2019

State of the Science
National Firefighter Cancer Symposium

FIREFIGHTER CANCER INITIATIVE

RESEARCH > EDUCATION > PREVENTION

SYLVESTER COMPREHENSIVE CANCER CENTER
UNIVERSITY OF MIAMI HEALTH SYSTEM

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Dear Firefighter Cancer Symposium Attendee,

Welcome to the 2019 State of the Science National Firefighter Cancer Symposium! We at the Firefighter Cancer Initiative at Sylvester Comprehensive Cancer Center at the University of Miami Miller School of Medicine are proud to host this inaugural event. The theme of the symposium is Building a Scientific Roadmap for Cancer Control and Prevention in the U.S. Fire Service.

Since reporting that firefighters have an increased risk of developing cancer, there has been a nationwide effort to combat cancer in the fire service. Growing epidemiologic evidence suggests that firefighters are at increased risk of site-specific cancers from the respiratory, digestive, and urinary tract organ systems when compared to the general U.S. population. Despite our improved understanding of major carcinogenic risk factors in the work environment, we have not seen a widespread reduction in cancer incidence and mortality in the U.S. firefighter workforce.

Over the next two days, we will address critical barriers in scientific knowledge, including the development of uniform data collection instruments, exposure assessment, a better understanding of cancer mechanisms, designing a national firefighter cancer registry, effective cancer screening, and the inclusion of potentially vulnerable groups such as women and racial/ethnic minority firefighters.

Thank you for joining us at the University of Miami; we are honored to provide the latest research on firefighter cancer prevention and thank you for participating in this year's symposium. We look forward to working with all the attendees to create a scientific roadmap for the control and prevention of cancer in the U.S. fire service.

Thank you.

Erin Kobetz, Ph.D., M.P.H.
Symposium Co-Chair; Director & Principal Investigator of the Firefighter Cancer Initiative; Associate Director for Population Science and Cancer Disparity; Chief of Population Health and Cancer Disparities for UHealth Oncology Service Line; Co-Leader, Cancer Control Research Program, Sylvester Comprehensive Cancer Center; Professor of Medicine, Public Health, and Obstetrics and Gynecology

Alberto J. Caban-Martinez, D.O., Ph.D., M.P.H., CPH
Symposium Co-Chair; Deputy Director, Firefighter Cancer Initiative, Sylvester Comprehensive Cancer Center; Principal Investigator, FEMA Fire Fighter Cancer Cohort Expansion Study; Deputy Director, Miami Occupational Research Group, a NIOSH Total Worker Health Affiliate; Assistant Professor of Public Health Sciences and Physical Medicine and Rehabilitation, University of Miami Miller School of Medicine

SCHEDULE AT A GLANCE

Monday, June 10

7 a.m. - 8 a.m.
Registration and Continental Breakfast

8 a.m. - 8:30 a.m.
Introduction/Welcome
Dr. Erin Kobetz and Dr. Alberto Caban-Martinez

8:30 a.m. - 9:30 a.m.
Keynote
Patrick Morrison (IAFF), Chief Nathan Trauernicht (IAFC/UC Davis Fire), and Dr. Kenny Fent (NIOSH)

9:30 a.m. - 10 a.m.
Epidemiology of Cancer in Firefighters
Dr. David Lee and Dr. Miriam Siegel

10 a.m. - 10:15 a.m.
Break

10:15 a.m. - 10:45 a.m.
Plenary #1 - Biomedical Studies
Dr. Alberto Caban-Martinez and Dr. Jefferey Burgess

10:45 a.m. - 11:30 a.m.
Panel #1 - Exposure Studies
Dr. Gavin Horn, Mr. Jeffrey Stull, and Mr. Jeramy Baum

11:30 a.m. - 12:30 p.m.
Lunch

12:30 p.m. - 1 p.m.
Plenary #2 - Cancer Screening and Prevention
Dr. Natasha Schaefer Solle and Dr. Virginia Weaver

1 p.m. - 1:45 p.m.
Panel #2 - Survivorship
Dr. Frank Penedo, Dr. Bryan Frieders (FCSN), Lt. Tina Guiler, and Firefighter/Engineer Steve Harvey

1:45 p.m. - 2 p.m.
Break

2 p.m. - 3 p.m.
Breakout Session #1
Table Topics (One Table Miscellaneous Items)

3:10 p.m. - 4:10 p.m.
Breakout Session #2
Table Topics (One Table Miscellaneous Items)

4:10 p.m. - 5 p.m.
Summary/Discussion

5 p.m. - 6 p.m.
Poster, Wine, and Cheese

Tuesday, June 11

7 a.m. - 8 a.m.
Continental Breakfast

8 a.m. - 8:20 a.m.
Message
Julius Halas (Florida Fire Marshals Office) and David Finger (National Volunteer Fire Council)

8:20 a.m. - 8:50 a.m.
Plenary #3 - Firefighter Subgroups
Dr. Rachel Morello-Frosh (Women Biomonitoring), Dr. Matt Rahn (Wildland), Ms. Nicole Strait (Volunteer)

8:50 a.m. - 9:20 a.m.
Plenary #4 - Risk Factors (Nutrition/Physical Activity)
Dr. Sara Jahnke and Dr. Laura Barger

9:20 a.m. - 9:30 a.m.
Break

9:30 a.m. - 10:15 a.m.
Panel #3 - Education and Training/Clean Cab and Decon Practice
Mr. Casey Grant, Chief Babinec (Clean Cab), and Dr. Erin Kobetz

10:15 a.m. - 11:15 a.m.
Breakout Session #3
Table Topics (One Table Miscellaneous Items)

11:15 a.m. - 12:15 p.m.
Summary/Closing Remarks

12:15 p.m.
Box Lunch

1 p.m. - 3 p.m.
Firefighter Cancer Registry Meeting
NIOSH
**Open to the General Public

3:15 p.m. - 5:15 p.m.
Fire Service Occupational Cancer Alliance Meeting
Firefighter Cancer Alliance

5:45 p.m. - 6:45 p.m.
Prevention and Wellness Clinic Tour and Reception

WIFI ACCESS

Free access to Wi-Fi: CanesGuest

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PARKING

Pavia Parking Garage

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5615 Pavia Street, Coral Gables, FL 33146

As indicated in the garage, please use the Pay by Phone app and enter code 330012 for free parking on Monday, June 10 and Tuesday, June 11 from 6 a.m. - 7 p.m.

NATIONAL
PLANNING COMMITTEE

Lawrence Petrick, Jr.
International Association of Fire Fighters
Occupational Health and Safety Deputy
Director of the International Association
of Fire Fighters

Dr. Jefferey Burgess
University of Arizona Mel and Enid Zuckerman
College of Public Health
Professor, College of Public Health, Community,
Environment &Policy
Associate Dean for Research and Professor

Dr. Kenneth Fent
NIOSH
Research Industrial Hygienist

Casey Grant
Fire Protection Research Foundation
Executive Director

Chief John B. Tippett
National Fallen Firefighters Foundation
Director of Fire Service Programs

Bryan Frieders
Firefighter Cancer Support Network
President

LOCAL
PLANNING COMMITTEE

Dr. Alberto Caban-Martinez
University of Miami
Symposium Chair
Deputy Director,
Sylvester Firefighter Cancer Initiative
Assistant Professor of Public Health Sciences

Dr. Erin Kobetz
University of Miami
Symposium Co-Chair
Director & PI, Firefighter Cancer Initiative
Associate Director for Population Science and
Cancer Disparity
Professor of Medicine

Dr. Natasha Schaefer Solle
University of Miami
Symposium Evaluation Team Leader
Research Assistant Professor,
Department of Medicine

Cynthia Thiry
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Symposium Abstract Program Manager
Research Support Specialist

Jessica Cambridge
University of Miami
Symposium Support Specialist
Sr. Project Coordinator

Cynthia Beaver
University of Miami
Symposium Evaluation Team Member
Research Support Specialist

Paola Louzado-Feliciano
University of Miami
Symposium Planner
Research Associate

Kevin Griffin
University of Miami
Symposium Webmaster and Co-Planner
Graduate Assistant

KEYNOTE SPEAKERS:

Kenneth W. Fent, Ph.D., CIH
Research Industrial Hygienist
National Institute for Occupational Safety and Health

Dr. Kenneth Fent is a research industrial hygienist at the National Institute for Occupational Safety and Health (NIOSH). He obtained his Master of Science and doctoral degrees in Environmental Sciences and Engineering from the University of North Carolina at Chapel Hill. Dr. Fent joined NIOSH in 2008, where he currently works as a research industrial hygienist. He is also a Commander in the U.S. Public Health Service, where he is a member of a rapid deployment team and has responded to numerous emergency events, including the Ebola response in West Africa. Dr. Fent's research has focused on assessing dermal and inhalation exposures to combustion byproducts in firefighters. Currently, he is involved in a comprehensive study of cardiovascular and carcinogenic risks during modern firefighting in collaboration with the Illinois Fire Service Institute (IFSI) and the UL Fire Safety Research Institute (UL-FSRI) and a prospective firefighter cancer cohort study (in collaboration with the Universities of Arizona and Miami).

David Finger, M.P.S.
Chief of Legislative
and Regulatory Affairs
National Volunteer Fire Council

Dave has always had a strong interest in politics and followed that passion all the way to Capitol Hill, working for Representative Nick Smith and for the House Committee on Science before joining the NVFC in 2005. He is the contact point for anything related to legislative, regulatory, and standards issues. Dave serves as the NVFC's liaison with Congress and federal agencies and advises the board and membership on governmental matters. An alumnus of Michigan State University with a bachelor's degree in political economy, Dave also has a master's degree in legislative affairs from The George Washington University.

