (TTP) (Preferably cryo poor plasma)</li> <li>Reversal of Warfarin if active bleeding: preferable to use Prothrombin Complex Concentrate (PCC) eg. Haemosolvex Factor IX</li> <li>Vitamin K deficiency associated with active bleeding</li> <li>Scoline Apnoea</li> </ul> <p>Paediatric use: Haemorrhage Disease of the Newborn: use FFP and intravenous Vitamin K. <b>There is no justification for use of FFP</b> in hypovolaemia, plasma exchange procedure (except TTP), nutritional support and protein losing states.</p>
 Cryoprecipitate (Cryo)	Cryo is the cold insoluble fraction of FFP which remains after the thawing and draining at 0-4 $^{\circ}\text{C}$ within 8 hours of collection.	6-8ml	<ul style="list-style-type: none"> <li>FVIII and vWF <math>\pm</math>100 IU per unit</li> <li>Fibrinogen 150-250 mg per unit</li> <li>Fibrinectin</li> <li>FXIII</li> </ul> <p><b>N.B.</b> Cryoprecipitate does not have a pathogen reduction process whereas freeze-dried Anti-Haemophilic Factor does.</p>	<ul style="list-style-type: none"> <li>Hypofibrinogenaemia (Acquired or congenital) May also be used for treating:</li> <li>Hereditary FXIII deficiency</li> <li>In emergency situations in Haemophilia A if Anti-Haemophilic Factor n/a</li> </ul>
 Cryosupernatant	Cryosupernatant is the unit of plasma that has had the cryo removed.	280 $\pm$ 50ml		<ul style="list-style-type: none"> <li>Thrombotic thrombocytopenic purpura (TTP)</li> </ul>
 Human Anti-Haemophilic Factor	Prepared from small pools (5-6 bags) of cryo. This is an intermediate purity FVIII concentrate. It undergoes a viral inactivation procedure that has been shown to inactivate HIV, HBV and HCV.	250 IU 500 IU	<ul style="list-style-type: none"> <li>250 IU or 400-600 IU FVIII:C</li> <li>Therapeutic levels of von Willebrand factor</li> </ul> <p><b>N.B.</b> Does not contain therapeutic concentrations of fibrinogen</p>	<ul style="list-style-type: none"> <li>Treatment of FVIII deficiency (Haemophilia A)</li> <li>Also of use in von Willebrand's disease</li> </ul>
 WPBT - 20% Albumin	Prepared from large pools of plasma that has undergone ethanol fractionation which further reduces the risk of viral transmission. The albumin solution is sterilised by filtration and finally pasteurised by heat, a process validated and shown to inactivate HIV, HBV and HCV.	50ml 100ml	<ul style="list-style-type: none"> <li>Total protein 200 g/l</li> <li>Albumin <math>\geq</math> 96% of total protein</li> <li>Sodium <math>\leq</math> 130 mmol/l</li> <li>Potassium <math>\leq</math> 10 mmol/l</li> <li>Osmolality 220 mOsm/kg</li> <li>pH 7.0</li> </ul>	<ul style="list-style-type: none"> <li>Expansion of blood volume in patients with shock</li> <li>Replacement fluid following paracentesis</li> <li>Therapeutic plasma exchange</li> <li>Treatment of protein loss in patients with extensive burns</li> <li>Nephrotic syndrome</li> <li>As an adjunct to exchange transfusion in fullterm neonates with hyperbilirubinaemia</li> <li>As an adjunct to patients undergoing dialysis</li> </ul>








