12. Transfusion-Transmitted Infection (TTI)

Definition

A report is classified as a **transfusion-transmitted infection** if, following investigation:

- the recipient had evidence of infection post transfusion, and there was no evidence of infection prior to transfusion and no evidence of an alternative source of infection;

and, either

- at least 1 component received by the infected recipient was donated by a donor who had evidence of the same transmissible infection,

or,

- at least 1 component received by the infected recipient was shown to contain the agent of infection.

DATA SUMMARY

Total number of cases	3

Implicated Components	
Red cells	**2**
FFP	**0**
Platelets	**1**
Other	**0**

Mortality / morbidity	
Deaths due to transfusion	**0**
Deaths in which reaction was contributory	**0**
Major morbidity	**3**

Gender	
Male	**1**
Female	**2**

Age	
<16 years	**0**
<1 year	**0**
<4 weeks	**0**

Emergency vs. routine Core hours vs. out of core hours	
Emergency	**0**
Routine	**3**
Not known	**0**
In core hours	**2**
Out of core hours	**1**
Not known/applicable	**0**

Where transfusion took place	
Emergency	**0**
Theatre	**0**
ITU/HDU/Recovery	**0**
Wards	**3**
Community	**0**
Other	**0**
Not known	**0**

Information technology and appropriateness of transfusion (in the opinion of the SHOT reviewer)	
In how many cases was failure or absence of IT a factor?	**0**
In how many cases was a transfusion possibly unnecessary or inappropriate?	**0**

Reports of suspected transfusion-transmitted infections

During 2007, 25 reports of suspected transfusion-transmitted infections were made from blood centres throughout the UK to NBS/HPA Centre for Infection Surveillance. All UK blood centres contributed to the scheme.

Three reports (bacteria), described below, were determined to be TTIs according to the above definition. Twenty-one cases were concluded as not transfusion-transmitted infections (4 hepatitis B [HBV], 3 hepatitis C [HCV], 7 HIV, 2 HTLV, 1 malaria, 1 Parvo B19 and 3 bacteria). One case (CMV) is pending complete investigation.

Case report of transfusion-transmitted *Enterobacter cloacae*

A recipient (62-year-old female) was prescribed red cell treatment for anaemia. This patient was diabetic and in renal failure. Soon after the start of the first unit (21 days old) she became tachycardic with rigors, hypertension and pain at the IV site. The transfusion was stopped, blood cultures taken and antibiotics started. The patient made a full recovery. *Enterobacter cloacae* was isolated from the blood cultures taken from the patient at the time of the reaction and from the red cell pack. Pulsed field gel electrophoresis (PFGE) shows that the strain isolated from the patient's blood culture

and the strain isolated from the remains of the red cell pack were identical. The donor was recalled and skin swabs were taken from the venepuncture site. No enterobacter or coliforms were isolated. *Enterobacter cloacae* is not part of usual skin flora, so the absence of this bacteria on the skin is not surprising. It is also unlikely that the donor was bacteraemic at the time of donation. An associated platelet unit had already been transfused, with no adverse reaction reported. This investigation was concluded to be a proven case of bacterial contamination of a red cell unit with *Enterobacter cloacae*; the source of the contamination was not identified.

Case report of transfusion-transmitted *Pseudomonas putida*

An 89-year-old female patient was prescribed red cell treatment for postoperative anaemia. One and a half hours after the start of the first unit (17 days old) she became tachycardic and short of breath. The transfusion, which started during the evening, was terminated, blood samples were taken and the patient was started on antibiotics. The patient made a full and rapid recovery. *Pseudomonas putida* was isolated from the patient blood sample and from the red cell pack. These isolates were confirmed by PFGE to be the same strain. There were no associated units.

Pseudomonas putida is an environmental organism, and transient bacteraemia in a healthy donor is unlikely. It is able to survive at 4ºC and this strain was able to grow actively at that temperature, although only at a high inoculum. Fridges and cold rooms at the blood centre and at the hospital transfusion laboratory were examined for contamination but all were negative. The surface of the pack was also negative. This investigation was concluded to be a proven case of bacterial contamination of a red cell unit with *Pseudomonas putida*; the source of the contamination was likely to be environmental, but the exact source was not identified, despite investigation of likely sources.

