Irradiated blood components – QRG with summary tables

ANZSBT Guidelines for Prevention of Transfusion-Associated Graft-Versus-Host Disease (TA-GVHD) 2nd Ed, Jan 2024, provide comprehensive guidance. The summary below is intended for SA Health Services to endorse or use as a template to adapt for local policies. Information taken from Recommendations [R], Practice Points [PP] & specific pages within the ANZSBT guideline are marked for when further detail is required. Refer also to the SA Health Clinical Update on Irradiated blood components for additional information including requesting, prescribing & communication.

Emergency transfusion for patients at risk of TA-GVHD & storage duration of red cells

Emergency transfusion for patients at risk of TA-GVHD

Important! In the event of critical & life-threatening bleeding, transfusion should not delayed if irradiated cellular products cannot be sourced immediately & a delay in transfusion may result in death [Flow Chart, page 47].

Red cells: Provision of irradiated red cells in emergencies may be limited by local stock availability & time.

- Lymphocyte proliferation & risk of TA-GVHD declines with red cell storage.
- In patients at risk of TA-GVHD who need emergency transfusion, the use of the shortest expiry (oldest) suitable red cells is acceptable if irradiated (or equivalent) units are not available [from PP26].
- For neonates/infants, refer to local guidance regarding age of suitable red cells.

Platelets: all platelets provided by Lifeblood are irradiated before issue.

Cryoprecipitate, fresh frozen plasma & **manufactured plasma** products **do not** require irradiation [R8] (do not contain viable T-cells)

Effects of storage duration on refrigerated red cells

- Red cells stored for ≥ 21 days are irradiation equivalent [from R4]; Red cells stored for ≥ 14 days may be considered TA-GVHD safe & utilised for patients at risk of TA-GVHD when irradiation equivalent red cells are not available [from PP4].
- Where an irradiation equivalent or TA-GVHD safe component is issued where an irradiated component was otherwise indicated, the unit must be tagged (by the issuing laboratory) accordingly [from R12].

Irradiation practice for specific types of blood components

Cellular blood components

- Cellular blood components including red cells, platelets & granulocytes must be irradiated where there are appropriate indications [from R6]. See full guideline (page 27) regarding other components (including cryopreserved red cells & platelets).
- Cryoprecipitate, FFP & manufactured plasma products do not require irradiation (do not contain viable T-cells) [R8, page 25].

⚠ **IMPORTANT:** Stem cells, donor T lymphocytes, CAR-T cells or other cellular products required to engraft, whether allogeneic or autologous, **must NOT** be irradiated as they will be rendered ineffective [from R7 & page 39].

Blood components requiring irradiation (even if patient is immune-competent)

Red cells & Platelets from HLA-matched or Related donors

√ Cellular blood components from HLA-matched (HLA-compatible) or related donors must be irradiated [from R31 & R32].

All Granulocytes

√ Granulocytes for all recipients should be irradiated as soon as possible after production & transfused with minimal delay.

Adult & Paediatric Haematology, oncology, transplant, cytotoxic & immunosuppressive therapy

Remission induction & consolidation therapy *for acute leukaemia & chemotherapy of similar intensity for other malignancies*

√ **For patients undergoing chemotherapy equivalent to AML or ALL intensive remission induction & consolidation therapy**, irradiated cellular blood components are recommended; to continue for a period of 6 months following intensive therapy [from R21, see page 35 for more information]. Refer to local guidance/expertise regarding 'equivalent' intensive therapies.

× When **supportive care only or lower intensity** chemotherapy is offered, irradiated cellular blood components are **NOT required** [from R21].

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Haematopoietic cell donors *(including autologous stem cell & T lymphocyte donors)*

√ Should receive irradiated cellular blood components from 7 days prior to (& during) the planned collection [from R24].

Allogeneic stem cell transplant recipients

√ Should receive irradiated cellular blood components from the time of conditioning & for a minimum of 12 months post-transplant, but to continue while there is active GVHD or immunosuppression for GVHD [from R22].

Autologous stem cell transplant recipients

√ Should receive irradiated cellular blood components from the time of initiation of conditioning, with this to be reviewed 6 months post-transplant [R23]. These timelines may be personalised based on T cell recovery & longer durations may be required based on other therapies received [page 36].

Chimeric antigen receptor T cell (CAR-T cell) recipients

√ Should receive irradiated cellular blood components for a period of 6 months following CAR-T cell infusion. Longer or shorter periods may be applied based on conditioning regimens & cellular targets [R25].

Hodgkin lymphoma *(at any stage of the disease process)*

√ Irradiated blood components are recommended [from R26]. Duration: An indefinite requirement is advised, with a very low level of certainty [part of PP25]. Refer to full PP 25 (page 14) for further details.

Aplastic anaemia

√ Cellular blood components should be irradiated during & following treatment with immunosuppressive therapy including anti-thymocyte globulin or similar T lymphocyte depleting therapy (e.g. alemtuzumab) & to continue until all immunosuppression has been ceased (including ciclosporin) [R28].

Cytotoxic therapies for malignant & non-malignant indications

√ Patients treated with **purine analogues (e.g. fludarabine, cladribine, clofarabine, pentostatin)** or **bendamustine**, for malignant or non-malignant indications, cellular components should be irradiated during & following treatment [from R29 & page 38].

√ For patients with **haematological neoplasms treated with alemtuzumab (anti-CD52),** cellular components should be irradiated during & following treatment [R30].

× **Irradiation is NOT required for lower dose alemtuzumab used for immune modification** (including **multiple sclerosis, vasculitis & solid organ transplantation**) which are lower doses than used for haematological neoplasia [from page 5 & 38].

Radiation exposure / acute radiation injury

√ Patients requiring cellular blood components due to radiation injury should receive irradiated products [R33].

