



Research Campaign: GenSpaceBase©

Tripti M. Mathew

[Alpha & Omega Healthcare Management Consulting](#)

Phone: (973)-669-2821; (862)-224-1698

Email: DrMathewTM@gmail.com

I. Product Overview/Technology

GenSpaceBase© is a genetic health profile literature database designed to monitor studies on different haplogroups and associated illnesses (both mtDNA and Y-DNA haplogroups illnesses). This database will help astronauts in space query the database for potential susceptibility of people with certain mtDNA haplogroups to an illness and prevalence of a particular illness like COVID-19 and other pandemic illnesses on a planet (Mars, Moon etc.) in humans or aliens based on earlier Space travel of documented citizens from earth. The database is web-based and can be accessed anywhere in the world or in space (where Wi-Fi/internet is available) anytime. It is user friendly, and inexpensive to access once completely developed (with flexible users or unlimited users plan based on the institution/researchers needs ranging from \$0 or \$5/user/month to enterprise express plan of \$999/month, hosted online) within 12 to 18 months from date of award of the grant. The costs for the different plans might vary slightly in future years. The database concept was designed in 2014 and being developed in 2016 was an online database development software. Currently (2021), the latest technologies, R programming and App development software is being used to develop this database. The database will be available online and as an App and updated once a month and/or as new literature becomes available.

a) Market

The growing interest in flying to the moon/other planets, space travel has resulted in the development of more Aerospace Movies e.g., *Elysium*, *Gravity* etc. (released in 2013), Aerospace Medicine/New Technologies (e.g., Space Skin Suits, Med Pods etc.) and Space Tourism (sub-orbital space ride, one way ticket to Mars).

Mitochondria is present in every cell of the body except red blood cells. Failure of the mitochondria (due to inherited or spontaneous mutations in mtDNA) results in mitochondrial diseases.

There are several mitochondrial (mtDNA) illnesses (e.g., Acute Mountain Sickness Syndrome, High Altitude Pulmonary Edema etc.). In the U.S, over 50 million people suffer from these illnesses (United Mitochondrial Disease Foundation, 2016)

Haplogroup is a group of same haplotypes that share a common ancestor having the same single nucleotide polymorphism (SNPs) mutations. There are mtDNA haplogroups and Y-DNA haplogroups and they are at increased or decreased risk of certain illnesses. Some people are prone to develop certain illnesses/conditions based on the presence or absence of certain markers/SNPs of their genes, for example, Acute Mountain Sickness Syndrome. At present, NASA astronaut candidates as part of the medical check-up, also have genetic testing done to find out their genetic health profile. This is done to monitor their health for clinical diseases/disorders/conditions caused by oxidative stress, damage to DNA by free radicals from ionizing radiation, when they return from Space.

At the 85th Aerospace Medical Association Annual Meeting, San Diego, CA in 2014, a poster title, “*New Frontiers for Aerospace Medicine: Genetic Health Profile and ID for Earthlings*,

Space Travelers, and Future Citizens of Space” was presented. Another presentation on the database, *GenSpaceBase© - Learning the Genetic Risks of Space Travel and Cosmonauts*”, was made in 2016 at the 64th International Congress on Aviation and Space Medicine (ICASM) in New Delhi, India. It was well accepted by Aerospace Medicine researchers nationally and internationally. Some of the comments/feedback at this meeting included the need for documenting epidemiological studies on mitochondrial illnesses, the association between mtDNA and illnesses, interest in finding out about other mtDNA and Y-DNA illnesses including hypoxia etc. Some of the literature (a sample) mentioned in the references are documented in GenSpaceBase©.

b) Competition and Competitive Advantage

Currently, such a database does not exist in the Aerospace Medicine field or in the Genetic field. Our competitive advantage is that the key team member of this project, Dr. Tripti M. Mathew, Sr. Medical Director has the expertise of designing, developing, implementing, and maintaining this database as she had worked on a similar project (Medical Device Database Project-MEDDevbase) as Project Manager and Medical Officer (Epidemiology) at the Food and Drug Administration, Center for Devices and Radiological Health from 2006-2008.

Dr. Mathew has completed many courses in Aerospace Medicine (UTMB's Principle of Aviation and Space Medicine Course, NASA Initial Physiological Training lectures and 25,000 Foot Altitude Chamber Flight in 2013, ICAO Aviation Medicine Concepts for Medical Examiners in 2017, Basic Course in Aviation Medicine, European School of Aviation Medicine, Germany in 2018 , FAA's Clinical Aerospace Physiology for Aviation Medical Examiners (CAPAME) in 2021 and passed the FAA's Recreational UAS Safety Test (TRUST) in 2021. Dr. Mathew is also board certified in Aerospace Medicine, Clinical Informatics, Preventive Medicine and Public Health by the International Board of Medicine and Surgery (IBMS) since 2014. She also received the International Medical License from IBMS in 2021. She is a member of the Aerospace Medical Association since 2013.

