Annual SHOT Report 2014 – Supplementary Information

Chapter 17: Transfusion-Transmitted Infections (TTI)

The table below is an excerpt from the full Table 17.2 which can be viewed in the main report.

Case reports with further details of the 6 bacterial and 6 viral transfusion-transmitted infection incidents from 2008 to 2014 have been prepared by the NHSBT/PHE Epidemiology Unit, and are described in the following pages.

Number of confirmed TTI incidents by year of transfusion in the UK reported to SHOT between 2008 and 2014

Year of transfusion*	Number of incidents (recipients) by infection											Implicated component			
	Bacteria	HAV	HBV	HCV	HEV	HIV	HTLV I	Parvovirus (B19)	Malaria	vCJD/ prion	Total	RBC	Pooled platelet	Apheresis platelet	FFP
2008	4 (6)	0	0	0	0	0	0	0	0	0	**4 (6)**	0	2	4	0
2009	2 (3)	0	0	0	0	0	0	0	0	0	**2 (3)**	1	0	2	0
2010	0	0	0	0	0	0	0	0	0	0	**0**	0	0	0	0
2011	0	0	1 (2)	0	1 (2)	0	0	0	0	0	**2 (4)**	2	0	0	2
2012	0	0	1 (1)	0	1 (1)	0	0	1(1)	0	0	**3 (3)**	2	0	0	1
2013	0	0	0	0	0	0	0	0	0	0	**0**	0	0	0	0
2014	0	0	0	0	1 (2)	0	0	0	0	0	**1 (2)**	1	0	0	1

**No screening was in place for HEV or parvovirus B19 at the time of the documented transmissions.*

Bacterial Case 1: *Klebsiella pneumoniae*

Infection	*Klebsiella pneumoniae*
Year of Transfusion	2008
SHOT report	SHOT report 2008
Component	Platelets-apheresis
Component Age	3 day (pack 1) & 4 day (pack 2)
No. recipients	2
Morbidity	Death
Source	The source of the organism was most likely the donor gut, transferred to the venepuncture site and from there to the donated component. Alternatively this may have been due to a transient bacteraemia in the donor.
Reason TTI occurred	It is recognised that the donor arm cleansing procedure is not 100% effective. If no illness reported and no visual signs of contamination in pack no reason not to issue and use the components of the donation.
Index case	A donation of apheresis platelets was split to produce 2 platelet doses. Pack 1 transfused into neurosurgery patient (head injury) with pre-existing ischaemic bowel, liver disease and sepsis. Pack 2 given to patient with AML with chemotherapy-related pancytopenia.
Diagnosis	The neurosurgery patient died 11 hours post transfusion thought to be due to sepsis from the ischaemic bowel. Transfusion reaction was not suspected at this point and pack 1 was not retained but patient blood cultures were taken prior to death. Five minutes into the transfusion the AML patient became acutely unwell, requiring admission to ITU before cardiac arrest and death. The remains of the transfused pack 2 were cultured at the hospital before being returned to the Blood Service.
Investigation	Blood cultures from both patients prior to death yielded *Klebsiella pneumoniae*, as did cultures of the unit transfused to the patient with AML, and all 3 isolates were found to be of a single strain. The case was concluded as a proven incident of bacterial contamination of two platelet units with *K. pneumoniae*.

Bacterial Case 2: *Streptococcus dysgalactiae* (Group G Streptococcus)