Non-Hodgkin lymphoma

- Irradiated cellular blood components are **NOT recommended UNLESS indicated due to specific therapies** received [R27].

T cell immunosuppression including HIV, solid organ transplantation, long term immunosuppression & new cytotoxic agents

√ Patients with known or suspected **severe congenital T-lymphocyte immunodeficiency syndromes, irradiated** cellular blood products are recommended [from R20 & PP22] – for further details see Intrauterine, neonatal & paediatric section below.

× **More common immunodeficiency presenting in adults, is NOT** known to be a risk factor for TA-GVHD [page 39].

× **HIV/AIDS: NOT** included as an indication. Patients with severe HIV infections have not shown an increased TA-GVHD risk [p39].

× There is no evidence that **most long-term immunosuppression regimens** increased the risk of TA-GVHD. Immunosuppression following **solid organ transplant**, corticosteroids, m-TOR inhibitors, antimetabolites, & other agents used in the longer-term control of autoimmune disorders are not known to be associated with TA-GVHD and patients are **NOT** recommended for irradiated blood products in any international guidelines. **New agents** should be evaluated in this context [page 39].

- **New Immunosuppressants** as they are introduced **should be considered as an indication for irradiation** of cellular blood products based on the depth & duration of T cell suppression (from Flow Chart, page 47). There are many **new & emerging cytotoxic & immunosuppressive agents** targeting T cells & it is not possible to provide evidence-based advice on all therapies within these (ANZSBT) guidelines. **Individual clinical risk assessment with emerging therapies should be considered** [see p 39].

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Intrauterine transfusion (IUT)

√ Cellular blood products used for intrauterine transfusion (IUT) should be irradiated [R14].

Red cells for IUT should be fresh as possible (<5 days old; page 29) & must be transfused within 24 hours of irradiation [R15].

Neonatal exchange transfusions (ET)

√ Red cells for neonatal exchange transfusion (ET) should be irradiated [R16].

Red cells for neonatal ET should be fresh as possible (<5 days old; pg 29) & must be transfused within 24 hours of irradiation [R17].

Neonatal small volume ('top-up") transfusions

√ **Prior IUT**: In neonates who have received prior IUT, irradiation is required for small volume transfusions [R18].

- **In extremely pre-term (<28 weeks) & extremely low birthweight (<1000g) infants, the decision for irradiated components should be based on additional features rather than only gestational age & weight** [PP17].

× **Term neonates & pre-term (>28 weeks)** infants receiving small volume transfusions do **NOT** require irradiated blood components [PP16].

Timing: Where irradiated red cells are used for small volume neonatal transfusion, it is recommended
- that inventory be managed so that freshest irradiated products are prioritised for neonatal transfusion wherever possible;
- that modified components (including paediatric leucodepleted red cell units) be transfused within 48 hours of irradiation as per their manufacturing recommendations; & centrifuged, supernatant removed products (including adult leucodepleted red cell units) be transfused within 14 days of irradiation [PP20, also see PP19 re minimising red cell shelf-life following irradiation].

Neonatal emergency & large volume transfusions

× **For emergency transfusions in the setting of neonatal resuscitation**, irradiated cellular blood components are **NOT** required, even in neonates otherwise considered at higher risk of TA-GVHD [R19]. See page 33 for further details.

Timing: For large volume neonatal transfusion where it has been determined that irradiation is required, red cells should be transfused as soon as possible after irradiation, & preferably within 24 hours of irradiation [PP21].

Neonates and infants with congenital heart disease (CHD) requiring cardiopulmonary bypass (CPB) surgery or extracorporeal life support (ECLS); & those undergoing cardiothoracic surgery.

√ **Cardiac surgery for an undiagnosed T-cell immunodeficiency:** Consider evaluation of neonates & infants undergoing cardiac surgery for an undiagnosed T-cell immunodeficiency, & where this is not possible/feasible **consider irradiation** of cellular blood components until risk of relevant immunodeficiency has been excluded [PP13].

√ **Suspected T cell immunodeficiency: Consider irradiation** of red cells in suspected T cell immunodeficiency.

-As a guide, a CD4+ T-lymphocyte count >400 cells/µL, of which 30% are naive T lymphocytes, largely excludes severe T cell immunodeficiency & in this case, there is **NO need to irradiate** [from PP14].

-Discussion with paediatric immunologist is suggested if there are concerns of a possible T-lymphocyte immunodeficiency [PP14].

Timing: To reduce the risk of hyperkalaemia to patients undergoing CPB, ECMO and cardiac surgery requiring large volume transfusion, IF irradiated red cells are used, transfusion should ideally be as soon as possible post-irradiation & should be within 24 hours of irradiation [PP15].

Congenital & acquired immunodeficiencies in infants & children

√ In patients with **severe congenital T-lymphocyte immunodeficiency syndromes** with significant qualitative or quantitative T-lymphocyte deficiency it is recommended that cellular blood products are irradiated [R20].

√ If a **severe T-lymphocyte immunodeficiency disorder is suspected**, irradiated components should be given while diagnostic testing is undertaken [PP22].

√ **Suspected congenital HLH & lymphopenia:** It **may be reasonable** to give irradiated cellular blood components for patients with suspected congenital HLH & lymphopenia, **until T-cell immunodeficiency has been excluded** [page 34].

× Irradiation of cellular blood components is **NOT indicated for infants or children with temporary defects of T-lymphocyte** function, including following viral infections, acquired T-lymphocyte deficiencies, those with HIV/AIDS [from PP24].

Refer to health service guidance on irradiated blood components for the local endorsement or adaption of this summary & for updates. To be read in conjunction with the SA Health Clinical Update on Irradiated blood components.

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