Nanobodies

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In News: Nanobodies are a potential therapeutic strategy for treating COVID-19. While many previous studies report nanobodies active against SARS-CoV-2 in vitro, none have been evaluated via animal models' intranasal administration.

About the Research

- At least one of these nanobodies could prevent infections and detect virus particles by grabbing hold of SARS-CoV-2 spike proteins, the researchers suggest in the journal Scientific Reports.
- This nanobody, called NIH-CoVnb-112, appeared to work equally well in either liquid or aerosol form, which suggests it could remain effective after inhalation.
- A nanobody is a special type of antibody naturally produced by the immune systems of camelids, a group of animals that includes camels, llamas, and alpacas. They are called nanobodies because they are tiny, about a tenth the weight of most human antibodies.
- Because nanobodies are more stable, less expensive to produce, and easier to engineer than typical antibodies, researchers have been using them for medical research.
- Since the pandemic broke, several researchers have produced llama nanobodies against the SARS-CoV-2 spike protein that may be effective at preventing infections.
- In the current study, the researchers used a slightly different strategy than others to find nanobodies that may work especially well, NIH said in a statement.
- The spike protein acts like a key during coronavirus infection. It "unlocks" the door to infections when it binds to a human protein called ACE2 receptor on the cell surface.
- The NIH scientists developed a method that would isolate nanobodies that block infections by covering part of the

spike protein that bind to and unlock the ACE2 receptor.

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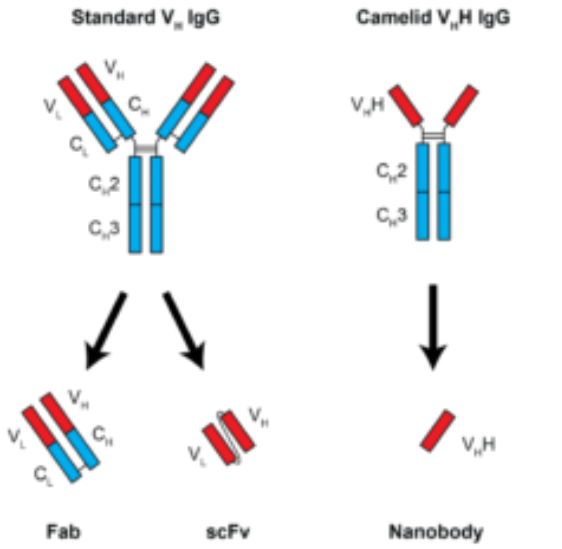
- Nanobodies are a unique kind of monoclonal antibody derived from a camelid IgG variant, consisting of a single heavy-chain variable domain that can bind its antigen as strongly as a standard antibody.
- As nanobodies lack a light chain, they are both significantly smaller than standard antibodies, and have unique flexibility at their antigen-binding interface.
- This combination allows nanobodies to bind in different modes than typical antibodies, covering more chemical space and allowing binding to epitopes otherwise inaccessible to antibodies.
- Nanobodies are also significantly smaller (~15 kDa) and more stable than standard antibodies, and can be easily genetically engineered for additional functionality.



IgG variants and their derivatives. Standard IgG structures contain both heavy and light chains. Variable regions from both chains must be combined for use as an Fab fragment or for recombinant expression as a linked scFv. The camelid V_HH IgG variant has only heavy chains. The single variable region can be cloned and expressed independently as a nanobody.