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| **.**  | **Granulocytes collected from unrelated donors for neutropenic patients should not be irradiated, to avoid damage to transfused neutrophils.**  |

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|  | **B.**  | **Irradiation is an alternative approach to leukodepletion to reduce transmission of CMV infection in transplant recipients.**  |

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|  | **C.**  | **Platelets must be transfused within 24 hours of irradiation to prevent hyperkalemia in susceptible patients.**  |

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|  | **D.**  | **The American Association of Blood Banks recommends a dose of 75 Gy to the central part of the irradiated blood component.**  |

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|  | **E.**  | **It is not necessary to irradiate plasma, used in treating patients with clotting factor deficiencies.**  |

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Transfusion associated graft versus host disease (TA-GvHD) is a rare and potentially fatal complication of blood components containing lymphocytes, which irradiation is used to prevent. Therefore it is not necessary to irradiate plasma. Irradiated products should receive a dose of 25 Gy in the center of the product and no less than 15 Gy at the periphery. Granulocytes are an impure product and contains millions of lymphocytes per unit which could cause TA-GvHD. Leukodepletion reduces the risk of CMV transmission from virus present in the lymphocytes by reducing cell numbers, while irradiation does not. Irradiation can cause accelerated leakage of potassium from red cell products, not platelet products, and is of concern for patients at high risk, such as during intra-uterine transfusions.

Approximately 16-18 million units of blood are transfused in the United States each year (2009 NATIONAL BLOOD COLLECTION AND UTILIZATION SURVEY REPORT). For non-emergent transfusion, consent should be obtained. According to the AABB Standards (28th) edition, there are several key elements that a blood bank/transfusion medicine service must have in place for recipient consent for transfusion.

Which of the following are considered key elements of recipient consent?

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|  | **A.**  | **The right to accept or refuse transfusion**  |

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|  | **B.**  | **Opportunity to ask questions about the transfusion**  |

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|  | **C.**  | **Description of the risks, benefits, and alternatives to transfusion**  |

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|  | **D.**  | **All of the above**  |

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**Explanation:**
AABB Standards [5.26.1.1] indicate that at a minimum recipients of blood transfusion should be consented, and this process should describe the risk/benefit profile to transfusion, including no-transfusion. Additionally, during the consent process patients should be able to exercise autonomy and refuse or accept transfusion. Lastly, patients should be provided the opportunity to ask questions about the transfusion.

A 26 year old African-American male with sickle cell disease (HbSS) presents for a simple red blood cell transfusion. During his serologic investigation a positive antibody screen is noted. This patient has been transfused previously (more than 1 year ago), but never at your institution. During the course of the serologic evaluation the medical technologist suspects the patient may have an anti-f antibody.

Which of the following cells would demonstrate reactivity to anti-f?
**[Please select ALL correct answers**]

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|  | **R1R1**  |

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|  | **R2R2**  |

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|  | **R0R0**  |

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|  | **R1R2**  |

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**Explanation:**
Anti-f antibodies will react when there is a haplotype that expresses ce (in *cis*, the compound antigen).  The R0 (Dce) and the r (ce) haplotypes are the only listed haplotypes that can express the f antigen.

Anti-f was first reported in the plasma of a hemophiliac who had received numerous transfusions.

**References:**

* Rosenfield R E, Vogel  P, Gibbel N, Sanger R, Race. [RR: A ‘new’ Rh antibody, anti-f. Br Med J i: 975 (1953)](https://pathquestions.com/cgi-bin/q.pl?todo=redirect&q=TeaHqp&u=MwfjvPXa&redirect_to=%3A%2F%2Fwww.ncbi.nlm.nih.gov%2Fpubmed%2F13032583).

Transfusion-associated graft-versus-host disease (TA-GVHD) is the result of donor lymphocyte engraftment in an immunosuppressed recipient.

According to AABB Standards, which of the following is the appropriate transfusion modification for recipients identified as being at risk for TA-GVHD?

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|  | **A.**  | **Providing leukocyte-reduced products**  |

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|  | **B.**  | **Soliciting directed donations**  |

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|  | **C.**  | **Irradiating cellular blood products**  |

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|  | **D.**  | **Screening volunteer donors with questions that identify risk-associated behavior**  |

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|  | **E.**  | **Providing washed blood products**  |

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The AABB Standards for Blood Banks and Transfusion Services, 28th edition, specifies in standard 5.17.3.1 that cellular components shall be irradiated when "a patient is identified as being at risk for transfusion-associated graft-versus-host disease." TA-GVHD is a serious, almost uniformly fatal complication of transfusion. At risk patients include immunosuppressed individuals and HLA heterozygous recipients receiving a product from an HLA homozygous individual who shares a haplotype with the recipient, as may occur when a first degree relative donates for a family member.