Julius Halas, M.S.
Director
Division of State Fire Marshal

Julius Halas currently serves as the Director of the Florida Division of State Fire Marshal (SFM) under the authority of CFO/State Fire Marshal Jimmy Patronis. Director Halas has 45 years of experience in fire protection having served as a firefighter, paramedic, and instructor, while moving up through the ranks of Lieutenant, Captain, Battalion Chief, and Deputy Chief. He achieved the position of Fire Chief for the City of Sarasota in 1992 and then served as the Fire Chief for the Town of Longboat Key from 1999 until May 2009. As SFM Division Director, since being appointed in May of 2009, he is responsible for the oversight of the bureaus of Fire Prevention and Fire Standards and Training, as well as the Florida State Fire College. He is also responsible for leading the management and staffing of firefighters and search and rescue teams (ESF 4 and 9) in the event of a disaster or state emergency. Director Halas is a member of several fire and emergency management related organizations and he is a past President and current member of the Florida Fire Chiefs Association and National Association of State Fire Marshals (NASFM) currently serving as President. He is also an appointed representative to the Florida State Domestic Security Oversight Council. In 2013, Director Halas in conjunction with the Small County Coalition and ISO formed a task force to assist local fire departments with achieving improvements in their fire protection grading schedule. Director Halas received his Associate Degree in Fire Science Technology (1991) from State College of Florida (formerly Manatee Community College), graduating Summa Cum Laude, and received a (MS 2001) Master of Science and a (BA 1993) Bachelor of Arts Degree from National Louis University, graduating with honors.

Patrick Morrison
Assistant to the General President,
Division of Occupational Health,
Safety and Medicine
International Association
of Fire Firefighters

Patrick Morrison is the Assistant to the General President for the International Association of Fire Fighters (IAFF) in the Division of Occupational Health, Safety and Medicine. The IAFF is an International Labor Union representing over 315,000 professional fire fighters in the United States and Canada. The Division of Occupational Health, Safety and Medicine provides IAFF affiliates with a comprehensive array of services addressing the occupational health and safety of firefighters and emergency medical personnel. He is responsible for the daily operations of the Division as well as the development and implementation of fire service occupational health and safety standards, including those promulgated by federal, state, and provincial governments, including crucial health and safety issues published by National Fire Protection Association, National Institute for Occupational Safety and Health, and IAFF Wellness Fitness Labor/Management Task Force. Mr. Morrison's expertise is in the design and implementation of behavioral health, safety, and wellness programs to improve fire firefighters' overall physical and mental health, address their medical needs, and increase protections from the hazardous elements of firefighting. Prior to joining the IAFF, Mr. Morrison was a career firefighter for 21 years with the Fairfax County Fire and Rescue Department in Fairfax, Virginia.

Nathan J. Trauernicht, M.P.A., B.S.
FPST, CFO, CEMSO, CTO, MIFireE,
CA Certified Fire Chief #30
Fire Chief
University of California – Davis

Serving in the fire service since 1993, Nathan J. Trauernicht is the Fire Chief for University of California – Davis, providing overall leadership and direction to a department that serves a population of over 40,000. Nathan was recognized by the Sacramento Business Journal as one of its 40 Under 40 for 2015, representing the region's youngest and brightest professionals. In large part this recognition can be attributed to a series of innovative programs he championed, including introducing the life-saving smartphone application PulsePoint, the vision behind the multi-agency training division known as the West Valley Regional Fire Training Consortium, and Fit for Fire which introduces the community to the fire service through a challenging group fitness class. Nathan earned his undergraduate degree in Fire Protection and Safety Engineering from Oklahoma State University and holds a master's degree in public administration. Beyond completing the Executive Leadership and Management Institute (ELMI) at Stanford University, Nathan is a graduate of the UC Davis Executive Program, Member of the Institution of Fire Engineers (MIFireE), and is designated as a Chief Fire Officer® (CFO), Chief EMS Officer® (CEMSO), and as a Chief Training Officer® (CTO) by the Center for Public Safety Excellence. Chief Trauernicht is active in a number of professional groups, boards and committees; he currently serves as President of the Oklahoma State University Alumni Association - Chief Fire Officers Chapter, Co-Chair of California FirstNet (CalFRN), Member at Large on the Board of Directors of the International Association of Fire Chiefs (IAFC) Safety Health & Survival Section, Co-Lead of the IAFC Diversity Executive Leadership Program (iDELP), is a Past President of the California Fire Chiefs Association (CFCA), two-time Past President of the CFCA - Operations Chiefs Section, and is appointed to the Board of Directors of the National Fire Service Research Center and Policy Institute.

SYMPOSIUM SPEAKERS:

Frank Babinec
Chief
Coral Springs-Parkland
Fire Department

Frank Babinec was appointed as the Chief of the Coral Springs-Parkland Fire Department in February of 2014, in 2016 the department obtained an ISO Class 1 rating. The fire department is comprised of approximately 400 members with core services consisting of Fire Administration, Fire Operations, Emergency Medical Services, Community Risk Reduction, Training (State Certified Regional Training Center), and Community Emergency Response Team.

A native Floridian, and a resident of Coral Springs since 1991, Chief Babinec joined the department in 1993 as a volunteer firefighter and was hired full-time in 2000 as the training officer. He spent 7 years as an Assistant Chief (shift commander) and another 7 years as the Deputy Chief of Operations, dedicating over 25 years of service to the communities of Coral Springs and Parkland. Chief Babinec spent 12 years as a Lead Instructor for the Coral Springs Fire Academy. Chief Babinec holds a Bachelor's degree in Organizational Leadership and an M.B.A. in Public Administration. He possesses a Chief Fire Officer designation from the Center for Public Safety Excellence, Fire Officer IV from the State of Florida, and an Executive Fire Officer designation from the National Fire Academy.

In 2017, the Coral Springs-Parkland Fire Department was selected "EMS Provider of the Year" for the State of Florida, received the American Heart Association 2017 "Mission Lifeline Silver Award" for best practices in patient care, the Florida Fire Chiefs Association named Chief Babinec "Fire Chief of the Year", the Coral Springs Institute of Public Safety was named the "Training and Education Center of the Year," for the State of Florida. In June of 2018, Chief Babinec was named as the Fire Chief of the Year by the Southeastern Association of Fire Chiefs. In July of 2018, Chief Babinec received the Community Leader of the Year by the Broward Council of Professional Firefighters. Chief Babinec serves as the President of the Fire Chiefs Association of Broward County and the Chair for the Florida Fire Chiefs Association Safety and Health Section.

Laura K. Barger, Ph.D.
Assistant Professor
Harvard Medical School

Dr. Barger is an Assistant Professor in the Division of Sleep Medicine at Harvard Medical School and an Associate Physiologist in the Division of Sleep and Circadian Disorders at Brigham and Women's Hospital. She earned an undergraduate degree in engineering at Michigan State University. She has master's Degrees from California State University, Sacramento (Exercise Physiology) and from Harvard Medical School (Clinical Science) and a Ph.D. from University of California, Davis (Physiology).

Dr. Barger's research has focused on the health and safety risks associated with the work hours of various occupational groups, including resident physicians, police officers, flight controllers, maritime bar pilots, and federal air marshals. She has directed NASA-sponsored research projects including the largest study of the sleep of crewmembers on spaceflight missions. As part of the Harvard Work Hours, Health and Safety Group, Dr. Barger implemented sleep health education and screening for common sleep disorders in 67 fire departments across the country, describing the prevalence of the risk of sleep disorders in firefighters and their associations with adverse health, safety, and behavioral outcomes in the research journals and Firehouse Magazine. Additionally, Dr. Barger is a retired Lieutenant Colonel having spent 20 years in the United States Air Force Reserve with over 10 years of operational aviation experience as a navigator on the KC-135 Stratotanker. Her last assignment was at Headquarters Air Combat Command where she was responsible for development and analysis of fatigue countermeasures for pilots.

Jeramy L. Baum
Doctoral Candidate in Chemistry
University of Miami

Jeramy Baum is a doctoral candidate in chemistry and a member of the Departments of Chemistry and of Biochemistry and Molecular Biology at the University of Miami. During his graduate career, he has focused on the development of field-deployable sensors and methods for sampling volatile and semi-volatile organic compounds known to be biomarkers and exposure risk compounds. He is also experienced in the use of spectroscopic analyses to identify physiologically and environmentally relevant compounds. As part of Sylvester's Firefighter Cancer Initiative, he has helped implement sampling methods and sensors to trace the origin and presence of carcinogenic exposure sustained by firefighters throughout the State of Florida.

Jefferey L. Burgess, M.D., M.S., M.P.H.
Associate Dean for Research and Professor
University of Arizona Mel and Enid Zuckerman College of Public Health

Dr. Burgess has been collaborating with firefighters on health and safety research for over 25 years, encompassing respiratory protection, injury prevention, cardiovascular disease, and cancer. Regarding firefighter cancer prevention, he is the Principal Investigator of the Federal Emergency Management Agency (FEMA) grant, "The Firefighter Multicenter Cancer Cohort Study: Framework Development and Testing," better known as the Fire Fighter Cancer Cohort Study, and he also led the recently completed FEMA grant "Cancer Prevention in the Fire Service: Exposure Assessment, Toxic Effects and Risk Management." These studies are identifying epigenetic markers as potential links between firefighting exposures and the development of diseases such as cancer, and also measuring the effectiveness of interventions to reduce exposures among firefighters. In relation to per- and polyfluoroalkyl substances (PFAS), Dr. Burgess has measured elevated PFOS and PFHxS levels in Arizona firefighters compared to national averages, and he has ongoing research projects on PFAS exposures in firefighters in other parts of the United States and on potential associations between PFAS exposures and epigenetic markers in firefighters. In addition to firefighters, his translational occupational and environmental health research focuses on the evaluation and prevention of injurious exposures to miners, law enforcement officers, arsenic-exposed populations, and American Indian populations. Dr. Burgess has worked as an Emergency Medicine physician, Medical Toxicologist, and Occupational and Environmental Medicine physician. He also serves as the co-chair of the National Institute for Occupational Safety and Health (NIOSH) National Occupational Research Agenda (NORA) Public Safety Sector Council and is a member of Fire Service Occupational Cancer Alliance, facilitated by the National Fallen Firefighters Foundation (NFFF).

