The Lifetime Surveillance of Astronaut Health

NEWSLETTER

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Editor's Note

BY **RONNIE RAFANAN (Aegis Aerospace)**

Welcome to the April 2025 issue of the Lifetime Surveillance of Astronaut Health (LSAH) Newsletter. In this issue, we will introduce you to the new LSAH/LSDA lead, Ruth Reitzel, PhD, and share with you articles related to astronaut medical data collection and analysis and how they help shape the future of manned spaceflight. Be sure to check out our recurring *Clinic Corner* and *HRP Corner* as well. *Enjoy!*

In this Issue…

CLINIC CORNER:
LSAH Exam Numbers for 2024

BY **DR. TIM LAVAN (NASA JSC)**

Welcome to the Spring 2025 update. While you are reading this in April, I am writing this in February, so we have just completed the end-of-year (astronaut reunion) burst of physicals and are deep in the midst of another round of astronaut selection physicals. We were happy to see another strong year with another enthusiastic turnout, especially around reunion time. With **31** physicals completed (20% of all physicals completed in 2024) during the weeks before and after the reunion in December 2024, we completed a grand total of **154** physicals in 2024. We sent out **246** invitations for exams, so **62.6%** of invitations were accepted, getting us back to our steady state, pre-COVID rate. Selection of the new class of astronauts is going smoothly, and we expect this class to carry on the strong tradition of excellence seen throughout the history of the astronaut corps.

As a reminder, getting your annual surveillance exam helps not just you but the rest of the astronaut corps, both active and retired. Because we have so few astronauts in the pool of "subjects" and astronauts are so healthy to start out, it is often very difficult to identify small upticks in the incidence of chronic illnesses. This is especially problematic when searching for "signals" of diseases that have long latency periods (the time from an exposure until onset of detectable aspects of the disease). We hope that the annual surveillance will help identify chronic illnesses in their earliest phases, enabling individuals to seek earlier and more effective treatment. Each exam adds to both numerator and denominator data when performing epidemiologic calculations, contributing to the body of knowledge about potential spaceflight associated medical conditions.

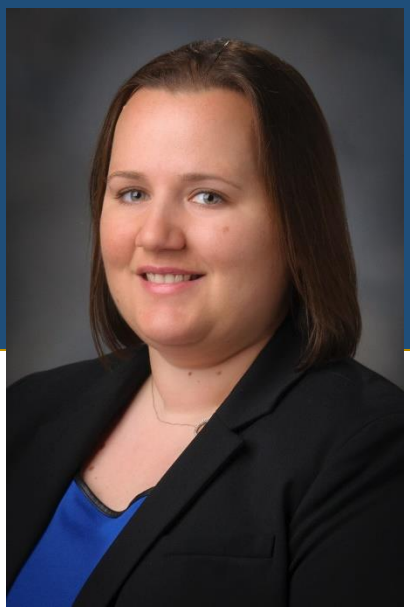
As a further reminder, the surveillance exam is not designed to replace regular medical care with a primary care provider, so we encourage all to continue to seek regular care with a PCP, and we are happy to provide the data from the surveillance exam to these providers. Further, for those who choose not to travel to Houston for an exam at the JSC Clinic, we would still welcome any data you are willing to provide from your regular provider. Contact us here at the Clinic for details about how we can conveniently and securely request, transfer, and store this data.

We are always happy to see our LSAH friends here in the Clinic. Reach out if there is anything we might be able to help with and we will see what capabilities we have.

If you are interested in scheduling your annual visit, on-site or virtual, please feel free to call the FMC and we will help you get it set up. **Flight Medicine Clinic (FMC): (281)483-7999**

LSAH Team Spotlight:
Meet **Ruth Reitzel, PhD**

By **Mary Van Baalen, PhD (NASA JSC)**



Ruth Reitzel, PhD

In June 2024, Ruth Reitzel, PhD, joined NASA as the Epidemiology & Data Analytics Lead overseeing Lifetime Surveillance of Astronaut Health (LSAH) and Life Sciences Data Archive (LSDA). Ruth is a critical part of the Space Medicine Operations Division in the Exploration Medical Integration Office, enabling the appropriate use of archived astronaut data and epidemiologic data analysis in the Agency's data driven decision making.

Ruth comes to Houston from San Antonio, by way of College Station where she originally studied Animal Science at Texas A&M University with the intention to go to veterinary school. While studying and working in a research lab at the vet school, she realized she was far more interested in researching genetic interactions and why bacteria cause disease in some hosts but not others. This led to an additional degree in genetics and diving headfirst in the world of biomedical research.