# Life Blood Issue 9

Product	Preparation	Volume	Composition	Indications
<b>WPBT - Stabilised Serum</b> 	Prepared by selective absorption of lipoprotein, coagulation proteins and complement components from large pools of plasma. Potential viral pathogens are reduced by this process and ultraviolet irradiation plus a heat treatment step validated as a viral inactivation procedure for HIV. This product is stabilised by the removal of lipoproteins and fibrinogen.	50ml 250ml	<ul style="list-style-type: none"> <li>• Total protein of 50g/l</li> <li>• Albumin 36g/l</li> <li>• Immunoglobulin G 10g/l</li> <li>• Immunoglobulin A 2g/l</li> <li>• Immunoglobulin M 1g/l</li> <li>• Sodium 130 mmol/l</li> <li>• Potassium 3.5 mmol/l</li> <li>• Calcium 1.2 mmol/l</li> <li>• Chloride 130 mmol/l</li> <li>• Osmolality 260 mOsm/kg, pH 7.5</li> <li>• Erythrocyte antibodies – both Anti-A and Anti-B titres are 4 or less.</li> </ul>	<ul style="list-style-type: none"> <li>• For volume replacement in the initial stages of shock and hypovolaemia, where the replacement of clotting factors is not required.</li> <li>• May be used in hypoproteinaemia and in burns.</li> </ul>
<b>Bioplasma FDP</b> 	Produced from pooled fresh human plasma. It undergoes a viral inactivation step using a solvent detergent process which inactivates lipid enveloped viruses such as HIV, Hepatitis B and Hepatitis C.	50ml 250ml	<ul style="list-style-type: none"> <li>• After reconstitution with water for injection each 100ml Bioplasma FDP contains 4g-6g plasma proteins with a normal distribution of human plasma components including albumin, immunoglobulins, coagulation and complement factors and their inhibitors. Bioplasma FDP contains a minimum of 0.4 IU/ml of each coagulation factor.</li> </ul>	<ul style="list-style-type: none"> <li>• Bioplasma FDP can be used where plasma and/or coagulation factors are required. Bioplasma FDP has been used successfully for: <ul style="list-style-type: none"> <li>• Replacement of inherited single factor deficiencies</li> <li>• Multiple coagulation factor deficiencies</li> <li>• Thrombotic thrombocytopenic purpura (TTP)</li> <li>• Reversal of warfarin effect</li> <li>• Vitamin K deficiency</li> <li>• Scoline Apnoea</li> <li>• Paediatric use – Haemorrhage Disease of the Newborn</li> </ul> </li> </ul>
<b>Haemosolvate© Factor VIII</b> 	Intermediate purity FVIII concentrate, with a high specific factor VIII (factor VIII:C) and von Willebrand factor (factor VIII:vWF) activity. Prepared from pooled fresh human plasma. The manufacturing method includes a process of solvent detergent treatment developed to inactivate lipid enveloped viruses such as HIV, HBV and HCV.	300 IU 500 IU	<p>When each vial of the product is reconstituted with water for injection, the solution (per vial) will contain:</p> <ul style="list-style-type: none"> <li>• 300 IU factor VIII:C</li> <li>• &gt;300 IU factor VIII:vWF</li> <li>• ≤ 0.31g sucrose</li> <li>• ≤ 0.15g protein of which not more than 80% is fibrinogen</li> </ul> <p>When each vial of the 500IU product is reconstituted with water for injection, the solution (per vial) will contain:</p> <ul style="list-style-type: none"> <li>• 500 IU factor VIII:C</li> <li>• &gt; 500 IU factor VIII:vWF</li> <li>• ≤ 0.31g sucrose</li> <li>• ≤ 0.25g protein of which not more than 80% is fibrinogen</li> </ul>	<p>Haemosolvate© Factor VIII is indicated for the treatment of:</p> <ul style="list-style-type: none"> <li>• Haemophilia A</li> <li>• von Willebrand's disease</li> </ul>
<b>Haemosolvex© Factor IX</b> 	This prothrombin complex is prepared from pooled fresh plasma. It undergoes a viral inactivation step using a solvent detergent process which inactivates lipid enveloped viruses such as HIV, HBV and HCV.		<p>It consists of:</p> <ul style="list-style-type: none"> <li>• Factor II (prothrombin)</li> <li>• Factor VII (proconvertin)</li> <li>• Factor IX (Christmas factor)</li> <li>• Factor X (stuart-Prower factor)</li> </ul>	<p>Haemosolvex © Factor IX is indicated for:</p> <ul style="list-style-type: none"> <li>• the management of Haemophilia B</li> <li>• Treatment of severe bleeding resulting from an overdose of oral coumarin-derivative anticoagulants (eg. warfarin)</li> </ul>
<b>Polygam©</b> 	This is a polyvalent normal immunoglobulin product which contains a normal distribution of IgG subclasses derived from pooled human plasma from South African donors. It is prepared by cold ethanol fractionation and pH4.0 pepsin treatment. The pH4.0 pepsin process has been validated and shown to be effective against enveloped viruses HIV, HBV and HCV.	1g 3g 6g 12g	<ul style="list-style-type: none"> <li>• Polygam consists primarily of monomeric immunoglobulin (IgG) and contains trace amounts of IgA and IgM.</li> </ul>	For further information regarding indications and directions for use, please refer to the package insert.
<b>Intragam©</b> 	This is a human normal immunoglobulin for intramuscular injection derived from pooled human plasma from South African donors. This product contains antibodies to a wide variety of pathogens to which the donors have been exposed.	2 ml 5 ml	Intragam© contains 16% gammaglobulin.	For further information regarding indications and directions for use, please refer to the package insert.



