

# 5

things you need  
to know about

**NANOBODIES®**

## What are nanobodies?

A Nanobody is about 1/10 the size of an antibody. Nanobodies are found in camelids (e.g. dromedaries and llamas).

# 1/10

of the size of an antibody

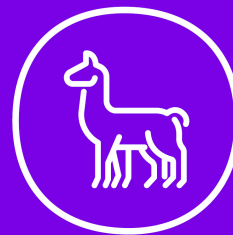
## How were nanobodies discovered?

Immunologist Raymond Hamers came across Nanobodies by chance in 1989 at the Free University of Brussels when he and his students found that the dromedary produced an entirely novel, simpler and smaller variety of antibodies. It took fresh dromedary blood, flown in from Mali, and two years for Hamers to confirm this unexpected discovery. Given that llamas can adapt better to our European climate, dromedary blood was replaced by llama blood.



## How were nanobodies produced?

Llamas are immunized with an antigen, comparable with a vaccination. Within the following six to 12 weeks, the llama produces antibodies from which Nanobodies can be made in the lab (no animals are harmed in the process).



## What impact do they have?

Nanobodies are the next generation of antibody-derived biologics and have great potential. They are being developed in various therapeutic areas, including inflammation, hematology, immuno-oncology, oncology and rare diseases.



## Why do they represent progress?

Due to their small size and unique structure, multiple Nanobodies can be combined to address several disease-causing targets in a single drug molecule. This «mix & match» approach is a unique advantage. Their robust nature and stability allow administration through multiple delivery routes, including intravenous and subcutaneous injection, as well as potentially through the ocular route and orally for local treatment in the gut. Also, Nanobodies can be easily and quickly produced.

### Sources :

<http://csmres.co.uk/cs.public.upd/article-downloads/Nanobodies-as-therapeutics-big-opportunities-for-small-antibodies.pdf>  
<https://www.ablynx.com/technology-innovation/understanding-nanobodies/>  
<https://www.scientificamerican.com/article/nanobodies/>  
<https://www.nature.com/articles/nbt1217-1115>  
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5495861/>  
<https://www.nature.com/articles/srep0660#f1>  
[https://www.cell.com/cell-chemical-biology/pdf/S1074-5521\(06\)00433-9.pdf](https://www.cell.com/cell-chemical-biology/pdf/S1074-5521(06)00433-9.pdf)

**sanofi**