



Blood supply protection: how much is enough?

Introduction

The delivery and maintenance of a safe blood supply are imperative for Australia's security and medical advancement. Practices such as the use of voluntary non-remunerated donors (1927), and early coordination to identify optimal testing regimes, e.g. for Hepatitis B virus (HBV) 1975, Human Immunodeficiency virus (HIV) 1985 and Hepatitis C virus (HCV) 1990, have ensured the Australian public are at minimal risk of exposure to unsafe blood.

However, the AIDS epidemic did reveal significant flaws and weaknesses in our delivery of a safe blood supply, unfortunately with some devastating ramifications. Since that time, public tolerance of adverse events following receipt of infectious donations is very low. Does Australia now have a safe blood supply, and is safety assured against future potential catastrophes?

Threats to the blood supply

To answer these questions, we need to know what does threaten our blood supply. It is broadly accepted that the major threat is that posed by blood-borne infectious diseases, both present and emerging.

Posing the highest risk to the safety of blood and tissues are the unknown agents, as was experienced with the emergence of HIV and Severe Acute Respiratory Syndrome (SARS)¹. However, the following threats are those that are known, and these provide a constant challenge to the management of blood. Some of these will be discussed in more detail by Dr Young in his articles accompanying this paper.

Bacterial contamination, usually obtained from the skin surface, is a major issue with platelet transfusions. This is a result of the requirement to store platelets at room temperature. The implementation of improved clinical practice standards, as well as faster diagnostic methods, are

Robyn Wood

Manager, IVD Assessment
Medical Device Assessment Section
Office of Devices, Blood and Tissues
Therapeutic Goods Administration
PO Box 100, Woden ACT 2606
Tel: (02) 6232 8281
Fax: (02) 6232 8785
E-mail: robyn.wood@health.gov.au

Richard Pembrey

Chief Clinical Advisor
Blood and Tissues Unit
Office of Devices, Blood and Tissues
Therapeutic Goods Administration
PO Box 100, Woden ACT 2606
Tel: (02) 6232 8685
Fax: (02) 6232 8531
E-mail: richard.pembrey@health.gov.au

alleviating the impact of this contamination.

Mosquito-borne infections have had a major impact in the USA with the transmission of West Nile Virus via blood transfusion. Australian blood providers have to respond to the regular importation of Dengue virus into North Queensland. This is achieved by restricting use of fresh blood components, excluding those collected from Dengue affected areas, thereby avoiding the risk of transmission by this vehicle. An outbreak of malaria in 2003 highlighted the vulnerability of our border defence in the area of vector control. With global warming, this issue will probably increase in significance, and the response will need to adjust with the changing environmental issues.

Variant Creutzfeldt-Jacob disease (vCJD) poses grave issues in the management of transmissible diseases via the blood supply. Diagnosis is not yet possible by laboratory analysis on blood, and more stringent donor deferral can result in significant losses to the donor bank.

Agents of biological and chemical warfare also are identified as real threats to which we need a response. Donors may become

infected and, if undiagnosed or not detected in donors, the agent may contaminate blood products.

This is not intended to be an exclusive list of infections encountered in transfusion medicine, but to highlight those of prime concern. The impact of adverse events following a transfusion acquired infection such as those described above is not only on the individual/s affected, but, indirectly, can leave blood providers vulnerable, potentially facing crippling litigation and compensation. This later position is in itself a major threat to the blood supply.

So what has Australia done to secure its position against these threats?

Protecting the blood supply

Since the HIV epidemic began, the focus of attention and efforts has been on understanding, detecting, preventing and treating these infectious diseases that pose such large risks to the blood supply. Resources have been directed with governmental oversight to ensure that all Australians have access to safe blood.

The strategy broadly adopted in Australia to combat this threat has been based on minimising exposure of the blood supply to infectious diseases. The implementation of this strategy requires strong political and professional leadership, and is heavily reliant upon the collaboration of multiple stakeholders from all jurisdictions.

In 1989 the National Serology Reference Laboratory (NRL) was formed using State and Federal funding. Its mandate was to protect the nation's blood supply through rapid introduction of a suitable donor screening test for HIV. The federal government regulator, the Therapeutic Goods Administration (TGA) was given statutory power to regulate the quality, safety and performance of assays for HIV and, later, HCV tests. The combined roles



of the TGA and the NRL have provided a means whereby the tests used by Australian blood transfusion services for HIV and HCV are among the most sensitive and specific available. These actions have significantly contributed to the protection of the individual recipient from infectious donations and have resulted in minimal wastage due to false results.