# Life Blood Issue 9

Product	Preparation	Volume	Composition	Indications
 Hebagam® IM	This contains gammaglobulin derived from pooled human plasma with a high titre of antibodies to the hepatitis B surface antigen. Immunoglobulins are the antibody-containing fraction of human plasma obtained by fractionation of pooled plasma units.	2 ml	Each 2 ml ampoule contains 200 IU (100IU/ml) of hepatitis B antibodies.	For further information regarding indications and directions for use, please refer to the package insert.
 Rabigam® IM	This contains gammaglobulin derived from pooled human plasma with a high titre of antibodies to the rabies virus.	2 ml	Each 2 ml ampoule contains 300 IU (150IU/ml) rabies virus antibodies.	For further information regarding indications and directions for use, please refer to the package insert.
 Rhesugam IM	This contains gammaglobulin derived from pooled human plasma sourced from Rh <sub>0</sub> -negative donors who have antibodies to the Rh <sub>0</sub> (D) erythrocyte antigen.	2 ml	Each 2 ml ampoule contains 500 IU (100 µg) of human anti-D (Rh <sub>0</sub> ) immunoglobulin.	For further information regarding indications and directions for use, please refer to the package insert.
 Tetagam IM	This contains gammaglobulin derived from pooled human plasma with a high titre of antibodies to tetanus toxin.	500 IU 250 IU	Tetagam IM is available as a 250 IU (2 ml) and 500 IU (1 ml) preparations.	For further information regarding indications and directions for use, please refer to the package insert.
 Vazigam® IM	This contains gammaglobulin derived from pooled human plasma with a high titre of antibodies to the varicella-zoster virus.	2 ml	Each 2 ml ampoule contains at least 200 IU (100 IU/ml) varicella-zoster virus antibodies.	For further information regarding indications and directions for use, please refer to the package insert.

**Footnotes:**

Each donation is collected from healthy volunteer non-remunerated donors has been individually tested by serologic and nucleic acid technology for HIV, HBV and HCV and is non-reactive for these tests.

For further information regarding indications and directions for use, please refer to the package inserts of each product.

## The Role of Additives, Anticoagulants and Preservatives in Blood Transfusion

No medications or other fluid should be added to the blood or blood products before or during a transfusion because:

- bacterial contamination is a real hazard whenever any unit of blood is entered.
- a reaction could occur between the drug and the anticoagulant or nutrient fluid in the blood, e.g. Dextrose solutions might cause lysis or aggregation of the red cells in the transfusion set.
- blood may be administered slowly thus therapeutic levels of a drug may not be achieved.

If it is however difficult to infuse medication through an alternative access site, a Y piece may be inserted near the junction of the insertion of the intravenous transfusion cannula.

