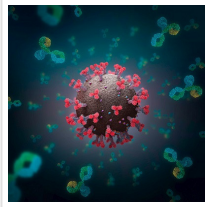

Recapping 2020's Top Nanotechnologies for Life: Nanobodies: Unharnessed Potential in COVID-19 Treatment



2021-02-03

Clarifying the new methods of the present COVID-19 pandemic countering pathways, a new procedure of utilizing nano-bodies (Nbs) as engineered efficient antibody-based proteins for virus diagnosis and treatment is being discussed in detail.

The new-age fatal pandemic of Coronavirus also known as COVID-19 indicates scientifically challenging and health serious threatening to death or organ dysfunction in high-risk cases. This type of COVID virus has accelerated and focused scientific and therapeutic society attempts in accordance with its remedy toughening features.

In fact, economic problems and other social issues resulted from efficient drug-free methods reducing viral engagement such as case isolation, contact minimization, and social distance in an individual and global situation (mostly known as non-pharmaceutical interventions) is not a suitable long-term solution for COVID virus high elimination. Therefore, pharmaceutical approaches appear to be essential steps in facing related challenges of current viral infection.

On the other hand, mentioned nano-bodies (NBs) which are suggested by this report as the performing solution (related article can be found in Biomolecular Structure and Dynamics journal), have been under attention for many years. To present examples, caplacizumab drug advantaging bivalent approved Nb, used for thrombotic thrombocytopenic purpura or vobarilizumab, an IL-6R Nb, which is being studied for its use in rheumatoid arthritis can be discussed.

However, due to the more accuracy requirement for NBs as antiviral feature possessing antibody with high-reliability factor, there had been a delay in its serious functional presence in therapeutic performances. To point the Nbs affection mechanism and creation in details, it should be explained that nano-body or heavy chain variable domains (VHHs) are the new coming type of proteins which are formed based on antibody heavy-chain part (an antibody is

a Y-shape protein with four parts as two heavy and two light chains which are antigen-binding (Fab) agents for antigen connection and crystallizable (Fc) agents for cell receptor attachment ability, respectively) of camelids antibodies.

These heavy-chain parts inside Nbs, prepare antigen connecting domains with the size of around 15kDa and 110 length residue which provides high coherency while attaching. Elucidating nano-bodies development, camelids blood containing immunized antigen of SARS-CoV-2 get collected; in the second step, PBMCs (peripheral blood mononuclear cells) of the blood will be extracted which are selective responders to the immune system.

In the following RNA will be gathered with RT-PCR assistance to boost VHH amount and VHH DNA transfers to a phagemid vector A and alters into E. coli. VHH phage display will be carried out to isolate SARS-CoV-2 antigen-specific clones. After rounds of panning on the antigen of interest, the SARS-CoV-2 antigen-specific VHH coding sequence can be selected.

The identified VHH coding gene is inserted into a yeast expression vector to produce a soluble VHH. Going into other specifics, antiviral properties of these compounds have been explicated recently and additionally, new receptor-binding domain(RBD) of the coronavirus spike protein is found out to be capable of counteracting SARS coronavirus, MERS coronavirus, and also able to interact with RBD of SARS-CoV-2 which open up ways for succession in the current project.

The other notable aspects of nano-bodies can be counted as inflammatory reported properties which reduce the probability of cytokine storm happening in COVID-19 engaged cases, the ability to be nebulized by the respiratory system which grantees these particles great affection and also easy processing of viral confrontation property caused by their simple FC combination to various groups of the human antibody.

It should be mentioned that in accordance with these particles' minimal size, stability, high solubility, high tissue diffusion as a result of their low molecular weight and cost-efficient processing method based on yeast material, Nbs are focused to be suitable therapeutic proteins. Relevant challenges of utilizing nano-bodies have been reported to be low intestine absorption and moreover, low specificity and sensitivity in diagnostic applications consisting of serological diagnosis, targeting the IgM and IgG antibodies against the virus.

The mentioned issue can be modified through using rapid antigen kits (for instance developed kits of ELASA). Nowadays, Recent advances indicate new recombinant nanobodies of Peruvian llama leading to SARS-CoV-2 treatment.

Again, we elucidated another important nanotechnology event of 2020. Now, it's your turn to make the choice about the most important event among the other 10 reported ones by the survey in the link:

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