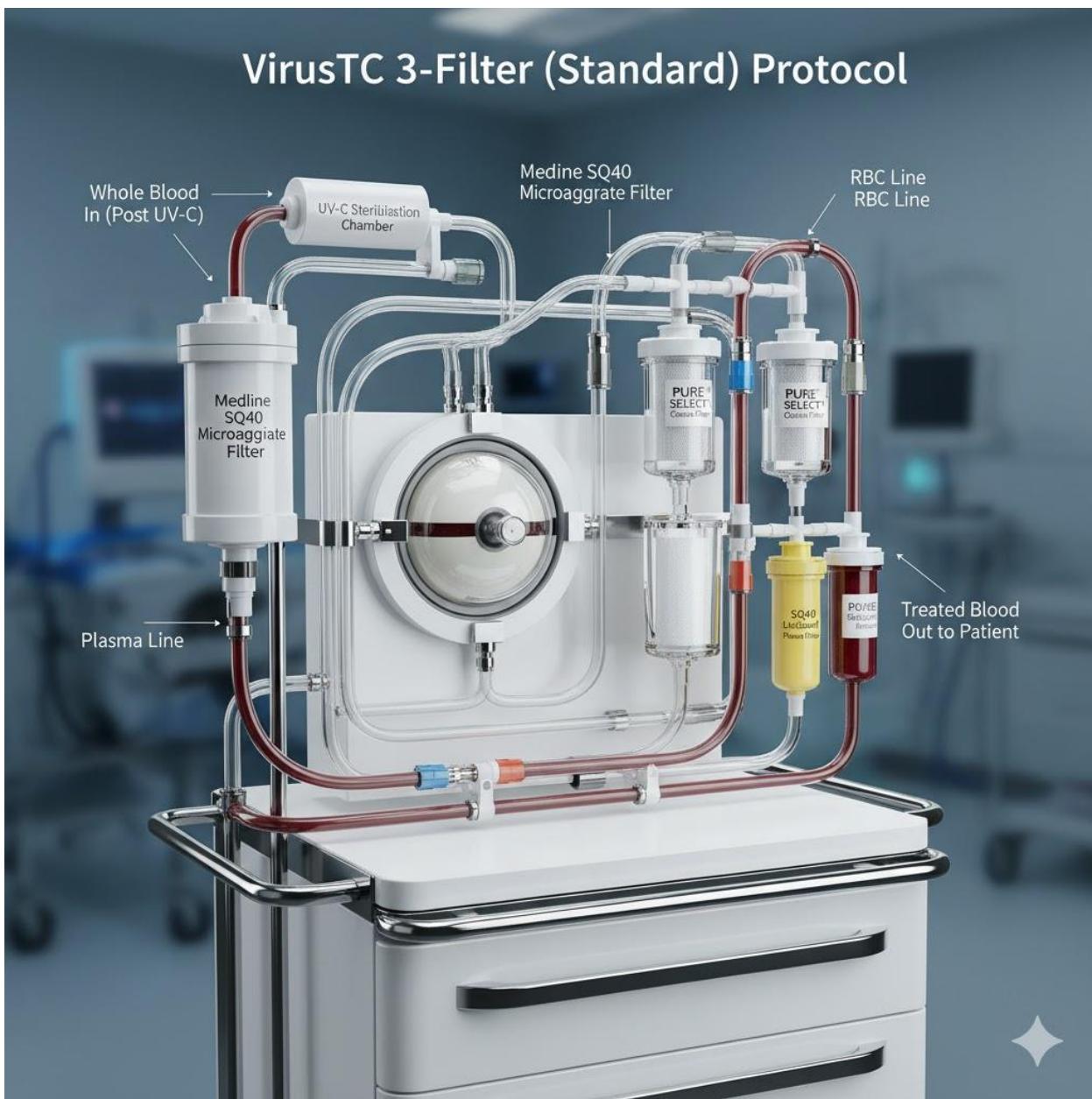


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Virus Treatment Centers [VirusTC]  
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American Society for Apheresis (ASFA)

## VirusTC's UV-C Autologous Blood Treatment: A New Strategy for Blood Sepsis (Septicemia) at Fred Hutchinson Cancer Center

## VirusTC 3-Filter (Standard) Protocol



In global Oncology departments, the most immediate danger to many patients isn't the cancer itself, but life-threatening complications. Sepsis, often triggered by severe treatment-induced neutropenia, is one of the most critical and frequent culprits. To provide a new, rapid line of defense against this threat, Fred Hutchinson Cancer Center is introducing the VirusTC UV-C Autologous Blood Treatment.

*"VirusTC outlines the process, mechanism, and benefits of this advanced new therapy."* – FADM Melody Bouck USCG

## The Autologous UV-C Treatment Process

When a patient is identified for treatment, the process begins much like a standard apheresis procedure. IV access is established, and the patient's blood is drawn into the specialized apheresis machine. From there, the blood undergoes a multi-stage cleaning process:

1. Initial Treatment: The patient's whole blood is drawn, immediately passes through a UV-C light array, and is then filtered by a GVS SQ40 Blood Transfusion Filter.
2. Separation: While under continuous UV-C exposure, the blood is separated into its core components: red blood cells and plasma.
3. Targeted Filtration: Both components are then filtered *again*—each one passing through its own leukocyte reduction filter and an additional GVS SQ40 Blood Transfusion Filter.
4. Reinfusion: Finally, the treated, purified plasma and red blood cells are recombined and safely returned to the patient.