Case report of transfusion-transmitted *Bacillus cereus*

A 47-year-old female was transfused with 1 unit of pooled platelets (4 days old) during the morning because of a low platelet count (owing to leukaemia). Before the end of the transfusion, the patient became pyrexial and hypotensive. The transfusion was stopped and the patient was started on antibiotics. Although very unwell for the first 12 hours following transfusion, she made a full recovery within 4 days. *Bacillus cereus* was isolated from the pooled platelet pack. Associated red cells and plasma from the donations contributing to the buffy coat were all negative. This investigation was concluded to be a proven case of bacterial contamination of a pooled platelet unit with *Bacillus cereus*; the source of the contamination was not identified.

Other incidents

Near Miss

A 4-day-old apheresis platelet unit (pack 1 of 2) was returned to the blood service by a hospital following an observation of a large white clump in the pack; *Staphylococcus aureus* was isolated (not methicillin resistant). The platelets were so heavily contaminated that Gram positive cocci could be seen in an uncentrifuged smear of the pack contents. The second pack (4 days old) had been transfused into a paediatric oncology patient with no adverse effect. Had this pack also been contaminated with *S. aureus,* it is not unreasonable to assume that the patient would have experienced a reaction. Both packs had been subject to bacterial screening prior to issue, with negative results. The contamination of one of the two packs remains unexplained.

Staphylococcus aureus in apheresis platelet unit

vCJD

There have now been 4 cases of transmission of vCJD infection (see Table 29 for years of transfusion) associated with blood transfusion; three of the recipients developed clinical vCJD. These cases were among a small group of recipients of blood who were under active surveillance as they had received blood components from donors who later developed vCJD. Although there are no reports of transfusion-transmitted vCJD or prion disease in this report, 1 case reported in the 2006 Annual Report was in fact identified in early 2007. All 4 cases had received transfusions of non-leucodepleted red blood cells between 1996 and 1999; none relate to plasma products. Since 1997 the UK blood services have introduced a number of precautionary measures, including leucodepletion of all blood components (1999), use of methylene-blue virally inactivated FFP obtained outside the UK for children under 16 (2002), importation of plasma for fractionation (1998), imported solvent detergent (SD) treated FFP for adult patients with thrombotic thrombocytopenic purpura (TTP) (2006), and the exclusion of donors who have received a blood transfusion in the UK since 1980 (2004).

Cases reported as pending in previous years

The case reported as pending in 2004 (HHV-8) is now completed. No donor was found to have evidence of HHV-8 infection; it was concluded that there was no evidence of transfusion transmission. The pending HBV case from the 2006 report was confirmed as not transfusion transmitted.

