Transcript
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Adam Holyoak: The project we're looking at, we aim to study brown snake venom particularly. Brown snakes are the commonest cause of snake bite, particularly when you are looking at deaths from snake bite in Australia they're all attribute to brown snakes these days.

When we talking about numbers, we're talking about a handful of deaths a year, literally one or two, but still it's a very prevent form of death. And certainly a brown snake bite, at least in the Southern states, is the most common form of envenomation that we see.

Snake venom, like all venoms, is a toxic soup that people are only really starting to scratch the surface to understand. One of the human effects of brown snake venom is bleeding and there is a relatively new technology: it's certainly emerging and becoming more widely spread, at least in the major hospitals around the country and around the world. And it's called ROTEM technology. And that stands for rotational thromboelastometry. So that's a big word. It basically looks at how the blood clots in a machine in a different way to standard laboratory tests for that. Why it's unique is because it actually looks at how your blood clots in the same way it would in your body as opposed to, you know, putting in a little chemical and then seeing what the reaction is and then making an assumption on no parameters, which is what our standard laboratory tests do.

So we thought that would be quite interesting because whilst there's been reasonable body of work done on the bleeding side-effects of brown snake and other elapid envenomation, nothings really been done looking at it in a really live, *in vivo*, type of setting like the ROTEM gives us access to. There's not been any published data on using the ROTEM with snake venom on the whole and so I guess the main aim of this project is to get some of that information predominately see what happens when you've got blood that has brown snake venom added to it and how it clots and doesn't clot and the ROTEM technology, the machine, will tell us which part of the clotting system is most affected.

Now we already know the particular factors that brown snake venom acts on when you look at it in a pure laboratory and isolating parts of the clotting cascade. But what we don't know is how that works in a real sense in a real human.

Just to step sideways a little bit, one thing that we've noticed using the ROTEM in other settings, say for example trauma. In trauma, one of the biggest risks of dying is from bleeding. Out standard laboratory tests give us numbers and we used to treat people on the basis of those numbers and wondered why they still flared and had issues with bleeding. What the ROTEM's shown us is that parts that were perhaps insignificant in the cascade forming clots are actually the primary processes that we need to address.

So that's, I guess, some of the background thinking, that whilst we might know in a laboratory sense how venom might work, this will add a whole lot new data to that.

David Chen: Once you have that data, I mean how will we apply that in a real world sense?

Adam Holyoak: So that's obviously the next step and at the end of the day where we'd like to go with this, and this a long way off yet, is to be able to work out what the right dose of antivenom is to give to someone.

Now that sounds a little strange to say we don't know what that right dose is yet, but when you look at it scientifically you don't really know how effective antivenom is on the whole. And certainly, some of the laboratory data that we have so far gives us some mixed ideas as to how well antivenom actually works.

What we know about antivenom is that it is certainly a foreign protein to humans; it comes from out of horse antibodies so people can allergic reactions to it and the biggest trigger for allergic reaction is the size of the dose that you get and previous exposure to the anivenom.

So at the end of the day, we would hope that all of the research not just our research, but all research on venom and antivenom, works to optimising our dose so that we can give better patient care. And I guess, and this will become part of the first step in that process from some of the theories that we have and part of this project is looking at what the effects of antivenom might directly have to the ability of the venom to still cause clotting or lack of clotting in the blood on the ROTEM machine.

David Chen: Is there such a thing as too much antivenom or too little antivenom for medicine?

Adam Holyoak: So there definitely is too little antivenom, in that if you don't have enough it won't neutralise all of the venom that's in the system. If you think of it as like a number of balloons floating around and pins to pop those balloons if the balloons are the venom and the pins the antivenom, if you don't have enough antivenom there's still balloons floating around that can go on to cause harm – so the venom.

Is there such a thing as too much antivenom? That's a tough question. I would say there is. Certainly if you think of it as say any other medication, there is a window where the medication still works, but the more you get, the more likely you are to have side effects before you reach a threshold where it is toxic and harmful. Antivenom probably doesn't work quite in the same way in there's a defined relationship to where it becomes toxic. But certainly, as I said, in terms of severe allergic reactions, too much puts you at high risk of that certainly.

David Chen: And just finally Adam, antivenom is obviously expensive to produce and expensive to store. I mean if you get the data that you're hoping to get from this experiment, do you think that might I guess make it easier for hospitals to administrate that keeping of the antivenom and the storing of the antivenom?

Adam Holyoak: Absolutely! As you said, antivenom is expensive to produce. It is difficult to store and it has a short shelf-life, so that raises the cost to the consumers and the public. So as I said, being able to get the right dose means that people are exposed to less potentially harmful substances, we don't need to keep as many stocks, and it keeps the whole system working very well.