



Automation Safety in Agriculture

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CAPT (Retired), US Public Health Service

NIOSH Office of Agricultural Safety and Health

2022 Meeting of the Mine Automation and Emerging Technologies Partnership, September 14th-15th, 2022



Jennifer Lincoln, PhD, CSP

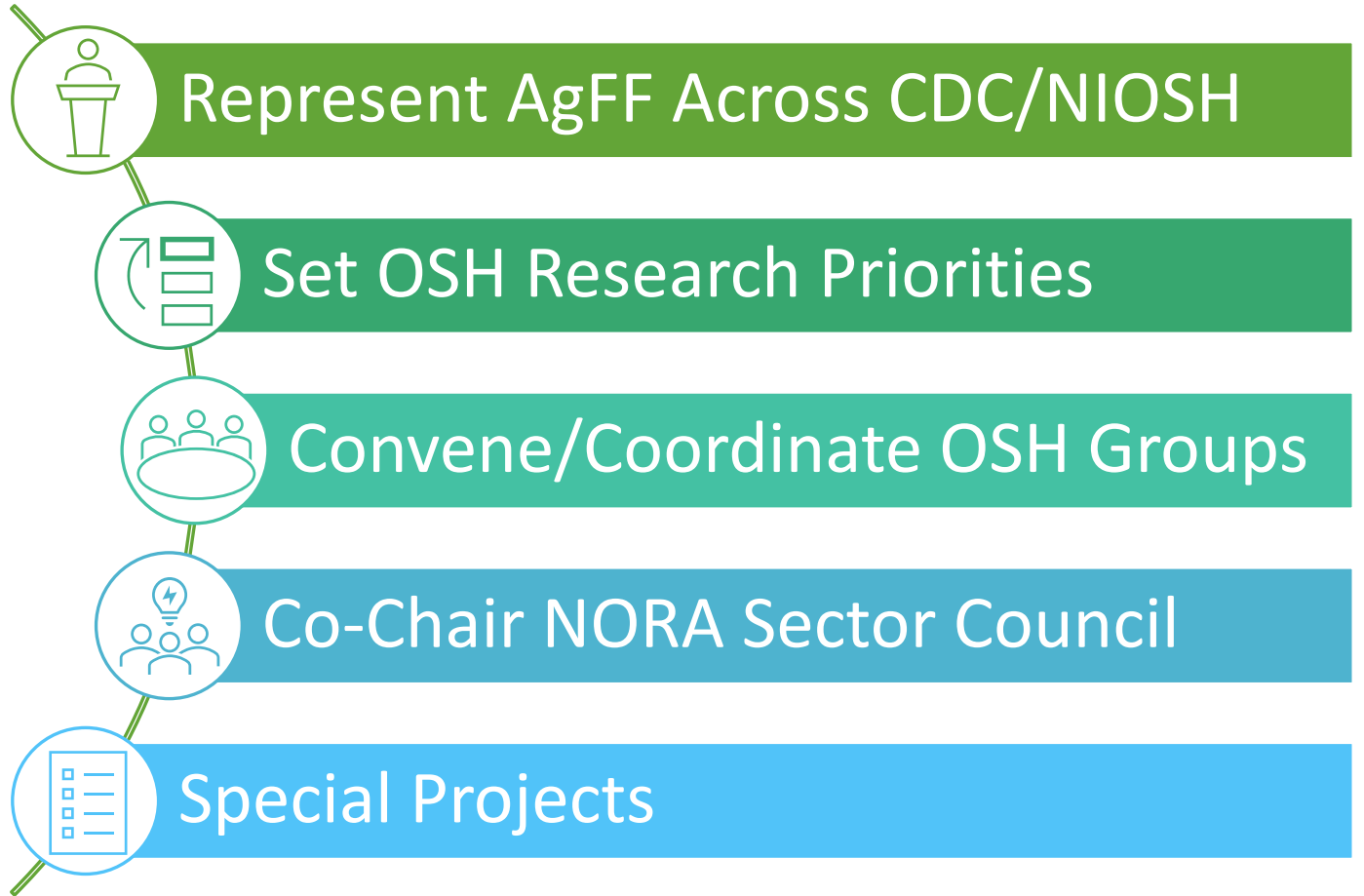
Associate Director

NIOSH, Office of Agriculture Safety and Health

