Government of Newfoundland and Labrador

Department of Health and Community Services
Provincial Blood Coordinating Program

IRRADIATED BLOOD COMPONENTS	NLBCP-020

Office of Administrative Responsibility	Issuing Authority
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Overview

Irradiation of cellular blood components is a well-established intervention for the prevention of transfusion-associated graft-versus-host disease (TA-GVHD). The National Advisory Committee on Blood and Blood Products (NAC), on request of the Canadian Blood Services Provincial Territorial Blood Liaison Committee, compiled evidence-based recommendations for use of irradiated blood components in Canada.

The need for irradiated blood components is a clinical decision. This document can be used as a guide to help prescribers determine which patients require irradiated components. The link to the full NAC document in located in the reference section.

Policy

1. Cellular components, such as red blood cells (RBCs) and platelets (unless pathogen reduced by a method approved by Health Canada) shall be irradiated for prevention of TA-GVHD in recipients at risk.
2. The authorized prescriber must notify the Transfusion Medicine Laboratory (TML) when a patient requires irradiated blood components.
3. The TML shall review the request to ensure it is appropriate and complies with TML policy. The TML will update the recipient's record.
4. The authorized prescriber shall document irradiated components are required on each blood order. See Guidelines for Transfusion Orders for Blood Components and Blood Products.
5. All human leukocyte antigen (HLA)-selected/matched platelets shall be irradiated, even if the patient is immunocompetent.
6. All recipients of allogenic hematopoietic stem cell transplantation (HSCT) shall receive irradiated blood components from the time of initiation of conditioning chemo/radiotherapy and should be continued while the patient continues to receive GVHD prophylaxis. If the irradiation criteria are removed but the patient's immunosuppressive treatment is reinstated, then irradiated blood components should be given indefinitely.
7. All cellular components for intrauterine transfusion (IUT) and for exchange transfusion where there was a previous IUT shall be irradiated. RBCs should be as fresh as possible and transfused within 24 hours of irradiation.

8. All transfusions from first- or second-degree relatives shall be irradiated, even if the patient is immunocompetent (e.g., maternal blood for baby in IUT).
9. Patients with Hodgkin lymphoma shall receive irradiated RBCs and platelets from the time of diagnosis and for a minimum of six months following achievement of remission.
10. All patients treated with purine analogue drugs (fludarabine, cladribine, deoxycoformicin (pentostatin), and nelarabine) shall receive irradiated blood components for a minimum of six months after cessation of therapy.
11. Patients who have received alemtuzumab (anti-CD52) therapy in the context of aplastic anemia or hematological malignancies shall receive irradiated blood components for a minimum of six months after cessation of therapy.
12. Recipients of irradiated blood components shall continue to receive irradiated components if clinically indicated. The indication should be reviewed regularly by the practitioner/prescriber.
13. RBC and platelet units shall be labelled to indicate that the component has been irradiated.
14. All cases of suspected or confirmed TA-GVHD shall be reported to the blood operator as soon as possible.

Guidelines

1. Red cell components may be irradiated up to 28 days after collection.
2. Irradiated RBCs should be transfused as soon as possible, but no later than 14 days after irradiation, and in any case, no later than 28 days after collection.
3. Platelets can be irradiated at any stage during storage; therefore, can be stored up to their normal shelf life.
4. If irradiated RBCs are required for emergency transfusion and are not available, red cells stored for at least 14 days, but preferably more than 21 days, should be provided.
5. Patients who should receive irradiated blood components:
    5.1. Neonates with complex cardiac abnormalities and a diagnosis of a congenital T-cell immune deficiency should receive irradiated components for life.
    5.2. Immunocompetent neonates and infants (and older patients) undergoing cardio-pulmonary bypass surgery. There should be a high index of suspicion concerning co-exiting cardiac defects and immunodeficiency.

5.3. Neonates with previous IUT until six months after the expected delivery date (40 weeks gestation).

5.4. Neonates receiving exchange transfusions provided it does not unduly delay transfusion.

5.5. Very low birth weight infants (less than 1500g at birth) with congenital immunodeficiency or who have had a previous IUT.

5.6. Patients who have received anti-thymocyte globulin (ATG) in the context of aplastic anemia or hematologic malignancies.

5.7. Patients treated with other purine antagonists and new or related agents, such as bendamustine and clofarabine (for a minimum of six months after cessation of therapy).

5.8. Patients with severe T-lymphocyte immunodeficiency syndromes with significant qualitative and quantitative T-lymphocyte deficiency. In centers where neonatal screening is available there should be a communication strategy in place to ensure the TML is notified.

5.9. Patients requiring donor lymphocyte infusion (DLI) in the content of their post-allogeneic transplant therapy.

5.10. Patients undergoing bone marrow or peripheral blood stem cell 'harvesting' for future autologous re-infusion, during and for seven days before the bone marrow/stem cell harvest.

5.11. Patients undergoing autologous bone marrow or peripheral blood stem cell transplant from initiation of conditioning chemo/radiotherapy until three months post-transplant. Six months if total body irradiation was used.

5.12. Patients with suspected congenital haemophagocytic lymphohistiocytosis (HLH), until T-cell immunodeficiency has been excluded.

