



Interview with Prof. Roger Y. Dodd and Prof. Susan L. Stramer: pathogen inactivation, a technology that will help reduce the emerging infections

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Experts' introduction

Roger Y. Dodd, PhD, obtained his BSc in biochemistry at the University of Sheffield in 1964 and PhD in Microbiology at the George Washington University in 1978. He has worked for the American Red Cross for 44 years, with research interest focused in transfusion-transmitted infections. In 2014, he retired from his position as Vice President, Research and Development, and Director of the Holland Laboratory. He is an adjunct associate professor of pathology at Johns Hopkins University. He has more than 200 publications and has edited three books on transfusion transmitted infections. He has been an Advisor to WHO and he serves on the Editorial Boards of Transfusion and Transfusion Medicine and is a Past President of the AABB. He was elected to the position of Vice President on the International Society of Blood Transfusion (ISBT) Board in 2010 and is currently Secretary General. He has served as Chair of the Global Collaboration on Blood Safety. He has received the Morten Grove-Rasmussen and Emily Cooley Memorial Awards from the AABB, etc.

Susan L. Stramer, PhD, obtained her PhD in Medical Microbiology and Bacteriology at the University of Wisconsin in 1984. She is Executive Scientific Officer at American Red Cross, and serves in many international academic societies, including the Chair of the AABB Transfusion-Transmitted Diseases Committee, Member of the ISBT Working Party for Transfusion-Transmitted Infectious Diseases, Member of the Hema-Quebec Safety Advisory Committee, etc. She has received numerous awards including NIH Richard J. Davey Award and Lectureship, American Red Cross President's Award for Employee Excellence in Management, etc.

Editor's note

Organized with the Chinese Society of Blood Transfusion

and co-organized by Guangzhou Blood Center, the 28th Regional Congress of the ISBT was successfully held in Guangzhou from November 25th to 28th, 2017. This 4-day meeting attracted experts from different countries and regions in the field of blood transfusion. Breakthroughs were shared and difficulties were discussed. Communication and brainstorm made this meeting a feast for all participants.

In the meeting, Prof. Roger Y. Dodd and Prof. Susan L. Stramer from the American Red Cross gave excellent presentations on the topics "Pathogen Reduction Technology" (*Figure 1*), and "Re-emerging Infections: Chikungunya and Dengue" (*Figure 2*), respectively. After their presentations, we were honored to conduct an interview with them (*Figure 3*).

Interview questions & responses

AME: You are both distinguished invited speakers for this conference. Would you like to summarize some main points of your presentations?

Prof. Stramer: I'm going to talk about vector-borne emerging infectious diseases, so most of my talk will cover mosquito-borne viruses (that is, arboviruses), including dengue virus, which is common through most of the world; chikungunya that has been responsible for explosive outbreaks, especially those starting after 2013; Zika virus which again started to explode in the Pacific area with the first outbreak and then moved to the Americas. For this section, I'll discuss the possibility of doing tests for these viruses, and the ability of pathogen inactivation systems to reduce or eliminate the risk of their transmission by blood transfusion. Currently, we have approved technology for the reduction of mosquito-borne viruses in plasma and platelets. I will then touch on one parasite that is similar to malaria, causing a disease called babesiosis. Different from mosquito-borne viruses, it spreads by a tick, but the



Figure 1 Snapshot of Prof. Dodd during his presentation.



Figure 2 Snapshot of Prof. Stramer during her presentation.



Figure 3 Meeting with Prof. Dodd and Prof. Stramer.

symptoms, presentation and diagnostics are very similar to malaria. For this part, I'll talk about the type of testing that we do for *Babesia*, the causative agent, and its susceptibility to pathogen inactivation.

In summary, we have many new emerging infections, so we always have to be watchful. We can introduce tests and pathogen inactivation for the safety of the blood supply, but technology is allowing us to actually identify agents at

a very rapid pace. We need to be mindful about what to do once those agents are identified.

Prof. Dodd: Susan and I work closely together and our talks are really going to interlock quite well in this particular session. I'm also going to spend a little time making the point that the blood supply is really very safe, but at the same time there continues to be a strong expectation from patients, the general public and governments that blood should be as safe as possible.