The only fluids that can be given concurrently through the same IV device as a red cell transfusion are:

- Normal saline
- 4% Albumin
- Plasma protein fractions
- ABO – compatible plasma

The anticoagulant of choice viz. CPD is constituted of citrate, phosphate and dextrose. Citrate binds to the free calcium in blood thereby inhibiting clotting since clotting is a calcium dependent mechanism. Dextrose serves as a substrate for ATP production and phosphate acts as a pH buffer and substrate for 2,3-DPG formation.



## Life Blood Issue 9

The unique combination of sodium chloride, adenine, glucose and mannitol in SAGM preservative provides optimal red cell viability. Sodium Chloride provides isotonicity, adenine maintains ATP for red cell viability, glucose supports red cell metabolism and mannitol helps reduce red cell lysis.

The advantages of using SAGM additive solution are:

- It allows preparation of RBC units with a final hematocrit of about 60%.
- It provides an increased plasma yield for optimum production of platelets, plasma and cryoprecipitate as well as reduces the metabolic burden to patients because of the reduced glucose load.
- It extends red cell dating for utilization in pre-deposit autologous blood programmes.
- It improves inventory management with 42-day red cell storage.
- It increases flow rates for easier transfusion and eliminates pre-dilution of red cells.
- It provides 3-5 days platelet storage.

**NB.** WPBTS Red Blood Cells are obtained from a unit of Whole Blood that has had the plasma and buffy coat removed following centrifugation. SAGM is then added to the blood.

WPBTS blood products contain the following:

- Whole Blood: 525 ± 50ml contains 63ml CPD anticoagulant.
- Red Cell Concentrate: 300 ± 50ml from 480ml Whole Blood in 63ml CPD anticoagulant contains 100ml of SAGM solution.
- Red Cell Concentrate Prestore Leucocyte Poor: 260 ± 50ml from 480ml Whole Blood in 63ml CPD anticoagulant contains ±100ml of SAGM solution.
- Infant Red Cell Concentrate Leucocyte Poor: 75 ± 20ml contains ± 33ml SAGM solution.
- Paediatric Red Cell Concentrate Leucocyte Poor: 130 ± 25ml contains ± 32ml SAGM solution.
- Pooled Random Donor Platelet: Contains 50 ±10ml per random donor pool in CPD anticoagulant.
- Apheresis Platelet Concentrate: Contains ± 200ml prepared from a single donor using ACD anticoagulant.
- Infant Apheresis Platelet: Contains 40-60ml prepared from a single donor using ACD anticoagulant.
- Fresh Frozen Plasma: 280 ± 70ml of which ± 55ml is CPD anticoagulant.
- Fresh Frozen Plasma Cryo Poor: 230-330ml of which ±55ml is CPD anticoagulant.
- Paediatric Fresh Frozen Plasma : 130 ± 30ml of which ± 25ml is CPD anticoagulant.
- Cryoprecipitate : ± 100 i.u. Factor VIII in 6-8 ml plasma prepared from a single unit of whole blood in 63ml CPD anticoagulant.

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### Should blood be warmed prior to transfusion?

If cold blood is administered at a slow rate it does not appear to affect the circulatory system. However in cases where rapid transfusion is necessary, complications such as cardiac arrhythmias can be avoided by warming the blood to not more than 37 °C. Overheating of the blood can cause extensive haemolysis with renal damage and possible death. Blood should be warmed with a blood warmer specifically designed for this purpose. This apparatus should be equipped with a visible temperature-monitoring device and should have an audible alarm. The practice of warming blood in a sink of warm water is ineffectual, as only the outer red cell layers are warmed. It may also present an infectious hazard as the ports may become contaminated. Furthermore, overheating may occur with devastating haemolysis.

Under no circumstances should blood be heated in a microwave oven or similar device. This not only results in extensive haemolysis but also causes conformational changes and denatures proteins. Blood warming is not routinely indicated and refrigerated blood may be transfused without harm over several hours.



# Life Blood Issue 9

Indications for warming are:

- Massive transfusion of more than 50ml/kg/h.
- Infants transfused at greater than 15ml/kg/h.
- Neonates receiving exchange transfusion or large volume transfusion.
- Patients with high titre cold haemagglutinins reactive in vitro at temperatures above 30 °C.