Alberto Caban-Martinez, D.O., Ph.D., M.P.H., CPH
Assistant Professor of Public Health Sciences, University of Miami Miller School of Medicine

Dr. Alberto Caban-Martinez is an occupational epidemiologist, osteopathic physician board certified in public health, and Assistant Professor of Public Health Sciences at the University of Miami Miller School of Medicine, and Deputy Director of the Firefighter Cancer Initiative at Sylvester Comprehensive Cancer Center. He is also a Fellow of the National Academy of Sciences' Gulf Research Program. He currently serves as Principal Investigator of the FEMA-funded national Fire Fighter Cancer Cohort Study Expansion that includes fire investigators, fire trainers, volunteers, and wildland-urban interface firefighters.

Bryan Frieders, M.P.A.
President
Firefighter Cancer Support Network

Bryan Frieders, a deputy chief with the Pasadena (CA) Fire Department, is president of the nonprofit Firefighter Cancer Support Network. He was elected in October 2014. Frieders previously served on the FCSN board as director of communications; he remains FCSN's liaison to the IAFC Safety, Health and Survival Section. Frieders has more than 20 years of fire/EMS experience, including training and emergency management assignments. He is an instructor for the Virginia Fire Officer Academy, conducted annually by the Virginia Fire Chiefs Association on the University of Richmond campus. He also is an instructor for the Northern Virginia Fire & Rescue Leadership Development Institute, held each year on the George Mason University campus. Frieders delivers training related to fire-service wellness, leadership, and cultural paradigm shifts. He earned a master's degree in public administration, a bachelor's degree in vocational education, and an associate's degree in fire science. Frieders is also an accomplished commercial instrument-rated pilot with 1,150 hours of flight time.

Casey C. Grant, P.E., FSFPE
Executive Director
Fire Protection Research Foundation

Casey Grant is the Executive Director for the Fire Protection Research Foundation, a nonprofit organization that works with the National Fire Protection Association as its research affiliate. Casey holds a Bachelor of Science degree from the University of Maryland and a Master of Science degree from Worcester Polytechnic Institute, both in Fire Protection Engineering. He is a Registered Professional Engineer in Fire Protection Engineering in the States of California and Tennessee, and is a member of both the Beta and Gamma Chapters of the Salamander Fire Protection Honorary Society. Casey is a Fellow of the Society of Fire Protection Engineers, a Fellow of the Institute of Fire Engineers, and has one fire protection related U.S. patent. Prior to joining the Research Foundation in 2007, Casey was the Secretary of the NFPA Standards Council and Assistant Chief Engineer.

Tina D. Guiler
Lieutenant
Miami-Dade Fire Rescue

Lt. Guiler started. started her career in 1999 as a firefighter/EMT and became a paramedic within 3 years. She earned Driver engineer and for the past 13 years she has served as a Lieutenant for Miami-Dade Fire Rescue (MDFR). She has an Associate of Science degree and is a Florida State certified Fire Inspector. She is also a certified CPAT Proctor for MDFR's hiring process and an active member of MDFR's Critical Incident Stress Management Team (CISM). Guiller was the recipient of the Employee Excellence award and pin in 2010 for creating two yearbooks for the department. She also received a Significant Event award and pin in 2019 for responding with her CISM Team to help the firefighters involved in the horrific mass shooting call at Stoneman Douglas High School in 2018. After 18 years in operations, she has obtained the bid position of a Lieutenant Fire Inspector for Miami-Dade Fire Rescue. Lt. Guiler is also the head of the business Triple F - Fabulous Female Firefighters, creating an environment that has allowed women to support other women, uplift other women and inspire women, to become their best selves in the fire service and life.

Steve Harvey
Driver/Engineer
Marco Island Fire Rescue

Steve Harvey began his career in 2001 as a paid firefighter, following his 8 years as a volunteer with Marco Island Fire Rescue. During his 19-year career, he was promoted to engineer in 2006; he also had the responsibility as acting captain during that time. Engineer Harvey is a full-time boat operator at the department working towards his six pac marine captains license. He has been an accredited Hazardous Materials Technician since 2003 with several classes of certifications from New Mexico Tech for awareness, prevention, and response to terrorist bombings. Like most people in the fire service who strive to continue and strengthen their education, Steve is working on his Associates degree in fire science. He is also a state registered EMT. Most of his career has revolved around radio communications and helping to manage and maintain fluid communications for the department as technology continues to rapidly and consistently

advance. He also has a strong mechanical and automotive background and holds many certifications in the automotive and fire apparatus field. He also has sat on the apparatus committee for 10 years to help design and maintain the proper equipment and apparatus for the department. Steve is also a two-time cancer survivor and occasionally is contacted by, or reaches out to, the Firefighter Cancer Support Network for people in need of support or direction. He has been part of this program for 6 years, as well as a spokesperson for LifeScan wellness.

Gavin Horn, Ph.D.
Firefighter and Director of Research
Illinois Fire Service Institute

Gavin Horn has served as the Director of IFSI Research since August 2004, immediately after receiving his Ph.D. in Mechanical Engineering from the University of Illinois at Urbana-Champaign. Horn's research interests focus on firefighter health and safety, First Responder technology development, material testing and design, and nondestructive evaluation. He has published over 60 peer-reviewed journal articles and given presentations at meetings, conferences, and symposia around the world. Horn also serves as a firefighter/engineer with the Savoy Fire (IL) Department.

Sara A. Jahnke, Ph.D.
Director, Center for Fire, Rescue, and EMS Health Research
National Development and Research Institutes

Dr. Jahnke is the Director of the Center for Fire, Rescue, and EMS Health Research at the National Development and Research Institutes, Inc. She completed her doctorate in psychology with a health emphasis at the University of Missouri – Kansas City and the American Heart Associations' Fellowship on the Epidemiology and Prevention of Cardiovascular Disease. Dr. Jahnke has served as the Principal Investigator of several large-scale studies of the health and readiness of the U.S. Fire Service. She serves as a consultant to fire service organizations including the National Volunteer Fire Council and the National Fallen Firefighters Foundation and is an active member of the Safety, Health, & Survival Section of IAFC.

Erin Kobetz, Ph.D., M.P.H.
Associate Director for Population Science and Cancer Disparity, Chief of Population Health and Cancer Disparities for UHealth Oncology Service Line Sylvester Comprehensive Cancer Center, University of Miami

Dr. Erin Kobetz is a tenured professor in the Departments of Medicine, Public Health Sciences, and Obstetrics and Gynecology at the University of Miami Miller School of Medicine. Additionally, she is Associate Director of Population Science and Cancer Disparities at UM's Sylvester Comprehensive Cancer Center, as well as Chief of Population Health and Cancer Disparities for UHealth Oncology Service Line. Dr. Kobetz also serves as Program Director for the Community Engagement and Multidisciplinary Team Science Components of the Miller School's Clinical Translational Science Institute (CTSA) and is Director of Sylvester's Cancer Control Program.

She earned a Master's in Public Health from Rollins School of Public Health at Emory University (1999), and joined the University of Miami in September of 2004, after completing her Ph.D. at the University of North Carolina at Chapel Hill, Gillings School of Public Health. Soon after, Dr. Kobetz established Patnè en Aksyon (Partners in Action), Sylvester's first ever campus community partnership in Miami's Little Haiti, the largest enclave of Haitians in the U.S., and remains committed to integrating diverse stakeholders into the translational research continuum. Dr. Kobetz currently works as the Principal Investigator of multiple grants from the National Cancer Institute (NCI) and National Institute of Minority Health and Health Disparity (NIHMD) to support collaborative science with numerous South Florida communities. Collectively, they have garnered over over $30 million in extramural funding and serve as the university's model for stakeholder engagement. Dr. Erin Kobetz has also partnered with South Florida firefighters - similarly characterized by excess cancer risk - and leads the Firefighter Cancer Initiative (FCI), a university-wide interdisciplinary strategy to address disparity from "bench" to "bedside" to "community." Such efforts have been locally and nationally recognized and serve as an important approach to develop new community-based models for cancer prevention and achieve sustainable health and social change in underserved communities.

David J. Lee, Ph.D.
Professor of Public Health Sciences
University of Miami, Miller School of Medicine

Dr. David Lee is a chronic disease and occupational epidemiologist and has been continuously funded as Principal Investigator on various grants from the National Institutes of Health and the Centers for Disease Control and Prevention since 1993. He also serves as Principal Investigator for the Florida Cancer Data System, which is the second largest state cancer registry in the United States. Dr. Lee is lead or co-author on over 200 peer-reviewed research articles. He is the director for the Florida Firefighter Cancer Registry and Senior Investigator of the Sylvester Firefighter Cancer Initiative.