Infection	*Streptococcus dysgalactiae* (Group G Streptococcus)
Year of Transfusion	2008
SHOT report	SHOT report 2008
Component	Platelets-apheresis
Component Age	4 day (pack 1) & 5 day (pack 2)
No. recipients	2
Morbidity	Major morbidity
Source	The apheresis donor denied any recent illness or change in bowel habit, but GGS was identified from their stool sample. The likely but unproven chain of transmission was from donor gut to venepuncture site via the donor's fingers, and from there to the donated component. Alternatively this may have been due to a transient bacteraemia in the donor.
Reason TTI occurred	It is recognised that the donor arm cleansing procedure is not 100% effective. If no illness reported and no visual signs of contamination in pack no reason not to issue and use the components of the donation.
Index case	A unit of apheresis platelets was split to produce 2 platelet doses. Pack 1 was transfused to a teenager with acute lymphoblastic leukaemia (ALL). Pack 2 was transfused to a patient in their 50s with acute myeloid leukaemia (AML).
Diagnosis	Recipient of pack 1 (ALL) reacted with allergy-like symptoms. Recipient of pack 2 developed chills, nausea and a feeling of impending doom.
Investigation	The remains of both units were returned to the blood services for investigation, with a delay in the return of pack 1 due to the initial diagnosis of an allergic reaction. Blood cultures from both patients yielded Lancefield Group G streptococcus (GGS), as did cultures of both platelet units carried out at the blood services. GGS are known as both commensals and pathogens in animals and humans. All 5 isolates (from both patients, both packs and the donor) were sent to a national reference laboratory for typing, and were found to be of the same strain.

Bacterial Case 3: Lancefield Group G Streptococcus

Infection	Lancefield Group G Streptococcus
Year of Transfusion	2008
SHOT report	SHOT report 2008
Component	Platelets-pooled
Component Age	4 day
No. recipients	1
Morbidity	Major morbidity
Source	Platelet donor who did not report any illness at or around the time of donation either unrecognised or asymptomatic.
Reason TTI occurred	It is recognised that the donor arm cleansing procedure is not 100% effective. If no illness reported and no visual signs of contamination in pack no reason not to issue and use the components of the donation.
Index case	A patient in their 50s with severe aplastic anaemia received 1 unit of pooled platelets.
Diagnosis	Within 5 minutes of starting the infusion the patient developed urticaria and pain along the access vein. Antihistamine was given and the transfusion was continued. One hour later the patient became pyrexial and hypotensive, requiring admission to the ITU.
Investigation	Patient blood cultures revealed Lancefield Group G streptococcus (GGS), as did cultures of the remains of the platelet pool. Associated units (4 red cells, 1 FFP) were recalled but cultures were all negative. The donors contributing to the platelet pool were recalled; GGS was identified in stool samples of 3 of the 4 donors. Typing confirmed that 1 of these isolates represented the same strain as that from both the patient blood cultures and the platelet unit.

Bacterial Case 4: *Staphylococcus epidermidis*

Infection	*Staphylococcus epidermidis*
Year of Transfusion	2008
SHOT report	SHOT report 2008
Component	Platelets-pooled
Component Age	6 day
No. recipients	1
Morbidity	Major morbidity
Source	Contamination of the platelet unit by skin flora from the donor venepuncture site was probably responsible for the patient's reaction. *S. epidermidis* is a common skin commensal.
Reason TTI occurred	It is recognised that the donor arm cleansing procedure is not 100% effective. Informal quality audits carried out by the blood services during 2008 suggested that the procedure could be improved, and an extensive staff re-training exercise was undertaken.
Index case	An elderly patient was transfused with a unit of pooled platelets for thrombocytopenia.
Diagnosis	During the transfusion the patient developed chills, rigors, back pain and hypotension, and the transfusion was stopped.
Investigation	*Staphylococcus epidermidis* isolated from patient blood cultures and from remains of the platelet pack. Four associated red cell units and 1 unit of FFP were negative on culture. *S. epidermidis* was identified from venepuncture site samples from 2/4 of the donors contributing to the platelet pack, from pre-cleaning swabs only. 1 strain was identical to that in platelet pack. The blood culture from the patient was not available for further investigation so it was not possible to determine if all 3 isolates (from patient, donor and pack) were identical.

