UNIVERSITY OF KENTUCKY RESEARCH FOR KENTUCKY

Ilhem Messaoudi, Acting Vice President for Research

University of Kentucky

Hi. I'm Ilhem Messaoudi.

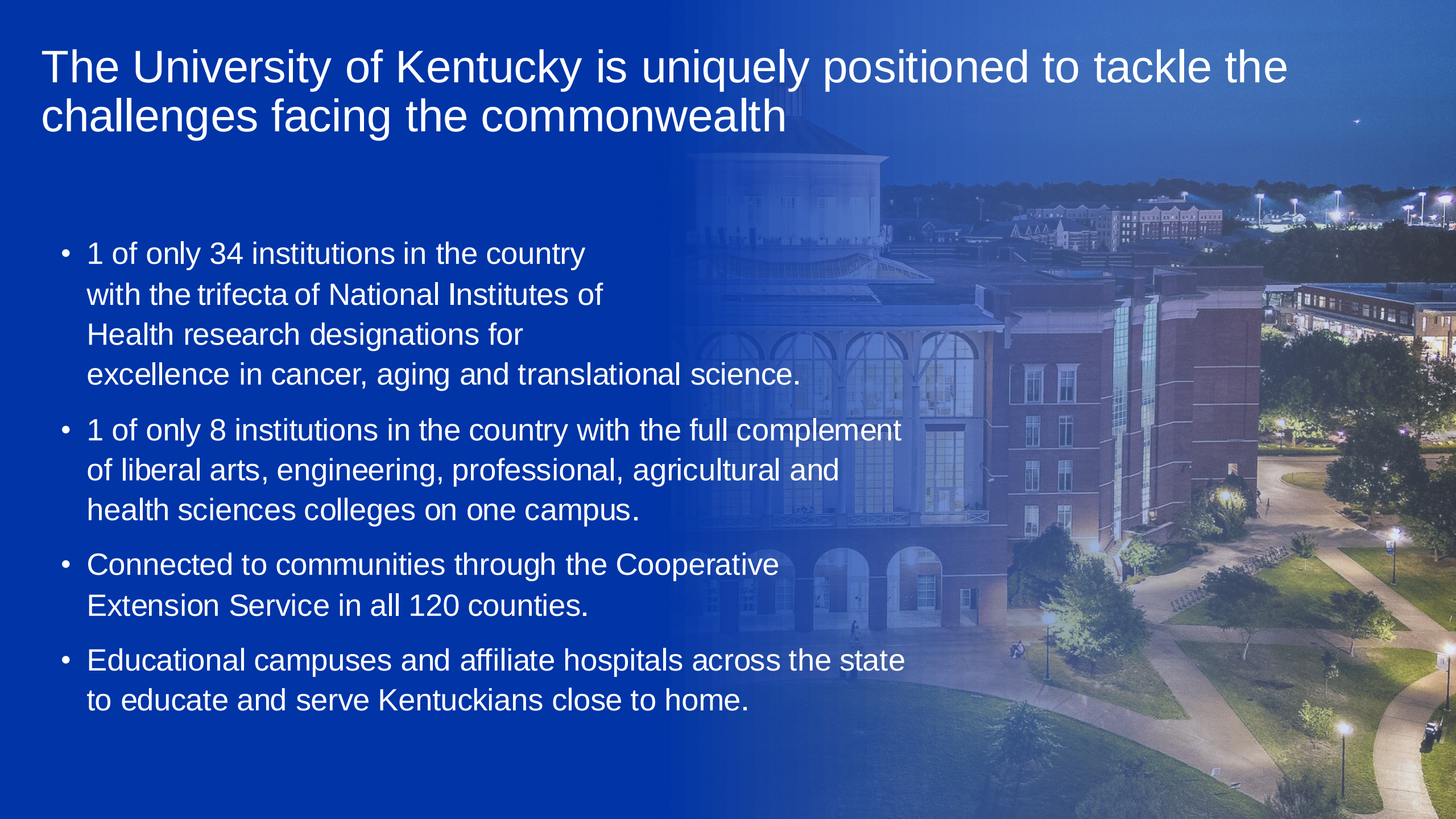
- Came to UK in 2021, currently a professor and chair in the Department of Microbiology, Immunology, and Molecular Genetics in the College of Medicine.
- Research focus
  - Infectious diseases
  - Substance use disorder
  - Maternal and fetal health
- Appointed Acting Vice President for Research at the University of Kentucky in September 2024.
- Lead the university's research enterprise, overseeing the development of research proposals, administration of grants and contracts, human subjects protection, 14 multidisciplinary research centers and institutes, and eight service core facilities.
- Provide leadership for university's eight Research Priority Areas focused on addressing Kentucky's most pressing challenges.