Rachel Morello-Frosch, Ph.D.
Professor
University of California, Berkeley

Rachel Morello-Frosch is Professor in the Department of Environmental Science, Policy and Management and the School of Public Health at UC Berkeley. For over 20 years, her research has examined social determinants of environmental health among diverse communities with a focus on inequality, psychosocial stress, and how these factors interact with environmental chemical exposures to produce health inequalities. Much of her work has examined this environmental justice question in the context of ambient air pollution, exposures to environmental chemicals, and effects on fetal growth and developmental outcomes, often using community-based participatory research methods for data collection. In collaboration with communities and scientists, she has developed science-policy tools for assessing the cumulative impacts of chemical and non-chemical stressors to improve regulatory decision-making and advance environmental justice. This has included development of the Environmental Justice Screening Method, which served as a foundation for Cal-EPA's regulatory decision-making tool, CalEnviroScreen, a spatial screening method to identify California's vulnerable communities that are disproportionately burdened by multiple sources of pollution and social stressors, and that require enhanced regulatory attention. In collaboration with firefighters, environmental health advocates, and scientific colleagues, Dr. Morello-Frosch is a principal investigator of the Women Worker Biomonitoring Collaborative, the first biomonitoring study to compare exposures to potential breast carcinogens and other endocrine disrupting compounds between women firefighters, nurses, and office workers in San Francisco, CA. In addition to using targeted and non-targeted chemical biomonitoring methods, the WFBC is evaluating the impact on biomarkers of early effect (i.e. thyroid hormone disruption and telomere length) of chemical exposures and workplace stress.

Frank J. Penedo, Ph.D.
Professor and Associate Director for Cancer Survivorship and Translational Behavioral Sciences
University of Miami

Frank J. Penedo, Ph.D., an internationally recognized expert in cancer survivorship and psychosocial oncology, is the Associate Director for Cancer Survivorship and Translational Behavioral Sciences at the University of Miami Miller School of Medicine and Sylvester Comprehensive Cancer Center. Dr. Penedo is the Sylvester Professor of Psychology and Medicine and co-leads the Cancer Control research program. He received his Ph.D. in clinical health psychology at the University of Miami and completed his clinical residency at the University of Pittsburgh Western Psychiatric Institute, and an NIH post-doctoral fellowship in psychosocial oncology and behavioral medicine at University of Miami Department of Psychology and Sylvester. From 2000 until 2012, he held a faculty position in the Department of Psychology at the University of Miami. In 2012, he joined the Feinberg School of Medicine at Northwestern University in Chicago and was awarded the inaugural Roswell Park endowed chair in the Department of Medical Social Sciences. At Northwestern, he served as leader of the cancer control and survivorship research program and director of survivorship at the Robert H. Lurie Comprehensive Cancer Center. He rejoined Sylvester and Department of Psychology at the University of Miami in 2018. His work evaluates the role of sociocultural, bio behavioral, and psychosocial mechanisms underlying disease activity and health outcomes, and the efficacy of evidence-based psychosocial interventions in promoting optimal chronic disease management and health outcomes in cancer. His work also involves translational research evaluating the impact of symptom and toxicities monitoring and management in ambulatory oncology, patient reported outcomes (PROs) in survivorship care, precision oncology, and phase 1 trials, as well as the implementation of evidence-based behavioral interventions delivered within health systems and the community to improve patient and system level outcomes.

Matt Rahn, Ph.D., J.D.
Director
CSUSM Environmental Leadership Institute and Wildfire Program

Dr. Matt Rahn is currently serving on the Temecula City Council and was Dr. Matt Rahn currently sits on the Temecula City Council and served as mayor in 2018. In his academic role, he serves as the Director for the CSUSM Environmental Leadership Institute and Wildfire Program. He is the lead instructor for the Environmental Leadership Academy and coursework in wildfire science, CEQA, water management, conservation planning, and energy.
Dr. Rahn has over two decades of experience in applied sciences and policy, with an emphasis in environmental science, biology, statistics, public policy, and wildfire science. Having earned both a Ph.D. and J.D., Dr. Rahn has focused much of his work on the interface between science and policy, supporting local, state, and federal programs in collaboration with lawyers, policymakers, and scientists on issues ranging from wildfires, to watershed management, endangered species, transportation, land use planning, and renewable energy. Dr. Rahn has been involved in wildfire issues throughout his career, with a specific emphasis on economic impacts, improving attack effectiveness, and firefighter health and safety.
He currently leads a cooperative program in research and education aimed at advancing the wildfire industry and providing timely research and education advancements in the field. This collaboration is done in partnership with CAL FIRE, CAL FIRE Local 2881, the International Association of Fire Fighters, the National Institute of Standards and Technology, and the U.S. Forest Service. Rahn Conservation Consulting, LLC was created as a private full-service environmental firm that provides support for environmental, planning, wildfire, energy, conservation, policy, and sustainability issues for local, state, and federal agencies, tribal government, private developers, and nonprofit organizations.

Natasha Schaefer Solle, RN, Ph.D.
Research Assistant Professor of Medicine University of Miami Miller School of Medicine

Dr. Schaefer Solle's research interests focus on occupational cancer risks and improving cancer screening in underserved communities. She has played a critical role in the conception of the Firefighter Cancer Initiative (FCI), a multi-faceted project funded by the state of Florida to study firefighters' exposure to carcinogens, examine their cancer risk, and develop methods of education about prevention and early detection. She has led multiple projects within FCI focusing on the epidemiology and cancer screening behaviors of active and retired firefighters.

Miriam Siegel, Dr.P.H., M.P.H.
Epidemiologist / Associate Service Fellow
National Institute for Occupational Safety and Health

Dr. Siegel is the Lead Epidemiologist for NIOSH's Firefighter Registry Team. She completed her doctorate in epidemiology with a concentration in occupational epidemiology at the University of Kentucky as a Central Appalachian Regional Education and Research Center trainee. Dr. Siegel joined NIOSH in 2017 as an Epidemic Intelligence Service Officer where she has been involved in a broad range of research topics including occupational reproductive health, workplace violence, firefighter fatality surveillance, and wildland firefighter safety and health. She is now involved in designing a national registry of firefighters for the purpose of measuring cancer incidence and identifying cancer risk factors.

Nicole Strait
Volunteer Firefighter
Barber County Rural Fire Department

Nicole is a volunteer firefighter from rural Kansas. Having wanted to be a firefighter since she was a child, she has a passion for fire service and education of her fellow volunteers. In addition to being a volunteer firefighter for the Medicine Lodge Fire Department, Nicole works in a professional setting as the Emergency Communications Director for Barber County Kansas. Nicole graduated from Penn Foster College with an A.S. in veterinary Technology and is currently finishing an A.S. in criminal justice. She has plans to pursue a B.S. in fire science and emergency management in the fall.

Jeffrey O. Stull, M.S., Ch.E.
President
International Personnel Protection, Inc.

Mr. Stull has been providing expertise in the area of personal protective equipment (PPE), including firefighter protective clothing and equipment, for the past 36 years. Mr. Stull formed International Personnel Protection, Inc. (IPP) in 1993 after five years of private industry in PPE testing, and a nine-year U.S. Coast Guard career as an officer, part of which was with the Coast Guard's Office of Research & Development responsible for hazardous materials and firefighting PPE programs. A substantial part of his research at IPP has addressed contamination control within the fire service, including the investigation of firefighter clothing as a source of contamination and specifically in the effectiveness of cleaning techniques in removing various forms of contamination, work that he oversaw beginning in the mid-1990s. Since that time, he had conducted numerous studies for the federal government, private industry, and fire departments related to firefighter health and safety, including contamination control and prevention of or protection from hazardous exposures. Most recently, Mr. Stull provided technical leadership of a research program for the Fire Protection Research Foundation sponsored by the U.S. Department of Homeland Security for verifying cleaning in removing contaminants from firefighter protective clothing. The test methods and criteria based on this study were adopted within the NFPA 1851 standard for selection, care, and maintenance of firefighting protective clothing. Mr. Stull maintains an active role in fire service standards for PPE and has extensively worked with various fire service organizations for promoting improved PPE for protection against hazardous exposures, introducing appropriate hygiene and cleaning practices, and pursuing increased guidance to facilitate firefighter awareness to the risks of exposure.

Virginia Weaver, M.D., M.P.H.
Associate Professor at Johns Hopkins University

Dr. Virginia Weaver is an Associate Professor at the Johns Hopkins University Bloomberg School of Public Health with a joint appointment in the School of Medicine. She received her medical degree from New York University and her M.P.H. from Johns Hopkins. She is dual-boarded in Internal Medicine and Preventive Medicine (Occupational Medicine). She has been on the faculty at Johns Hopkins since completing her occupational medicine residency and post-doctoral research fellowship there in 1993. She directed the Occupational and Environmental Medicine Residency at Johns Hopkins from 2006 until 2014. She has been a member of International Association of Fire Fighters (IAFF) Medical Advisory Board since 1995. She has served as a medical preceptor for resident physicians rotating at IAFF for over a decade. She was a member of the World Trade Center Health Program Scientific/ Technical Advisory Committee from 2011-2016 and participated in the determination of cancers that would be compensable under the program. Dr. Weaver focuses on firefighter cancer and other health and safety issues in her public health practice activities. Her research focuses on populations with exposure to chemicals that damage the kidneys. She has given numerous national and international presentations on cancer in firefighters and is an author on more than 80 peer-reviewed articles, chapters, and abstracts.

POSTER 1

Title:
Implementing the Personal Exposure Reporter (PER) System for Florida Fire Fighters: The Sylvester Firefighter Cancer Initiative

Authors:
Barbara Millet, Alberto J. Caban-Martinez, Clay Ewing, Neal Niemczyk, Natasha Schaefer Solle, and Erin N. Kobetz
Submitting Author Affiliation:
University of Miami, Miami, FL, USA

Learning Objective:
Describe the design and implementation of a personal exposure record system for firefighters.

