HemoClear Factsheet

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product

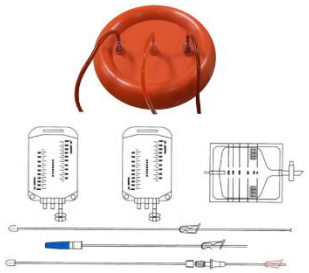
The HemoClear blood filter recuperates patients own Red Blood cells (RBCs), from wound fluid while eliminating all substances putting the patient at risk.

HemoClear provides an effective, safe and fast bedside solution for acute anemia due to severe bleeding by reinfusion fresh retained patient' own RBCs with high haematocrit.

HemoClear Kit

The sterile HemoClear blood filtration kit consist of;

- The HemoClear blood filter
- Two 1.000 ml blood bags
- One waste 2.000 ml waste bag
- All connecting lines



Additional products to consider

20-45µ Filters

When microaggregates or bone fragments are expected, it is necessary to filter shed blood to avoid tubes or filter channels to be clogged.

Blood collection reservoir (including 45µ Filter)

Easy transfer of collected blood to the HemoClear filter procedure. The by HemoClear selected, blood collection reservoir can 'follow' the patient from OR to ICU

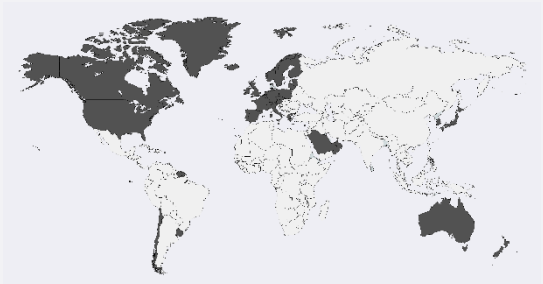
HemoClear

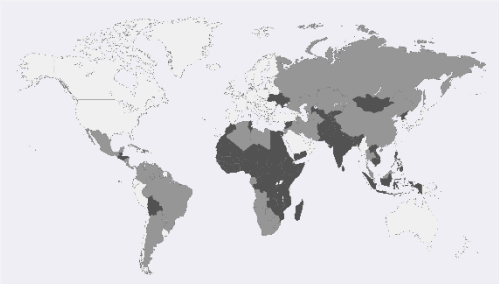
importance of the product

Red blood cells (RBCs) carry oxygen from the lungs through the bloodstream to the tissues. The vast majority of oxygen in blood is bound to hemoglobin (Hb) in RBCs. Anemia is a condition that develops when blood lacks enough RBCs, consequently resulting in a lowered ability of the blood to carry oxygen. Commonly caused anemia by blood loss due to trauma and bleeding is associated with significant increases in morbidity and mortality.

Every second of every day, people around the world—of all ages and from all walks of life—need blood transfusions to survive.

HIGH INCOME COUNTRIES	MIDDLE & LOW INCOME COUNTRIES
Although methods of blood collection, preparation and storage have improved significantly, potential complications and efficacy, especially of allogeneic RBC transfusions, are still a major concern. Allogeneic RBC transfusions in patients having cardiac surgery is strongly associated with both infection and ischemic postoperative morbidity, length of hospital stay, increased early and late mortality and indirect hospitalization costs. One long-standing primary concern has been bacterial and viral contamination but recently other risks have been identified, mostly related to recipient immunomodulation and storage lesion-related changes.	Low Income countries face chronic shortage of donor blood which particularly affect children with severe anemia due to malaria or malnutrition and women with complications of pregnancy or childbirth. Many patients requiring transfusion do not have timely access to safe blood. The need for blood transfusion may arise at any time in both urban and rural areas. The unavailability of donor blood has led to deaths and suffering from ill-health. More than 500.000 women die yearly during pregnancy or childbirth, 99% in low income countries. Hemorrhage is the principal cause of these deaths and timely access to safe blood contributes to their survival.