Dr. Mathew has conducted research and has many presentations and publications in the Aerospace Medicine discipline. These include:

Mathew, TM. Aerospace Medicine sans Frontières: Improving Passenger and Personnel Safety. *Aerospace Medicine and Human Performance*, Volume 91, Number 7, July 2020, pp. 611-614(4). <https://doi.org/10.3357/AMHP.5621.2020>
(Invited Paper on Technology, for Science and Technology Column of Aerospace Medical Association Journal- Aerospace Medicine and Human Performance).

Mathew, TM. High Altitude Oxygenation. StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing. 2019.
Internet. <https://www.ncbi.nlm.nih.gov/books/NBK539701/>

Mathew, TM. GenSpaceBase©-Learning the Genetic Risks of Space Travel for Astronauts and Cosmonauts. Presented at the 64th International Congress on Aviation and Space Medicine (ICASM), Nov 6-10, 2016, New Delhi, India.

Mathew, TM. Review of Respiratory and Metabolic Diseases for the Aerospace Medicine Professional. Aerospace Medicine Board Review. Presented at the 87th Annual Scientific Meeting of the Aerospace Medical Association, April 24-28, 2016, Atlantic City, NJ. Clinical Panel: Epidemiology/Biostat. Review of Respiratory & Metabolic Diseases on April 26, 2016.

Mathew, TM. Airport Disasters Medical Response and Management. Aerospace Medicine Board Review Course developed for the 86th Annual Scientific Meeting of the Aerospace Medical Association, May 10-14, 2015, Orlando, FL. Panel LXXXII-Aerospace Medicine Review Board #3 Operational Aerospace Medicine, Management and Administration on May 14, 2015. Available online at <https://www.youtube.com/watch?v=aEjI4CwgzqM>

Mathew, TM. New Frontiers for Aerospace Medicine: Genetic Health Profile & ID for Earthlings, Space Travelers, and Future Citizens of Space. Abstracts of the Aerospace Medical Association (AsMA) 85th Annual Scientific Meeting, May 5-10, 2014, San Diego, California. *Aviat Space Environ Med.* 2014 Mar; 85 (3):215-374. <https://www.ncbi.nlm.nih.gov/pubmed/24783630>

Mathew, TM. The Sky is not the Limit, Space is not the Final Frontier. Presented (poster) at the 61st International Congress of Aviation and Space Medicine (ICASM), October 8, 2013, Jerusalem, Israel. <https://www.youtube.com/watch?v=1g8g5LVIIqE>

Mathew, TM. Cross-Cultural Training of Astronauts and Space Travelers. Presented (oral) at Principles of Aviation and Space Medicine Course, University of Texas Medical Branch, Galveston, Texas, July 26, 2013. Available September 1, 2013, onwards at <https://www.youtube.com/watch?v=AYCRcsnyPQo>

II. The PRL for the Earth market

The product readiness level (PRL) for this technology is currently equal to 3.

III. Benefits of this product/technology for humans in space.

Genetic health profile is useful to space travelers, earthlings, and space citizens as it will help them become aware of the different mitochondrial illness that they are at risk for developing and steps that they can take to reduce the effects or prevent these illnesses. The astronaut (s) will have the *GenSpaceBase*© technology at the tips of their hand and can be used in Space during a space flight for research purposes, to refer to different mtDNA and Y-DNA illnesses that an astronaut might be susceptible based on his/her mtDNA and Y-DNA haplogroups profile.

This database can also be used by researchers on Earth.

IV. Patent position.

Once the database is fully developed (within 24 months), a patent application will be submitted for the database, *GenSpaceBase*©. It is currently copyright protected and will be protected by trademark later.

V. Key team members and the company's financial standing

The key member of this technology project will be Dr. Tripthi M. Mathew, Sr. Medical Director/President & CEO of the Alpha & Omega Healthcare Management Consulting/Dr. Tripthi Mary Mathew, L.L.C who had presented at the 85th Aerospace Medical Association's Annual Meeting. The company is based in West Orange, New Jersey, USA with fewer than 500 employees. It is registered with the New Jersey Division of Revenue as an LLC. The company is in good financial standing with no loans/debts.