- Injury Epidemiologist
- Focus on preventing traumatic injuries in high-risk industries.
- Known for my work with the commercial fishing industry
- NIOSH Office of Agriculture (forestry and fishing) Safety and Health

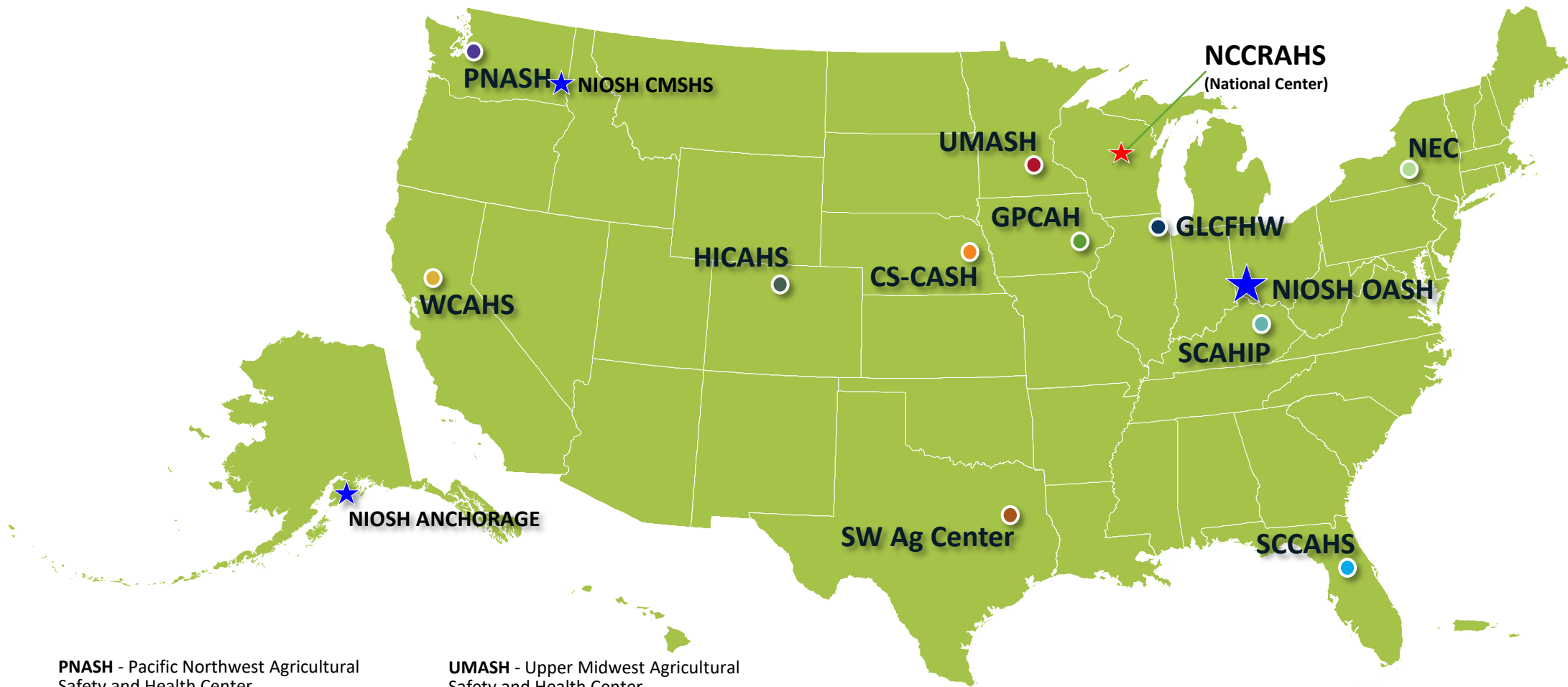


NIOSH Agricultural, Forestry and Fishing Program



[Agriculture, Forestry and Fishing Program | NIOSH | CDC](#)