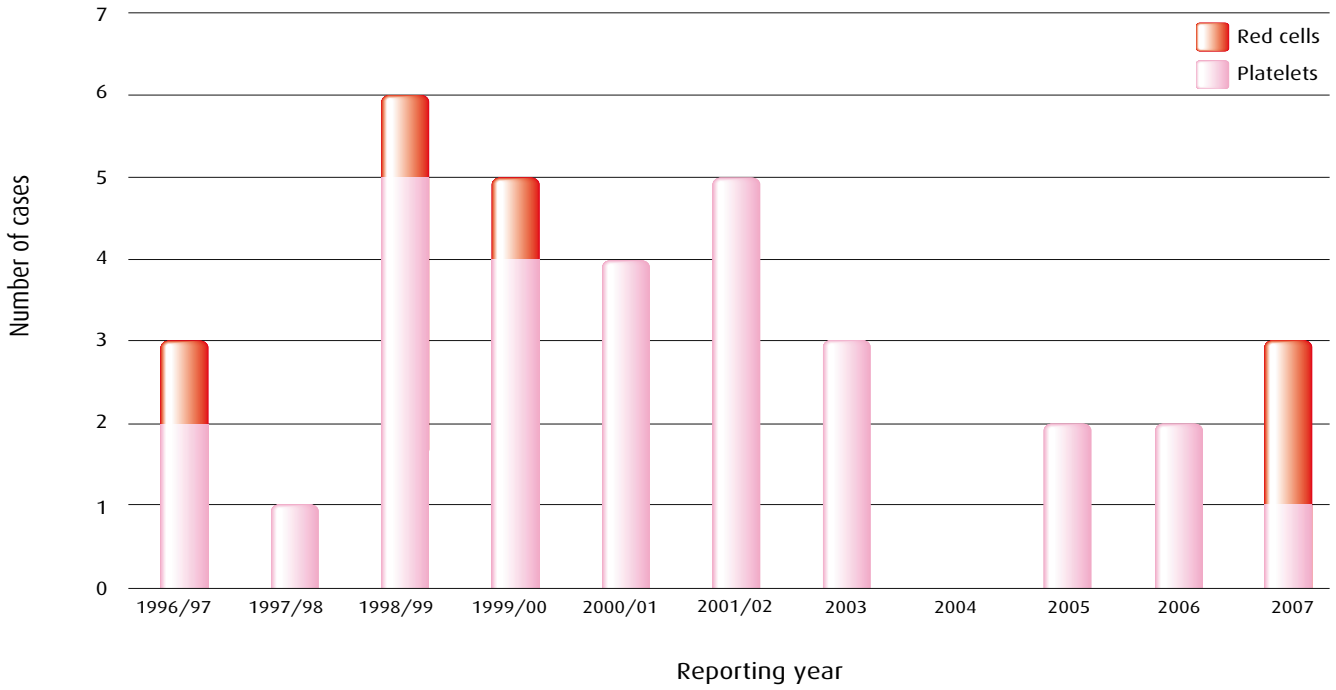
Cumulative data

Reports of suspected viral and bacterial TTIs have traditionally been received and investigated by the UK blood services, and then reported to a national TTI surveillance scheme outside of, but closely aligned with, SHOT. From here, data were included in the annual SHOT reports. Cases reported in one year to the blood services were included in the same SHOT reporting year, even if the investigation had not been completed. Investigation of some suspected viral TTIs may take many months, which is why the decision was taken to report all known cases within the same reporting year, for completeness, rather than waiting until the investigation had finished. For example, the suspected HHV-8 transmission first reported in the SHOT 2004 report was completed in late 2007. Hence, each year, some cases were reported as pending and the conclusion was reported in the subsequent report. This procedure differs from that adopted by SHOT, where cases were included in the year that the investigation was completed. Previous SHOT reports have included data on total mortality and morbidity; these were generated by counting the cases reported in the main paragraph in each chapter. Unfortunately this missed TTI cases initially reported as pending, which were later confirmed to be TTIs. These counts also excluded the vCJD and prion cases reported in recent years. Consequently some differences in numbers presented in the last report have been identified. The cumulative data presented below, in addition to the mortality and morbidity data in the data summary on page 102, are accurate and should replace all previous data.

Bacterial data

Since 1996, 34 cases of transfusion-transmitted bacterial infection have been reported (Figure 16), of which 8 recipients died due to the transfusion. The majority of these cases (n = 28) relate to platelet units (10 apheresis and 18 pooled).

Figure 16
Confirmed bacterial transfusion-transmitted infections, by year of report and type of unit transfused (Scotland included from 10/1998)*