For the next 15 years, Ruth worked studying infectious disease at MD Anderson Cancer. The scope of her work broadened from understanding the genetic aspect of infectious disease to biomedical engineering and the development of medical devices that prevent device related infections for which cancer patients are at high risk. Ultimately the goal was to move novel devices from bench science, through pre-clinical investigations, to clinical trials, FDA approval, and ultimately to the clinic for patient use. During that time, Ruth also earned a MSPH and PhD in Epidemiology at UT Health School of Public Health, as well as a Professional Project Management (PMP) certification.

In 2020, Ruth changed careers from the epidemiology of infections in cancer to mitigating health risks in astronauts. She joined KBR and LSAH as the contractor project manager responsible for managing the appropriate re-use of astronaut medical and research data. The skill sets of an epidemiologist and project manager allow for understanding unique epidemiologic challenges to the re-use of data in the astronaut corps (privacy concerns, small populations, appropriate interpretations, how the data was archived) driving the scope and schedule of LSAH projects and data requests.

In the last 10 months, Ruth has been focused on enabling the appropriate analysis and re-use of astronaut data to inform decisions made in buying down risk to the astronauts. This includes

- Working to develop the NASA Life Science Portal (NSLP - https://nlsp.nasa.gov/), the platform for the LSDA archive portal to request archived medical and research data.
- Working to enhance archiving capabilities to better support re-use of research data and secondary data analysis.
- Conducting occupational surveillance activities and understanding individual variability in astronaut outcomes. Ruth has also been working with many Agency stakeholders in communicating that **astronauts spend a lot of their time having data collected** throughout their career, NASA has that vast wealth of data archived, and **it should be used to make Agency decisions.**

“Car Bees” hive at Fairlane Farms

On a personal level, Ruth and her husband Josh have a small hobby farm, Fairlane Farms, in Santa Fe, Texas. Ruth had wanted to be a beekeeper for many years, fascinated with the biological system of honeybees. Unfortunately, as you can imagine, living in a suburban neighborhood was not conducive to beekeeping. It was a sign of amazing things to come when they purchased undeveloped land and the seller left a 1965 Ford Fairlane on the property—full of bees! It became her first hive, the “car bees,” and the beginning of Fairlane Farms.

NASA Mortality Assessment Group

By **Jacqueline Charvat, PhD (KBR) & Christopher Coble-Upton, MPH (Aegis Aerospace)**

Mortality is defined as the state of being mortal. In epidemiology mortality is a common principle to understand the number and causes of death in a population. In the United States, the Centers for Disease Control (CDC) routinely analyzes mortality data to help assess healthcare and public health activities (see CDC MMWR). Common uses for mortality data are to longitudinally compare rates of deaths during certain periods to evaluate whether changes in policy, exposures, or treatment have changed death rates. A common example to show this is the changes in death rates due to lung cancer after changes in legislation for selling tobacco. For NASA, the Lifetime Surveillance of Astronaut Health (LSAH) routinely collects and analyzes mortality data to understand aging and the effects of spaceflight among our crewmembers based on available medical records, death certificates, and autopsy reports.

Mortality data are reported using death certificates. Following a pronouncement of death—typically by a physician or nurse practitioner—information surrounding the death event is recorded on a death certificate. This certifying health care practitioner will utilize medical training, knowledge of medicine, available medical history, symptoms, diagnostic tests, and autopsy results, if available, to determine, with their best medical opinion, the cause of death. For LSAH epidemiologist purposes, the most important pieces of information on a death certificate are the cause of death and the causes that lead to the death. As we age, we may have several co-morbid conditions that could lead to death; these are also listed on a death certificate.

An autopsy is a postmortem examination performed by a pathologist. It remains the gold standard for cause of death determination. Data from these examinations should always be used if it is an option since the cause of death comparisons between death certificates and autopsies differed by up to 50% in various studies. However, an autopsy is only conducted in 5% of deaths in the United States. For astronauts, this has been slightly higher at nearly 17%. In an attempt to improve understanding of disease that may lead to death among astronauts and obtain as complete as possible data upon death T*he Non-Accident Investigation Astronaut Autopsy Program* was established following the TREAT Act (14 CFR Part 1241). This piece of legislation is part of NASA's ongoing mission to better understand the long-term health effects of spaceflight. This program intends to obtain post-mortem information from former NASA astronauts. After approval from the next of kin, the Armed Forces Medical Examiner System (AFMES) conducts the autopsy and provides NASA with the results including all lab reports and imaging.