Background: Firefighters regularly are put into situations during work activities that place them at a greater risk for injury and illness than the general population. Collecting objective information from emergency and fire incident response in the fire service is critical for monitoring carcinogenic exposure and identifying at risk personnel. In the present study, we describe the development and implementation of the Personal Exposure Reporter (PER) system for firefighters.

Methods: A user-centered design framework was leveraged to design and develop an exposure reporting system tailored to firefighters. Based on firefighter focus groups, interviews, card sorts, and usability testing, six reporting domains were created: incident type, individual physical exposures, rehabilitation procedures, handling of safety gear, decontamination practices, and self-reported health symptoms.

Results: An encrypted, university-based, HIPAA complaint web application was built allowing firefighters to keep a digital record of their individual on-the-job exposures. The PER architecture uses a responsive design so that it can be accessed via mobile devices and desktop browsers.

Conclusions: The PER system provides firefighters with a lifelong, personal record of occupational exposures and supports occupational health and safety researchers with data to study firefighters' exposure and health-related conditions. The system offers an easy to use, non-punitive, readily accessible reporting mechanism designed to encourage voluntary reporting of occupational hazards exposure by Florida firefighters.

POSTER 2

Title:
Understanding Cancer Risk among Florida Firefighters Using an Integrated Data-Driven Approach

Authors:
Julia Seay, Alberto Caban-Martinez, Natasha Schaefer Solle, Feng Miao, Xing Wei, Tulay Koru-Sengul, and Hemant Ishwaran
Submitting Author Affiliation:
University of Miami, Miami, FL, USA

Learning Objective:
Identify correlates of cancer among Florida firefighters.

Background: Firefighters are at increased risk of developing and dying from several types of cancer, including but not limited to lung, prostate, and colorectal cancers. However, there is a paucity of research and data sources unique to examining cancer risk factors for workers employed in the fire service. The few epidemiologic studies that have examined such factors among firefighters have found both general and work-related (e.g. occupational chemical exposures) risk factors may contribute to the development of cancer. These studies have been mostly retrospective and based on self-report claims data, and lack the methodological rigor to extensively explore potential links between such risk factors and cancer among firefighters.

Methods: In 2015, the state of Florida funded the Firefighter Cancer Initiative (FCI), a large research program led and coordinated by multidisciplinary investigators at the University of Miami. The FCI includes several research studies collecting prospective data regarding cancer risk factors among both active and retired firefighters across the state of Florida. Importantly, there is substantial overlap in study participants between several of these studies (i.e. many firefighters participated in more than one of these studies). However, there is a major scientific gap in that there is no infrastructure within FCI to regularly and systematically integrate data between each of these research studies.

Results: The primary research goal of this hypotheses-generating pilot project is to merge and analyze current data streams between the aforementioned FCI projects. Using machine learning methodology, we will examine various potential cancer risk factors, including sociodemographic, behavioral, occupational, and exposure variables, and their associations with cancer within our integrated FCI dataset.

Conclusions: Preliminary results of this data analysis will be presented at the FCI Symposium.

POSTER 3

Title:

Real-time exposure monitoring of Polyaromatic Hydrocarbons using Solid-State Sensor System in Florida Firefighters

Authors:

Chitvan Killawala, Jeramy Baum, Umer Bakali, Katerina Santiago, Emre Dikici, Natasha Schaefer Solle, Kevin Moore, Erin Kobetz, Alberto Caban-Martinez, Sapna Deo, Sylvia Daunert

Submitting Author Affiliation:

University of Miami, Miami, FL, USA

Learning Objectives:

Assess the real time exposure of various polyaromatic hydrocarbon (PAH) to firefighters during fire. Demonstrate the detection of PAHs using solid state sensor array in real time and in vicinity of active fire. Design a graphene-based nanosensor to be able to detect selectively detect various PAHs.

Background: Studies on firefighters indicate high rates of exposure to toxic compounds including polyaromatic hydrocarbons (PAHs), known for their carcinogenicity. No readily available methods exist for determining the presence of these high-risk compounds in the field in real-time. Given high incidence of cancer in firefighters, it is necessary to detect PAHs in real-time to reduce the risk of exposure. We designed and deployed a portable detection system using solid-state sensors in controlled fire situations to evaluate their effectiveness in detecting PAHs. In addition, we have designed a nanosensor capable of outperforming current sensors in stability and selectivity.

Methods: Sensor arrays were deployed at controlled burns. These burns employ well-documented fuel sources, allowing for reproducible output of volatilized compounds of risk during the burn. Sensor arrays were designed to allow for multiple sensors specific to different target compounds to operate in parallel. Fabrication of proposed nanosensors will be performed in a Class 1000 Cleanroom.

Results: Sensor array responses measured at varying locations in the hot zone and warm zone of the controlled burn displayed significant differences in sensor activity consistent with expected PAH intensity in the area. Sensor responses to minor exposure events deviated from baseline compound response by at least 26%, 49%, and 63% and the largest exposures deviated by 48%, 76%, and 74% for Sensors 1, 2, and 3, respectively. Exposure events resulted in an average deviation of 31%, 55%, and 67% from the baseline. Results from fabrication will be detailed in the poster.

Conclusions: The demonstration of sensor activity validates sensor arrays as a viable proof-of-concept for further development of deployable real-time PAH detectors as an active safety monitor in active fire situations. A fully-realized PAH detection system will help inform policy and regulations to advance firefighter safety in the field.

POSTER 4

Title:

Evaluation of Carcinogenic Compound Exposure in South Florida Firefighters using Silicone-Based Passive Samplers in Controlled Burns

Authors:

Umer Bakali, Jeramy Baum, Chitvan Killawala, Katerina Santiago, Emre Dikici, Natasha Schaefer Solle, Alberto Caban-Martinez, Erin Kobetz, Sapna Deo, Leonida Bachas, Sylvia Daunert

Submitting Author Affiliation:

University of Miami, Miami, FL, USA

Learning Objective:

Describe the utility of silicone-based passive samplers in monitoring firefighter exposure to toxic compounds.

Background: Firefighters are recognized by the National Institute for Occupational Safety and Health (NIOSH) to sustain significant occupational exposure to a variety of toxic and/or carcinogenic volatile and semi-volatile organic compounds. Polycyclic aromatic hydrocarbons (PAHs) are carcinogenic compounds that are generated during incomplete combustion and comprise a significant portion of the total exposure of active-duty firefighters. In order to evaluate the type, intensity, and source of PAH contamination among firefighter cohorts throughout South Florida, specially-prepared silicone wristbands were distributed for firefighters to wear at controlled burns used to simulate active fire situations.

Methods: Silicone-based wristbands were repeatedly solvent-cleaned to remove impurities and improve their adsorptivity for volatile compounds; subsequently, they were dried overnight in a vacuum oven to remove solvent. Wristbands were distributed to firefighters to wear underneath their turnout gear immediately prior to a controlled burn. Following exposure, wristbands underwent solvent extraction. The extract was concentrated via evaporation under nitrogen and analyzed using GC-MS.

Results: Firefighters wearing wristbands at the controlled burn were present in the area for approximately six hours. GC-MS reporting on the average concentrations of 15 select PAHs present in wristband extracts returned time-weighted average (TWA) exposures of between 3 to 22 mg/m3. By comparison, OSHA guidelines for eight-hour TWA exposures to PAHs is 3.5 mg/m3, indicating that firefighters sustain exposure up to seven times the recommended limit during an active fire situation, depending on the PAH in question.

Conclusions: Results from repeated testing with wristbands are concordant with above-average exposure to various PAHs. Wristbands present a simple, inexpensive, and versatile means of documenting carcinogenic exposure in firefighters and other occupationally-exposed demographics. Further analyses of compounds will allow for logging personal profiles of PAH exposure for individuals to help mitigate future exposure.

POSTER 5

Title:

Monitoring Firefighters for Longitudinal Occupational Exposures Using Epigenetic Markers

Authors:

Alesia Jung, Jose Rueben Bautista, Jin Zhou, Timothy Jenkins, John Gulotta, Darin Wallentine, Stephanie Griffin, Devi Dearmon-Moore, Sally Littau, Jeffery Bugess

Submitting Author Affiliation:

University of Arizona, Tucson, AZ, USA

Learning Objectives:

Discuss why differential microRNA expression may be an important biomarker linking occupational exposures and future disease risk among firefighters. Describe the importance of expanding biological sample collection in the fire service to develop our knowledge of cancer incidence among firefighters.

Background: Firefighters have diverse exposures during fires, but we lack adequate biomarkers to assess future disease risk associated with these exposures. MicroRNA (miRNA) expression in blood is associated with disease outcomes, most notably cancer. We evaluated associations between surrogate fireground exposure measures and differential miRNA expression among firefighters, a group at increased cancer risk, over a two-year period.

Methods: Surveys and blood samples were collected at baseline and follow-up from Tucson Fire Department new recruits. We evaluated associations between length of follow-up and fireground exposures (total fire hours and total number of fires) with 9 a priori markers and a miRNA expression panel of 800 markers, using adjusted mixed effects models.

Results: On average, the 52 male firefighters were 28.2 years old (standard deviation (SD)= 6), had a BMI of 26.4 kg/m^2 (SD=3.7) and were non-Hispanic white (>90%). Over 26.5 months (SD=4.3), they averaged 27.0 fire hours (SD=8.6) over 49.2 fire runs (SD=15.0). In fully adjusted models (length of follow-up, fireground exposure, demographics, batch effects, Bonferroni correction, and time since most recent fire at follow-up), length of follow-up adjusted for fire hours was associated with 5 a priori miRNAs and 35 miRNA expression panel miRNAs. Length of follow-up adjusted for number of fires was associated with 4 a priori miRNAs and 27 miRNA expression panel miRNAs. The majority of these significant miRNAs were associated with increased cancer risk. However, fire hours and number of fires were not associated with differential miRNA expression in the fully adjusted models.

