

I NEED TO KNOW ABOUT IRRADIATION

Transfusion Fact Sheet Volume 1, Number 8
By Beverleigh Quested

Why do we irradiate some products?

Irradiation of cellular blood components inactivates donor lymphocytes (a type of white cell), which can reproduce and grow in the recipient. The engraftment of donor lymphocytes can cause an almost universally fatal disease called transfusion-associated graft versus host disease (TA-GVHD) in some recipients. The risk of developing TA-GVHD depends on the number and the viability of lymphocytes in a pack, susceptibility of the recipient's immune system and degree of immunological difference or similarity between recipient and donor.

What is TA-GVHD?

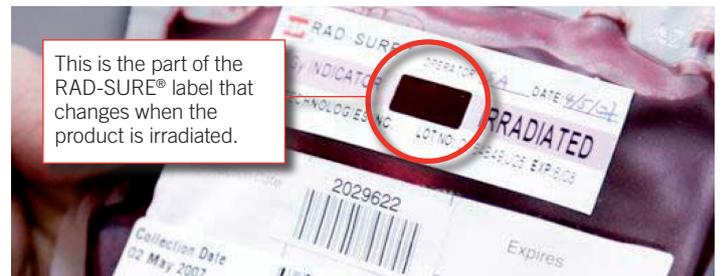
TA-GVHD occurs when donor lymphocytes from transfused blood engraft in the recipient. The donor lymphocytes are not detected by the recipient's weakened immune system; hence, the transfused cells grow in the bone marrow and start to take over. The engrafted donor's white cells then attack the recipient's cells. Typically, TA-GVHD occurs within 10–14 days post-transfusion causing fever, skin rash, hepatitis, diarrhoea and pancytopenia (very low platelets and total white cell count and low haemoglobin). It is **fatal** in almost all cases.

What does irradiation do to the blood component?

Gamma irradiation prevents the lymphocytes from being able to reproduce but it does not greatly affect the function of other blood cells. Irradiation does however cause minor damage to the outside membrane of the red cell. This damage causes the red cell's sodium-potassium pump to be weakened and potassium tends to leak out of the red cell, increasing the amount of extracellular potassium. Thus, red cells less than 14-days-old are selected to be irradiated and the storage life shortened to 14 days after they have been irradiated. The high potassium level can be a problem for unborn babies, neonates and paediatric recipients, so irradiated red cells for intrauterine or exchange transfusions are used within 24 hours for unborn babies and neonates or 48 hours for paediatric recipients. Platelet storage life remains the same, at five days.

Why doesn't leucodepletion stop TA-GVHD?

Leucodepletion removes most white cells, and probably reduces the risk of TA-GVHD. However, a small number of lymphocytes could remain, which can engraft into the recipient and result in TA-GVHD.



This is the part of the RAD-SURE® label that changes when the product is irradiated.

Who are at risk?

People with weakened immune systems, such as unborn babies with an immature immune system or bone marrow transplant recipients or diseases affecting their immunity like leukaemia, are at risk of TA-GVHD. Recipients receiving transfusion from a blood relative (directed donation) are also at increased risk of TA-GVHD because the immune systems within families may be too similar.

What products does the Blood Service irradiate?

The Blood Service irradiates some red cells according to clinical need and all platelets. All HLA-compatible platelets must be irradiated, including directed donations that the Blood Service collects. Fresh frozen plasma, cryoprecipitate and fractionated plasma products are not irradiated as they do not have lymphocytes that are able to reproduce.

How do we irradiate?

The packs are exposed to a controlled amount of gamma radiation by inventory and production staff at the Blood Service. A RAD-SURE® label confirms irradiation has taken place, with the writing on the label changing colour when exposed to radiation.

BLOOD FACT

Chimerism studies detect TA-GVHD. The test is named after the Chimera, a three-headed monster in Greek mythology.