Marinomed and Friedrich-Alexander-Universität Erlangen-Nürnberg publish new data on antiviral efficacy of iota-carrageenan against SARS-CoV-2 variants of concern

- Joint publication of virologists from the Friedrich-Alexander-Universität Erlangen-Nürnberg and Marinomed scientists demonstrates efficacy of iota-carrageenan (Carragelose) against the original SARS-CoV-2 strain as well as Alpha, Beta, Gamma and Delta variants
- Data shows that iota-carrageenan might be an effective virus blocker irrespective of present and possible future SARS-CoV-2 mutations
- Previous clinical studies have shown that iota-carrageenan-based nasal sprays can reduce COVID-19 cases by 80 % as well as prevent infections or reduce symptoms caused by multiple respiratory viruses
- Iota-carrageenan's physical mode of action enables broad efficacy against respiratory viruses, thereby conferring additional protection against the current and potentially also future pandemics
- Nasal sprays and further products containing iota-carrageenan are available without prescription in over 40 countries

Korneuburg, Austria, 09 December 2021 – Marinomed Biotech AG (VSE:MARI), an Austrian science-based biotech company with globally marketed therapeutics derived from innovative proprietary technology platforms, announced today a new study on the antiviral efficacy of iota-carrageenan (Carragelose) against the original SARS-CoV-2 strain and variants of concern (VOC), including the currently predominant Delta variant, has been published in the International Journal of Molecular Sciences. The peer-reviewed study is the result of a collaboration between virologists at the Friedrich-Alexander-Universität Erlangen- Nürnberg (FAU) and Marinomed as well as scientists from Ulm University Medical Center and the University Hospital Tuebingen who provided the patient-isolates of SARS-CoV-2 VOCs. In short, the study showed that iota-carrageenan was the most effective of the three carrageenans tested. At a concentration as low as 10 µg/ml, it was able to almost completely block virus replication in Calu-3 human lung cells for all SARS-CoV-2 strains tested, including the highly infectious delta variant.

Prof. Dr. Ulrich Schubert, Professor at the Institute of Clinical and Molecular Virology at the Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany, and principal investigator of the study, said: "Earlier this year, we have shown that iota-carrageenan can neutralize SARS-CoV-2. With our new data, we demonstrate that iota-carrageenan is also effective against highly infectious VOCs including the currently dominant delta variant. Iota-carrageenan acts via a physical mode of action and non-specifically envelops respiratory viruses via electrostatic forces and thus prevents the interaction between the virus and the cell. Iota-carrageenan has no pharmacological, immunological or toxicological activity and is not absorbed or metabolized, which makes it a safe biologically inert antiviral that can be applied topically, e. g. as nasal spray, throat spray or lozenges. Our results indicate that iota-

carrageenan might be effective for prophylaxis and treatment of SARS-CoV-2 infections independent of the present and potential future variants."

The researchers investigated the antiviral effects of iota-, lambda- and kappa-carrageenan, three sulfated polysaccharides extracted from red seaweed, on the original SARS-CoV-2 strain and the spreading VOCs: Alpha, Beta, Gamma and Delta. SARS-CoV-2 strains isolated from patients were used to infect two different human lung cell models for Coronavirus infection: a transgenic lung cell line made susceptible to SARS-CoV-2 and the Calu-3 human lung cell line, the best studied *in vitro* model for human lung cell infection. Treatment of these infected cells with iota-carrageenan efficiently blocked the replication of wildtype SARS-CoV-2 and all tested VOCs.

Dr. Eva Prieschl-Grassauer, Chief Scientific Officer of Marinomed and co-author of the study, commented: "COVID-19 cases are once again on a dramatically high level threatening to overwhelm hospital systems. While vaccines have been proven effective at reducing severe cases, they do not confer sterile immunity. Transmission of SARS-CoV-2 is not fully blocked and, especially with new, highly infectious variants like Delta and now likely Omicron, additional measures are needed to stop the spread of COVID-19. Our new published data show that Carragelose can very effectively block replication of all SARS-CoV-2 variants tested in human lung cells at concentrations in the microgram range, a fraction of what is used in marketed nasal sprays that contain over 1 mg per ml. This, together with previous clinical and laboratory studies by us and others, further supports that Carragelose nasal sprays can be an effective first line of defense against COVID-19 and help prevent both infection and transmission regardless of the variant. Used as an add-on to the vaccines, Carragelose can make a meaningful contribution to further protect people from COVID-19 (breakthrough-)infections as well as from other respiratory viral infections that are currently on the rise."