Bacterial Case 5: *Pseudomonas koreensis*

Infection	*Pseudomonas koreensis*
Year of Transfusion	2009
SHOT report	SHOT report 2009
Component	Red cells
Component Age	19 day
No. recipients	1
Morbidity	Death
Source	Unclear: *P. koreensis* is associated with cold temperatures. Contamination may have occurred within a cold storage room or processing area at blood service or hospital. Skin carriage of *P. koreensis* is rare. Donor swabs taken from arms were negative. Donor unlikely to have been the source. Despite extensive environmental sampling of processing and cold storage areas at hospital and blood services, source of the contamination could not be identified. Red cell pack was pressure tested but no holes or defects revealed so unclear how the bacteria may have entered the pack.
Reason TTI occurred	Possible environmental contamination in this incident led to an extensive review of cold room cleaning protocols within processing and issues areas.
Index case	Three units of red cells were transfused into an elderly patient receiving palliative care for cancer of the rectum and liver cirrhosis.
Diagnosis	Approximately 2 hours into transfusion of the third unit the patient became unwell with hypotension, fever (39.6°C), abdominal pain and vomiting; the patient died later the same day.
Investigation	*Pseudomonas koreensis* was cultured from the remains of the red cell unit at the microbiology laboratories of both the hospital and the blood service, and also from the patient blood cultures. All 3 isolates were found to be indistinguishable on molecular typing.

Bacterial Case 6: *Streptococcus pneumoniae*

Infection	*Streptococcus pneumoniae*
Year of Transfusion	2009
SHOT report	SHOT report 2009
Component	Platelets-apheresis
Component Age	5day (adult), 3day (baby)
No. recipients	2
Morbidity	Major morbidity
Source	Organism may have originated from the throat of the donor or donor carer and been transferred from there to the venepuncture site by fingers or a cough/sneeze or from an underlying asymptomatic bacteraemia in the donor. Approximately 4–8% of adults carry *S. pneumoniae.*
Reason TTI occurred	It is recognised that the donor arm cleansing procedure is not 100% effective. If no ilness reported and no visual signs of contamination in pack no reason not to issue and use the components of the donation.
Index case	An un-issued, expired unit of apheresis platelets was referred for microbiological testing after routine quality monitoring found pack to have low pH and abnormal colouration. *Streptococcus pneumoniae* was isolated from the unit.
Diagnosis	Retrospective investigations revealed that both patients had experienced transfusion reactions (including a fever of 39.8°C in the adult patient and 40.5°C in the baby), but these were thought at the time to have been related to the patients' underlying conditions.
Investigation	Four associated units had been transfused into 2 patients with acute myeloid leukaemia (AML)– 1 to an adult and 3 to a baby. All transfused packs were discarded but a blood sample from the adult patient yielded *S. pneumoniae*. The neonatal patient blood cultures were negative, but on antibiotics at time of transfusion. The isolate from both the contaminated index pack and the adult patient were indistinguishable. Donor nose and throat swabs were negative; however, *S. pneumoniae* is known to be difficult to culture from swabs.

Viral Case 1: Hepatitis E

Infection	Hepatitis E virus HEV
Year of transfusion	2011
SHOT report year	SHOT Report 2012
Component	FFP / Red cells
No. recipients	2
Morbidity	Major morbidity (Death in index case unrelated to HEV infection)
Source	Repeat male donor, 20-30 year age group.
Possible risk factor	Not reported any illness pre- or post-donation.
Reason TTI occurred	HEV screening currently not required. Illness not reported in donor. Therefore nothing to suggest components from donation should not have been issued.
Index case	Adult recipient of stem cell transplant with associated transfusion support over the Autumn of 2011.
Diagnosis	Recipient developed abnormal LFTs in May 2012. Testing of stored samples established that the recipient had been HEV negative in December 2011 but HEV RNA positive in February 2012.
Investigation	34 donations investigated. Two donors confirmed HEV RNA positive at time of donation: Donor A virus sequence data matched recipient. Recipient received FFP from this donation. Donor B virus had divergent sequence. Unfortunately the recipient died in Autumn 2012 from causes unrelated to the HEV infection. The 2nd recipient of the same donation (red cells) was HEV RNA negative, but positive for HEV IgG and IgM, a year after transfusion, consistent with previous HEV infection. Donor had cleared the infection and seroconverted when tested six months later.