Conclusions: Results suggest that the evaluation of miRNAs can provide a measure of future disease risk following exposures in firefighters. We need to clarify how factors such as job task, fire type, and protective occupational behaviors may influence the effect of surrogate fireground exposure measures on miRNA expression.

POSTER 6

Title:

Post-Fire Turnout Gear Removal Practices Vary Among Florida Fire Departments

Authors:

Andrew Faus, Raymond Balise, Paola Louzado-Feliciano, Kevin Griffin, Katerina Santiago, Natasha Schaefer Solle, David Lee, Erin Kobetz, Alberto Caban-Martinez

Submitting Author Affiliation:

University of Miami, Miami, FL, USA

Learning Objective:

Compare the post-fire gear removal practices of firefighters in smaller departments (those with fewer firefighters per health and safety officer) to those of firefighters in larger departments (those with more firefighters per HSO). Formulate a hypothesis as to why these differences in gear removal practices exist between departments. Name the risks associated with improper gear removal practices (e.g. increased risk of cancer).

Background: Firefighters are at an increased risk of being diagnosed with cancer due to their exposure to different carcinogens such as polycyclic aromatic hydrocarbons (PAHs). A risk that can be reduced by removing and cleaning gear as soon as possible after overhaul is completed. Previous scientific investigations have not studied the length of time gear is kept on after a fire. We examine the association between firefighters per health and safety officer (HSO) and time to post-fire turnout gear item removal.

Methods: Using a cross-sectional study design, an anonymous survey was administered to Florida firefighters at the 2018 Florida Fire Chiefs' Safety and Health Conference. Time to gear removal after a fire was categorized and percentages of firefighters removing each piece of gear (e.g. hood, pants, etc.) in each time interval were reported. A contingency table analysis, using Fisher's exact tests, examined the association between the number of firefighters per HSO and gear removal time.

Results: Among the 138 respondents, representing 63 Florida fire departments, time to gear removal after overhaul varied. Gear items such as hoods were removed within 30 minutes (90.51%) whereas other items such as pants were left on for more than 30 minutes (40%). After adjusting for multiple comparisons, trends were seen as a function of the number of firefighters per HSO. Larger fire departments (i.e. more firefighters per safety officer) were more likely to remove certain gear items immediately when compared to smaller fire departments. A statistically significant difference between small and large fire departments was found in the time to remove jackets after a fire (67% of firefighters in larger departments removed their jacket immediately compared to 44% in smaller departments, p = 0.0165).

Conclusions: Fire department workforce size is associated with time to remove gear items once overhaul is completed.

POSTER 7

Title:
A State-Level Gross Decontamination Bucket Intervention for Florida Firefighters: Reducing the Risk for Carcinogenic Exposures

Authors:
Cynthia Beaver, Alberto Caban-Martinez, Natasha Schaefer Solle, Katerina Santiago, David Lee, Tulay Koru-Sengul, Jessica Diaz, Julius Halas, Erin Kobetz

Submitting Author Affiliation:
University of Miami, Miami, FL, USA

Learning Objectives:
Identify the benefits of decontamination bucket use among fire departments to reduce carcinogen exposure.
Discuss strategies to maintain and increase the adoption and use of decontamination buckets in fire departments of various sizes in order to potentially reduce cancer risk among firefighters.

Background: Firefighter field studies have documented that the use of dish soap, water, and scrubbing immediately after fire incident response is able to reduce carcinogen (i.e., polycyclic aromatic hydrocarbons [PAHs]) from bunker gear by 85%. in 2018, Sylvester's Firefighter Cancer Initiative, in collaboration with the State Fire Marshal office, distributed a total of 4,550 decontamination buckets to all fire trucks/engines in the State of Florida. In the present study we 1) describe the design, implementation, and use of a gross decontamination bucket intervention among Florida fire services; and 2) estimate predictors of decontamination bucket use among participating fire services.

Methods: We combined two data sources including the Florida fire department decontamination bucket distribution list containing fire department characteristics with survey data on decontamination bucket use collected from attendees of the 2018 Florida Fire Chiefs' Safety and Health Conference.

Results: 62 Florida fire departments represented by 138 Florida firefighter department leaders completed the decontamination bucket survey of which 83.3% reported receiving a decontamination bucket, 8.0% did not, and 8.7% were not sure if they received a bucket. Among fire departments who received a bucket, 86.3% reported using the bucket always to sometimes post fire incident response and 76.6% found the bucket useful. Over 83% of fire departments who received a bucket requested additional buckets. Firefighter department leaders reported using the bucket at least 1-5 times since receiving the bucket (88.2%) and had seen other firefighters use the bucket (61.9%). The top three most frequently recalled bucket items included: scrub brushes (82.0%), detergents (81.2%), and hoses (81.2%). Medium-sized fire departments (101-500 firefighters) were significantly more likely to report receiving a bucket compared to larger fire departments (odds ratio=7.86; 95%CI [1.32-46.74]).

Conclusions: Decontamination buckets packed with items that reduce carcinogens from turnout gear are well accepted by fire departments.

POSTER 8

Title:
Best practices for reducing firefighter exposure to contaminants in Quebec (Canada)

Authors:
Josianne Roy and Arnaud Courti

Submitting Author Affiliation:
Campus Notre-Dame-de-Foy, Quebec, Canada

Learning Objective:
Describe best practices of Quebec firefighters aimed at reducing exposure to contaminants and improving overall health.

Background: During their daily firefighting activities, firefighters are exposed to many contaminants such as soot, polycyclic aromatic hydrocarbons (PAHs), volatile organic compounds (VOCs), and particulates. According to several epidemiological studies, frequent exposure to these hazardous substances are associated with elevated risks of cancer, various health problems and higher mortality risks for firefighters than in the general population. In response to this issue, firefighters began to review their practices to reduce their exposure to contaminants. In Québec (Canada), for the last few years we've been witnessing much more awareness and a major positive change in health and prevention culture. Taking into account the reality of fire departments and the resources available, firefighters in Québec have improved their practices based on various models found around the world and recent scientific studies. This qualitative study shows these new measures put in place by Québec firefighters to reduce direct and cross contamination during a fire.

Methods: Data were collected through observations and personal interviews. A questionnaire was also administrated to health and safety officers. Descriptive and qualitative data analysis was performed.

Results: The results of this analysis show that these new measures include education, training, personal protection (respiratory and skin), hygiene, decontamination on scene, revised doffing, cleaning procedures of PPE, transport of contaminated equipment, ventilation and revised operational guidelines. Individual or collective actions are presented for both large fire departments and those of small municipalities.

Conclusions: Strategies and practices differ greatly from one city to another and there has been rapid change in recent years. Several fire departments are waiting for new studies to adapt certain practices because they imply higher costs and more complex operational procedures.

POSTER 9

Title:
Evaluation of firefighter breastmilk toxicity and flame retardant contaminants

Authors:
Shawn Beitel, Leanne Flahr, Christiane Hoppe-Jones, Fernanda Garavito, Sally Littau, Sara Jahnke, Jeffery Burgess, and Shane Snyder

Submitting Author Affiliation:
University of Arizona, Tucson, AZ, USA

Learning Objectives:
Assess the aryl hydrocarbon receptor mediated response in breastmilk of female firefighters before and after responding to structural fires.

Background: Lactating firefighters are exposed to a variety of chemicals at a fire scene which could impact their breast feeding children. One class of chemicals of concern include flame retardants such as polybrominated diphenyl ethers (PBDEs), which are found in many household items, along with other dioxin-like compounds present during fire suppression. It is known that environmental exposures can result in chemicals being deposited into breastmilk as a form of excretion from the body. Unfortunately, there is little known about the safety of breastmilk after fire-ground and emergency response exposures, resulting in concern from mothers making decisions about breastfeeding and/or the use of breastmilk produced after responding to a fire. Therefore, our aim is to investigate the concentration of PBDEs along with the mixture of dioxin-like compounds by assessing the aryl hydrocarbon receptor (AhR) mediated response in breastmilk before and after responding to structural fires.

Methods: Breastmilk samples were collected from female firefighters before and at several time points after responding to structural fires. Extraction of milk samples was conducted in order to quantify the concentration of 12 PBDEs by gas chromatography tandem mass spectroscopy, and to assess the AhR mediated response using the DR CALUX in vitro bioassay.

Results: A detectable AhR mediated response was quantified with the DR CALUX bioassay in extracts of breastmilk samples collected before and after structural fires. There was an increase in the bioassay response observed in post-fire breastmilk samples compared to pre-fire. Though ongoing analysis of more individuals is needed, these preliminary results suggest that this bioassay is able to assess the mixture of dioxin-like compounds present in the breastmilk.

Conclusions: More data should give insight into the time needed after responding to a fire for levels of these compounds and their toxicity to return to pre-fire levels.

POSTER 10

Title:
Identification of compounds in the urine of firefighters that contribute to an in vitro PAH CALUX response

Authors:
Shawn Beitel, Christiane Hoppe-Jones, Leanne Flahr, Fernanda Garavito, Sally Littau, Jeffery Burgess, and Shane Snyder

Submitting Author Affiliation:
University of Arizona, Tucson, AZ, USA

Learning Objective:
Identify compounds in the urine of firefighters that are responsible for aryl hydrocarbon receptor activation overall health.