Because of possibly inconsistent data reported on death certificates and the low rate of autopsies, NASA epidemiologists are creating a Mortality Assessment Group. This group will review the death certificate information, autopsy reports as available, and any recent medical records that are available in the JSC Electronic Medical Record. This group will decide, based on the provided information, how to record the cause of death in the LSAH records. Reports of these data will then be standardized to internal and external researchers and presented in a future newsletter article. Because of the unique exposures of spaceflight, studying cause of death aids NASA epidemiologists in understanding the health effects of space, especially as astronauts age.

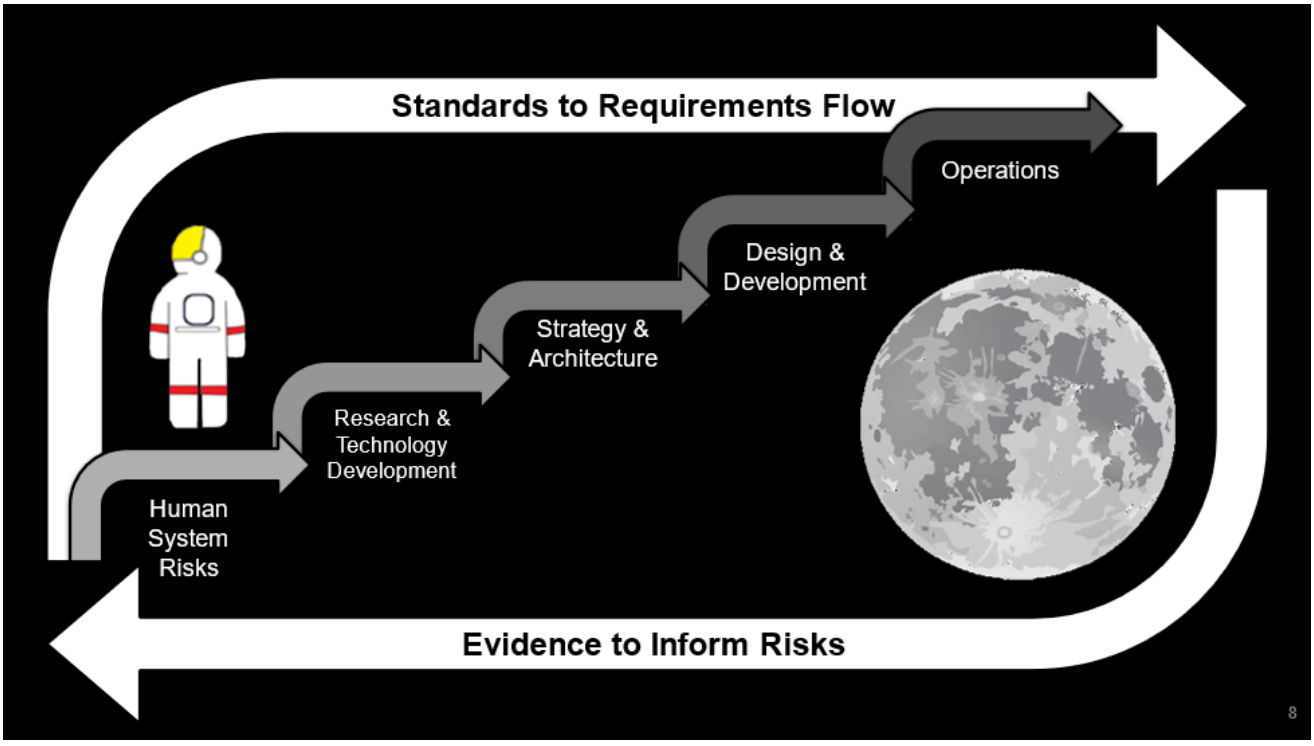
NASA Data Collection Informs the Human System Risks

BY **MARY VAN BAALEN, PHD (NASA JSC)**

Risk is inherent in human spaceflight. However, there are specific risks that can and should be understood, managed, and mitigated to reduce threats posed to astronauts. The relevant evidence in life sciences, medicine, engineering, and spaceflight operations is tracked and evaluated to identify ways to minimize overall risk to the astronauts and to ensure mission success. The goal of Human System Risk Management is to articulate and track these Risks to ensure knowledge gained through human spaceflight and advances in applicable terrestrial medicine and human performance are captured, documented, and applied in evolving human spaceflight programs to reduce the risks to the astronauts.

The largest contributor to the knowledge base is data collected on astronauts as part of their medical care as well as from their participation in human research. This data collection, the evidence base, starts with astronaut selection and continues throughout the career and into retirement. These data are archived and managed to allow future data mining for additional knowledge.