Then I'll try to explain some of the reasons why we have some remaining risks from the blood supply. I'll focus on issues including the early phase of donor infection before any test becomes positive. Additionally, I will focus on the risk of contamination from bacteria in platelet components, which is still a major problem in transfusion. The methods available to us to deal with these problems are essentially incomplete at the moment, so I will make the case that pathogen inactivation will be very helpful in many of these situations. Other safety measures are becoming harder and harder to manage in the face of the emergence of the types of diseases that Susan has just described. It's just really not possible to develop a new test every time we get an outbreak of a different virus. At the end, I'll talk a little about the technology of pathogen inactivation: where it's being used; what the methods are; and what is involved in the function of the current methods. Importantly, I will really try to indicate that this may be something that's going to need to be considered throughout the world.

AME: *Speaking of pathogen inactivation, how do you see its challenges and future development?*

Prof. Dodd: It's a very promising concept. In the past, it was realized that it was relatively easy to assure the safety of pooled plasma products, such as antihemophilic factor (AHF), using relatively simple methods. These methods could essentially eliminate the risk of infection from hepatitis viruses and HIV. This success was seen as a model for blood for transfusion. However, the difficulty is when you start looking at blood and blood components, it's very hard to inactivate one biological entity, such as a virus or bacterium, and retain the proper properties of the blood cells at the same time. Therefore, a great deal of work has gone into developing inactivation approaches that can achieve this goal.

To sum up, the major focus has been trying to look for methods that will damage the nucleic acid of the pathogen, without damaging the other necessary properties of red

cells and platelets. At the moment, this has been achieved successfully for plasma and for platelets, but there are still some issues and difficulties in dealing with red cells. Yet, there is rapid progress along this path.

Prof. Stramer: As Roger just said, the major challenge is the balance between inactivating the pathogen and preserving the biological activity of the blood components, in both red cells and platelets.

Let me comment on two difficulties that we have been facing. One is the cost of the technology. Because the development period has covered many years, the expenses are high. However, a robust pathogen inactivation technology will avoid the need for the introduction of many new tests and may also allow us to replace or eliminate some of the old tests that we do. The other challenge is that many blood centers will say is that they don't want to adopt the technology until they can use it for all blood components. If all components cannot be treated by inactivation, then testing would have to be retained. It would not be possible to achieve cost neutrality while doing tests and adding pathogen inactivation. Even so, tremendous progress has been made. There is licensed technology that blood centers can use in many parts of the world, including the United States and Europe. And I think it's very promising because we certainly have to do something to combat the number of infections that threaten blood safety. In fact, in the case of bacterial contamination of platelets, there is no intervention as successful at least as the one licensed technology that we have. It eliminates nearly all bacteria, so that's really good. But it is important that other technologies need to come forward and are licensed. In the future, we will have not just one technology, but multiple approaches.

Prof. Dodd: I agree, but I think at least for platelets, some countries like Switzerland, France and Belgium have adopted this technology for all their platelets throughout the country and others are beginning to follow the same direction. I think it's quite close. I was just, looking at the map from one of the providers and it shows that this technology is even available in Mongolia, right next door. I was a little surprised, but very much gratified to see that.

AME: *Comparing Chinese and American blood centers, what do you think are their characteristics and advantages respectively?*

Prof. Dodd: I've been visiting China for quite a few years now and I've seen a lot of changes, particularly your major

blood centers. I believe technically and operationally, there aren't a lot of differences between the function of a blood center here in China and in the United States. I think one of the biggest differences between our two countries is the philosophy under which blood systems are managed. In China, blood systems are developed and funded at the provincial level and are required to follow national law and guidelines.

In contrast, blood centers in the United States, while also standardized and strictly regulated, are managed as essentially private institutions with a certain amount of competition going on between them. They depend financially on payments from hospitals. In my opinion, this kind of system is in danger because it's very hard to manage the economic situation; indeed, there have been papers in the *New England Journal* recently about the fragility of the American blood supply. To summarize, I think that technically, our blood systems are essentially comparable, but operationally, there are differences and I think maybe they favor your side of the Pacific.

Prof. Stramer: I think all of the blood centers worldwide are interested in providing safe blood products to their patients and making sure that our life-saving missions exist without threat. But I think the major threat which Roger just highlighted, the amount of competition that we have in the United States, is not sustainable in long-term because we do run on a very competitive basis. It's not managed centrally by the government; the competitive basis can lead to problems.

AME: *What would you choose as your career besides the field of medicine?*

Prof. Stramer: I probably would have gone into music if I didn't choose medicine. And I'd have played piano or do something else that involves music.

Prof. Dodd: I would definitely stay in science. It would be very difficult for me to have a very different kind of career. Though I was interested in biochemistry in the first place, chances led me in other directions. I ended up working with microbiology. However, my interest in the process of science, the outcomes of science, and the way science makes you think never stops.

AME: *Thank you very much for your time!*

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