



Published in final edited form as:

*Magnes Res.* 2021 May 01; 34(2): 90–92. doi:10.1684/mrh.2021.0479.

## The magnesium global network (MaGNet) to promote research on magnesium in diseases focusing on covid-19

**Federica I. Wolf<sup>1,30</sup>, Jeanette A. Maier<sup>2,30</sup>, Andrea Rosanoff<sup>28</sup>, Mario Barbagallo<sup>3</sup>, Shadi Baniyadi<sup>4</sup>, Sara Castiglioni<sup>2,30</sup>, Fu-Chou Cheng<sup>5</sup>, Sherrie Colaneri Day<sup>28</sup>, Rebecca B. Costello<sup>28</sup>, Ligia J. Dominguez<sup>3</sup>, Ronald J. Elin<sup>6</sup>, Claudia Gamboa-Gomez<sup>7</sup>, Fernando Guerrero-Romero<sup>7</sup>, Ka Kahe<sup>8</sup>, Klaus Kisters<sup>9,29</sup>, Martin Kolisek<sup>10,29</sup>, Anton Kraus<sup>29</sup>, Stefano Iotti<sup>11,30</sup>, Andre Mazur<sup>12,30</sup>, Moises Mercado-Atri<sup>13</sup>, Lucia Merolle<sup>14</sup>, Oliver Micke<sup>15,29</sup>, Nana Gletsu-Miller<sup>16</sup>, Forrest Nielsen<sup>17</sup>, Jin O-Uchi<sup>18</sup>, Ornella Piazza<sup>19</sup>, Michael Plesset<sup>28</sup>, Guitti Pourdowlat<sup>20</sup>, Francisco J. Rios<sup>21</sup>, Martha Rodriguez-Moran<sup>7</sup>, Giuliana Scarpati<sup>19</sup>, Michael Shechter<sup>22</sup>, Yiqing Song<sup>23</sup>, Lisa A. Spence<sup>23</sup>, Rhian M Touyz<sup>21,30</sup>, Valentina Trapani<sup>1,24,30</sup>, Nicola Veronese<sup>3</sup>, Bodo von Ehrlich<sup>25,29</sup>, Juergen Vormann<sup>26,29</sup>, Taylor C. Wallace<sup>27,28</sup>, CMER Center for Magnesium Education, Research<sup>28</sup>, Gesellschaft für Magnesium-Forschung e.V. Germany<sup>29</sup>, SDRM Society (International Society for the Development of Research on Magnesium)<sup>30</sup>**

<sup>1</sup>Dipartimento di Medicina e Chirurgia Traslazionale, Fondazione Policlinico Universitario A. Gemelli IRCCS-Università Cattolica del Sacro Cuore, Rome, Italy;

<sup>2</sup>Dipartimento di Scienze Biomediche e Cliniche L. Sacco, Università di Milano, Italy;

<sup>3</sup>Geriatric Unit, Department of Medicine, University of Palermo, Italy;

<sup>4</sup>Tracheal Diseases Research Center, National Research Institute of Tuberculosis and Lung Diseases (NRITLD), Shahid Beheshti University of Medical Sciences, Tehran, Islamic Republic of Iran;

<sup>5</sup>Department of Medical Research, Taichung Veterans General Hospital, Taichung, Taiwan, ROC;

<sup>6</sup>Department of Pathology and Laboratory Medicine, University of Louisville, KY, USA;

<sup>7</sup>Biomedical Research Unit of Mexican Social Security Institute, Durango, Mexico;

<sup>8</sup>Department of Obstetrics and Gynecology and Department of Epidemiology, Columbia University Irving Medical Center, New York, USA;

<sup>9</sup>Internal Medicine I, St. Anna Hospital, Herne, Germany;

<sup>10</sup>Biomedical Center in Martin, Jessenius Medical faculty in Martin, Comenius University, Martin, 03601, Slovakia;

<sup>11</sup>Department of Pharmacy and Biotechnology (FaBit) Università di Bologna, National Institute of Biostructures and Biosystems, Italy;

---

**Correspondence:** <federica.wolf@unicatt.it>.

Conflict of interest: none.