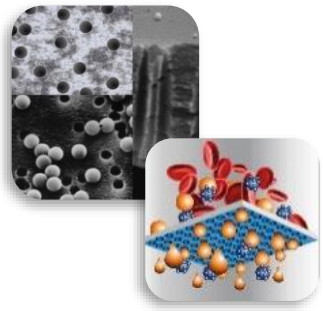
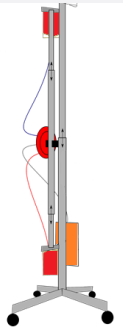


HemoClear

product description

The HemoClear filter is a sterile device that uses cross flow filtration by gravity and is capable of capturing RBCs and separating them from other fluids and plasma with a high degree of specificity. After filtering, the RBCs are re-infused (autologous blood transfusion) and the plasma fluid is deleted together with toxins and pathological elements.

The core technology of the filter is a medical grade polyurethane film that is bombarded by argon ions in a vacuum atmosphere. The multilayer filter module allows a large filtration surface with no blockage of the pores and still adequate filtration by gravity only.

Filter	Device	Set-up
		

where used

ICU	Recurring bleeding after operation or trauma care.	Urology	Radical retro pubic prostatectomy
Cardiac	All procedures depending on type and level of the cardiac centre. Examples of high risk bleeding procedures: Valve replacements, Aortic vessel surgery, Redo bypass grafting	Vascular	Thoraco-abdominal aortic aneurysm repair, Abdominal aortic aneurysm repair
Orthopaedics	Major spine surgery. Bilateral knee replacement. Revision of hip replacement	Trauma care	Massive blood loss casualties, disasters and war
Gynaecology	Abdominal Hysterectomy , Ruptured ectopic pregnancy	Liver Transplant	
Obstetrics	Fluxus post-partum bleeding	Other	Jehovah's Witnesses. Repeated allogeneic transfusion need

product validation

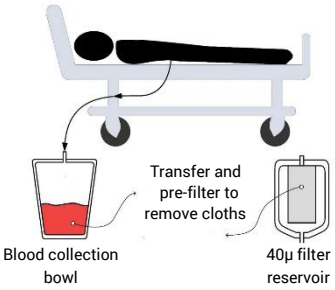
HemoClear versus Cell Saver: Comparing the effect of two blood concentrations techniques after cardiothoracic surgery.
Study performed in academic hospital UMC Utrecht, Utrecht, The Netherlands and Isala Hospital, Zwolle, The Netherlands

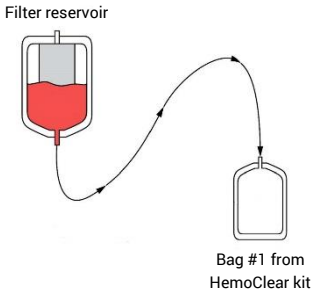
Methods:
This study was conducted at the Isala Clinics, Zwolle, The Netherlands from July to October 2015 and compared the effect of two blood concentration techniques after cardio-thoracic surgery: the conventional Cell Saver and the new HemoClear. The study design was a noninferiority hypothesis of HemoClear compared to Cell Saver. Shed blood was collected from 20 patients and processed for 18 hours after cardiothoracic surgery. The volume was equally divided in two parts. The first half was processed by Cell Saver and the second half of the volume was processed by the HemoClear. The same amount of saline infusion that was used by the Cell Saver was added to the beginning shed blood to be processed by HemoClear. Both volumes resulted in a concentrate and a filtrate. The study-endpoints were hemoglobin, hematocrit, leukocytes, platelets, (total load of) free hemoglobin, D-dimer and complement C3 and C4. The statistical analysis included descriptive statistics and paired T-tests.