NIOSH AgFF Offices and Centers for Agriculture Safety and Health



PNASH - Pacific Northwest Agricultural Safety and Health Center

WCAHS - Western Center for Agricultural Health and Safety

HICAHS - High Plains Intermountain Center for Agricultural Health and Safety

CS-CASH - Central States Center for Agricultural Safety and Health

UMASH - Upper Midwest Agricultural Safety and Health Center

GPCAH - Great Plains Center for Agricultural Health

GLCFHW - Great Lakes Center for Farmworker Health and Well-being

SW Ag Center - Southwest Center for Agricultural Health, Injury Prevention and Education

SCCAHS - Southeastern Coastal Center for Agricultural Health and Safety

SCAHIP - Southeast Center for Agricultural Health and Injury Prevention

NEC - Northeast Center for Occupational Health and Safety

NCCRAHS - National Children's Center for Rural and Agricultural Health and Safety

NIOSH CMSHS - NIOSH Center for Maritime Safety and Health Studies (National)

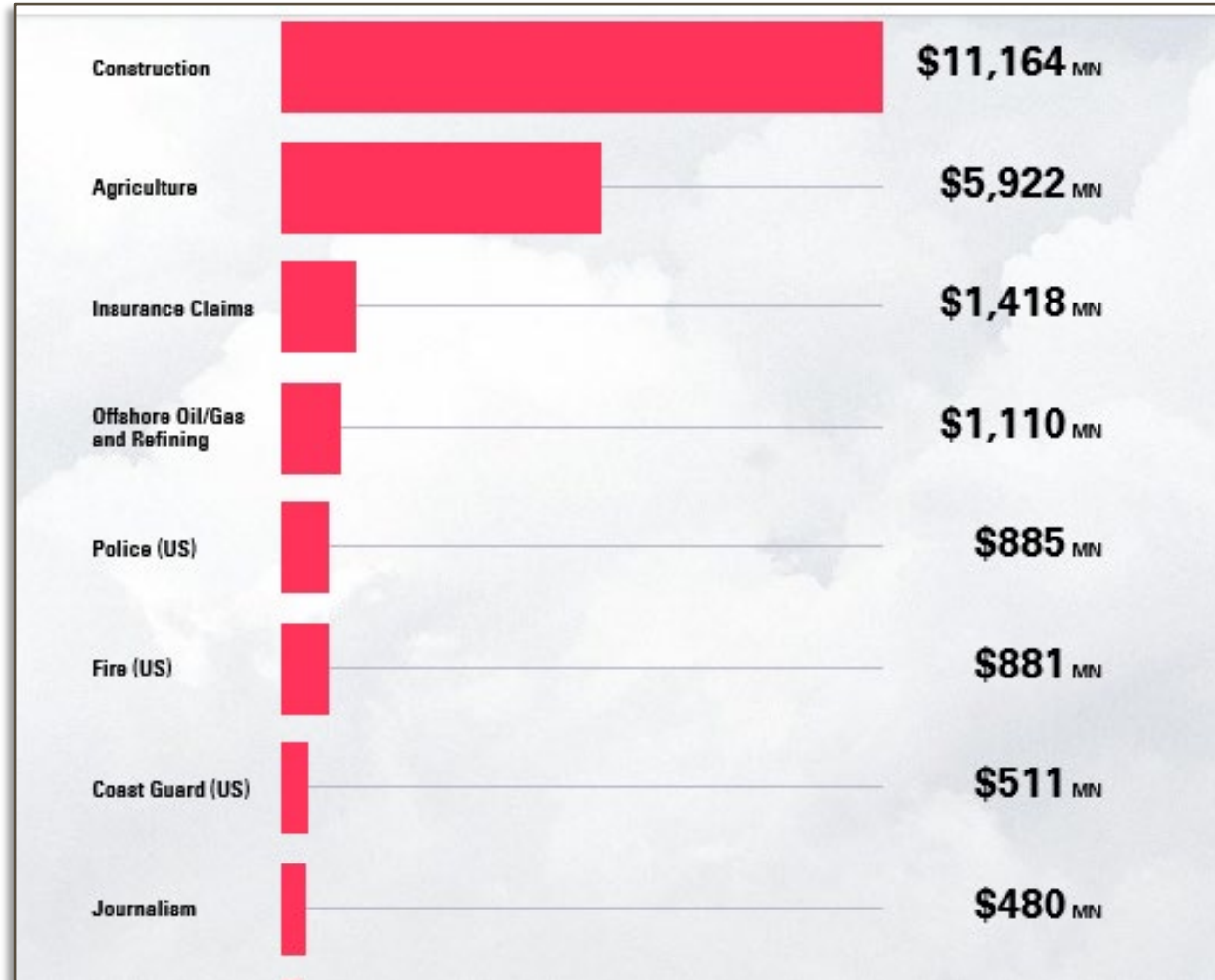
NIOSH OASH - NIOSH Office of Agriculture Safety and Health (National)



