

FACT SHEET



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Therapeutic Antibodies from Alpaca: A New Market Opportunity

The issue

This proof of concept study has explored the use of alpaca for the production of medical grade therapeutic antibody products. Alpaca are members of the camelid family. Camelids produce a unique class of immunoglobulin molecules in their blood stream¹. These immunoglobulins can be harvested and refined for production of specialised therapeutic medical products.

The unique properties include reduced allergenic potential, greater heat stability and greater capacity for inactivating certain enzymes^{2,5}. Australia is an ideal location for sourcing alpaca blood because it is recognised as one of the lowest disease risk countries in the world for producing medical products derived from animals³. There are over 130,000 alpaca currently in Australia. This early stage research has successfully demonstrated that alpaca can be used to produce therapeutic antibodies. These findings could lead to a new high-value niche market for producing alpaca derived medical products in Australia.



What are therapeutic antibodies?

Therapeutic antibodies are molecules found in the bloodstream that can bind to, and inactivate, a wide range of chemical substances. There is a billion dollar global demand for therapeutic antibodies⁴. A diverse range of medical products with well-defined markets already exists. Amongst these include various anti-toxin serums for snakes, spiders, bacterial infections (tetanus, rabies, botulism, anthrax), emerging anti-cancer therapies, and a host of other applications⁴. Currently these products are produced primarily in horses, sheep, rabbits and a small range of other animal species. Camelid antibodies have tremendous potential to improve the quality of products available in this existing product marketplace⁵.

How are therapeutic antibodies made?

The production of antibodies requires stimulating the immune system with the product that antibodies are desired for. This process takes time for the animal's immune system to respond with high levels of a specific antibody. Blood is then collected from the animal and processed to concentrate the specific antibody fraction. The product is then tested for its potency and a range of other physiochemical parameters. Typically, these products are final-packaged in sterile glass vials for human or veterinary medical use.

Alpaca derived anti-toxin antibodies:

This proof of concept project explored the potential for alpaca to make therapeutic antibodies against a range of different snake venom toxins. Snake venoms were chosen because, for an antibody to be effective, it must neutralise the actions of the venom. This approach provides a very robust demonstration of all the steps required to produce the neutralising antibody. (continues overleaf)





Snake venom is a complex pharmacological substance with many different components. This project has also examined the antibody response of alpaca to different venom components. Alpaca respond to venom immunisation with rapid development of neutralising antibodies. Extremely low doses of venom were used, which did not harm the animals. Blood tests were performed regularly to monitor the animals' general health and these showed no abnormalities. All animal procedures were approved by the Victorian Department of Primary Industries Wildlife and Small Institutions Animal Ethics Committee (Approval numbers 16.11 and 06.16). The alpaca serum was successfully processed with modification to existing protocols used for other species. A very pure and concentrated antibody product was produced from the alpaca serum. When tested for venom neutralising capacity the experimental products were effective in neutralising venom.

Industry opportunities:

This proof-of-concept study has demonstrated that alpaca can be used successfully to make therapeutic camelid-type antibody products. For such an industry to develop in Australia, a commercial partner would be required who would develop the antibody products and support them through the relevant government testing and approvals processes. Australia has potential for such an industry given it has an abundant number of alpaca, at an affordable price with low disease risk³.



Manual restraint of alpaca



For more information

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³Anon. *Bovine Spongiform Encephalopathy Status of Members*. Office Internationale Epizootica. 2012 [cited 2012 15 Jan 2013]; Available from: <http://www.oie.int/animal-health-in-the-world/official-disease-status/bse/list-of-bse-risk-status/>.

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