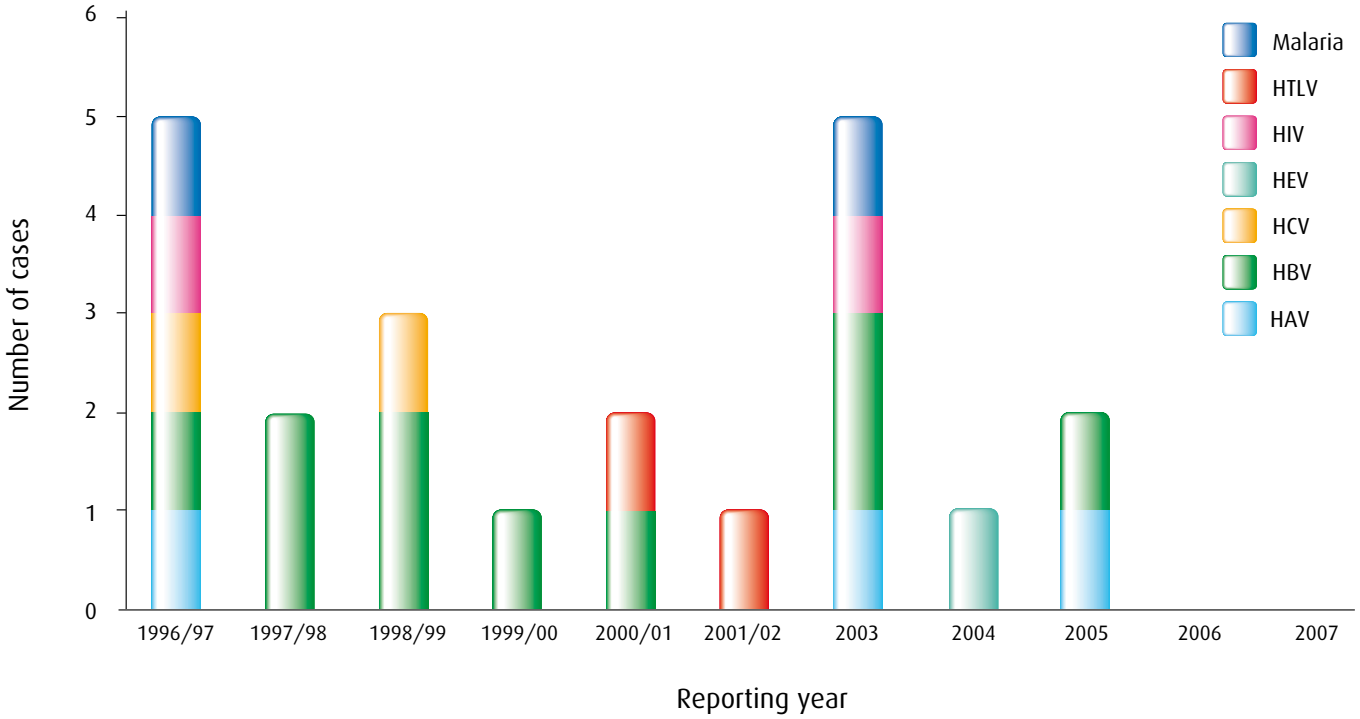


* In 2004 there was a further incident involving contamination of a pooled platelet pack with *Staphylococcus epidermidis*, which did not meet the TTI definition because transmission to the recipient was not confirmed, but it would seem likely (not included in Figure 16).

Cumulative viral data

Since 1996, 22 cases of transfusion-transmitted viral infections have been reported (Figure 17): 10 HBV, 3 HAV, 1 HEV, 2 HCV, 2 HIV, 2 HTLV and 2 malaria. There have been no cases of transfusion-transmitted viral infections for 2 years running (2006 and 2007).

Figure 17
Confirmed transfusion-transmitted viral infections, by year of report and infection (Scotland included from 10/1998)



* The year of transfusion can be many years prior to the year the case is investigated and reported in SHOT, due to the chronic nature of some of these infections leading to delay in identification of the infection.

Table 29
Cumulative TTI data shown by SHOT report year (Scotland included from 1998-99 report)

	1996-1997	1997-1998	1998-1999	1999-2000	2000-2001	2001-2002	2003	2004	2005	2006	2007	Total	Death (due to infection)	Major morbidity	Minor morbidity
Bacteria	3	1	6	5	4	5	3	0	2	2	3	34	8	23	3
HAV	1	0	0	0	0	0	1	0	1	0	0	3	0	2	1
HBV	1	2	2	1	1	0	2	0	1	0	0	10	0	10	0
HCV	1	0	1	0	0	0	0	0	0	0	0	2	0	2	0
HEV	0	0	0	0	0	0	0	1	0	0	0	1	0	0	1
HIV	1	0	0	0	0	0	1	0	0	0	0	2	0	2	0
HTLV	0	0	0	0	1	1	0	0	0	0	0	2	0	2	0
Malaria	1	0	0	0	0	0	1	0	0	0	0	2	1	1	0
Prion	0	0	0	0	0	0	0	1	0	0	0	1	0	1	0
vCJD	0	0	0	0	0	0	1	0	1	1	0	3	3	0	0
Total	**8**	**3**	**9**	**6**	**6**	**6**	**9**	**2**	**5**	**3**	**3**	**60**	**12**	**43**	**5**

Further cumulative data are available at http://www.hpa.org.uk/infections/topics_az/BIBD/menu.htm.