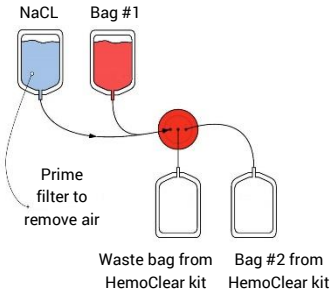
Results:
Within the concentrate, free hemoglobin (P=0.008), platelets (P=0.002), D-dimer (P=0.014) and complement C3 (P=0.000) and C4 (P=0.000) were statistically significant. Within the filtrate, hemoglobin (P=0.003), hematocrit (P=0.030), free hemoglobin (P=0.000), total load free hemoglobin (P=0.001) and platelets (P=0.001) were statistically significant. Within the concentrate, hemoglobin (P=0.990), hematocrit (P=0.962), total load free hemoglobin (P=0.001) and leukocytes (P=0.098) were not statistically significant. Within the filtrate, only leukocytes (P=0.120) was not statistically significant.

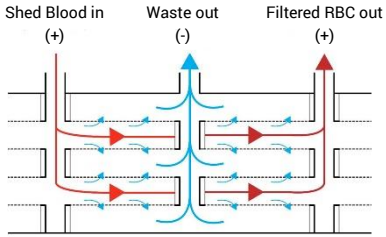
Conclusion:
The study set-up was based on a worse-case scenario. The processing time was more than 18 hours after surgery and filling the Cell Saver reservoir was done by complete suction out of drain boxes. The results of the HemoClear compared to Cell Saver for the cellular components demonstrated equal efficacy in concentrating erythrocytes and leucocytes, platelets are also passing through the HemoClear and frail erythrocytes would be more prone to hemolysis by HemoClear. The results of the HemoClear compared to Cell Saver for the non-cellular components demonstrated that the clinical efficacy was comparable between the two methods due to reduction of total load by 90% of measured components.

