2019 Annual SHOT Report – Supplementary Information

Chapter 20: Transfusion-Transmitted Infections (TTI)

The table below is an excerpt from the full Table 20.3 which can be viewed in the main report.

Case reports with further details of the 1 bacterial and 15 viral transfusion-transmitted infection incidents from 2010 to 2019 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 2010 and 2019

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	Cryo
2010	0	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	0
2012	0	0	1 (1)	0	1 (1)	0	0	1 (1)	0	0	**3 (3)**	2	0	0	1	0
2013	0	0	0	0	0	0	0	0	0	0	**0**	0	0	0	0	0
2014	0	0	0	0	2 (3)	0	0	0	0	0	**2 (3)**	1	0	0	1	0
2015	1 (1)	0	0	0	4 (5)	0	0	0	0	0	**5 (6)**	0	3	1	1	1
2016	0	0	0	0	1 (1)	0	0	0	0	0	**1 (1)**	1	0	0	0	0
2017	0	1 (1)	0	0	0	0	0	0	0	0	**1 (1)**	0	0	1	0	0
2018	0	0	0	0	1 (1)	0	0	0	0	0	**1 (1)**	0	0	1	0	0
2019	0	0	0	0	1 (1)	0	0	0	0	0	**1 (1)**	0	0	1	0	0

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

Bacterial Case 1: *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 2: *Streptococcus pneumoniae*

Infection	*Streptococcus pneumoniae*
Year of Transfusion	2009
SHOT report	SHOT report 2009
Component	Platelets - apheresis
Component Age	5 day (adult), 3 day (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.

Bacterial Case 3: *Staphylococcus aureus*

Infection	*Staphylococcus aureus*
Year of Transfusion	2015
SHOT report	SHOT report 2015
Component	Platelets - pooled
Component Age	6 day
No. recipients	1
Morbidity	Major morbidity
Source	Donor found to carry *Staphylococcus aureus*, no current or past history of eczema or other skin conditions
Reason TTI occurred	It is recognised that the donor arm cleansing procedure is not 100% effective. There is a small residual risk that bacteria may not be detected during bacterial screening.
Index case	A female neutropenic patient in her 70's with Acute Myeloid Leukaemia was transfused with a six day old pooled platelet unit
Diagnosis	Fifteen minutes into the transfusion, the patient became agitated and experienced symptoms of rigors, tachycardia and pyrexia. The patient's temperature spiked at 38.7°C and continued to rise overnight reaching 40°C.
Investigation	*Staphylococcus* was initially reported in patient blood cultures. This was later confirmed by the hospital microbiology laboratory to be *S. aureus*. The same strain of *Staphylococcus aureus* was isolated from cultures from the almost empty pack of the transfused unit and skin swabs from one of the donors whose donation was included in the pool, this was also confirmed by molecular typing.

Bacterial Case 4: *Staphylococcus epidermidis*

Infection	*Staphylococcus epidermidis*
Year of Transfusion	2018
SHOT report	SHOT report 2018
Component	Platelets - apheresis
Component Age	7 day
No. recipients	2 - one was patient had no evidence of an adverse reaction to the transfusion
Morbidity	Moderate
Source	Donor investigations are ongoing.
Reason TTI occurred	**This is a case of probable transmission.** It is recognised that the donor arm cleansing procedure is not 100% effective. There is a small residual risk that bacteria may not be detected during bacterial screening.
Index case	A young child received one standard unit of a 7-day old apheresis platelet. The child was receiving blood components due to ongoing chemotherapy for an underlying medical condition.
Diagnosis	Within five minutes of the platelet transfusion being started the child experienced an anaphylactoid reaction including a rise in temperature to 40°C that lasted for 24 hours. This was treated empirically with intravenous antibiotics to cover the possibility of either a bacterial TTI or a central line infection. The patient made a good recovery and was discharged home within days to complete a week of antibiotics.
Investigation	*Staphylococcus epidermidis* was repeatedly isolated from recipient blood cultures and a transfusion reaction investigation was commenced by NHSBT. Routine bacterial screening of the transfused platelet unit was negative but on return to the NHSBT national bacteriology laboratory *Staphylococcus epidermidis* was isolated from the index pack. This isolate was sent for typing along with isolates from the recipient's blood cultures and they were shown to be indistinguishable. Donor investigations are ongoing.

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	FFP / Red cells
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.