COMMENTARY

- After the introduction of diversion of the first 20 mL of a donation (2002) and improved donor arm disinfection, bacterial contamination of platelets and red cells continues to occur, albeit at a lower level, and causes major morbidity in transfusion recipients. Despite full investigations by the blood services, the source of contamination was not identified in any of the 3 cases this year. Visual inspection of 1 platelet unit prevented the probable transmission of *S. aureus*; it is important that staff starting the transfusion visually check all components prior to transfusion. However, bacterial contamination is possible even in the absence of visible features.

- This is the first instance since 1999 of any report of bacterial contamination and transmission from a red cell unit. These 2 cases were not linked in any way. The occurrence of 2 cases in a year was most likely a chance finding due to the small number of events.

- For the second year running there were no confirmed viral transmissions consistent with the current very low estimated risk of HIV (0.25 per million), HCV (0.02 per million), HBV (1.62 per million) and HTLV (0.10 per million) infectious donations entering the UK blood supply. For more information see http://www.hpa.org.uk. *[Follow the headings: infectious diseases, topics A-Z, blood borne infections in blood donors, epidemiological data.]*

- The risk of acquiring vCJD from blood transfusion is unknown. The incidence of vCJD has been declining since 2000 and the number of people harbouring infection is uncertain. Prevalence of infection in the general population, and in the donor population, is unknown. Susceptibility and the incubation period of the disease are affected by genetic factors. The risk of transfusion transmission will be related to the prevalence of infection and to the length of any asymptomatic 'carrier state' with blood infectivity. The precautionary measures introduced by UK blood services, described above, should reduce the risk of acquiring vCJD through blood transfusion.

- Of the 3 confirmed TTIs, 2 transfusions took place during core hours and 1 outside of core hours. All were appropriate transfusions.

- Surveillance of TTIs tends to be biased towards ascertainment of acute cases that are clinically apparent. The onset of symptoms related to a transfusion-transmitted viral infection may occur from several weeks to years after the date of the transfusion. Just under half of the investigations into suspected viral transmissions reported here were transfused in 2003 or earlier. The reporting of incidents involving acute infections that tend to be clinically apparent and diagnosed within days after receipt of the infectious transfusion, such as bacteraemia, may be relatively complete, but incidents involving chronic viral infections may not.

RECOMMENDATIONS

New recommendation from this report

- Staff involved in transfusion should remain vigilant for visual signs of bacterial contamination of red cell and platelet units. However, bacterial contamination is possible even in the absence of visible features, so staff should remain vigilant for any adverse reactions post transfusion.

  Action: HTTs/ nurses/ BMS's

Recommendations still active from previous years

Year first made	Recommendation	Target	Progress
2005	Hospitals should consult the blood services about the investigation of transfusion reactions suspected to be due to bacteria. Attention should be paid to the sampling and storage of implicated units or their residues and packs returned to blood services for testing	**HTTs**	Guidance for English hospitals can be found on the NBS hospitals website: http://www.blood.co.uk/hospitals/library/request_forms/aer/; for other services please discuss with your supply blood centre
2003	Efforts to prevent bacterial contamination of blood components should continue. 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) ■ careful attention to adequate cleansing of donors' arms ■ adherence to BCSH guidelines (1999) with regard to the visual inspection of blood components for any irregular appearance immediately prior to transfusion The UK blood services should continue to investigate methods to reduce bacterial contamination	**UK blood services hospital transfusion laboratories, staff undertaking pre-transfusion bedside checking**	UK blood services have introduced enhanced donor arm cleansing and continue to monitor and evaluate the success of all interventions
2003	Hospitals should continue to report and investigate all possible incidents of post-transfusion infection appropriately and adequately	**HTTs**	Serious Adverse Reactions are required to be reported by hospitals under the terms of the BSQR