In 2022, Kentucky ranked:

- 2nd in cancer deaths
- 3rd Hepatitis C rates
- 3rd in septicemia
- 4th in influenza & pneumonia deaths
- 18th in HIV deaths
- 7th in overdose deaths
- 8th in heart disease deaths
- 9th in diabetes-related deaths
- 10th in obesity prevalence
- 16th in strokes
- 6th in maternal mortality
- 7th in preterm births
- 28th in infant deaths

Source: 2022 National Center for Health Statistics, Stats of the States. CDC.

The University of Kentucky is uniquely positioned to tackle the challenges facing the commonwealth

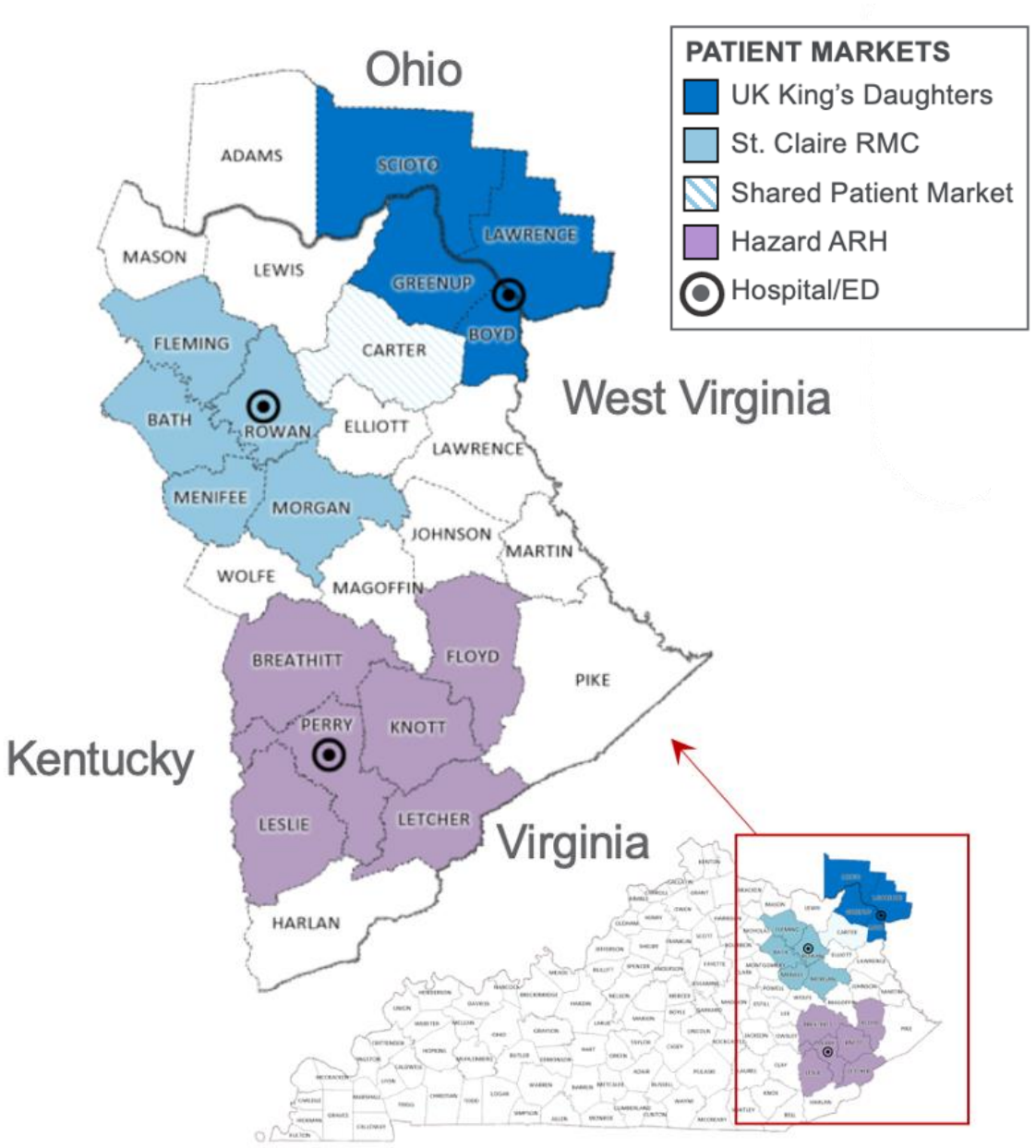


- 1 of only 34 institutions in the country with the trifecta of National Institutes of Health research designations for excellence in cancer, aging and translational science.
- 1 of only 8 institutions in the country with the full complement of liberal arts, engineering, professional, agricultural and health sciences colleges on one campus.
- Connected to communities through the Cooperative Extension Service in all 120 counties.
- Educational campuses and affiliate hospitals across the state to educate and serve Kentuckians close to home.

Eradicating Hepatitis C

Comprehensive Hepatitis C Eradication and Care in Kentucky Emergency Departments (CHECKED)

- The UK research team developed a screening model in Emergency Departments (ED) across three rural sites in Kentucky:
    - St. Claire HealthCare, Morehead
    - Hazard Appalachian Regional Healthcare
    - King's Daughters, Ashland
- By focusing on screening and linking patients to follow-up care, UK is targeting this viral infection.



Healthy pregnancies

Roughly 20 of every 1,000 babies born in Kentucky in 2020 had symptoms of neonatal opioid withdrawal syndrome (NOWS) — the third-highest rate in the U.S.

In Appalachia Kentucky, that frequency increases to 77 babies of every 1,000.

Opioid use during pregnancy can increase the risk of neurodevelopment impairment in babies born with NOWS.

A team of researchers, led by AVPR Ilhem Messaoudi and John O'Brien, are studying the health of the placenta and what long-term effects there may be for the baby.

From coal fires to pharmacies

In 2012, College of Pharmacy's Jon Thorson began "bioprospecting," looking for new organisms that could be useful to make drugs.

Thorson worked with Jim Hower at the Center for Applied Energy Research to study the remains of Kentucky's Ruth Mullins coal fire that's burned for more than a decade.

Using an enzyme found in the soil in the coal fire smoke vents, the team made new and more effective versions of the antibiotic daptomycin.