The graphic below illustrates how the Human System Risks inform the spacecraft design and development process. Gaps in the evidence base provide priorities for research and technology development which then drives the strategy and architecture and design and development. Once spaceflight operations commence, data is collected and fed back to the data archives and used to support the Human System Risk assessments.



Credit: NASA

Given the ambitious goals of the Artemis campaign, the character and magnitude of the hazards have shifted from those in low Earth orbit operations. New challenges will be encountered because new vehicle designs and mission tasks will place unprecedented demands on astronauts' capabilities during the lunar missions. In addition, health risks are expected to escalate with the lengthening duration of exposure to the spaceflight environment and distance from Earth. Those same extended spaceflights are expected to increase risk to the long-term health (LTH) of astronauts after the mission. Currently, data are being evaluated to provide evidence to ensure the success of these mission. In planning for Mars, the focus will shift once again.

References:

Antonsen, E. L., Connel, E., Anton, W., Reynolds, R.J., Buckland, D. M., & Van Baalen, M., (2023) *Updates to the NASA human system risk management process for space exploration,* npj Microgravity Vol 9, 72

Romero, E and Francisco, D., (2020), The NASA human system risk mitigation process for space exploration *Acta Astronautica* 175 606–615

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https://www.nasa.gov/directorates/esdmd/hhp/human-system-risk-board/

HRP Corner:

Highlights from the 2025 HRP Investigators' Workshop

BY **DINA FINE MARON (PCI PRODUCTIONS)**

NASA's Human Research Program (HRP) held its annual Investigators' Workshop (IWS) earlier this year in Galveston, Texas. From January 28–31, researchers from around the world convened at IWS 2025 to discuss the cutting-edge science that helps keep astronauts safe and healthy in space. IWS 2025 also celebrated the 20-year anniversary of HRP!

Some highlights include the speed networking and career development tables, HRP's 20th anniversary celebration mixer, and nine student travel awards given to undergraduates to enable their participation.

Here's a breakdown of the workshop by the numbers:

- 3,086 registrants (up ~17% from last year!)
- 1,573 in-person attendees (up ~11% from last year!)
- 62 countries represented (up 15% from last year!)
- 212 oral presentations
- 400 poster presentations
- 730 interns/postdocs/students
- **More than 11,000 visits to the IWS website!**

David Baumann, Human Research Program director, delivers opening remarks at IWS 2025.

This year's workshop featured the second annual John B. Charles Memorial Lecture and Award, a 60-minute presentation from an up-and-coming human spaceflight research scientist that dives into an area of intriguing research that affects NASA's missions. This year's lecture was presented by Dr. Catherine Davis, a professor in the department of pharmacology and molecular therapeutics at the Uniformed Services University of the Health Sciences in Bethesda, Maryland. Her talk focused on space radiation and what we're learning from rodent research about how radiation affects the central nervous system. Space radiation, though invisible to the human eye, is considered one of the most hazardous aspects of human spaceflight.

Catherine Davis delivering a plenary talk at IWS 2025.

Networking and career development sessions at IWS 2025

The workshop also featured a plenary talk given by NASA astronaut Mike Barratt. He's logged a combined total of 446 days in space and most recently returned to Earth on October 25, 2024, after spending eight months aboard the International Space Station. He spoke about his own participation in the Complement of Integrated Protocols for Human Exploration Research (CIPHER) experiment and provided his personal insights about what life is like in space: from pre-launch health care to preferred foods in space and much more. [You can watch his talk here.]

NASA Astronaut Mike Barratt delivering a plenary talk at IWS 2025.

This year's overarching theme was partnerships: international, commercial, among government agencies, and more. A new partnership on display at this year's IWS was a partnership with the HUNCH (High school students United with NASA to Create Hardware) program. The top 25 HUNCH teams presented their NASA-funded projects during the poster sessions, and there was so much excitement about the work and passion that the students brought that the HUNCH Manager is hopeful for future participation.

HUNCH teams presenting at IWS 2025

December 2024 Astronaut Reunion!

Had a great time at the December 2024 Astronaut Reunion? We'd like to hear from you! Feel free to send us any pictures you would like for others to enjoy,and we will include them in a collage in the October 2025 newsletter! Email us at jsc-lsah@mail.nasa.gov and include "**Formers Corner**" in the subject line. Looking forward to hearing from you!

Did you move? New email address? Remember to update us so we can continue to send you the LSAH Newsletter, LSAH invitational physical exam letters, and any other news we may need to share with you. Contact Denise Patterson at 281-244-5195 or denise.a.patterson@nasa.gov.

You may also write us at

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