Viral Case 2: Hepatitis B

Infection	Hepatitis B virus (HBV)
Year of transfusion	2011
SHOT report year	SHOT Report 2012
Component	Red cells / FFP
No. recipients	2
Morbidity	Major morbidity
Source	White-British male donor, 30-40 year age group.
Possible risk factor	The only possible reported donor risk was participation in contact sports. Asymptomatic and unaware of his HBV infection.
Reason TTI occurred	A donor with no reported deferrable risks donating with an early HBV infection undetectable by the screening tests in place at the time. Although HBV DNA is not a mandatory blood donation screening test it is included in the Triplex NAT screening test currently used on all donations. It was concluded that the level of HBV DNA was too low to be detected in the pooled NAT screening test.
Index case	A recipient of multiple transfusions during emergency cardiac surgery in August 2011.
Diagnosis	Diagnosed with acute HBV after jaundice and a high ALT test result prompted HBV testing in December 2011. The recipient was shown to be anti-HBc negative on an archived sample from December 2008. The recipient gradually cleared HBV infection over the following months.
Investigation	Fifteen of 16 donors cleared. One donor whose FFP had been transfused to the recipient had evidence of exposure and immunity to HBV (anti-HBc positive/anti-HBs >100 mIU/ml) on a donation 4 months after the implicated index donation. The index donation had been HBsAg screen negative (individual sample testing) and HBV NAT negative in testing of pooled samples. Retrospective individual sample testing of the archived sample of the index donation detected HBV DNA in one of two PCR tests used in the reference laboratory. Retrospective testing of 3 archived donation samples given before July 2011 showed no evidence of exposure to HBV. Lookback into the fate of the associated red cell component from the July index donation revealed chronic asymptomatic HBV infection (HBsAg and HBeAg positive) in the elderly female immunosuppressed recipient. The recipient of red cells from the subsequent donation, at which time the donor had immunity to HBV, was HBV negative.

Viral Case 3: Hepatitis B

Infection	Hepatitis B virus (HBV)
Year of transfusion	2012
SHOT report year	SHOT Report 2013
Component	Red cells
No. recipients	1
Morbidity	Major morbidity
Source	Repeat female donor , 20-30 year age group.
Possible risk factor	Tattooing reported but not recent ie not requiring deferral or additional testing for anti-HBc. Both donor and recipient of non-UK, European heritage.
Reason TTI occurred	**This is a case of probable transmission.** A donor with no reported deferrable risks donating with an HBsAg negative infection undetectable by the screening tests in place at the time. Although HBV DNA is not a mandatory blood donation screening test it is included in the Triplex NAT screening test currently used on all donations. The level of HBV DNA was too low to be detected in the pooled NAT screening test.
Index case	An elderly recipient on immunosuppressive therapy received 7 units of red cells in summer 2012, during surgery for a bowel problem.
Diagnosis	Mildly abnormal LFTs in April 2013 prompted HBV testing: recipient HBsAg positive, low level anti-HBc IgM reactive, HBeAg positive, avidity results inconclusive. Virus, genotype A2. A patient sample in June 2013 suggested HBeAg-positive chronic hepatitis B infection.
Investigation	Seven donors investigated. Six negative for evidence of HBV. One HBV DNA reactive on the index archive sample, tested retrospectively by individual sample testing having tested negative by routine pooled Triplex NAT screening at the time of donation. The donor was anti-HBc positive on a subsequent sample. An archive sample from 2011 was anti-HBc positive / HBV DNA negative. A donor follow-up sample was anti-HBs positive / HBV DNA positive. These test results could reflect a resolving HBV infection or reactivation of an occult chronic HBV infection. Recipient had lived in UK all her life. Viral genotyping revealed an HBV virus currently circulating in England, unlikely to have been acquired through vertical transmission. Genotyping of donor virus could not be undertaken due to insufficient HBV DNA in the samples, therefore absolute proof of transmission lacking,