Viral Case 7: Hepatitis E

Infection	Hepatitis E virus (HEV)
Year of transfusion	2014
SHOT report year	SHOT Report 2015
Component	FFP
No. recipients	1
Morbidity	Minor
Source	A repeat male donor > 65
Possible risk factor	Donors were 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	A male liver transplant recipient received 32 blood products during surgery.
Diagnosis	He was found to be significantly viraemic 68 days post-transplant (October 2012) whereas he was negative when assessed in June 2012.
Investigation	An investigation was carried out and it was identified that he had received 5 apheresis platelets, 14 fresh frozen plasma, 9 red blood cell concentrates, 1 platelet pool (4 donors) and 1 cryoprecipitate (5 donors) in August 2012. Two platelets transfused in 2011, prior to CH being reported as HEV positive, were excluded from this investigation. Thirty-seven blood donor exposures were identified. Archive samples from all 37 donations were retrieved and tested for antibodies to HEV (IgG and IgM) and HEV RNA. One donor (FFP) showed evidence of active HEV infection (HEV IgM & HEV RNA positive; HEV IgG negative) at the time of donation. Sequence analysis showed that the sequence in the HEV RNA positive donor was a highly-conserved match with the transplant patient sample.

Viral Case 8: Hepatitis E

Infection	Hepatitis E virus (HEV)
Year of transfusion	2015
SHOT report year	SHOT Report 2015
Component	Platelets - pooled
No. recipients	2
Morbidity	Patient deceased, due to underlying condition, however HEV may have contributed to patient's death.
Source	Repeat male donor > 25; repeat male donor > 60
Possible risk factor	Donors were 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	A male patient in is 50's (vegetarian) with multifocal CNS (central nervous system) lymphoma diagnosed in December 2014, underwent autologous stem cell transplant for reversible bone marrow failure and had extensive transfusion support including multiple pooled platelets from June 2015.
Diagnosis	HEV testing was carried out in view of persistent transaminitis. The patient eventually died with decompensated liver failure.
Investigation	There were thirty-three donor exposures based on donations transfused in the 12 weeks prior to the first positive result. Two donations by two donors (one pooled platelet transfused on 2nd June 2015 and one apheresis platelet transfused on 21st May 2015) were found through retesting archive samples to have been HEV RNA positive. Due to the changing nature of the virus in the recipient it is not possible to say with certainly whether one or both donations were responsible for the hepatitis E infection, however the apheresis platelet donation had a high viral load and resulted in transmission to the recipient who received the other platelet pack.

Viral Case 9: Hepatitis E

Infection	Hepatitis E virus (HEV)
Year of transfusion	2015
SHOT report year	SHOT Report 2015
Component	Platelets / cryoprecipitates
No. recipients	1
Morbidity	Major morbidity
Source	Repeat male donor >75 years
Possible risk factor	Donors were 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	A male patient in his 40's with non-Hodgkin's lymphoma received 2 units of platelets and 2 units of cryoprecipitate in July 2015 (18 donor exposures).
Diagnosis	In October 2015 (80 days post transfusion), he was admitted in hospital for jaundice, nausea and abdominal discomfort. He was HAV, HBV and HCV negative, however he was HEV IgG (low) and IgM (high) positive.
Investigation	Records of all donors were examined. None of the donors had reported any illness at the time of donation or subsequently. Archive samples from the eighteen index donations were tested for HEV RNA, of which one donation which was included in one of the cryoprecipitate doses was HEV RNA positive.

Viral Case 10: Hepatitis E

Infection	Hepatitis E virus (HEV)
Year of transfusion	2016
SHOT report year	SHOT Report 2016
Component	Red cells
No. recipients	1
Morbidity	Major morbidity
Source	Repeat male donor >40 years
Possible risk factor	Donors were asymptomatic- no illness before or after donation.
Reason TTI occurred	HEV screening was not required. No clinical illness in donor, therefore nothing to suggest components from donation should not have been issued.
Index case	A male patient in his 70's with aplastic anaemia received regular blood transfusions of two units of red cells every month.
Diagnosis	The patient was noted to have abnormal LFT's when tested on 24th February 2016. Sample dated 2nd March 2016 was reported anti-HEV IgM and IgG positive by PHE Bristol. This sample was referred to PHE Colindale where it was confirmed to be HEV RNA positive with a viral load of 410,000 IU/ml.
Investigation	Records of all donors were examined. None of the donors had reported any illness at the time of donation or subsequently. Archive samples from the ten index donations were tested for HEV RNA, of which one donation was HEV RNA positive, viral load 3574 IU/ml. All donors remain on the donor panel.

