In Canada and other countries, many steps are taken to minimize the risk of infection through transfusion of blood or blood products (1). However, the infection risk can never be zero because these are biological products taken from living donors who are never ‘germ free’ (2). This is in contrast to other drugs that can be manufactured de novo under sterile conditions in a laboratory. The present note provides information on transfusion infection risks in Canada, which may be helpful to practitioners in their discussions with patients and parents when obtaining informed consent before blood or blood product administration.

While any infectious agent that has a blood phase has the potential to be transmitted by transfusion of blood or blood products, the probability of infection in the recipient depends on a number of factors including (3):

- the prevalence of the agent in the blood of the donor population;
- the tolerance of the agent to the blood handling, storage and manufacturing procedures;
- the infectivity and pathogenicity of the agent;
- the recipient’s health status; and
- the effectiveness of donor screening or donor testing for the agent.

The recent recognition of the possible transmission of West Nile virus after receipt of blood in the United States (4) and of transfusion-related babesiosis in Canada (5) illustrates the importance of vigilance and questioning about transfusions when a blood infection occurs with an unexpected or ‘new’ agent.

In Canada, the infectious disease risks of transfusion are minimized through multiple steps, including blood collection from volunteer unpaid donors, donor interview and selection procedures, donor screening by serological and other tests (Table 1), and viral inactivation procedures included in the manufacturing of plasma-derived products (6). For example, solvent and detergent procedures dissolve the lipid envelope of the human immunodeficiency virus, hepatitis B virus and hepatitis C virus, but are not effective against nonlipid enveloped viruses such as hepatitis A virus or parvovirus B19. A variety of other viral removal and viral inactivation steps are also used in the manufacturing process. The leucocyte reduction technique that is used by Canadian Blood Services and Héma-Québec to ensure the safety of the blood supply also reduces infection transmission risk, particularly for cytomegalovirus (7).

Unfortunately, the solvent and detergent procedures noted above cannot be used on red blood cells or platelets because neither can withstand these vigorous viral inactivation processes. Pathogen reduction techniques suitable for these labile blood components are in development and, in some cases, are now in clinical trials.

Almost all reported acute infectious complications during blood product transfusion are associated with bacterial pathogens (8) (Table 2). While the use of closed multicom-

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Table 1

<table>
<thead>
<tr>
<th>Testing of blood donors in Canada* by Canadian Blood Services and Héma-Québec</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIV-type 1/2/0† group</td>
</tr>
<tr>
<td>HBV</td>
</tr>
<tr>
<td>HTLV type I/II</td>
</tr>
<tr>
<td>Syphilis</td>
</tr>
<tr>
<td>HCV</td>
</tr>
<tr>
<td>Other§</td>
</tr>
</tbody>
</table>

*Personal communications considered. Dr Gilles Delage, Héma-Québec; Dr Heather Hume, Canadian Blood Services; †The human immunodeficiency virus (HIV) antibody (Ab) test is not licensed to detect HIV group O, which is why donors are asked questions related to travel to the parts of the world where HIV-D infection is prevalent; ‡Antibody to hepatitis B core antigen (Anti-HBc) testing is being considered; §Héma-Québec is developing bacterial culture testing for thrombopheresis platelets. CMV Cytomegalovirus; Hbs Ag Hepatitis B surface antigen; HBV Hepatitis B virus; HCV Hepatitis C virus; HTLV Human T-lymphotropic viruses; NAT Nucleic acid testing
ponent plastic blood pack collection systems has helped to decrease the problem, contamination of platelet concentrates is still a concern (9). The risk of bacterial contamination of frozen components such as fresh frozen plasma and cryoprecipitates is now very low due to the killing of the usual microbes by freezing and other storage conditions. Where plasma has been found to be the source of infection, this has been due in the past to contamination of the water bath used to thaw the product (10). Newer microwave techniques, using microwaves specifically designed for this purpose, minimize this risk.

The estimated per unit risk of contamination in Canada for a number of viral, bacterial, parasitic, prion and tick borne agents are presented in Table 3. Where Canadian data are not available, data from the United States and other countries are included (3). As the data in Table 3 show, the risks of transmission of infectious agents by blood in Canada is indeed extremely low. For context, a one in 3,000,000 risk is similar to the risk of being hit by lightning.

Even though the risk of transmission is extremely low, the possibility of new unrecognized agents remains. Experience from hepatitis C and human immunodeficiency virus traceback and look-back programs, where authorities have tried to trace transfusion recipients, have shown that many patients are unaware that they actually received a transfusion. Because no national electronic record of transfusion yet exists, to facilitate any potential future tracing programs for a new transmittable agent, it is important to make sure that transfused patients are aware of the receipt of blood and blood products, and that the discharge note adequately documents the nature of the transfusions that took place and the label code numbers for the specific products.

### REFERENCES


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The recommendations in this note do not indicate an exclusive course of treatment or procedure to be followed. Variations, taking into account individual circumstances, may be appropriate. This article also appears in Paediatr Child Health 2003;8(3):135-137.
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