NIOSH Center for Occupational Robotics Research



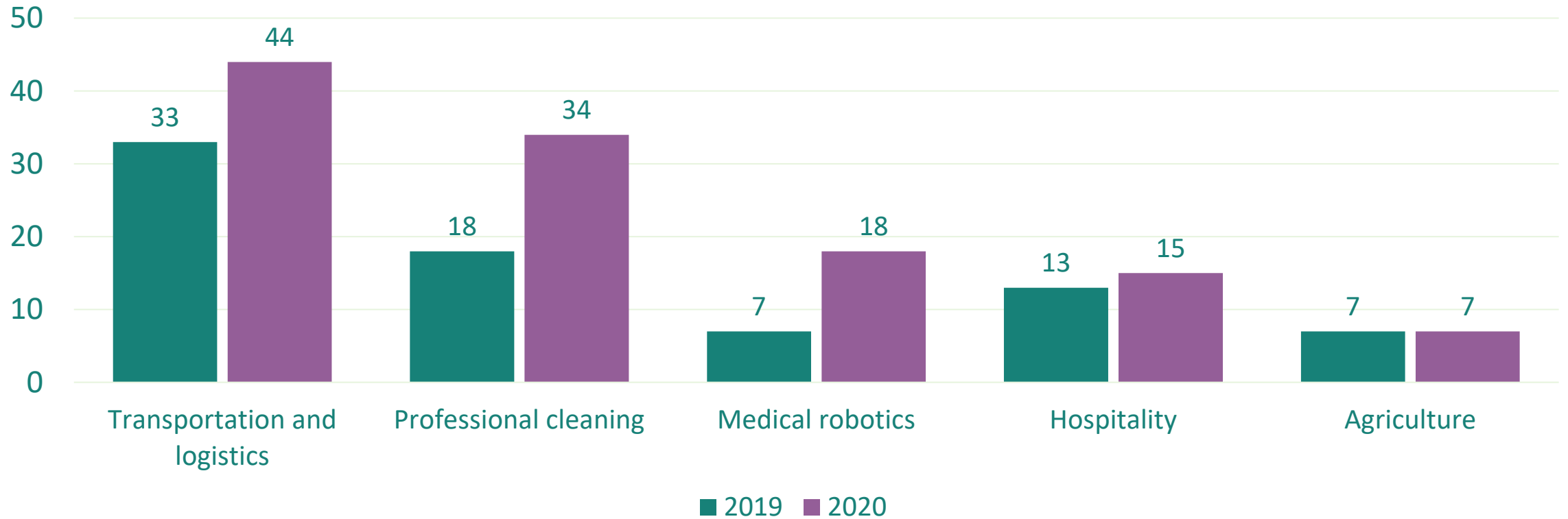
Projected Worldwide Drone Market by Industry/Function