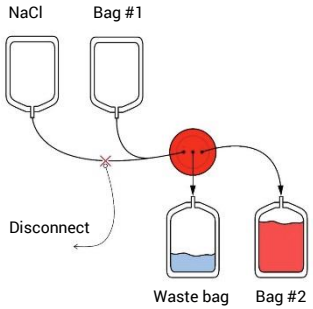
instructions for use

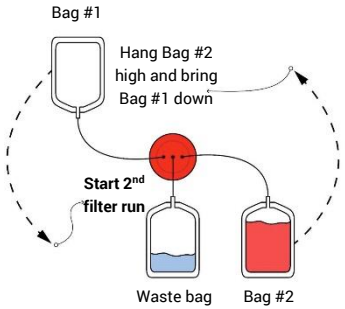


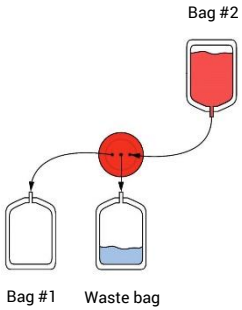


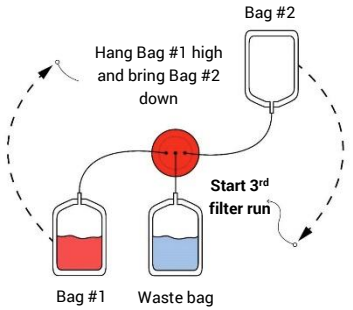


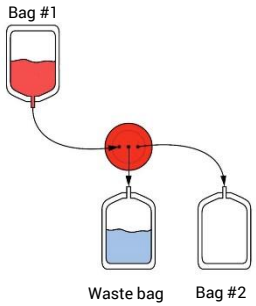


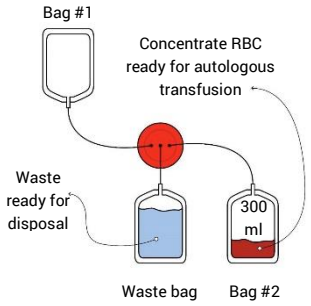


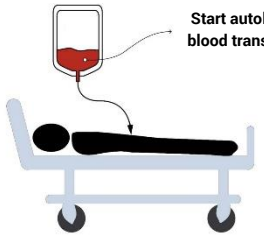












Introduction video HemoClear

HemoClear

Features & benefits

Feature	Benefit	Feature	Benefit
Filter	No equipment investment	Cross flow	Multiple filter runs without disconnection tubing
	No maintenance or depreciation	Modular layers	Large surface, fast filtering (10 minutes per run)
	No technical operator needed	Kit	Ready to use unit with all required consumables
	Bedside procedure	Elementary	Simple procedure, easy to train
Gravity flow	No need for electricity	Shelf life	Years compared to days with donor blood
Secured pores	High Red Blood Cell specific filtration	Non biological	No cold chain storage or transportation
Polyurethane	Minimum harmed disrupted cells, fluent filtering	Single use	No cleaning procedure and activities
Fresh blood	High functional hematocrit, right temperature, PH and composition	Autologous blood	Cost efficient, no demand on donor blood pool
Patients own blood	Recovery of the patient is significantly better as the patient is receiving body's own red blood cells *(Möhnle et al., 2011; Murphy et al., 2007; Shander et al., 2011)*	Patients own blood	Total costs of surgical interventions will be lower as a result of both better and faster recovery, with less demand on medical resources *(LaPar et al., 2013; Schmidt, Refaai,; Blumberg, 2016a; Shander, Hofmann, Gombotz, Theusinger,;Spahn, 2007; Shander et al., 2010; Zilberberg ; Shorr, 2007)*
	The need for blood donor transfusion is reduced, so both the dependency of available donor blood (type, amount, place, costs) and the chances of adverse side effects of transfusion are decreased. *(Avgerinos, DeBois; Salemi, 2014; Madjdpour,Spahn, 2005; Murphy et al., 2015)*		HemoClear deals with any safety, health, ethical or personal issues on blood transfusion *(Azab, Vrakking, Verhage,; Rosseel, 2010; Moraca et al., 2011) ;*
	Addresses the Increased risk of infection after surgery with allogeneic red blood cell transfusion (*Hod etal., 2010; Horvath et al., 2013; Spiess, 2013)*		HemoClear adds a valuable contribution to patient blood management programs *(Schmidt et al., 2016a; Schmidt, Refaai, Kirkley, & Blumberg, 2016b)*

competitive advantages

The HemoClear Red Blood Cell Filter is first in Class providing filtered autologous blood for transfusion but there are other sources for blood transfusion:

Allogeneic donor blood:

- Costly; handling donor blood equals 3-5 times donor blood unit purchase.
- Short shelf life
- Risk of undesirable effects
- Not always available

Centrifuged patient blood, cell saver technology:

- Complex technology
- Handling requires trained operator
- Needs stringent cleaning procedure
- Consumable costs

Other filters, not Red Blood Cells specific

- There're several blood filters available aiming for;
  - Concentrating collected blood by filtering out the water component.
  - Filtering out microaggregates or bone fragments

These filters are often complementary to the HemoClear filter, not competing

competitors

Donor Blood is exclusively supplied by supervised blood banks.
Cell Saver equipment is supplied by Medtronic, Cobe, Fresenius, Haemonetics

regulatory status

The technical file will be submitted in December 2018 for review and audit to The CE Regulatory agent in Europe, ECM, Germany. Obtaining the CE authorization is expected in March 2019.

Safety has been evaluated following International Organization for Standardization (ISO) 10993 standards and FDA guidance (May 1,1995). Device category is defined as; externally communicating devices, blood Path, Indirect with a limited (less than 24 hours) contact duration. To prove biocompatibility the following tests have been performed: Cytotoxicity, Intracutaneous study in rabbits, Acute Systemic Toxicity in mice, Guinea Pig Maximization Sensitization test, Guinea Pig Maximization Sensitization test, Product validation study.

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Commercial and regulatory

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