Viral Case 4: Hepatitis E

Infection	Hepatitis E virus (HEV)
Year of transfusion	2012
SHOT report year	SHOT Report 2013
Component	FFP
No. recipients	1
Morbidity	Major morbidity
Source	Repeat male donor over 60 years old.
Possible risk factor	Not reported any illness pre- or post-donation.
Reason TTI occurred	HEV screening currently not required. Illness not reported in donor. Therefore nothing to suggest components from donation should not have been issued.
Index case	A recipient with multiple medical problems on immunosuppressive therapy received 129 donor exposures during a period of intensive plasma exchange and blood transfusion in May 2012.
Diagnosis	Recipient developed biochemical hepatitis in mid-August 2012, prompting hepatitis virus testing. He became HEV RNA positive in July 2012 (stored samples tested retrospectively) and seroconverted in August 2012 with subsequent clearance of HEV RNA.
Investigation	The vast majority of the 129 donors were cleared on the basis of subsequent negative serology and all tested index samples were RNA negative except for one. Sequencing studies identified this donation to be the source of infection in the recipient. Donor was HEV RNA positive, anti-HEV negative at the time of the index donation and had cleared virus and seroconverted by the next donation 5 months later.

Viral Case 5: Parvovirus B19

Infection	Parvovirus B19
Year of transfusion	2012
SHOT report year	SHOT Report 2012
Component	Red cells
No. recipients	1
Morbidity	Major morbidity
Source	Repeat donor , 20-30 year age group.
Possible risk factor	Not reported any illness pre- or post-donation
Reason TTI occurred	Parvovirus screening not currently required. Illness not reported in donor. Therefore nothing to suggest components from donation should not have been issued.
Index case	A child given a red cell transfusion for sickle cell anaemia in September 2012.
Diagnosis	A temperature of 41°C and lymphopenia 48 hours later. Parvovirus B19 DNA and IgG and IgM antibodies detected approximately 2 weeks post transfusion.
Investigation	The implicated donation was found to be parvovirus B19 DNA positive, IgM negative and IgG equivocal. A subsequent sample from the donor was positive for DNA, IgM and IgG. Both recipient and donor shared the same B19 genotype, although it was a very common form.

Viral Case 6: Hepatitis E

Infection	Hepatitis E virus (HEV)
Year of transfusion	2014
SHOT report year	SHOT Report 2014
Component	FFP / Red cells
No. recipients	2
Morbidity	Major morbidity (index case), minor in associated case
Source	Repeat male donor, >55 years
Possible risk factor	Donor was asymptomatic- no illness before or after donation.
Reason TTI occurred	HEV screening not required. No clinical illness in donor. Therefore nothing to suggest components from donation should not have been issued.
Index case	Male recipient in his 70s with multiple chronic medical problems including alcohol-related liver cirrhosis. Received red cells, platelets and FFP totalling 17 donor exposures in September 2014 for lower gastrointestinal bleeding secondary to diverticulitis.
Diagnosis	Discharged from hospital following transfusion but subsequently readmitted with hepatic encephalopathy. Investigation included testing for viral hepatitis markers, with results consistent with acute hepatitis E infection.
Investigation	Testing of 17 donation archive samples identified an HEV RNA positive donation without detectable antibodies. Index recipient received FFP from this donation. A further donor blood sample confirmed clearance of the virus and seroconversion. The recipient liver symptoms and enzyme function had improved by February 2015. The associated red cells were transfused in October 2014 and the recipient had shown no symptoms of HEV infection. A blood sample in February 2015 had test results consistent with a resolving HEV infection. The recipient had received chemotherapy and radiotherapy one year previously, probably accounting for the delayed clearance of the HEV infection, which was nevertheless expected to resolve over the following months.