Source: Goldman Sachs Research (2016): [Drones reporting for work](#)

Service Robots for Professional Use

Top 5 Applications: Unit Sales ('000s of Units)



Data source: International Federation of Robotics [2021]. World Robotics Industrial Robots 2021.

Emerging robotic technologies present potential to prevent injury as well as concerns for new hazards

Examples of potential to reduce exposure to hazards

Welding

Traditional robots

Search and rescue

Mobile robots

Heavy lifting
Repetitive motions

Exoskeletons

Inspections

Drones

Examples of potential to introduce hazards

Maintenance injuries

Unintended contact with workers
Ignition of explosive atmospheres

Unintended loading on body
Impacts on balance

Distraction for workers in area



NIOSH Center for
Robotics Research

Emerging
Technologies in Ag
Safety Workgroup

Literature Review

Purpose

- Understanding the current robotic and emerging technologies applied in agriculture
- Determine if studies considered or evaluated the health and safety of the worker by applying these technologies

NIOSH Center for Robotics Research

Emerging Technologies in Ag Safety Workgroup

- **Crop:** Harvesting, vineyard, and greenhouse robots; Spraying, monitoring, and management drones; autonomous tractors, crawlers, and transplanting vehicles; exoskeletons; sensor technology; artificial intelligence; and machine learning
- **Livestock:** Automated milking, milk and pallet feeders; and automated cleaners, sprayers, and herding systems
- **Primary focus:** Productivity, animal/crop welfare
- **Very little research** studied the **physical or psychosocial effects** on agriculture workers

Agricultural Digital Technologies



Risks



Regulations
and
Standards



Current
and Future
Research



Workforce
needs and
Training

OPPORTUNITIES



SAVE THE DATE!

Safety For Emerging Robotics and Autonomous Agriculture (SAFER AG) Workshop

November 9-10, 2022

<https://go.illinois.edu/SAFERAG>



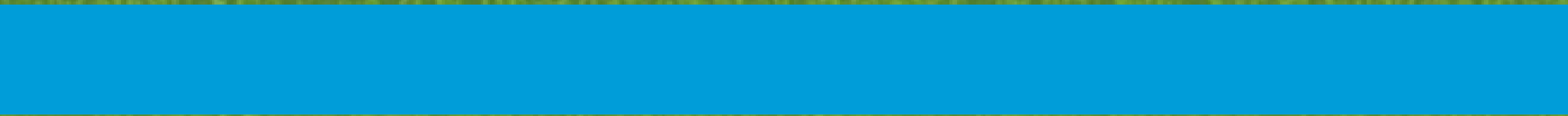
Source: Getty Images

A red and white automatic milking machine (AMR) is positioned in the foreground of a barn. The machine has a red top section with a white handle and a white base. A red cylindrical component is attached to the top. In the background, several brown and white cows are standing in a metal stall, looking towards the camera. The barn has wooden walls and a concrete floor. The word "Risks" is overlaid in white text in the center of the image.