## Workflow Summary

Step	Action	Description
1	Draw & Initial Treat	Patient's whole blood is drawn and <i>immediately</i> passes through a UV-C light array and a GVS SQ40 Blood Transfusion Filter.
2	Separate	While still under continuous UV-C exposure, the blood is separated into its core components: plasma and red blood cells.
3	Purify Components	The separated plasma and red blood cells <i>each</i> pass through their own set of filters (a leukocyte reduction filter and another GVS SQ40 filter).
4	Recombine & Return	The purified, treated plasma and red blood cells are recombined and safely returned to the patient.

## The Dual-Action Inactivation Mechanism

This treatment protocol is designed to inactivate pathogens using a powerful, dual-action approach:

1. Direct Genetic Inactivation (Photochemistry): The UV-C light is the primary sterilization tool. As pathogens and residual leukocytes pass through the light array, their DNA and RNA absorb the UV-C photons. This energy causes a photochemical reaction, forming pyrimidine dimers—essentially creating permanent, fatal breaks in their genetic code. This damage makes it impossible for them to replicate or cause infection.
2. Oxidative Inactivation (Ozone): Simultaneously, the UV-C light generates medical-grade ozone ( $O_3$ ) within the machine. This ozone is a potent virucidal agent that physically destroys pathogens. It works by oxidizing and breaking down their protective outer layers—such as the lipid envelope of a virus or the cell wall of bacteria—rendering them inactive.

## Mechanism Summary

Mechanism	Direct Genetic Inactivation (Photochemistry)	Oxidative Inactivation (Ozone)
Agent	UV-C Light Photons 	Medical-Grade Ozone ( $O_3$ )
		
Target	DNA & RNA (the genetic code)	Viral Envelope & Capsid (the outer shell)
Action	Forms pyrimidine dimers, breaking the code and preventing replication.	Oxidizes and physically destroys the pathogen's protective layers.
Result	Pathogen is genetically "dead" and cannot reproduce.	Pathogen is physically destroyed and rendered inactive.



## Key Patient Benefits: Speed and Safety

The primary advantage of the VirusTC UV-C treatment is the immediate, critical intervention it provides. Conventional sepsis treatment often involves a hospital stay of weeks or even months, with a long recovery period. Our autologous process is designed to achieve its therapeutic goal in a matter of hours.

This rapid treatment is accomplished using the patient's own blood, which provides two major benefits:

1. **Immediate Availability:** There is no delay waiting for compatible donor blood.
2. **Enhanced Safety:** It completely eliminates the risks associated with transfusions, such as immune reactions, compatibility issues, and the transmission of unknown pathogens.

## Benefits: At-a-Glance Comparison

Metric	VirusTC UV-C Autologous Treatment	Conventional Sepsis Treatment
Treatment Time	Designed to achieve therapeutic goal in hours.	Recovery often takes weeks to months.
Blood Source	Autologous (patient's own blood).	Relies on Donor Blood (allogeneic).
Availability	Immediate—no waiting for a match.	Dependent on blood bank supply and cross-matching.
Key Risks	Minimizes risk by avoiding transfusion.	Risk of immune reactions, compatibility issues, and supply delays.



## Specialized Filtration for Patient Safety

A critical component of our protocol is managing the *result* of this highly effective treatment.

- The Challenge: Our dual-action UV-C process is so effective at inactivating pathogens that it creates a significant volume of inert cellular debris.
- The Solution: To ensure this debris is completely removed before the blood is returned to the patient, our protocol uses high-performance GVS filters. These filters are specifically chosen for their high-quality construction and enhanced mechanical strength, allowing them to handle the heavy debris load and ensure the final autologous blood product is purified to the highest standard.



## VTCNL PRO TIP: Is your apheresis machine stopping due to color changes caused by UV-C treatment?

Using UV-C light can interfere with the optical sensors in the apheresis machine. The machine's interface detection relies on optical sensors that differentiate blood components based on their natural absorption of light. When UV-C treatment alters the color of blood components, these sensors can be affected, causing the machine to trigger false alarms and stop. [1, 2, 3, 4, 5]

To prevent the apheresis machine from stopping due to color changes caused by UV-C treatment, you can follow these strategies:

