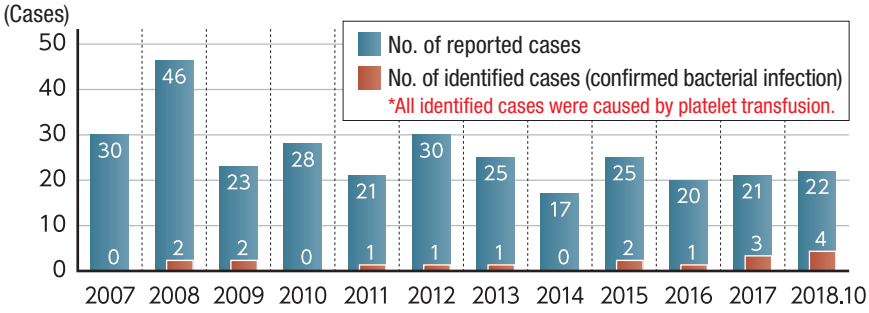
Transfusion-transmitted bacterial infection

The Japanese Red Cross Society (JRCS) takes safety measures to prevent transfusion-transmitted bacterial infection (TTBI), such as thorough interviews with prospective donors, improvement of skin disinfection, diversion of the initial blood flow, pre-storage leukocyte reduction, limited shelf life for platelets, and visual inspection of products. However, complete elimination of bacterial contamination in the blood bags is challenging, and several cases of TTBIs were confirmed every year.

All cases identified as TTBIs since 2007 were caused by platelet components. All of these cases were reported as severe, including 1 death reported last year. In the following figures, the cases are classified based on whether the causative bacteria were Gram-positive or Gram-negative, and are broken down by time to symptom onset and clinical manifestations.

Monitor the recipient's conditions after starting the transfusion. If suspected symptoms of an infection appear, stop the blood transfusion immediately and provide appropriate treatment.

Changes in the number of cases suspected TTBIs (Jan. 2007 to Oct. 2018)

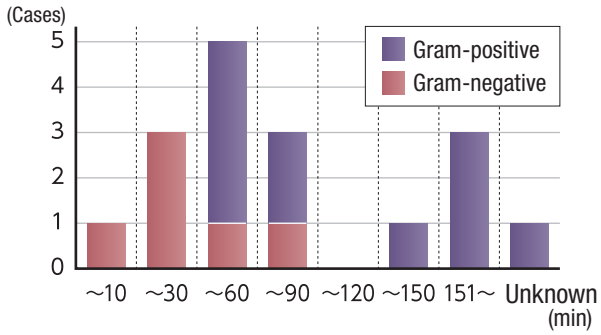


JRCS supplies approximately 800,000 units of platelets annually. Since the introduction of initial blood flow diversion and pre-storage leukocyte reduction (2007), 17 cases of bacterial infection have been identified, all of which were caused by platelet transfusions.

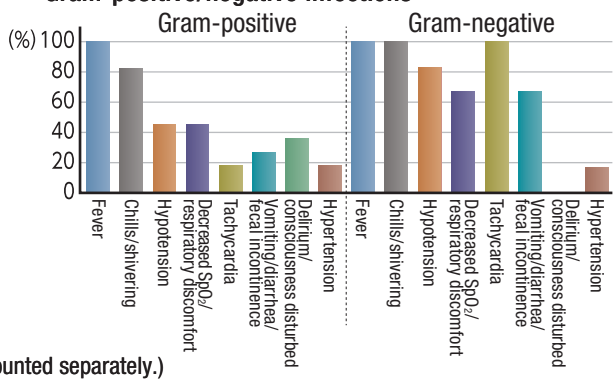
Time to onset of symptoms from starting transfusion and clinical manifestations in bacterial infection cases (Jan. 2007 to Oct. 2018)

Cases identified as transfusion-transmitted bacterial infection often presented with severe fever, hypotension, decreased SpO_2, tachycardia, and/or gastrointestinal symptoms. In Gram-negative infections, symptoms tended to develop rapidly, and severe tachycardia was characteristically observed.

Time to symptom onset from starting transfusion



Incidence of major symptoms of Gram-positive/negative infections



Symptoms manifested (multiple symptoms in 1 case are counted separately.)