The formation of the nationally managed Australian Red Cross Blood Service (ARCBS) united the eight semi-autonomous blood services². This has resulted in consistent policies for best practice with blood and blood products across the State and Territory jurisdictions. Consequently, equity in service and consistent standards of blood safety based on international best practice are provided to all Australians.

It was a national ARCBS decision that led to the screening of the blood supply for HIV and HCV using nucleic acid-amplification testing (NAT). The impact of this decision on risk is well demonstrated by the following example. It is estimated that, in the USA, the incidence of acquiring a HIV or HCV infected donation if screening serologically was 1 in 1.5 million and 1 in 276,000 respectively. Since the introduction of NAT screening, which has reduced the 'window period' between detecting infection and serological conversion, the risk of both is approximately 1 in 2 million blood units. In the USA this represents the prevention in transmission of approximately five HIV infections and 56 HCV infections per annum, but it is important to note that this has come at a cost of approximately US\$2 million per infection prevented^{1,3}.

In 2001 Sir Ninian Stephens led the *Review of the Australian Blood Banking and Plasma Product Sector*. A government initiative arising from this was the formation of the National Blood Authority (NBA) in 2003 to undertake national supply planning and management, and to develop and implement contingency planning to manage supply risks. The NBA also will play a role in strengthening quality assurance and is exploring proposals for the development of a haemovigilance programme. The goal of this programme

is to provide evidence collected from adverse events due to receipt of blood and blood products. This information will then be used in formulating safer and more effective blood transfusion practices.

Monitoring of adverse test related events is the responsibility of the TGA. Participation in national Quality Assurance and Quality Control programmes provides data on the performance of the assays used by the various laboratories of the ARCBS. Lot to lot assay performance is monitored in real time using EDCNet, the QC monitoring programme developed by the NRL. Consequent to this, poor lot or kit performance is rapidly identified and remedial action implemented.

State, Territory and Federal agencies, and interested parties, have been instrumental in the development of national strategies for reducing the number of infected people in the community with HIV and HCV. A strong focus of these strategies is the supply of safe blood.

In response to community concerns regarding the quality and safety of the blood supply, the Australian Health Ministers Council (AHMC) has recommended the extension of the regulatory framework of the TGA. The role of the TGA in providing improved outcomes for a safe blood supply is by regulatory oversight of the provision of safe therapeutic products (biological therapies and pharmaceuticals), and testing of patients. The extended framework will now encompass tissue and biological therapy products (blood is considered a biological therapy) and all in vitro diagnostic devices, including those used in screening for other infectious agents in the blood supply. An underlying principle for this extended framework is that the level of regulatory oversight for a product be commensurate with the level of risk to the individual and the community.

Conclusion

In Australia, blood is safer than ever before. The impact of AIDS on the blood supply has resulted in a paradigm shift within the field of transfusion medicine. No longer does transfusion medicine remain within the confines of the laboratory, but the

practice has evolved into a "clinically-oriented discipline emphasising patient care"². We have been forced to review our processes and develop strategies that promise public protection of the supply to both real and potential threats.

Technological advances have delivered significant increments in levels of safety, as was experienced with the implementation of NAT. It is hoped that future impacts on testing formats will result in cost reduction as well as better analytical performance (microarrays etc). Safe and effective pathogen reduction methods for fresh blood components are currently under clinical and TGA review⁴. Improvements in this area hold much promise⁴. The strategy of minimisation of exposure has benefited not only from better laboratory techniques, but also from clinical practices that discourage the unnecessary transfusion of blood⁵.

In the future, it will be the continual improvements in all aspects of blood delivery that will combine to have the largest impact on blood safety. This requires an ongoing emphasis on coordination and collaboration of all organisations (public and private) and jurisdictions involved in the supply of safe blood. Further public discussion should be encouraged to ascertain perceptions and to provide education regarding benefits, risks and costs.

Is the blood supply protected sufficiently? The Australian public will decide. Let us hope that we have learnt wisely from the lessons of the past and that our capacity to keep our blood supply safe is proven capable in the event of any future threat.

References

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