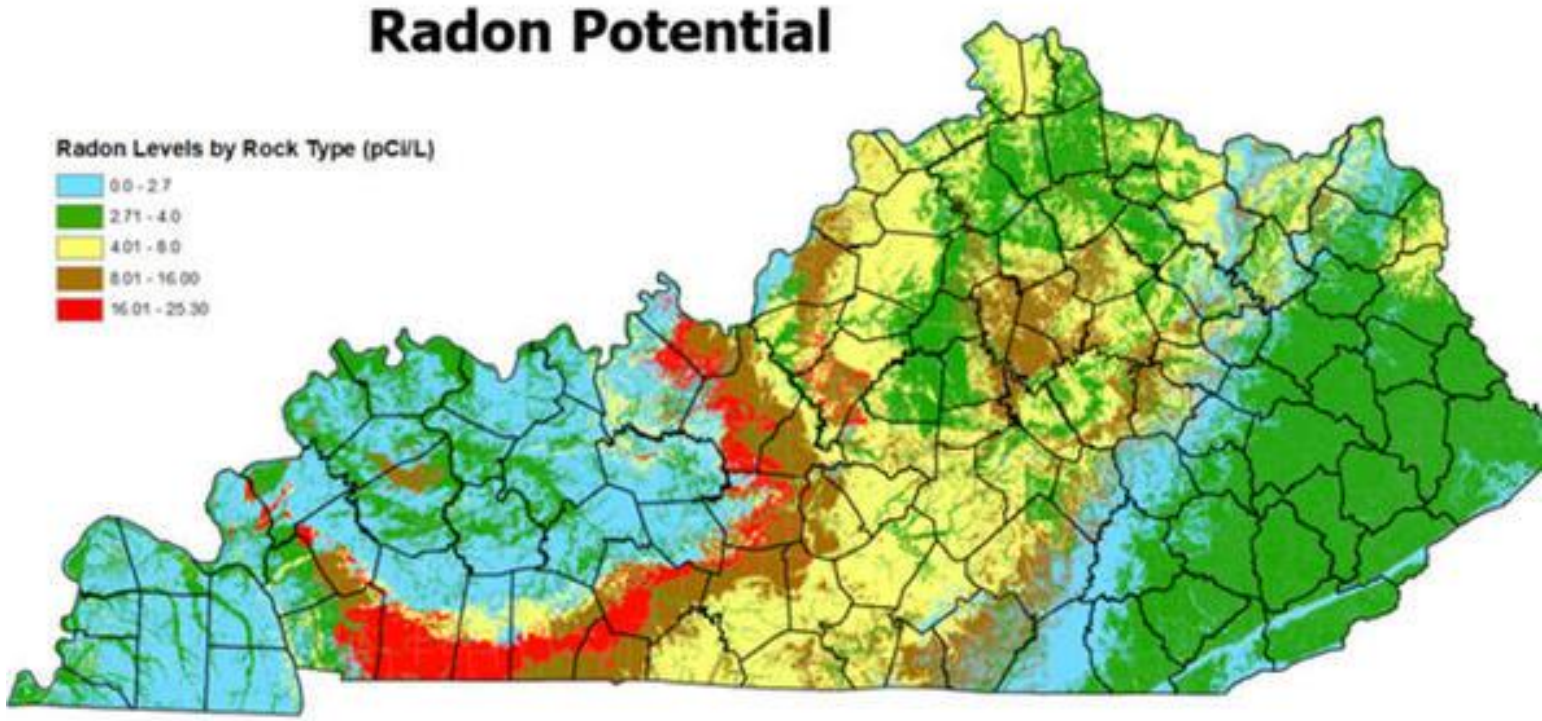
Daptomycin treats skin infections, infections in bloodstream, endocarditis.

Radon citizen science

Researchers at UK and the Kentucky Geological survey are working with public libraries and the Health Education Center to engage citizens by loaning detection equipment to collect data and educate on radon exposure.

Because of the geologic makeup, many Kentuckians are unknowingly exposed to the radioactive gas.

It contributes to roughly 1,000 new cases of lung cancer a year.



Predicting pandemics

UK is one of four institutions to earn the U.S. National Science Foundation's Predictive Intelligence for Pandemic Prevention program, an $18 million award.

Pigman Engineering's Scott Berry leads a team focusing on environmental surveillance by combining social science, engineering, bioinformatics and risk modeling at UK and with other institutional partners.

Flash flooding in Appalachia

Communities in Eastern Kentucky are still recovering from devastating flooding in 2022.

Researchers at UK and regional universities are working to understand how the climate and landscape affect flash flooding.

The ultimate goal is to create a better warning system in Appalachia.

Climate resiliency

A $20 million award from NSF EPSCoR is helping advance Kentucky's climate resiliency.