## Therapeutic Phlebotomy Programme



At WPBTS we offer a therapeutic phlebotomy facility where patients are bled under the careful supervision of our medical personnel.

In order to schedule appointments, the clinicians request and patient consent forms (attached to brochure) must be submitted to the therapeutic phlebotomy unit.

**Contact Details:**

**Telephone:** 021 5076348 or 021 507 6320

**Fax:** 021 531 3335

**E-mail:** [phlebotomy@wpbts.org.za](mailto:phlebotomy@wpbts.org.za)

The patient's clinician is responsible for the overall medical management of the patient as well as setting and altering the phlebotomy intervals, regular iron study testing and patient referral to specialist haematologist where required. The WPBTS will perform a blood pressure, pulse and haemoglobin test at each donation. Full blood count results will be sent to the requesting clinician periodically. The patient is responsible for attending the phlebotomy clinics as prescribed, report any unusual symptoms and schedule regular medical follow ups with own clinician.

Should you require Therapeutic Phlebotomy brochures for your patients or for display purposes in your waiting area contact the marketing officer on telephone 021 5076326 or e-mail [marketing@wpbts.org.za](mailto:marketing@wpbts.org.za)

## Automatic Blood Component Extractor



**T-Ace II Terumo Automatic Component Extractor**

The T-Ace II is utilised in our component processing laboratory to effectively separate various blood components. Several technologies are incorporated to achieve this viz. a pneumatic press system utilised for guiding different components to the appropriate bags; scales which weigh the amount of collected volume entering the bags; an optical detector used for sensitive detection to obtain eg. the largest plasma volumes or as a security detection to prevent the buffy coat or RBC from flowing to the wrong bag in the case of mechanical failure; clamps used to route the flow into the correct bag; sealing hands to seal tubing; LED detectors will notice the difference between plasma and buffy coat or RBC.



# Life Blood Issue 9

In addition quality control tests are performed on a representative sample of production to monitor processes used and to obtain an indication of whether the process is in control or not.

Whole Blood units are:

- Visually checked for signs of leakage, damage to the container, excessive air, microbial contamination, haemolysis and turbidity.
- Weighed and the volume calculated.

Red Cell Concentrates are:

- Visually checked for signs of leakage, damage to the container, excessive air, microbial contamination, haemolysis and turbidity.
- Weighed and the volume calculated.
- Haematocrit calculated.
- Leucocyte count performed.

Washed Red Cell Concentrates are:

- Visually checked for signs of leakage, damage to the container, excessive air, microbial contamination, haemolysis and turbidity.
- Weighed and the volume calculated.
- Haematocrit calculated.
- Protein content of supernatant checked.

Infant Apheresis Platelets are:

- Visually checked for signs of leakage, damage to the container, excessive air, microbial contamination, haemolysis and turbidity.
- Weighed and the volume calculated.
- pH checked
- Total platelet count performed.

Pooled Random Platelets are:

- Visually checked for signs of leakage, damage to the container, excessive air, microbial contamination, haemolysis and turbidity.
- Weighed and the volume calculated.
- Total platelet count performed.
- Leucocyte count performed if leucocyte depleted.
- pH checked within 24 hours of expiry.

Fresh Frozen Plasma is:

- Visually checked for signs of leakage, damage to the container, excessive air, microbial contamination, haemolysis and turbidity.
- Weighed and the volume calculated.
- Factor VIII:C checked.

Cryoprecipitate is:

- Visually checked for signs of leakage, damage to the container, excessive air, microbial contamination, haemolysis and turbidity.
- Weighed and the volume calculated.
- Factor VIII:C checked.



# Life Blood Issue 9

## SANAS Accreditation 2009



The management and staff of WPBTS are committed to a quality management system that ensures blood products and related services meet the requirements of clinicians and their patients.

To this end the Service seeks SANAS accreditation annually. Ongoing accreditation has been achieved for 2009 thereby confirming the Service as a centre of excellence.

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## Technilaw Health and Safety



In 2008, WPBTS retained its 5 star accreditation for the 6th consecutive year.