Fighting COVID-19 with milk?

A new study in the Journal of Dairy Science® *tests the properties of cow milk protein against SARS-CoV-2 variants*

Philadelphia, February 28, 2022 – As the COVID-19 pandemic continues to claim lives around the world, dairy scientists may have a surprising role to play. In a new report published in the *Journal of Dairy Science®*, scientists from the University of Michigan (Ann Arbor, MI, USA) and Glanbia PLC Research and Development (Twin Falls, ID, USA) have collaborated to investigate the antiviral properties of cow milk protein against variants of SARS-CoV-2, the virus behind the illness.

The protein in question is lactoferrin, found in the milk of most mammals. Bovine lactoferrin, from cow milk, has bioactive characteristics against many microbes, viruses, and other pathogens and has been found to inhibit SARS-CoV-2 infection under experimental conditions by blocking the ability of the virus to enter target cells, as well as by supporting cells' antiviral defense mechanisms.

"Bovine lactoferrin has shown antiviral activity in human clinical trials," says lead investigator Jonathan Sexton, PhD, of the University of Michigan Department of Internal Medicine. "For example, orally administered bovine lactoferrin has been shown to improve the severity of viral infections, including rotavirus and norovirus. Given the broad antiviral efficacy and safety, minimal side effects, and commercial availability of bovine lactoferrin, several review papers have suggested using it as a preventive or post-exposure treatment for SARS-CoV-2 infection."

With the goal of improving clinical relevance and translatability, the team tested bovine lactoferrin against some of the most common SARS-CoV-2 variants of concern from around the world, including the WA1

variant representative of the United States outbreak in 2020, the B.1.1.7, B.1.351, and P.1 variants, and the Delta variant. Sexton explains, "Each of these variants includes modifications to the SARS-Cov-2 spike protein that reduce the efficacy of newly produced vaccines. Furthermore, each of these strains shows reduced neutralization by vaccination sera."
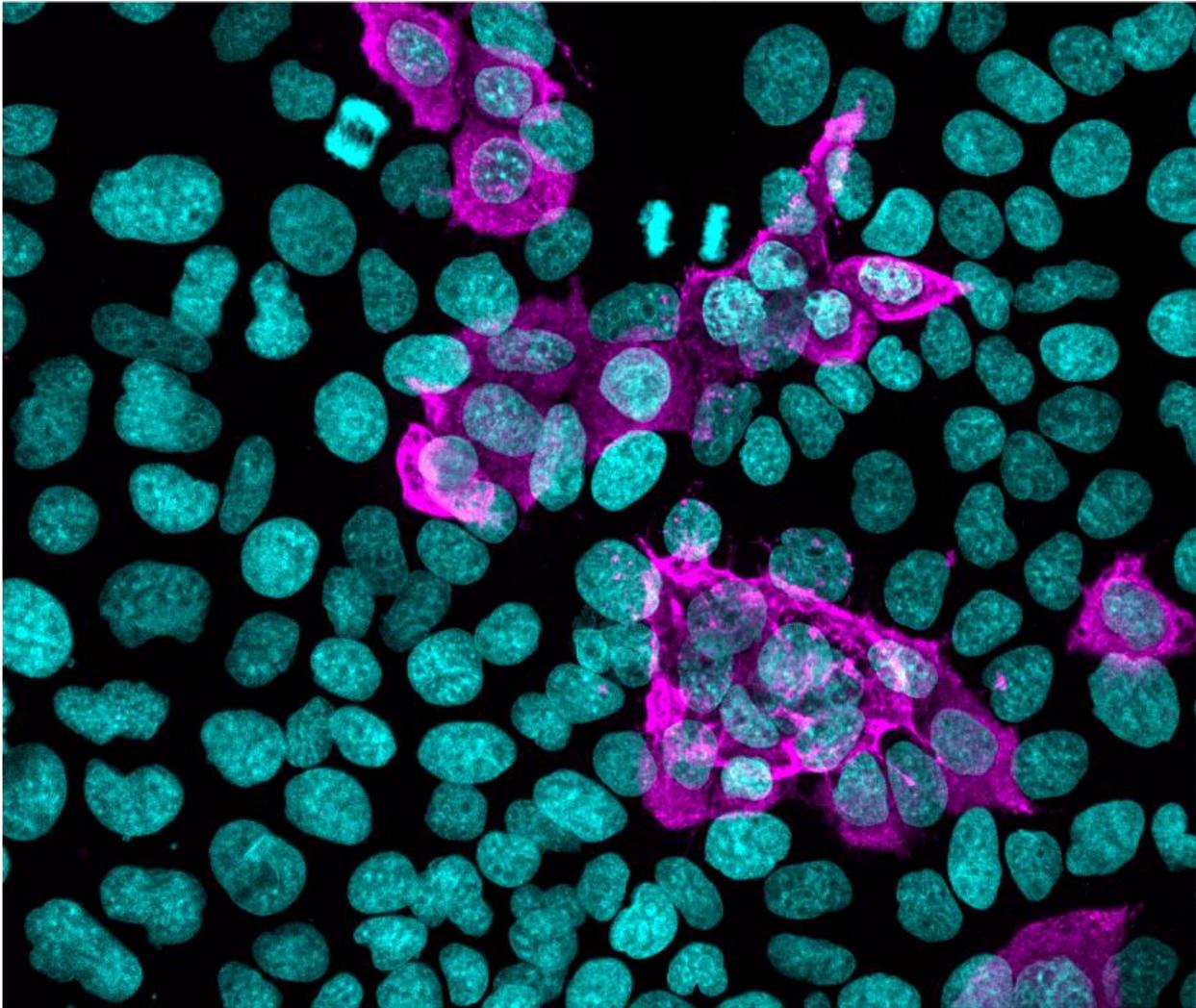
Caption: Infected cells shown in magenta (Credit: Jonathan Z. Sexton).