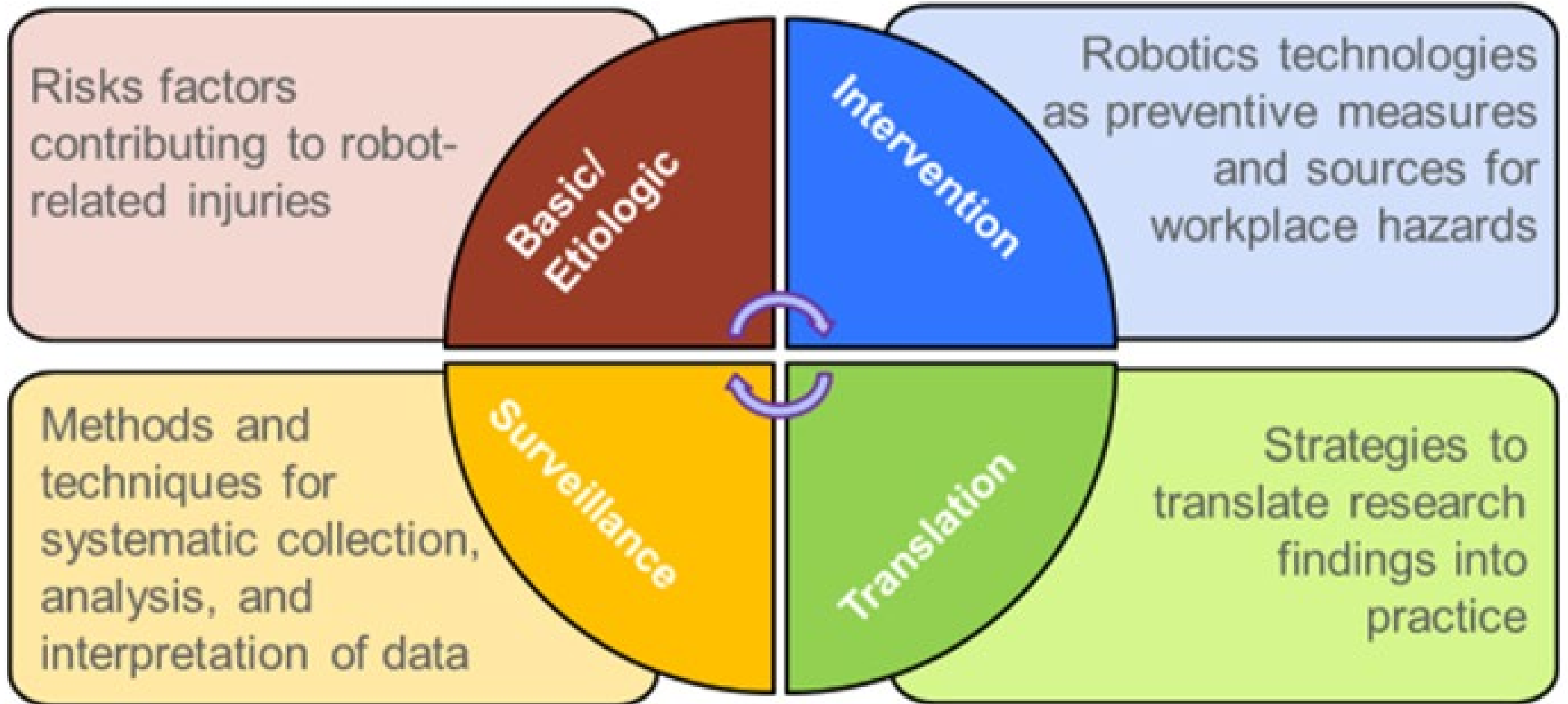
Risks



Regulations and Standards



OCCUPATIONAL ROBOTICS RESEARCH NEEDS





Workforce Needs and Training



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Acknowledgements

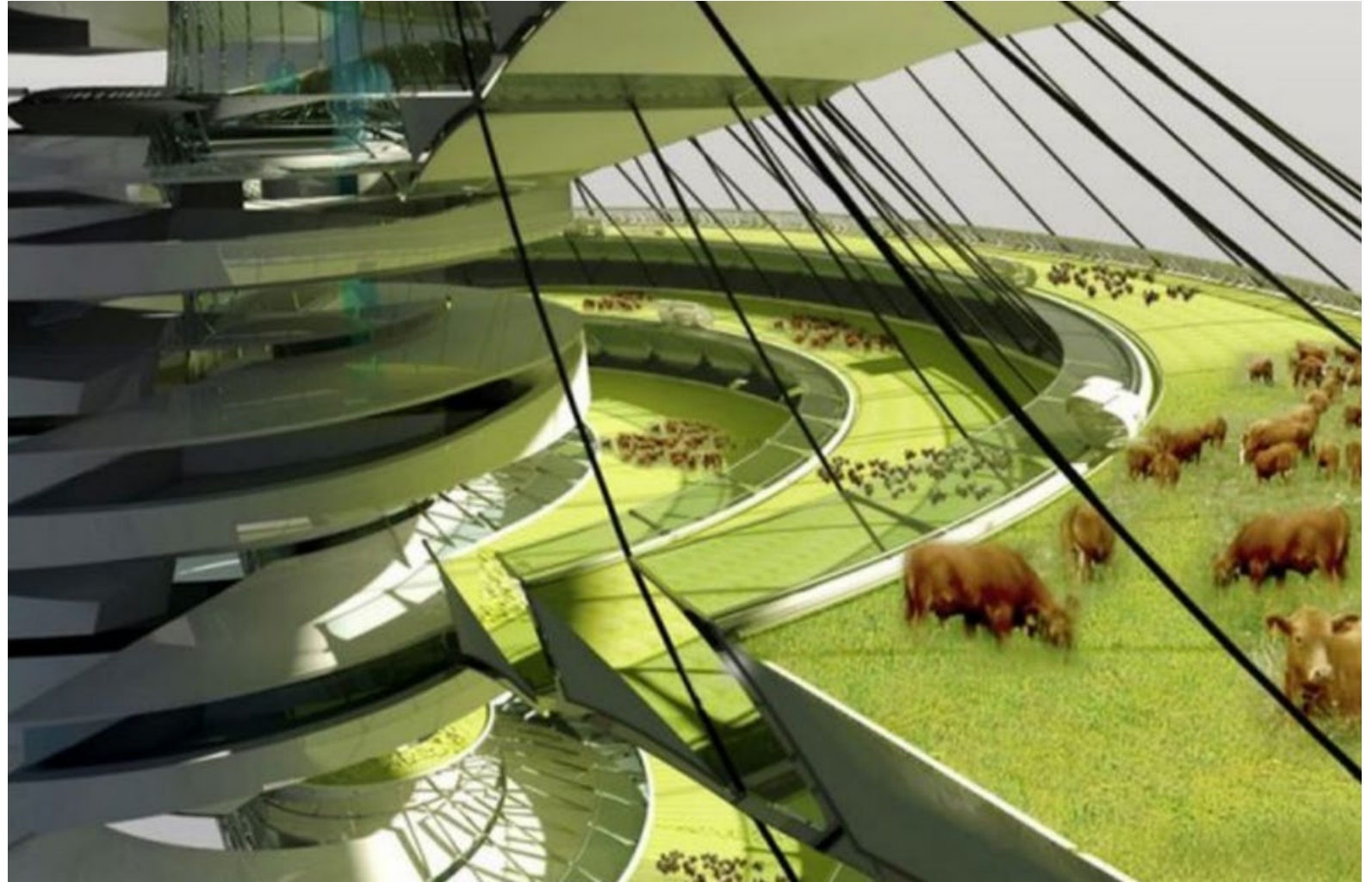
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NIOSH Center for Robotics Research

Emerging Technologies in Ag Safety
Workgroup

Organizing committee for the
SAfety For Emerging Robotics and
Autonomous aGriculture
(SAFER AG) Workshop



Thank you!

Jennifer M. Lincoln

NIOSH Office Of Agricultural Safety And Health

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Email: Jlincoln@cdc.gov

For more information, contact CDC
1-800-CDC-INFO (232-4636)
TTY: 1-888-232-6348 www.cdc.gov

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