Transfusion-Transmitted Infections (TTI) - Previous Recommendations

Year first made	Action	Recommendation
2013	**Hospital Transfusion Teams (HTT), Trust/Health Board Chief Executive Officers and Medical Directors responsible for all clinical staff**	Clinical staff requesting investigation of a possible transfusion-transmitted infection (TTI) by the UK Blood Services are reminded to report as soon as practical to Serious Adverse Blood Reactions and Events (SABRE) and SHOT. The reporter should remember to tick the SHOT box to prompt SHOT reporting. Reporters should update their report once the outcome of the UK Blood Services investigation is known. These should be reported even if not currently screened for by the Blood Service
2012	**Clinicians, Transfusion and Microbiology Laboratory Managers**	Retain suspected bacterially contaminated packs, even if near empty, for return to the Blood Service as the residue can be washed out and cultured. Report a suspected bacterial TTI promptly to the Blood Service to allow recall of any associated packs for testing. If sampling packs locally for bacterial testing, use ports rather than breaching the pack to minimise environmental contamination of the pack
2012	**Clinicians, Transfusion Laboratory Managers, Hospital Transfusion Team (HTT)**	Hospitals and Blood Centres investigating a possible viral TTI are reminded of the importance of locating any archived recipient samples (transfusion-related or not) for testing. It is important that laboratories facilitate access to those samples (with due consent of appropriate parties including the patient)
2012	**HTTs, Clinicians**	Even if TTI is excluded in a case of ATR, the case should still be reported to SHOT as an ATR If necessary
2012	**Clinicians, UK Blood Services**	Clinicians investigating suspected viral TTIs should explore all possible risk exposures in parallel with the Blood Service investigations, in order to determine the patient's most likely source of infection. This includes checking records and testing samples taken prior to the implicated transfusion(s) to check that the recipient was not infected prior to transfusion
2010	**Hospital microbiology laboratories**	Attention should be paid to the sampling and storage of implicated units or their residues to avoid sampling or environmental contamination of the pack
2010	**HTTs, clinicians**	Even if TTI is excluded in a case of ATR, the case should still be reported to SHOT as an ATR

2010	**Clinicians, UK Blood Services**	Clinicians investigating suspected viral TTIs should explore all possible risk exposures in parallel with the Blood Service investigations, in order to determine the patient's most likely source of infection. This includes checking records and testing samples taken prior to the implicated transfusion(s) to check that the recipient was not infected prior to transfusion.
2009	**HTTs**	Staff should maintain a high index of suspicion for bacterial causes when managing acute transfusion reactions. Symptoms may appear to be related to the patient's underlying condition, and temperature rises may be small or absent altogether. A BCSH guideline on the management of acute transfusion reactions is currently in preparation.
2009	**HTTs, UK Blood Services**	Processing and issues teams at the UK blood services and hospital transfusion teams should be vigilant to any abnormalities or clumps present in packs prior to transfusion, as highlighted by the Near Miss case in 2009.
2009	**HTTs, UK blood services**	Cleaning protocols for cold rooms and processing and storage areas should be reviewed regularly. Compliance with these should be audited.
2009	**Clinicians, UK Blood Services**	Clinicians investigating suspected viral TTIs should explore all possible risk exposures in parallel with the blood service investigations, in order to determine the patient's most likely source of infection.
2008	**Hospital transfusion teams**	Staff must maintain a high index of suspicion of bacterial causes when managing acute transfusion reactions. Symptoms may appear to be allergic in nature, but cultures must still be performed whenever bacterial contamination is a possibility.
2005, 2008, 2009	**Hospital transfusion teams, UK blood services**	Where bacterial contamination is suspected, staff should report the incident to the blood services as soon as possible in order to facilitate the return of implicated packs and the recall of any associated units. Attention should be paid to the sampling and storage of implicated units or their residues to avoid environmental contamination of the pack.
2003, 2008	**UK blood services, SaBTO, blood collection teams, hospital transfusion laboratories, staff undertaking pre-transfusion bedside checking**	Strategies to reduce bacterial contamination of blood components should continually be reviewed. These include: - Diversion of the first 20–30 mL of the donation (likely to contain any organisms entering the collection needle from the venepuncture site) - Enhanced donor arm cleansing using chlorhexidene - Consideration of bacterial screening interventions and/or pathogen inactivation - Adherence to BCSH guidelines (2009) with regard to the visual inspection of blood components for any irregular appearance immediately prior to transfusion