Viral Case 11: Hepatitis E

Infection	Hepatitis E virus (HEV)
Year of transfusion	2015
SHOT report year	SHOT Report 2017
Component	Platelets-pooled
No. recipients	1
Morbidity	Major morbidity
Source	Repeat male donor > 50 years
Possible risk factor	Donor was asymptomatic- no illness before or after donation.
Reason TTI occurred	Pre-dates introduction of routine HEV screening. No clinical illness in donor, therefore nothing to suggest components from donation should not have been issued.
Index case	A male patient in his 60s diagnosed with myelodysplastic syndrome (MDS), proceeding to an allogeneic stem cell transplant, received blood transfusions from late 2014 to mid 2015
Diagnosis	A deterioration in liver function test result in early 2016 led to HEV testing, the patient was HEV IgM positive, IgG not detected
Investigation	Archive samples of all the donations were retrieved and tested for HEV RNA. One donation was identified as HEV RNA positive with a viral load of 2,000,000 IU/mL. The platelet and plasma from this donation was used in preparation of a platelet pool which was transfused in the patient. Sequence analysis indicates viruses in the donor and recipient samples are likely to be linked and therefore this TTI is confirmed. The associated red cell pack was transfused to an immunocompetent individual who did not require any further follow-up.

Viral Case 12: Hepatitis E

Infection	Hepatitis E virus (HEV)
Year of transfusion	2015
SHOT report year	SHOT Report 2017
Component	FFP
No. recipients	1 (+red cell recipient- see above)
Morbidity	Major morbidity
Source	Repeat male donor > 30 years
Possible risk factor	Donors were 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	A male patient in his 60's received multiple plasma exchanges with FFP as treatment for Focal Segmental Glomerulosclerosis (FSGS) which he developed after undergoing a renal transplant in November 2014.
Diagnosis	In March 2017 following further investigations after the patient developed ascites over 6 months and portal hypertension, the patient was found to be HEV RNA positive. Public Health England confirmed these results as HEV IgM positive and IgG positive, genotype 3 with a viral load of 1,500,000 IU/mL. The patient had therefore developed chronic HEV infection, dating from at least August 2015, on a background of immunosuppression following a renal transplant. The patient subsequently developed multi-organ failure and died.
Investigation	Archive samples were retrieved and tested, 57 were HEV RNA negative, one sample was insufficient for testing and one was identified as HEV RNA positive, IgM and IgG negative, indicating early HEV infection in the donor at the time of donation. An associated red cell pack from the same donation did not result in transmission probably due to low levels of virus in the pack. Sequence analysis indicates viruses in the donor and recipient samples (genotype 3c) are likely to be linked and therefore this is confirmed as a TTI.

Viral Case 13: Hepatitis A

Infection	Hepatitis A virus (HAV)
Year of transfusion	2017
SHOT report year	SHOT Report 2017
Component	Platelets-apheresis
No. recipients	1
Morbidity	Major morbidity
Source	Repeat male donor > 50 years
Possible risk factor	Donor felt unwell two days prior to donation but recovered and attended donation, the following day the donor felt unwell and developed dark urine but no jaundice. A week after donation the donor was admitted to hospital. Upon investigation, it was found that the donor had visited a bakery that was linked in a Hepatitis A outbreak.
Reason TTI occurred	Donations are not routinely screened or hepatitis A.
Index case	A female patient in her 50's with renal cancer, neutropenic sepsis and low platelet count received an apheresis platelet unit.
Diagnosis	HAV RNA was detected in the recipient, however the patient had evidence of previous hepatitis A infection or immunisation (HAV IgG detected and HAV IgM negative. Sadly, the patient died of their underlying disease.
Investigation	Health Protection Scotland and SNBTS worked together to ensure that no other donors potentially affected by the outbreak were eligible to donate for 6 months. The Public Health services in England and Scotland have modified their hepatitis A questionnaire for patients and contacts to ask an additional question about recent blood donation. Public health teams will notify their blood service if patients answer yes to this question to allow appropriate actions to be taken. Sequence analysis indicates viruses in the donor and recipient samples are likely to be linked and therefore this TTI is confirmed.