- <sup>12</sup>Université Clermont Auvergne, INRAE, UNH, Unité de Nutrition Humaine, Clermont-Ferrand, France;
- <sup>13</sup>Research Unit in Endocrine Diseases, Specialty Hospital, National Medical Center, Century XXI, Mexican Social Security Institute at Mexico City, Mexico;
- <sup>14</sup>Transfusion Medicine Unit, Azienda USL-IRCCS di Reggio Emilia, Reggio Emilia, Italy;
- <sup>15</sup>Department of Radiotherapy and Radiation Oncology, Franziskus Hospital, Bielefeld, Germany;
- <sup>16</sup>Department of Epidemiology, Indiana University Richard M. Fairbanks School of Public Health, Indianapolis, IN 46202, USA;
- <sup>17</sup>Research Nutritionist Consultant, Grand Forks, ND, USA;
- <sup>18</sup>Cardiovascular Division, Department of Medicine, University of Minnesota Medical School, Minneapolis, MN, USA;
- <sup>19</sup>Anestesiologia e Rianimazione, Dipartimento di Medicina e Chirurgia, Università degli Studi di Salerno, Italy;
- <sup>20</sup>Chronic Respiratory Diseases Research Center, National Research Institute of Tuberculosis and Lung Diseases (NRITLD) Shahid Beheshti University of Medical Sciences, Tehran, Islamic Republic of Iran;
- <sup>21</sup>Institute of Cardiovascular and Medical Sciences, University of Glasgow, Glasgow, UK;
- <sup>22</sup>Leviev Cardiothoracic and Vascular Center, Chaim Sheba Medical Center and the Sackler Faculty of Medicine, Tel Aviv University, Israel;
- <sup>23</sup>Department of Applied Health Science, School of Public Health, Indiana University, Bloomington, IN, USA;
- <sup>24</sup>Alleanza Contro il Cancro, Rome, Italy;
- <sup>25</sup>Internal Medicine Private Practice, Kempten, Germany;
- <sup>26</sup>Institute for Prevention and Nutrition, Ismaning, Germany;
- <sup>27</sup>Think Healthy Group, Department of Nutrition and Food Studies, George Mason University, Washington, USA;
- <sup>28</sup>CMER Center for Magnesium Education & Research, Pahoia, HI 96778, USA
- <sup>29</sup>Gesellschaft für Magnesium-Forschung e.V., Germany
- <sup>30</sup>SDRM International Society for the Development of Research on Magnesium

### Keywords

hypomagnesaemia; hypermagnesaemia; inflammation; thrombosis; prevention; disease severity; supplementation; nutrition; ICU

---

Dear Editor,

When the current SARS-CoV-2 pandemic began in early 2020, the global magnesium researcher community came together and noted the striking similarities between COVID-19 risk factors and conditions associated with magnesium deficit state in humans, reasoning that magnesium deficiency could worsen the course of COVID-19 [1–4]. This prompted establishment of a worldwide collaborative network with regular virtual meetings to brainstorm the associations between magnesium and COVID-19. We hypothesize that magnesium deficiency, a common but mostly unrecognized state in modern global societies, could be an important component of the susceptibility to SARS-CoV-2 infection. Consequently, restoring the magnesium deficit may be a putative therapeutic strategy to possibly ameliorate or prevent COVID-19.

Magnesium deficiencies, measured by both dietary and blood parameters, have been associated with many chronic diseases afflicting our modern world including cardiovascular diseases, *diabetes mellitus*, hypertension, dyslipidaemia, immune dysfunction, cancer and aging [5–8]. In addition, magnesium requirement increases with rising BMI, making obesity a risk factor for magnesium deficit and chronic diseases [9].

The low-magnesium state, long established in Western Societies consuming a modern processed food diet, can be exacerbated by certain long-term prescribed medicines [5], and is spreading worldwide as a consequence of globalization of lifestyles. As the world increases in wealth, consumption of processed, low-magnesium containing food is expanding, and along with it the chronic diseases associated with low magnesium state, probably also due to decrease of magnesium content in soil and water [10].

Sars-CoV-2 pandemic is a global concern due to the enormous number of infected persons and deaths worldwide (to date 144,099,374 and 3,061,912, respectively [11]), and no disease-specific treatments available.

There are at least two different domains where magnesium could be directly involved. First, nearly all the co-morbidities that exacerbate the risk of infection and the severity of symptoms are associated with magnesium status imbalance (e.g. immunological disorders, *diabetes*, hypertension, cardiovascular diseases, metabolic syndrome, obesity/adiposity, cancer and aging) [5–9].

Second, considering the critical role of magnesium in cellular function, inflammation and immune responses to stress and infection, it is possible that perturbed magnesium status impacts the pathogenesis of SARS-COV2 infection and associated immune and inflammatory responses [12]. Moreover, magnesium may be involved in processes related to the function of ACE2, the receptor through which SARS-CoV-2 mediates host cell effects [13].