VI. Funding

The estimated cost of the complete development of the database and App is estimated to be at \$100,000 annually for 2 years and maintenance of \$100,000 annually thereafter for the duration of the research campaign of the Decadal Survey on Life and Physical Sciences Research in Space (2023-2032). The funds could be disbursed as a 2-year Research Fellowship (remote) in Aerospace Medicine for the first two years renewable annually for maintenance of the database or awarded as a \$1M 10-year grant. The funds when received will be used to further develop, maintain this database, and promote awareness about this technology/database at different aerospace medicine conferences/meetings including but not limited to Aerospace Medical Association (AsMA), International Congress of Aviation and Space Medicine (ICASM), International Genetic Epidemiology Society, World Medical Association, American College of Preventive Medicine Annual Meeting etc. In future years, the 100% match in funding could be raised through marketing this technology/database to the aerospace tourism industry like Virgin Galactic, Space-X etc. so that they can use it to screen their customers/future space travelers for the different mtDNA illnesses, to academicians at different educational institutions, Federal Government/ libraries for their research.

VII. References

Bloomer LD, Nelson CP, Eales J, Denniff M, Christofidou P, Debiec R, Moore J; Cardiogenics Consortium, Zukowska-Szczechowska E, Goodall AH, Thompson J, Samani NJ, Charchar FJ, Tomaszewski M. Male-specific region of the Y chromosome and cardiovascular risk: phylogenetic analysis and gene expression studies. *Arterioscler Thromb Vasc Biol.* 2013 Jul;33(7):1722-7. <https://doi.org/10.1161/ATVBAHA.113.301608>

Li FX, Ji FY, Zheng SZ, Yao W, Xiao ZL, Qian GS. MtDNA haplogroups M7 and B in southwestern Han Chinese at risk for acute mountain sickness. *Mitochondrion.* 2011 Jul;11(4):553-8. <https://doi.org/10.1016/j.mito.2011.02.003>

Li YJ, Minear MA, Qin X, Rimmler J, Hauser MA, Allingham RR, Igo RP, Lass JH, Iyengar SK, Klintworth GK, Afshari NA, Gregory SG; FECD Genetics Consortium. Mitochondrial polymorphism A10398G and Haplogroup I are associated with Fuchs' endothelial corneal dystrophy. *Invest Ophthalmol Vis Sci.* 2014 Jun 10;55(7):4577-84. <https://doi.org/10.1167/iovs.13-13517>

Malik D., Hsu T., Falatoonzadeh P. et al. Human retinal transmitochondrial cybrids with J or H mtDNA haplogroups respond differently to ultraviolet radiation: implications for retinal diseases. *PLoS One.* 2014 Jun 11;9(2):e99003. <https://doi.org/10.1371/journal.pone.0099003>

Mathew, TM. GenSpaceBase©-Learning the Genetic Risks of Space Travel for Astronauts and Cosmonauts. Presented at the 64th International Congress on Aviation and Space Medicine (ICASM), Nov 6-10, 2016, New Delhi, India.

Mathew, TM. New Frontiers for Aerospace Medicine: Genetic Health Profile & ID for Earthlings, Space Travelers, and Future Citizens of Space. Abstracts of the Aerospace Medical Association (AsMA) 85th Annual Scientific Meeting, May 5-10, 2014, San Diego, California. *Aviat Space Environ Med.* 2014 Mar; 85 (3):215-374. <https://www.ncbi.nlm.nih.gov/pubmed/24783630>

Quintana-Murci L, Weale ME, Thomas MG, Erdei E, Bradman N, Shanks JH, Krausz C, McElreavey K. Y chromosome haplotypes and testicular cancer in the English population. *J Med Genet.* 2003 Mar;40(3):e20. <http://dx.doi.org/10.1136/jmg.40.3.e20>

Symonette CJ, Adams PC. Do all hemochromatosis patients have the same origin? An analysis of mitochondrial DNA and Y-DNA. *Can J Gastroenterol.* 2011 Jun;25(6):324-6. <https://doi.org/10.1155/2011/463810>

Wang Z, Parikh H, Jia J, et al. Y chromosome haplogroups and prostate cancer in populations of European and Ashkenazi Jewish ancestry. *Human Genetics.* 2012 Jul;131(7):1173-1185. <https://doi.org/10.1007/s00439-012-1139-5>

Wu, Y., Wang, XH., Li, XH. et al. Common mtDNA variations at C5178a and A249d/T6392C/G10310A decrease the risk of severe COVID-19 in a Han Chinese population from Central China. *Military Med Res* 8, 57 (2021).

<https://doi.org/10.1186/s40779-021-00351-2>

Zifa E, Daniil Z, Skoumi E, Stavrou M, Papadimitriou K, Terzenidou M, Kostikas K, Bagiatis V, Gourgoulialis KI, Mamuris Z. Mitochondrial genetic background plays a role in increasing risk to asthma. *Mol Biol Rep*. 2012 Apr;39(4):4697-708.

<https://doi.org/10.1007/s11033-011-1262-8>