The team's aims for this study were to expand upon the observation of the potent in vitro anti-SARS-CoV-2 efficacy that bovine lactoferrin has demonstrated with a more thorough examination, as well as to screen commercially available milk products for antiviral activities, which may be enhanced by the presence of other ingredients in addition to lactoferrin. Finally, they investigated whether dextrose and sorbitol, commonly used in the manufacture of tablets for oral medications, would interfere with the ability of bovine lactoferrin to inhibit SARS-CoV-2.

The researchers found that bovine lactoferrin was effective against all the strains that were tested in vitro, and they expect it would also have activity against additional emergent strains. The other components in commercial milk products did not appear to offer antiviral protection, confirming that that the efficacy of these products does appear to be entirely dependent on bovine lactoferrin. Moreover, the team found that

dextrose and sorbitol did not reduce bovine lactoferrin's effectiveness against SARS-CoV-2 – suggesting the feasibility of developing an anti-COVID pill.

A key benefit of the broad antiviral efficacy of lactoferrin is its potential for the prevention or treatment of emerging diseases. Sexton emphasizes, "This is especially important when there are limited treatment options, or when the treatment options are too costly for widespread use. An orally available therapeutic that covers emerging strains would be ideal for treating SARS-CoV-2 in areas without widespread vaccination or if new strains escape the vaccine."

Although future work is needed to fully understand the antiviral potential for bovine lactoferrin in a clinical setting, this in vitro study represents promise for another tactic in the fight against the global COVID-19 pandemic.

Notes for editors
The article is "Evaluating the in vitro efficacy of bovine lactoferrin products against SARS-CoV-2 variants of concern," by Jesse W. Wotring, Reid Fursmidt, Loren Ward, and Jonathan Z. Sexton (https://doi.org/10.3168/jds.2021-21247). It appears online ahead of the *Journal of Dairy Science*, volume 105, issue 4 (April 2022), published by Fass Inc. and Elsevier.

The article is openly available at https://www.journalofdairyscience.org/article/S0022-0302(22)00115-1/fulltext.

Full text of the article is also available to credentialed journalists upon request. Contact Eileen Leahy at +1 732 238 3628 or jdsmedia@elsevier.com to obtain copies. Journalists wishing to interview the authors should contact the corresponding author, Jonathan Z. Sexton, Department of Internal Medicine, University of Michigan, Ann Arbor, MI, USA, at jzsexton@med.umich.edu.

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