These provocative considerations sparked important discussion in our magnesium network, with other important topics under consideration in COVID-19 and beyond, including:

- identification of the most appropriate approaches to evaluate body magnesium status;
- definition of the ideal reference range for serum magnesium levels;

- census of ongoing clinical studies and trials specifically dedicated to disclosing the role of magnesium in COVID-19, and design of further research projects;
- elucidation of the potential correlation between magnesium imbalance and severity of COVID-19.

To date we have had 13 virtual meetings. The original group included “veterans”, i.e. magnesium researchers who, up to 2008, used to meet at the dedicated Gordon Research Conferences. The network continues to grow as more researchers and clinicians interested in magnesium worldwide are identified. We welcome all those who were informed of the meetings through the SDRM website (International Society for the Development of Magnesium Research, [www.sdrmsociety.org](http://www.sdrmsociety.org)), where we post news, relevant references and recordings of our meetings.

Currently we are pursuing two projects:

- The collection of institutional or national serum magnesium reference ranges routinely used in hospitals around the globe, to discuss differences and propose standardized “normal” values.
- An accurate analysis of the relationship between magnesium status perturbations and COVID-19 pandemic based on upcoming data from ongoing clinical studies.

Our goal is to promote research on magnesium, the clinically still poorly acknowledged cation.

We hope to provide the scientific community with expert and up-to-date information and viewpoints on the role of magnesium in health and disease, especially related to COVID-19, the most urgent global challenge at this time.

### Financial support:

none.

### References

1. Iotti S, Wolf F, Mazur A, Maier JA. The COVID-19 pandemic: is there a role for magnesium? Hypotheses and perspectives. *Magnes Res* 2020; 33 (2):21–7. [PubMed: 32554340]
2. Micke O, Vormann J, Kisters K. Magnesium deficiency and COVID-19 – What are the links? Some remarks from the German Society for Magnesium Research e.V. *Trace Elem Electrol* 2020; 37(3):103–7.
3. Wallace TC. Combating COVID-19 and building immune resilience: a potential role for magnesium nutrition? *J Am Coll Nutr* 2020; 39: 685–93. [PubMed: 32649272]
4. Errasfa M Magnesium therapeutic potential against Covid-19: could it be an “All-in-one” therapy? *Magnes Res* 2021 Feb 11 doi: 10.1684/mrh.2020.0474. Online ahead of print.
5. Costello RB, Rosanoff A. Magnesium – Chapter 21. In: Marriott BP, Birt DF, Stalling VA, Yates AA, (eds). *Present knowledge in nutrition. volume 1: basic nutrition and metabolism*. 11<sup>th</sup> ed, ILSI – Academic Press, 2020: ILSI – Academic Press; 2020. p..
6. Shechter M, Bairey Merz CN, Rude RK, et al. Low intracellular magnesium levels promote platelet-dependent thrombosis in patients with coronary artery disease. *Am Heart J* 2000; 140: 212–8. [PubMed: 10925332]

7. Trapani V, Wolf FI. Dysregulation of  $Mg^{2+}$  homeostasis contributes to acquisition of cancer hallmarks. *Cell Calcium* 2019; 83: 102078. [PubMed: 31493712]
8. Barbagallo M, Veronese N, Dominguez LJ. Magnesium in aging, health and diseases. *Nutrients* 2021; 13(2):463. [PubMed: 33573164]
9. Rosanoff A Perspective: US adult magnesium requirements need updating: impacts of rising body weights and data-derived variance. *Adv Nutr* 2020; 12: 298–304.
10. Cazzola R, Della Porta M, Manoni M, Iotti S, Pinotti L, Maier JA. Going to the roots of reduced magnesium dietary intake: a tradeoff between climate changes and sources. *Heliyon* 2020; 6(11): e05390. [PubMed: 33204877]
11. WHO. WHO COVID-19 Dashboard. WHO, 2021. <https://covid19.who.int/> (accessed April 23rd, 2021).
12. Singh R, Kang A, Luo X, Jeyanathan M, Gillgrass A, Afkhami S, Xing Z. COVID-19: current knowledge in clinical features, immunological responses, and vaccine development. *FASEB J* 2021; 35 (3):e21409. [PubMed: 33577115]
13. Bourgonje AR, Abdulle AE, Timens W, et al. Angiotensin-converting enzyme 2 (ACE2), SARS-CoV-2 and the pathophysiology of coronavirus disease 2019 (COVID-19). *J Pathol* 2020; 251 (3):228–48. [PubMed: 32418199]