The goals of Climate Resilience through Multidisciplinary Big Data Learning, Prediction & Building Response Systems (CLIMBS):

- Address fundamental knowledge gaps
- Predict and respond to hazards (floods, landslides)
- Target infrastructure improvements (water, power, traffic, communications)

UK leads the eight-institution collaboration.

MacArthur Genius

Arts and Sciences' Loka Ashwood focuses on rural communities in her research.

She studies the intersection of:

- Environmental injustice
- Corporate and state power
- Anti-government sentiment

Her work has helped to address elevated cancer risks in rural Kentucky and empowered communities to take action.

She was honored as a 2024 MacArthur Genius Grant award winner.

Tackling implant infection

Implant infection happens frequently and can pose severe complications.

Pigman Engineering's Martha Grady studies the first step of an infection — the biofilm made up of bacteria.

Grady's work may ultimately lead to development of new antimicrobials to make implants safer in the body.

Virtual reality in health care

Researchers in the arts and neurology are studying how virtual reality tools can be used to mitigate the effects of Alzheimer's disease and related dementias.

The team includes:

- Amanda Glueck (College of Medicine)
- Jordan Harp (College of Medicine)
- Dima Strakovsky (College of Fine Arts)

Replicating success

Kentucky has the nation's highest lung cancer incidence and mortality rates.

The Commonwealth has the second-highest lung cancer screening rate.

A groundbreaking lung cancer screening project co-led by the UK Markey Cancer Center and University of Colorado Cancer Center is expanding to other states played a key role in the turnaround.

Jennifer Redmond Knight (College of Public Health) and Timothy Mullet (College of Medicine) will help replicate and adapt the program in Nevada and Mississippi.