Background: Firefighters are exposed to a variety of contaminants from combustion at a fire scene. With a greater cancer incidence observed in firefighters compared to the general population, research is underway to characterize the toxicity of individual chemicals and complex mixtures to which firefighters are exposed using in vitro biomarkers of effect. One particular in vitro bioassay measures aryl hydrocarbon receptor (AhR) activation, which is a mechanism by which polycylic aromatic hydrocarbon (PAH) and other PAH-like compounds (such as dioxins, and furans) express toxicity. Our research group identified that extracts of urine from firefighters collected post-fire had greater AhR bioactivity than extracts of urine pre-fire. However, it is uncertain which compounds in the urine of firefighters post-fire are responsible for the increase in bioassay response. Therefore, our aim is to identify compounds in the urine of firefighters that are responsible for AhR activation.

Methods: Urine samples obtained from training fires were extracted and analyzed with the in vitro bioassay and Gas Chromatography Quadrupole Time-of-Flight (GC-QTOF) to obtain the overall bioassay response and chemical profile of the mixture. An effect-directed-analysis approach using fractionation, bioassay testing, and chemical analytical testing is being used to narrow down and identify the number of toxicants potentially responsible for the bioassay response.

Results: Initial fractionation and analysis of the urine extracts using the in vitro bioassay identified three primary fractions of interest. With data analysis of the non-targeted chemical analysis underway, based on the fractionation pattern, it is hypothesized that some of the compounds responsible for the bioactivity might be more polar than the PAH-like compounds currently used to assess exposure.

Conclusions: Additional analyses may identify new biomarkers of exposure that better correlate to the bioactivity observed.

POSTER 11

Title:
Preparing New Jersey to participate in the National Firefighter Registry: Compiling a directory of New Jersey volunteer fire departments and conducting interviews with department leadership

Authors:
Taylor Black, Azanna Clemmings, Kathleen G. Black, Michael B. Steinberg, Judith M. Graber
Submitting Author Affiliation:
Rutgers, The State University of New Jersey, New Jersey, USA

Learning Objectives:
Discuss the challenges associated with creating a voluntary National Firefighter Registry and strategies stakeholders can use to engage fire departments.

Background: In 2018, federal legislation [H.R. 931] directed the Centers for Disease Control and Prevention to develop and maintain a national, voluntary registry of all US firefighters to track their cancer incidence. A major challenge will be obtaining electronic data that can be linked with population-based cancer and vital status registries. To prepare New Jersey (NJ) to participate in the registry, we are investigating existing data from NJ volunteer fire departments (FD). The first step is compiling and validating a comprehensive directory of all NJ volunteer FDs.

Methods: The directory is being created using data from the NJ Department of Community Affairs and the Fire-Community Assessment Response Evaluation System (FireCARES) (planned through a data use agreement). To assess accuracy, the data (e.g., roster numbers, contact information) will be verified by contacting up to 10% of departments. Using the directory as a sampling frame, we will select FDs for semi-structured interviews regarding FD characteristics, event response patterns, attitudes toward the registry, record-keeping practices, and the acceptability of confidential data sharing. Summary reports describing response themes and overall findings will be shared with government and community stakeholders.

Results: Directory development is ongoing; a preliminary analysis identified 413 volunteer FDs in 12 counties (NJ has 21 counties), 86% of which have multiple forms of contact information available. Most FDs have fewer than 50 volunteer firefighters (mean 42.4, standard deviation (SD) 28.1) and few female firefighters (mean 2.05, SD 2.37). However, 7% of FDs were listed under multiple municipalities; duplications will be resolved during data validation.

Conclusions: This project will contribute to the knowledge base of how volunteer FDs function and maintain records (e.g., recruitment, training, physical exams). This information will help inform development of the National Firefighter Registry which depends, in part, on its ability to engage volunteer FDs.

POSTER 12

Title:
Firefighter Cancer Prevention in Denmark and Europe

Authors:
Tommy Kjaer
Submitting Author Affiliation:
Firefighters Cancer Association, Denmark

Learning Objective:
Identify the best practice to avoid cross contamination after a fire and in the fire house. Demonstrate the state-of-the-art fire suits for better protection against PAH. Describe the best way to clean and decontaminate gear. Discuss best possible practice in your fire service. Compare this knowledge with your own working environment and rethink if any changes are needed.

Background: Firefighters are exposed to toxic substances when fighting fires such as polycyclic aromatic hydrocarbons (PAHs) and volatile organic compounds (VOCs). Many of them grouped by IARC as known cancer causing for humans Group A. Studies show an elevated risk for certain cancers in firefighters due to absorption through the breathing and digestive systems as well as dermal uptake. In order to reduce firefighters' exposure and the exposure time, it is necessary to implement prevention in many ways. Preventive work in firefighting is a focus in fire services all over Europe.

Methods: In Europe, we have developed best practices from the moment the firefighter goes on duty until they go off duty after a shift. We also cooperate closely with manufactures of PPE and decontamination systems in order to push for even better protection.

Results: BFC has developed practices based on a combination of science, what is practical and possible, and what is the best known technology to reduce cancer risk in firefighting. This includes:

- Always avoid cross contamination.
- Building of clean firehouses.
- Good behavior on the fire scene using breathing apparatus and definition of “safe zone.”
- Handle contaminated equipment separately from clean, unused equipment with special trucks made for this purpose.
- Proper cleaning and decontamination after every fire using LCO2 and Ozone.
- Proper personal hygiene after every fire intervention.
- Healthy living and exercise.
- Develop education programs for fire academies and training programs for older firefighters.

Conclusions: Future studies need to address other issues that potentially create health problems, such as interrupted sleep and psychological impacts. Areas where preventive measures should be prioritized even more. To reduce the number of firefighters affected by cancer, it's important for politicians, scientists, and firefighters to work together.

POSTER 13

Title:
Evaluation of long-term fire effluents hazards to firefighters (2018-2021)

Authors:
Ellen Goudsmits, Anna Clinton, and Anna Stec
Submitting Author Affiliation:
University of Central Lancashire, Preston, England, UK

Learning Objectives:
Analyze, evaluate, and discuss exposure of firefighters to carcinogenic toxicants. Identify exposure and metabolic routes for toxicants.

Background: There have been concerns, particularly in the U.S. and Canada, that fire effluents may have adverse health effects. The University of Central Lancashire has been asked by the Fire Brigade Union to assess if these concerns apply to UK firefighters, and to develop best practice for minimizing the risk of fire effluent contamination. The project will look at the exposure routes for fire effluents and other potential contaminants, via screening of firefighters' work environments and monitoring exposure and contamination during fires.

Methods: This research project is set to run for three years, with intermediate reports being released over the full duration. In order to ensure the study produces representative results, 15 UK fire stations will be specifically selected to participate. The investigation will include both emergency incident fires as well as those from training events where a variety of fuels and extinction methods can be studied. Atmospheric monitoring of gaseous and particulate matter will be supplemented by wipe samples taken from equipment and skin. The project is divided into three main areas;

1. Identification of potentially harmful components within fire effluents, soot deposits, and residues.
2. Evaluation of decontamination methods and equipment damage - influence of different cleaning processes, age and wear on permeability, and retention of contaminants.
3. Evaluation of potential exposure routes - inhalation, ingestion, and dermal absorption.

Results: Identification of the contaminants and their routes of exposure will allow for the optimization of decontamination methods for firefighters, their clothing and work environments. Subsequent work, including health screening, will allow for further optimization and development of prevention methods.

Conclusions: The outcome is to provide national guidance that will provide recognition of the fire hazards to firefighter health, increase awareness, and provide the best practice in minimizing exposure to the most common chronic fire effluents.

POSTER 14

Title:
Overview of current practice and awareness surrounding contaminants and decontamination in UK fire stations

Authors:
Anna Clinton, Ellen Goudsmits, and Anna Stec
Submitting Author Affiliation:
University of Central Lancashire, Preston, England, UK

Learning Objective:
Evaluate current practices in the UK with regards to contamination of PPE and ambient workspaces. Formulate a best practice policy for the Fire Brigade's Union.

Background: It is well documented that firefighters are exposed to carcinogenic substances both during firefighting activities, and from their ambient workplace environments. There is a substantial amount of data from studies carried out in the U.S. and Canada on firefighters and their health, however in Europe only recently have studies been carried out in Nordic countries showing that firefighters have higher rates of cancers when compared to the general population. The objective of this study was to carry out a survey of firefighters at stations across the UK to gain a comprehensive understanding and overview of the current practices used in UK fire stations with regards to decontamination, storage of PPE, and awareness of the health effects of contamination.

Methods: A survey was distributed to approximately 30,000 firefighters across the UK. The survey was broken down into sections to determine the individuals' demographic and activity within the service; variations in provision, use, cleaning, and storage of PPE; variations in workplace environment; approaches to personal hygiene; and awareness with regards to potential contaminants.

Results: Responses to the survey will be obtained and analyzed within the next two months. It will be analyzed for trends in practice and awareness across the country, employing statistical data analysis.

Conclusions: This survey will be implemented in a 3 year research project working to help shape "best practice" in fire stations/workplaces across the UK. This will ultimately help to reduce exposure of personnel to excessive amounts of contamination.

POSTER 15

Title:
Cancer and Disease Mortality Rates for Firefighters in Scotland: 1996-2017

Authors:
Louis Turrell and Anna Stec
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Learning Objectives:
Evaluate the risk of benign and malignant diseases in firefighters. Analyze the exposure-response characteristics in firefighters. Compare the disease and cancer mortality incidence in firefighters to that of the general population within the same age distribution for Scotland.

