Editorial Article ISSN 2998-4513

International Journal of Cardiology and Cardiovascular Disorder

Geomagnetic Cardiology and the Spherical Earth : Mechanistic Paradigm Shift with New Therapeutic Horizons

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Submitted : 30 Sept 2025 ; **Published** : 14 Oct 2025

Citation: Alabdulgader, A. (2025). Editorial: Geomagnetic Cardiology and the Spherical Earth : Mechanistic Paradigm Shift with New Therapeutic Horizons. *I J cardio & card diso; 6*(4):1-3. DOI : https://doi.org/10.47485/2998-4513.1048

Editorial

For the first time in medical history, cardiology has stepped beyond the confines of anatomy, genetics, and hemodynamics into the realm of planetary physics. In the landmark article "Higher Incidence of Congenital Aortic Valve Stenosis in Higher Magnetic Latitude Countries: New Insights and Potential Therapies" (Alabdulgader, 2025), congenital cardiology is shown to be inextricably linked to the Earth's geomagnetic architecture. This novel convergence of cardiology, astrophysics, and developmental biology carries implications not only for medicine, but also for humanity's understanding of its planetary environment. The Saudi Congenital Heart Disease Risk Factors Study provides the critical empirical backbone for demonstrating how cardiogenesis itself reflects planetary physics, thereby supporting the thesis that cardiology can serve as biological confirmation of Earth's sphericity. By analyzing 7,327 cases and controls with over three million statistical variables for genetic and environmental risk factors of congenital heart disease, in conjunction with other international studies , revealed that the incidence of bicuspid aortic valve stenosis (BCAS) rises consistently with increasing magnetic latitude, from Saudi Arabia through Europe to Canada, mirroring the dipolar gradient of Earth's geomagnetic field. Such a latitudinally ordered pattern cannot be explained by genetic or hemodynamic determinants alone, but rather reflects the structured variation in field strength (25,000–35,000 nT at equatorial latitudes versus ~65,000 nT at the poles). This observation is biologically profound: it positions embryonic endothelial mesenchymal transition (EndoMT), the process by which cardiac valves are formed, as a natural sensor of planetary magnetism. In effect, the human heart becomes a living "magnetometer," registering the curvature driven geomagnetic architecture of the Earth. Thus, cardiogenesis not only advances our understanding of congenital disease but also, through its predictable alignment with geomagnetic intensity, offers unprecedented biomedical corroboration of Earth's spherical form. The Alabdulgader Auroral Aorta and Polar Paradox Theory, introduced by Alabdulgader A, explains this phenomenon through the perturbation of endothelial mesenchymal transition (EndoMT), the embryonic process central to heart valve formation. EndoMT is exquisitely sensitive to electromagnetic influences; perturbation during the critical first seven weeks of embryogenesis leads to malformed valves. By integrating magnetometry (with sensitivity to 10^{-12} T), molecular cardiogenesis, and clinical epidemiology, the study opens the field of geomagnetic cardiology. Crucially, this evidence also provides biological confirmation of Earth's sphericity. The observed latitudinal gradient in CHD incidence is only possible because the Earth's dipolar magnetic field varies predictably with latitude, a property of a spherical, or oblate spheroidal planet. Thus, human embryonic hearts is not only the strongest electromagnetic field generator between all body organs, but serves also as natural sensors, biologically affirming the planet's curvature. Magnetic frequency, particularly in the extremely low-frequency (ELF) range has the capacity to modulate the behavior of charged particles, ion channels, and diverse biomolecules central to cellular signaling pathways. The principle of astrophysical resonance, and its translation into both physiological and cosmic rhythms, carries profound implications for sustaining life on Earth and shaping human conscious experience (Al Alabdulgader, 2021). Recent publications have detailed resonance-like responses of biological systems to low-frequency magnetic fields (LFMFs) when specific frequencies and amplitudes are applied (Krylov & Osipova, 2023). Among the proposed mechanisms, resonance remains the most compelling explanation for how electromagnetic fields exert biological effects. Nonetheless, alternative contributory mechanisms have been suggested, including fluid shear stress, hydrostatic pressure, substrate strain, and trophic factor modulation. Importantly, during embryogenesis, morphogenetic processes are governed by precise temporal mechanical forces. Both short-term perturbations of tissue structure and long-term cytoskeletal remodeling of neural tubes in human embryo organoids have now been experimentally induced through