1. Adjust optical sensor settings: Newer apheresis machines often allow for manual override or adjustment of the optical sensor's sensitivity.
- Modify "Bowl Optic" settings: During the procedure, specifically when treating the "buffy coat" with UV-C, you may need to manually lower the bowl optic setting or remove the hematocrit cuvette, as indicated in troubleshooting guides for photopheresis.
1. Consult the operator's manual: The manufacturer's operator manual is the primary resource for adjusting specific settings for your apheresis machine model, such as the COBE Spectra Optia. [1, 7, 8, 9, 10]
2. Reconfigure the workflow: The most effective solution is to separate the UV-C irradiation step from the internal optical detection of the apheresis machine.
3. Irradiate after collection: Treat the blood component with UV-C after it has been separated and collected by the machine, but before it is returned to the patient. For example, during ECP, the separated white blood cells are sent to a separate chamber where a photoactive drug is added and UVA light is applied. [3, 11, 12, 13]
4. Consult the manufacturer: The exact method for managing this issue can vary significantly depending on the make and model of the apheresis system.
5. Contact technical support: Always consult with the apheresis equipment manufacturer's technical support and service representatives. They can provide specific guidance on how to use their machine in conjunction with UV-C treatments and may be able to offer a software or hardware update to accommodate these procedures.
6. Inform vendors: Troubleshooting guides recommend informing vendors of problems experienced with specific equipment and disposables. [2]

## Follow best practices

General troubleshooting principles can also help address potential issues.

- Ensure good sensor contact: Poor contact between the tubing and the sensor can cause inaccurate readings. Make sure the kit is loaded correctly to ensure the sensor has optimal contact.
- Keep sensors clean: Dirt or smudges on the optical sensors can interfere with accurate detection of blood components. Clean the sensor according to the machine's maintenance instructions. [[14](#), [15](#), [16](#), [17](#)]

Important note: Modifying apheresis equipment settings should only be done by trained personnel and in accordance with manufacturer guidelines to ensure patient safety and proper treatment. [[18](#), [19](#), [20](#)]



## Apheresis Machine Photopheresis Support Articles:

- [1] [https://cdn.ymaws.com/www.apheresis.org/resource/collection/C24BF4FF-2B4D-48DB-966C-DA99C94A9B88/16.05.06\\_-\\_1445\\_-\\_AMBASSADOR\\_BALLROOM\\_-\\_PALOMINO\\_V2.pdf](https://cdn.ymaws.com/www.apheresis.org/resource/collection/C24BF4FF-2B4D-48DB-966C-DA99C94A9B88/16.05.06_-_1445_-_AMBASSADOR_BALLROOM_-_PALOMINO_V2.pdf)
- [2] <https://cdn.ymaws.com/www.apheresis.org/resource/collection/47C2CDF3-E008-4116-9FBC-BC289E1DA4BB/15.05.08-0945-LONESTARA-Burgstaler.pdf>
- [3] <https://www.upstate.edu/cancer/cancer-care/treatment-options/apheresis/photopheresis.php>
- [4] <https://www.sciencedirect.com/topics/nursing-and-health-professions/photopheresis>
- [5] <https://www.sciencedirect.com/science/article/abs/pii/S0145212623006525>
- [6] <https://eprajournals.com/IJMR/article/7311/download>
- [7] [https://www.ncbi.nlm.nih.gov/books/NBK572322/bin/fdacovideuas\\_136838.pdf](https://www.ncbi.nlm.nih.gov/books/NBK572322/bin/fdacovideuas_136838.pdf)
- [8] <http://startrinity3.com/mssn/04/Apheresis%20System%20Essentials%20Guide.pdf>
- [9] <https://pubmed.ncbi.nlm.nih.gov/27487161/>
- [10] <https://www.dentalcare.com/en-us/ce-courses/ce559/miscellaneous-errors>
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- [12] <https://pmc.ncbi.nlm.nih.gov/articles/PMC2787192/>
- [13] <https://ivelements.net/blog/benefits-of-uvbi>
- [14] <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10238822/>
- [15] <https://cdn.ymaws.com/www.apheresis.org/resource/collection/47C2CDF3-E008-4116-9FBC-BC289E1DA4BB/15.05.08-0945-LONESTARA-Burgstaler.pdf>
- [16] [https://www.bbraun.co.uk/content/dam/b-braun/en\\_gb/website-6/documents/products/therapies/extracorporeal-blood-treatment-therapies/omni/OMNI-troubleshooting-guide-2024.pdf](https://www.bbraun.co.uk/content/dam/b-braun/en_gb/website-6/documents/products/therapies/extracorporeal-blood-treatment-therapies/omni/OMNI-troubleshooting-guide-2024.pdf)
- [17] <https://www.sciencedirect.com/science/article/pii/S0956566325003227>
- [18] [https://msa.sm.ee/ctrl/et/Fail/laadi\\_alla/57104](https://msa.sm.ee/ctrl/et/Fail/laadi_alla/57104)
- [19] <https://onlinelibrary.wiley.com/doi/full/10.1111/trf.17143>



[20] [https://www.fafnir.com/de/sites/fafnir.com.de/files/2021-11/TeDo\\_ME-6\\_en\\_2020-02.pdf](https://www.fafnir.com/de/sites/fafnir.com.de/files/2021-11/TeDo_ME-6_en_2020-02.pdf)

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A handwritten signature in black ink, appearing to read "Correo" or "Hofstad".

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