The study joins a growing number of publications that support the virus-blocking effects of iota-carrageenan. In addition to inhibiting SARS-CoV-2 replication *in vitro*, an independent clinical study showed earlier in 2021 that an iota-carrageenan nasal spray can reduce COVID-19 cases in healthcare workers by 80 %.[1] Further, a number of clinical and *in vitro* studies have demonstrated that iota-carrageenan nasal sprays are also effective against many other respiratory viruses and can block viral replication, reduce symptoms and shorten the duration of infections.[2] Iota-carrageenan appears to be an effective tool against SARS-CoV-2 and its rapidly emerging variants, as well as against other respiratory viruses like rhinovirus A and B, influenza B virus or respiratory syncytial virus (RSV), which is currently spreading among children and causing high numbers of pediatric hospitalizations. Iota-carrageenan nasal sprays are widely available in many countries without a prescription and approved for the use in children as young as one year. The physical mode of action with its broad efficacy against a multitude of respiratory viruses provides additional protection against infections and may also prove useful in future pandemics. This is in line with the latest statement by the German National Academy of Sciences, Leopoldina, calling for broad antiviral therapeutics to fight both the current and future pandemics.[3]

About Carragelose®:

Carragelose® is a sulfated polymer from red seaweed and a unique, broadly active virus-blocking compound. It is known as a gentle, effective, and safe prevention and treatment of various viral respiratory infections. Several clinical and preclinical studies have shown that Carragelose® forms a layer on the mucosa that entraps entering viruses, thereby inactivating them, and preventing them from infecting cells. Laboratory and clinical data have shown that Carragelose® can also inactivate SARS-CoV-2.[1,4] Marinomed is the holder of the IP rights and has licensed Carragelose® for marketing in Europe, Canada, Australia, and parts of Asia and Latin America. Marinomed's portfolio of Carragelose®-containing nasal sprays and oral products can be accessed at https://www.carragelose.com/en/portfolio/launched-products, scientific publications on Carragelose® at https://www.carragelose.com/en/publications.

About Marinomed Biotech AG

Marinomed Biotech AG is an Austrian science-based biotech company with globally marketed therapeutics. Marinomed focuses on the development of innovative products based on two patent-protected technology platforms. The Marinosolv® technology increases the solubility and bioavailability of compounds that are hardly soluble in aqueous formulations. Under the brand Solv^{4U}, Marinomed provides formulation development based on the Marinosolv® technology for external partners. The Carragelose® platform comprises innovative patent-protected products targeting viral infections of the respiratory tract and may also reduce the risk of an infection with SARS-CoV-2. Carragelose® is used as a virus blocker in nasal sprays, throat sprays, and lozenges, which are sold via international partners in over 40 countries. Marinomed, Marinosolv® and Carragelose® are registered trademarks of Marinomed Biotech AG. These trademarks may be owned or licensed in select locations only. The company is based in Korneuburg, Austria, and listed on the Prime Market of the Vienna Stock Exchange (VSE:MARI) .Further information is available at https://www.marinomed.com.

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1 https://www.dovepress.com/efficacy-of-a-nasal-spray-containing-iota-carrageenan-in-the-postexpos-peer-reviewed-fulltext-article-IJGM

2 https://www.carragelose.com/en/publications (For example: Grassauer et al, 2008, Leibbrandt et al., 2010, Eccles et al, 2010, Fazekas et al, 2012, Ludwig et al, 2013, Könighofer et al, 2014, Morokutti-Kurz et al, 2015, Morokutti-Kurz et al. 2017, Graf et al 2018, Morokutti-Kurz et al, 2020)

3 https://www.leopoldina.org/publikationen/detailansicht/publication/antivirale-wirkstoffe-gegen-sars-cov-2-aktueller-stand-und-ansaetze-zur-verbesserten-vorbereitung-auf-zukuenftige-pandemien-2021/

4 https://www.marinomed.com/en/news/marinomed-biotech-ag-shares-positive-clinical-trial-results-for-iota-carrageenan-nasal-spray-in-the-prevention-of-covid-19-1

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