5.13. Patients undergoing peripheral blood lymphocyte collections for future chimeric antigen receptor T-cell (CAR-T) re-infusion. Irradiated components should be received for seven days prior to and during the harvest and should be used until three months following CAR-T cell infusion. Unless the patient requires a longer period based on a previous requirement (e.g., Hodgkin lymphoma or previous purine analogue treatment).

6. Overstocking of pre-irradiated red cell units for emergency transfusion is not recommended. If storage of pre-irradiated inventory is necessary, then red cells that have been irradiated within 14 days of collection should be obtained, if possible.

7. Irradiated components may be released to recipients not requiring irradiated components if they meet required storage and re-release policies. Irradiated RBC units may contain high potassium levels, in vitro hemolysis and decreased post-transfusion recovery may occur therefore proactive inventory management should be considered to avoid transfusion of irradiated RBCs to patients who do not require irradiated RBC units.
8. Patients at risk of TA-GVHD should be made aware of their need to receive irradiated blood components. The practitioner/prescriber is responsible for informing the patient and the TML in the jurisdictions that the patient will be receiving the irradiated components.
9. In the event a patient who requires irradiated components does not receive an irradiated component an investigation should be initiated, and the patient monitored for TA-GVHD.
10. For emergency transfusions of unmatched group O RBCs for neonatal resuscitation due to obstetrical complications and/or accidents, irradiated cellular components are not required.
11. Product monographs of new immunosuppressive therapeutic agents should be consulted by the authorized prescriber to determine if irradiated blood components are required.

Key Words

Irradiation, irradiated, graft-versus-host disease

Supplemental Materials

Appendix A: Quick reference of clinical indications for irradiated blood components

References

Canadian Society for Transfusion Medicine. (2022). *Standards for hospital transfusion services.* (Version 5.0). Markham, ON: Author.

Canadian Standards Association. (2020). *Blood and blood components, Z902-20.* Mississauga, ON: Author.

National Advisory Committee on Blood and Blood Products. (2023). *Recommendations for use of irradiated blood components in Canada: A NAC and CCNMT collaborative initiative.* Available at http://www.nacblood.ca/resources/guidelines/irradiated.html.

Appendix A

Quick reference of clinical indications for irradiated blood components

Patient Category	Condition	Duration of Irradiated Blood Requirement
General Population	Directed donation (blood from first-and second-degree relatives)	NA-Product related
	HLA-selected (matched) platelets	NA-Product related
	Granulocyte transfusions	NA-Product related
Pregnancy, to a fetal recipient	Intrauterine transfusion (IUT)	During the entire pregnancy
Pediatrics	Neonatal exchange transfusion	Each procedure only
	Neonatal small volume(top-up) transfusions • Prior IUT recipient, and until 6 months after the EDD (40 weeks gestational age) • Consult local policies in uncertain situations	6 months following the EDD
	Congenital severe T-cell immune deficiency • If suspected or proven ○ Consideration should be given to routine newborn screening results (if available)	Until immunodeficiency ruled out, or life-long if proven immunodeficiency
	Congenital cardiac abnormalities • If suspected to be related to an immunodeficiency syndrome	Until immunodeficiency ruled out, or life-long if proven immunodeficiency
Hematology	Hodgkin lymphoma • From diagnosis and following completion of curative therapy	Minimum of 6 months following achievement of remission
	Aplastic anemia • If patient has ever received ATG • If patient has ever received alemtuzumab	Unable to recommend a duration following therapy. Minimum of 6 months after cessation of therapy

	Allogeneic HSCT • From time of conditioning chemo/radiotherapy and following HSCT until all the following criteria are met: ○ greater than 6 months since transplant date ○ lymphocyte count > 1 x 10^9 ○ patient is free of active chronic GVHD ○ patient is off all immunosuppression. • In the context of DLI for post-HSCT therapy • If acute or chronic GVHD is present	Unless meets criteria for discontinuation. *Appropriateness of lifting the indication for irradiation should be reviewed at least yearly by the Transplant Hematologist
	Autologous bone marrow transplant • From initiation of chemotherapy and post-transplant (no total body radiation) and post-autologous cell infusion • From initiation of conditioning chemo/radiotherapy, including total body irradiation, and post autologous cell infusion.	Until 3 months post-transplant Until 6 months post-transplant
	CAR-T therapy • From initiation of conditioning chemo/radiotherapy and post-CAR-T cell infusion	Until 6 months post-CAR-T cell infusion
	Harvest (collection) of stem cells for autologous or allogeneic HSCT (apheresis or bone marrow source), DLI or CAR-T cell therapy	For 7 days prior to and during the bone marrow or peripheral blood stem cell/lymphocyte collection
Medications (generic names listed only) Refer to section 16 of NAC document for details.	Certain chemotherapy/immunosuppressive agents (generic names listed only) • Alemtuzumab-if given for in the context of a hematologic diagnosis • Anti-thymocyte globulin (rabbit or horse)-if given for aplastic anemia Purine analogues ○ Fludarabine ○ Cladribine ○ Deoxycoformicin (pentostatin) ○ Nelarabine • Purine-like analogues ○ Bendamustine ○ Clofarabine	Minimum of 6 months after cessation of therapy Unable to recommend a duration following therapy. During therapy and for a minimum of 6 months after cessation of therapy During therapy and for a minimum 6 months after cessation of therapy