weak magnetic field exposure (Abdel Fattah et al., 2023). Epithelial Mesenchymal Transition (EMT) and its vascular counterpart, Endothelial Mesenchymal Transition (EndMT), are fundamental physiological processes essential for normal embryonic development and tissue repair. EndMT is typically regarded as a specialized form of EMT, given that endothelial cells represent a distinct subtype of epithelial cells lining the vasculature. Under pathological circumstances, however, both EMT and EndMT can be coopted, driving aberrant remodeling that contributes to tissue fibrosis and the progression of cancer metastasis (Shu et al., 2020). The therapeutic implications are equally groundbreaking. Targeting Endothelial Mesenchymal Transformation (EndMT) signaling molecules represents a promising pathway for novel therapeutics in bicuspid aortic valve stenosis (BCAS). Core regulators such as TGF-β, BMP, Wnt, Notch, and VEGF play pivotal roles in valvular development and disease. Evidence indicates that EndMT pathways are influenced by low-frequency magnetic field exposure, suggesting that geomagnetic and solar electromagnetic fluctuations can act as epigenetic modulators of cardiac morphogenesis (Alabdulgader et al., 2018; Subrahmanyam et al., 1985). External modulation of these pathways—via pulsed electromagnetic fields (PEMF)—has been shown to stimulate bone morphogenetic proteins and promote osteogenesis, offering therapeutic promise (Flatscher et al., 2023; Kulkarni et al., 2007). Precision biomagnetism approaches, particularly magnetic nanoparticles (MNPs), further expand treatment potential by enabling frequency-specific modulation, mechanical stimulation, and targeted drug delivery (Mohsin et al., 2022; Chen et al., 2024). Iron oxide nanoparticles, in particular, can induce reversible EndMT, with applications already evidenced in tissue engineering and calcific aortic valve models (Duan et al., 2018; Cardoso et al., 2018; Reddy et al., 2012; Wen et al., 2019; Elfick et al., 2017). Collectively, Research on bicuspid aortic valve stenosis (BCAS) highlights its strong geographical and environmental determinants, with incidence progressively increasing at higher magnetic latitudes. This trend suggests that Earth's geomagnetic field acts as an epigenetic modulator of cardiac morphogenesis, particularly through its influence on endothelial–mesenchymal transition (EndoMT), a critical step in heart valve development. These findings challenge conventional genetic and hemodynamic models, introducing a new paradigm,geomagnetic cardiology, that integrates planetary physics, molecular biology, and clinical epidemiology. The implications extend beyond BCAS, raising the possibility that other congenital anomalies may also be shaped by electromagnetic fluctuations. From a public health perspective, this supports geographically tailored screening and prevention strategies, especially in high latitude regions. Therapeutically, advances in biomagnetism, pulsed electromagnetic fields, and iron oxide nanoparticles (MNPs) open new avenues for noninvasive modulation of EndoMT, offering futuristic alternatives to surgical and pharmacological interventions. Ultimately, this body of work positions cosmic and planetary forces as critical determinants of human biology, urging a more integrative biomedical approach that unites cardiology, developmental biology, and geophysics.

Key Messages

- **Novel Epidemiology:** Incidence of congenital bicuspid aortic valve stenosis increases with magnetic latitude, independent of genetics or local environment.
- **Mechanistic Insight:** Earth's magnetic field perturbs EndoMT during early embryogenesis, altering valve morphogenesis.
- **Proof of Sphericity:** The latitudinal gradient of disease incidence biologically confirms Earth's spherical geomagnetic structure.
- **Therapeutic Innovation:** External electromagnetic modulation and iron oxide nanoparticles offer promising non-invasive therapies for congenital and acquired valve disease.
- **New Discipline:** "Geomagnetic Cardiology" inaugurates a frontier where planetary forces and cardiology converge.