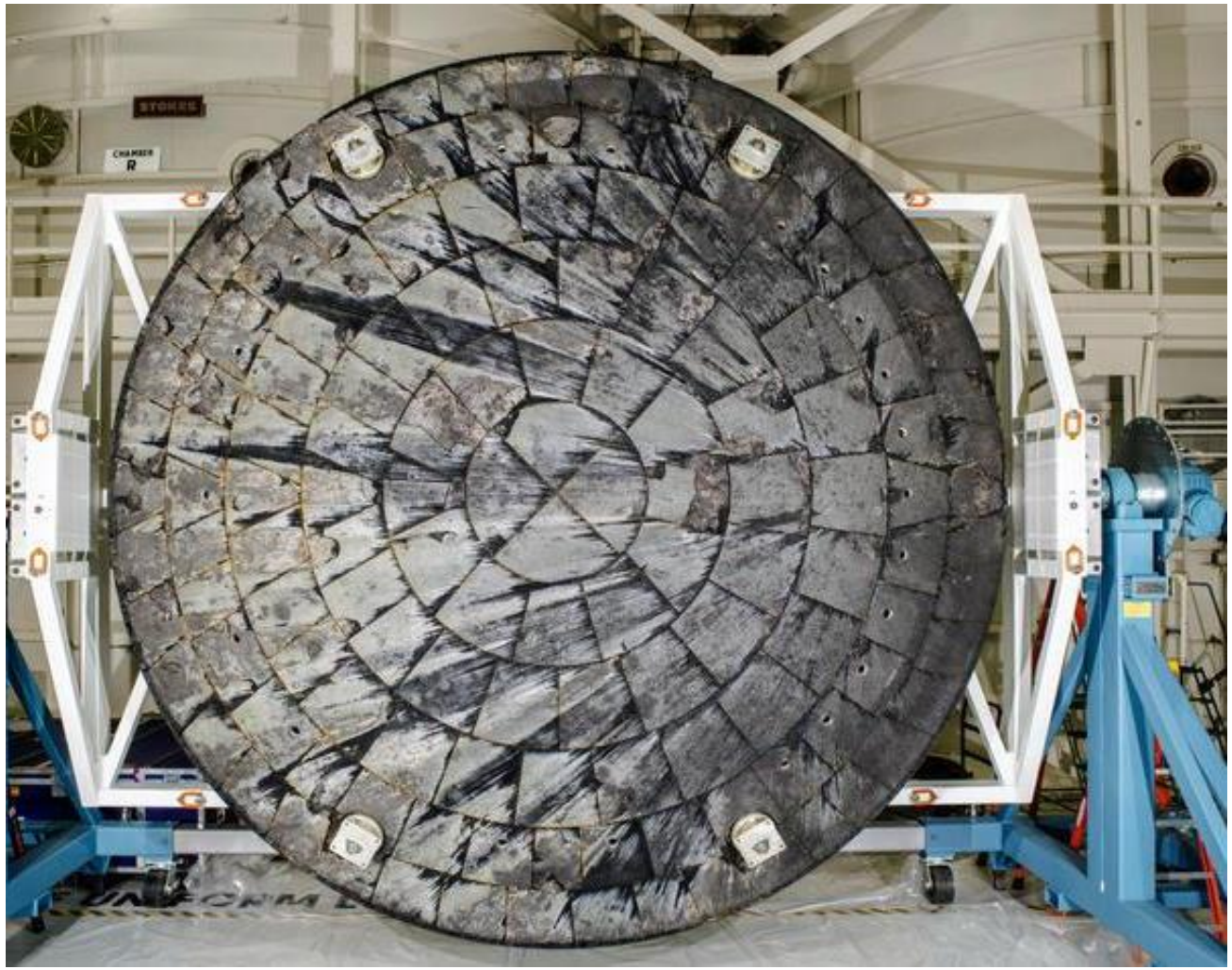
Advancing space travel safety

UK researchers are improving heat shields for NASA's Artemis Program.

Heat shields protect astronauts during a spacecraft's re-entry into Earth's atmosphere.

NASA's Artemis II is the first crewed mission to the Moon since Apollo.

Pigman Engineering's Alexandre Martin leads the research team advancing technology critical to the success of space exploration.



How do we continue to advance our research mission to meet the needs of the Commonwealth?

- Cultivate and Recruit Talent
  - Recruit talent from within and outside the state.
  - Turn Kentucky into a magnet for talented researchers.
  - Develop a pipeline of talent from within our communities.
- Invest in Talent
  - Support for faculty effort.
  - Enhance Infrastructure/Capacity to Accommodate Talent
  - Need for new or renovated research space.
  - Modernize our shared services cores.

Healthy Kentucky Research Building

- Opened: 2018. Fully operational: 2022.
- 300,000 square feet
  - 12,800 square feet of Vivarium space
  - 12,861 square feet of public research collaboration space
  - 63 laboratories in collaborative neighborhoods
- 642 HRKB researchers
  - 122 faculty (principal investigators)
  - 258 trainees (undergraduate, graduate and postdoc)
  - 262 support staff
- $190 million in HKRB-supported research & development since 2018
- Research targeting health disparities in cancer, diabetes & obesity, cardiovascular diseases & stroke, infectious diseases, neuroscience, and substance use disorder.
- **HKRB is at 100% capacity.**

HEALTHY KENTUCKY RESEARCH BUILDING (HKRB) 2

Vision for a new research building

- **Transdisciplinary research:** breaking traditional research boundaries and advancing research to deliver tangible societal benefits.
- **Imagine:** Researchers using AI to identify new, optimal materials for medical implants, conducting tissue testing, ensuring safety and efficacy, and launching a clinical trial to deliver solutions to patients in need.
- **The goal:** fuel the transdisciplinary pipeline from bench to bedside to community.
- **The value to Kentucky**:

Breakthrough discoveries are rapidly translated into direct community benefits.

Groundbreaking innovations from UK researchers are safeguarded, commercialized, and brought to market.

Innovative researchers are equipping the next generation of thinkers to tackle Kentucky's unique challenges.

Researchers partner with industry to address current challenges and prepare a skilled workforce for Kentucky's future.

University of Kentucky