Irradiation prevents TA-GVHD complications by preventing lymphocytes from undergoing mitosis. Irradiated lymphocytes from the donor are thus unable to engraft and proliferate in the transfusion recipient. Leukocyte reduction, washing, and donor screening do not acceptably mitigate the risk of TA-GVHD. Soliciting directed donations could increase a person’s risk for TA-GVHD if family members were recruited.

**Explanation:**

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| **RBC Product** | **Expiration** |
| **RBCs in ACD or CPD** | 21 days |
| **Frozen RBCs**  | 10 years |
| **Washed RBCs** | 24 hours |
| **RBCs in CPDA-1** | 35 days |
| **RBCs in additive solution** | 42 days |

The objective of red blood cell storage is to maintain viability and function. ACD, or acid-citrate-dextrose, provides dextrose as an energy source, citrate as an anticoagulant, and an acid pH to prevent carmelization in storage and can be stored for 21 days. CPD (citrate-phosphate-dextrose) contains these components, as well as phosphate, which serves to limit the loss of 2,3-DPG by stored cells, and can be stored for 21 days. CPDA-1 (citrate-phosphate-dextrose-adenine) contains all of the same components as CPD, with the addition of adenine, which enhances red cell survival in storage by providing an exogenous source of adenine. Red cell endogenous adenine is rapidly deaminated in storage. RBCs in CPDA-1 can be stored for 35 days. Additive solution contains saline, adenine, and dextrose, with or without mannitol. There are several variants of additive solution, which vary in the ratio of components. RBCs stored in additive solution can be stored for 42 days.

Washed red blood cells expire in 24 hours. Frozen red cells must be frozen within 6 days of collection and can be frozen for up to 10 years. A unit will still be acceptable if it is frozen after 6 days but before its expiration date if it is a rare unit.

**Reference:**

* AABB Standards for Blood Banks and Transfusion Services, 28th ed. AABB. Bethesda, MD, 2012

A 34 year old African American female G1P0 is seen by her OB/GYN doctor for her first prenatal visit. Her relevant history includes a single transfusion of pRBCs for symptomatic anemia secondary to menorrhagia 3 years ago. Among the tests ordered during this visit are a blood type (see below) and antibody screen (positive, not shown; see identification panel below).



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| **Likely resulted from prior exposure**  |

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|  | **Probably of IgM isotype and is naturally occurring**  |

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|  | **Poses no risk to the fetus**  |

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|  | **Likely of IgG isotype and could potentially result in an anamnestic response if re-exposed to the same antigen**  |

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|  | **Can be ignored if a future transfusion of RBCs is warranted, so long as there is crossmatch compatibility at 37 C**  |

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The **Explanation:**
The anThe antibody identification panel clearly shows a pattern consistent with an anti-Lea.  The Lewis antibodies are most often IgM anandd naturally occurring.  They react best at room temperature (immediate spin phase in tube testing as shown above) and only ccoccasionally at 37 C and the AHG phase.  Because they are of IgM isotype, they will not cross the placenta and will therefctherefore will not cause hemolytic disease of the fetus and newborn.  Additionally, Lewis antigens are expressed later in life comparcompared to Rh and ABO antigens, so neonates most often type as Le(a-b-).

Lewis aLewis antibodies are regarded as clinically insignificant for a few reasons.  As stated above, they are room temperature agglutiagglutinins and rarely react at body temperature.  Also, the antigens to which they are directed against (e.g. Lea or Leb) are synthesynthesized in the bodily fluids (e.g. plasma), where they subsequently passively adsorb onto RBCs.  A transfusion of, for exampl example Leb+ RBCs to a recipient possessing an anti-Leb would result in Leb eluting from the donor’s RBCs and being neutralneutralized by the recipient’s Leb antibodies.  Although many blood banks make an effort to match for Lewis when anti-Lewis antibodies are present, it is, practically speaking, safe to transfuse a patient irrespective of their Lewis status so long as there is crossmatch compatibility at 37 C.

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