References

1. Alabdulgader, A. (2025). Higher Incidence of Congenital Aortic Valve Stenosis in Higher Magnetic Latitude Countries: New Insights and Potential Therapies. *Archives of Clinical and Biomedical Research, 9*(2), 156-164. DOI: https://www.doi.org/10.26502/acbr.50170447
2. Al Alabdulgader, A. A. (2021). Quantum consciousness and the heart based resonant frequencies theory. *Arch Neurol Neurosci, 9*(4), 1-10. DOI: http://dx.doi.org/10.33552/ANN.2021.09.000719
3. Krylov, V.V., & Osipova, E. A. (2023). Molecular biological effects of weak low-frequency magnetic fields: frequency-amplitude efficiency windows and possible mechanisms. *Int J Mol Sci, 24*(13), 10989. DOI: https://doi.org/10.3390/ijms241310989
4. Abdel Fattah, A. R., Kolaitis, N., Van Daele, K., Daza, B., Rustandi, A. G., & Ranga, A. (2023). Targeted mechanical stimulation via magnetic nanoparticles guides in vitro tissue development. *Nat Commun, 14*(1), 5281. DOI: https://doi.org/10.1038/s41467-023-41037-8
5. Shu, D. Y., Butcher, E., & Saint-Geniez, M. (2020). EMT and EndMT: emerging roles in age-related macular degeneration. *Int J Mol Sci, 21*(12), 4271. DOI: https://doi.org/10.3390/ijms21124271
6. Alabdulgader, A., McCraty, R., Atkinson, M., Dobyns, Y., Vainoras, A., Ragulskis, M., & Stolc, V. (2018). Longterm study of heart rate variability responses to changes in the solar and geomagnetic environment. *Sci Rep, 8*(1), 2663. DOI: https://doi.org/10.1038/s41598-018-20932-x
7. Subrahmanyam, S., Sanker Narayan, P. V., & Srinivasan, T. M. (1985). Effect of magnetic micropulsations on biological systems—a bi-oenvironmental study. *Int J Biometeorol*, 29, 293-305. DOI: https://doi.org/10.1007/BF02189660
8. Flatscher, J., Pavez Loriè, E., Mittermayr, R., Meznik, P., Slezak, P., Redl, H., & Slezak, C. (2023). Pulsed electromagnetic fields (PEMF)-physiological response and its potential in trauma treatment. *Int J Mol Sci, 24*(14), 11239. DOI: https://doi.org/10.3390/ijms241411239

9. Kulkarni, N. H., Wei, T., Kumar, A., Dow, E. R., Stewart, T. R., Shou, J., N'cho, M., Sterchi, D. L., Gitter, B. D., Higgs, R. E., Halladay, D. L., Engler, T. A., Martin, T. J., Bryant, H. U., Ma, Y. L., & Onyia, J. E. (2007). Changes in osteoblast, chondrocyte, and adipocyte lineages mediate the bone an-abolic actions of PTH and small molecule GSK-3 inhibitor. *J Cell Biochem, 102*(6), 1504-1518. DOI: https://doi.org/10.1002/jcb.21374
10. Mohsin, A., Hussain, M. H., Mohsin, M. Z., Zaman, W. Q., Aslam, M. S., Shan, A., Dai, Y., Khan, I. M., Niazi, S., Zhuang, Y., & Guo, M. (2022). Recent Advances of Magnetic Nanomaterials for Bioimaging, Drug Delivery, and Cell Therapy. *ACS Appl Nano Mater, 5*(8), 10118-10136. DOI: https://doi.org/10.1021/acsanm.2c02014
11. Chen, J., Ren, T., Xie, L., Hu, H., Li, X., Maitusong, M., Zhou, X., Hu, W., Xu, D., Qian, Y., Cheng, S., Yu, K., Wang, J. A., & Liu, X. (2024). Enhancing aortic valve drug delivery with PAR2-targeting magnetic nanocargoes for calcifi-cation alleviation. *Nat Commun, 15*(1), 557. DOI: https://doi.org/10.1038/s41467-024-44726-0
12. Duan, M., Shapter, J., Qi, W., Yang, S., & Gao, G. (2018). Recent progress in magnetic nanoparticles: synthesis, properties, and applications. *Nanotechnology, 29*(45), 452001. DOI: https://doi.org/10.1088/1361-6528/aadcec
13. Cardoso, V. F., Francesko, A., Ribeiro, C., Bañobre-López, M., Martins, P., & Lanceros-Mendez, S. (2018). Advances in magnetic nanoparticles for biomedical applications. *Adv Healthc Mater, 7*(5). DOI: https://doi.org/10.1002/adhm.201700845
14. Reddy, L. H., Arias, J. L., Nicolas, J., & Couvreur, P. (2012). Magnetic nanoparticles: design and characterization, toxicity, and biocompati-bility, pharmaceutical and biomedical applications. *Chem Rev, 112*(11), 5818-5878. DOI: https://doi.org/10.1021/cr300068p
15. Wen, T., Du, L., Chen, B., Yan, D., Yang, A., Liu, J., Gu, N., Meng, J., & Xu, H. (2019). Iron oxide nanoparticles induce reversible endothelial-to-mesenchymal transition in vascular endothelial cells at acutely non-cytotoxic concentrations. *Part Fibre Toxicol*, 16, 30. DOI: https://doi.org/10.1186/s12989-019-0314-4
16. Elfick, A., Rischitor, G., Mouras, R., Azfer, A., Lungaro, L., Uhlarz, M., Herrmannsdörfer, T., Lucocq, J., Gamal, W., Bagnaninchi, P., Semple, S., & Salter, D. M. (2017). Biosynthesis of magnetic nanoparticles by human mesenchymal stem cells following transfection with the magnetotactic bacterial gene mms6. *Sci Rep,* 7, 39755. DOI: https://doi.org/10.1038/srep39755.