Symptoms	No. of cases	Frequency	Range of measured values
Fever	17	100%	38°C - 41.8°C
Chills/shivering	15	88%	-
Hypotension	10	59%	SBP 68 - 96 mmHg
Decreased SpO_2/respiratory discomfort	9	53%	93% to unmeasurable
Tachycardia	8	47%	106/min to 197/min
Vomiting/diarrhea/fecal incontinence	7	41%	-
Delirium/consciousness disturbed	4	24%	-
Hypertension	3	18%	SBP 161-170 mmHg

Tachycardia	Gram-positive	Gram-negative
Children	-	170 - 197/min (median, 190/min)
Adults	120 - 129/min	106 - 152/min (median 140/min)

*Other symptoms: DIC, generalized edema, cardiac failure aggravated, vascular pain, malaise, precordial pressure sensations (1 event each)

Precautions for blood transfusion

- During blood transfusion, monitor the recipient's condition appropriately. Close monitoring of the recipient is essential for at least the first 5 min, followed by further observation about 15 min after starting the administration of each blood component bag.[1] If transfusion-associated sepsis or endotoxic shock is suspected because of the recipient's symptoms, such as severe fever, tachycardia, hypotension, decreased SpO_2, vomiting, and/or diarrhea, stop the transfusion immediately, and provide appropriate treatment and culture the recipient's blood. Continue to observe the recipient even after the transfusion is completed, as symptoms of bacterial infection may occur several hours after completion of the transfusion.
- Before the blood transfusion, a visual inspection (presence of aggregates/clots, discoloration, (dis)appearance of swirling, etc.) of the components should be conducted.[1] Do not use the components if you find any visible abnormalities.
  *Bacterial infections have occurred with platelet transfusion even when no abnormalities were visible in the component.
- Prepare for emergency treatment in case of adverse transfusion reactions.
- Blood transfusions have risks of complications due to alloimmunization or microbial infection, etc. Therefore, it should be performed only when there is no alternative treatment, and when the effectiveness of blood transfusion is considered to overweigh its risk.[1]
- When a blood transfusion is performed, its necessity and the risks of infection/adverse transfusion reactions, etc. must be explained in easy to understand manner to the recipient or his/her family member in writing, and written informed consent must be obtained from them.[1]

Bacterial species detected (Jan. 2007 to Oct. 2018)

The causative bacteria in 17 cases identified as TTBIs are summarized in the following table.

Gram-positive/negative	No. of cases (deaths)	Bacteria detected from platelet components
Gram-positive	11 (0)	*Staphylococcus aureus* (3 cases) *Streptococcus dysgalactiae* subsp. *equismilis* (Group G Streptococcus) (5 cases) *Streptococcus agalactiae* (Group B Streptococcus) *Streptococcus pyogenes* (Group A Streptococcus) *Lactococcus garvieae*
Gram-negative	6 (1)	*Serratia marcescens* *Escherichia coli* (3 cases) *Klebsiella pneumoniae* *Citrobacter koseri*

*The severity of symptoms at onset (assessed by the attending physician) was reported as severe in all cases, regardless of whether the causative bacteria were Gram-positive or Gram-negative.

To Health Care Professionals at medical institutions

- If you find that the symptoms of an adverse reaction are relieved by treatment after discontinuing the transfusion, and are considering resumption, the decision should be made after carefully taking into consideration the recipient's condition, the possibility of adverse reactions such as anaphylaxis, the necessity of transfusion, etc.
- When TTBI is suspected, keep the residual blood bag properly* and contact the medical representatives of your local JRC blood center. Bacterial culture of residual bag should be conducted at the medical institute when aseptic specimen collection is available.
- In case of suspicious TTBI, please provide the residual bag to your local JRC blood center for investigation of cause.[2]

*** Storing residual blood component bags**

Tighten clamp of the transfusion set and return it to the transfusion department. Then, seal the top and bottom of the drip tube with a tube sealer (if you don't have a tube sealer, ligate properly with forceps, etc.), and put the bag in a plastic bag, and store it clean in a refrigerator (not in a freezer).

Reference: 1) Partial revision of "Guidelines for blood transfusion procedures" and "Guidelines for use of blood products." (PFSB Notification No. 1112-12, dated November 12, 2014).
2) Partial revision of "Guidelines for lookback studies of blood products" (Notification No. 0322-3, issued on March 22, 2018 by the Director of the Pharmaceutical Safety and Environmental Health Bureau, Ministry of Health, Labour, and Welfare)

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* For more information, please contact the medical representatives of your local JRC blood center.

For blood products and transfusion information
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