Viral Case 14: Hepatitis B

Infection	Hepatitis B virus (HBV)
Year of transfusion	2017
SHOT report year	SHOT Report 2018
Component	Red cells
No. recipients	1
Morbidity	Major - death
Source	New male donor in his forties.
Possible risk factor	May have been acquired as a child in the country of birth
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	A woman in her 70's received two units of red cells in response to a low haemoglobin level of 83g/l. She had multiple medical conditions including liver cirrhosis due to non-alcoholic steatohepatitis (NASH).
Diagnosis	Approximately six months later she was re-admitted to hospital with acute hepatitis and diagnosed with acute hepatitis B infection. She developed acute-on-chronic liver failure and unfortunately died about five weeks after the HBV diagnosis.
Investigation	The two donors associated with the units transfused to the patient were identified. One was a repeat donor who had an archive sample from the implicated unit and another archive sample for a subsequent donation; both tested negative for HBV. The other donor was a new donor, the archive sample from the implicated donation was retrieved and tested positive for anti-HB core antibodies but negative for HBV DNA using singleton NAT. The donor kindly provided a large volume sample which was concentrated and HBV DNA was detected at a level below the level of detection of our routine screening tests.

Viral Case 15: Hepatitis E

Infection	Hepatitis E virus (HEV)
Year of transfusion	2018
SHOT report year	SHOT Report 2018
Component	Platelets - apheresis
No. recipients	1
Morbidity	Major morbidity
Source	Asymptomatic donor who donated very regularly.
Possible risk factor	Hepatitis E virus has been mainly associated with the consumption of raw or undercooked pork meat or offal, but also with wild boar meat, venison and shellfish. The donor had no clinical signs of hepatitis E before or after donation.
Reason TTI occurred	This donation had been tested for HEV in a pool of 24 donations, as per normal screening procedures, and was issued as screen negative. The donor returned and gave another donation two weeks later when HEV RNA was detected on screening. A lookback investigation initiated by the blood service identified the previous donation as HEV RNA positive on singleton testing. The low viral load detected in this donation would have been below the level of quantification in the pooled screening, hence the screen negative result.
Index case	A haematology patient undergoing chemotherapy at the time of the transfusion.
Diagnosis	In late 2018, as part of routine screening, NHSBT identified a regular apheresis platelet donor who tested positive for HEV ribonucleic acid (RNA), indicating an acute HEV infection, and this donation was discarded. The donor had donated in the previous month and following the usual lookback process an archive sample from this previous donation was tested and found to be HEV RNA positive with a very low viral load.
Investigation	Both platelet packs from the previous low-level HEV positive donation had been issued and the hospitals were contacted and recipients identified. One recipient had died shortly after the transfusion from their underlying conditions. The other patient was informed and a blood sample was taken 11 weeks post transfusion, this tested positive for HEV RNA. Samples from the donor and recipient were sequenced and the hepatitis E virus isolated was found to be identical at the nucleotide level therefore confirming a TTI.

Viral Case 16: Hepatitis E

Infection	Hepatitis E virus (HEV)
Year of transfusion	2019
SHOT report year	SHOT Report 2019
Component	Platelets - apheresis
No. recipients	2
Morbidity	Major - death
Source	Asymptomatic repeat donor.
Possible risk factor	Hepatitis E virus has been mainly associated with the consumption of raw or undercooked pork meat or offal, but also with wild boar meat, venison and shellfish. The donor had no clinical signs of hepatitis E before or after donation.
Reason TTI occurred	This donation had been tested for HEV in a pool of 24 donations, as per normal screening procedures, and was issued as screen negative. The donor returned and gave another donation less than a month later when HEV RNA was detected on screening. A lookback investigation initiated by the blood service identified the previous donation as HEV RNA positive on singleton testing. The low viral load detected in this donation would have been below the level of quantification in the pooled screening, hence the screen negative result.
Index case	A patient in their 40s with aplastic anaemia, excessive alcohol use and portal hypertension (without cirrhosis).
Diagnosis	In September 2019, as part of routine screening, NHSBT identified a regular apheresis platelet donor who tested positive for HEV ribonucleic acid (RNA), indicating an acute HEV infection, and this donation was discarded. The donor had donated in the previous month and following the usual lookback process an archive sample from this previous donation was tested and found to be HEV RNA positive with a very low viral load.
Investigation	Both platelet packs from the previous low-level HEV positive donation had been issued and the hospitals were contacted and recipients identified. One recipient was followed up for 6 months during which time there was no evidence of hepatitis E infection. The other recipient was diagnosed with HEV infection two months after the identified transfusion took place. The viral load in the sample of the index unit was too low to perform sequence analysis but this was possible on the donor's subsequent donation in late September. Sequence obtained from the virus infecting the recipient was identical to that obtained from the donor. Based on this it was confirmed that blood transfusion was the source of the patient's HEV infection.

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 BSH guideline on the management of acute transfusion reactions has been prepared.
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**	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

	checking	- Adherence to BSH guidelines (2009) with regard to the visual inspection of blood components for any irregular appearance immediately prior to transfusion