Background: Fire effluents contain a cocktail of toxic, irritant, and carcinogenic species, which vary depending on the fire scenario; the specific materials burning and the fire conditions at the incident. Repeated exposure to chronic toxicants, with genotoxic and carcinogenic effects, are of particular concern for firefighters. Regardless of the specific materials burning, carcinogens such as benzene, polycyclic aromatic hydrocarbons (PAHs) and toluene are released in almost every single fire within both the smoke and the soot produced, while the release of halogenated polychloro- and polybromodibenzo dioxins and dibenzofurans, respiratory sensitizers such as isocyanates, and heavy metals (e.g. lead and cadmium) is strongly related to the fire scenario. This study is one of the largest linkage cohort studies evaluating the risk of benign and malignant diseases in firefighters, and the first with adequate statistical power for detailed examinations of the exposure-response characteristics. The disease and cancer mortality incidence in firefighters is compared to that of the general population within the same age distribution for Scotland.

Methods: The firefighter establishment figures for 1996-2017 were obtained via freedom of information (FOI) requests to the National Records department of the Scottish Government (NRS). The general population mortality data was obtained using the NRS online access tool.

Results: The statistical significance and higher risk factors for both cancer and other diseases, based on number of deaths per 1,000 firefighters was calculated. The mortality rates for multiple myeloma and skin melanoma are significantly higher amongst firefighters than the general population, while increased rates have also been noted for other cancers and diseases, in particular kidney disease.

Conclusions: Further research of the specific fire effluents that contribute to specific cancers and diseases is required, alongside long-term health assessments of firefighters.

POSTER 16

Title:
Exposure to fire effluents and its impact on firefighter's health

Authors:
Anna A. Stec
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Learning Objective:
Fire toxicity is dependent on both material and fire conditions. Carbon monoxide is a good indicator of incomplete combustion however, it is not always the major toxicant. Hydrogen cyanide concentrations increase by factors of 10 to 50 with under-ventilation. Irritants (hydrogen chloride, organics, and smoke particles) can prevent escape, but carbon monoxide will be recorded as the cause of death. Unwanted fires will also produce many more products of incomplete combustion, chronic toxicants, including carcinogens, such as polycyclic aromatic hydrocarbons (PAH), respiratory sensitizers such as isocyanates, and PBT compounds such as polychloro- and polybromodibenzo dioxins and dibenzofurans (PCDD/F and PBDD/F) ("dioxins") from fuels containing halogens.

Background: The toxicity of fire effluents is known to be the biggest cause of death injury from unwanted fires. Compared with natural materials (wood, leather, etc.), widely used synthetic polymers (derived from oil) burn more quickly; they also generate more smoke and toxic effluents, particularly when compounded with halogenated flame retardants.

Methods: Lethal fires often involve smouldering furnishing (bed or chair) where there is a gradual increase in the local concentrations of smoke and toxic gases. During this time carbon monoxide (CO) and a large number of organic products are generated in the smoke. This can incapacitate victims or put them into a deep sleep so they do not escape. Once flaming starts, these products of incomplete combustion are oxidised to carbon dioxide and water, and the effluent toxicity of the well-ventilated fire decreases briefly. Fire quickly grows then until the availability of oxygen is limited (under-ventilated). This results in an increase in smoke, reducing visibility as the asphyxiant (oxygen depriving) gases (CO, and hydrogen cyanide (HCN)); irritant gases (hydrogen chloride, hydrogen bromide, acrolein etc.); and deep lung irritants and particulates are generated. CO and HCN concentrations increase by factors of 10 to 50 with under-ventilation, are far more dangerous than the lack of oxygen, and untenable conditions rapidly develop. Unwanted fires will also produce many more products of incomplete combustion, including particulates, carcinogens, such as polycyclic aromatic hydrocarbons, respiratory sensitizers such as isocyanates, and persistent, bioaccumulative and toxic compounds such as polychloro- and polybromodibenzo dioxins and dibenzofurans (PCDD/F and PBDD/F) ("dioxins") from fuels containing halogens.

Results & Conclusions: The effects of fuel (various polymers, building products etc.) and fire conditions will be shown, providing a generic understanding of the release various acute and chronic fire effluents and their effect on firefighters' health.

POSTER 17

Title:
Cancer prognosis by detection method in Korean firefighters

Authors:
Kyoung Sook Jeong, In Dam Cho, and Jaehee Lim
Submitting Author Affiliation:
Hallym University Sacred Heart Hospital, Anyang, Republic of Korea

Learning Objectives:
Compare the prognosis and stage by chances of cancer diagnosis in firefighters. Discuss which cancers should be screened in firefighters.

Background: Firefighters are exposed to many carcinogens including benzene, 1,3-butadiene, polyaromatic hydrocarbon, diesel engine exhaust, shift work, and so on. In general, cancer screening reduces the burden of cancer. It is necessary to decide which cancers are screened in firefighters. We compared the prognosis and stage by detection method of cancer in Korean firefighters.

Methods: We registered cancers in Korean firefighters. We collected age, year of diagnosis, stage at cancer diagnosis, current status of cancer, employment year, shift work duration, longest job as firefighters, and so on. We compared the stage and current status of cancers by the chances of cancer diagnosis by chi-square test.

Results: A total of 323 firefighters registered cancers. The mean age and employment duration as firefighters were 42.9 (Standard deviation (SD) 8.52) and 15.5 (SD9.01) years, respectively. Thyroid cancer was most common (108 cases) and the stomach, colorectal, and lymph-hematopoietic system were registered 54, 35, and 31 cases, respectively. 71.6% was detected by health examination and 23.1% was diagnosed during evaluation for clinical symptoms. The death rates were 1.3% in detection cancers by health examination and 12.2% after clinical symptoms. (p=0.03) 16.4% and 54.5% were 3 and 4 stages, respectively. (p<0.001) The cancer stages and death rates were no differences by age, shift work duration, and longest job duration.

Conclusions: Health examination is contributed to the good prognosis in firefighters' cancer. We should study which cancers should be screened in firefighters in the future. This study was supported by Korea Fire Officials Credit Union.

POSTER 18

Title:
Development and measurement properties of a firefighter-specific work limitations scale

Authors:
Joy MacDermid
Submitting Author Affiliation:
Western University, Ontario, Canada

Learning Objective:
To describe the development and psychometric properties of a new firefighter-specific work limitations questionnaire.

Background: Previous validation of a generic Work Limitations Questionnaire tested in firefighters indicated problems with floor effects' likely arising from the unique and challenging nature of firefighting work.

Objective: To develop a firefighter-specific work limitations questionnaire using a mixed-methods approach.

Methods: Item generation included a series of interviews: 21 firefighters (15 males, six females) from fire services across Canada (Alberta, British Columbia, Nova Scotia, Ontario, Prince Edward Island, Quebec) were interviewed using a semi-structured guide to assess areas of work limitation. The phone interviews were recorded and transcribed verbatim. Content analysis identified five themes: physical, social/interpersonal, cognitive, emotional, routines/time management. In addition, we conducted two nominal group exercises with 20 firefighters at a provincial firefighter conference. Items were generated from the firefighter interviews/nominal activities and categorized into the five domains. A group of 53 firefighters completed a content analysis survey evaluating the relevance of the items and the frequency with which they were performed. From this analysis, items were classified as strong potential, questionable, or not appropriate. The strong and questionable items were further reduced and clarified by a panel of expert measurement experts working with firefighters.

Results: A beta version of a firefighter at-work limitations questionnaire was developed with five subscales, each subscale containing three to six items. Firefighters endorsed the new measure as relevant to their work. Content validity index for a subset of items and the resulting overall scale was high (> 80%). Additional psychometric properties of the questionnaire are underway and will be presented.

Conclusions: A firefighter-specific work limitations questionnaire was developed and will provide a mechanism for more accurate assessment of work limitations across a variety of health conditions (e.g., cancer) affecting firefighters. This type of instrument can also be useful in identifying early concerns with job abilities or planning return to work.

POSTER 19

Title:
Stability of wipe sampling for Semi-Volatile Organic Compounds and Polycyclic Aromatic Hydrocarbons from Firefighters' Skin and Clothing

Authors:
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Learning Objectives:
Evaluate literature methods for wipe sampling. Identify best practice for wipe sampling to ensure reliable, stable results. Formulate plans for monitoring contaminants on firefighters' skin and clothing.

Background: Wipe samples are commonly taken from firefighters' skin and PPE, as well as workplace surfaces. Throughout the literature there are numerous methods employed for collection of samples, with the use of different solvents, materials and analytical technique. This makes it difficult to compare results across different studies. The aim of this study was to optimize a method for wipe sampling which would give the greatest uptake of volatile organic compounds (VOC) and polycyclic aromatic hydrocarbons (PAH) combined with stability. Ultimately, this should improve the reliability of future sampling of this nature.

Methods: Wipe samples were taken from skin and surfaces using a wipe impregnated with isopropyl alcohol. Different methods were tried and optimized. Three wipes were taken each time, and these were analyzed using GC-MS at three time intervals from sampling; immediately, 24 hours, and 48 hours later. The intervals were chosen to represent possible logistical timescales between sampling and testing. The wipes for delayed testing were stored in sealed amber vials wrapped in foil in a dark place at two temperatures, ambient and refrigerated at 6Â°C.

Results: Wipe samples were found to be stable for 24 hours when stored at ambient temperature. After 48 hours, a number of compounds that were present in earlier analysis were no longer detectable, however benzo[a] pyrene and fluoroanthene remained stable for a longer period of time. When wipe samples were stored in a refrigerated environment, neither PAH nor VOC were seen to decrease significantly after 24h.

Conclusions: Storing the samples in air-tight refrigerated conditions is essential for sample stability. Research is continuing into the longer-term stability when refrigerated and into other methods which may provide greater stability.

POSTER 20

Title:
Evaluating Causation in Epidemiological Studies of Firefighters

Authors:
Tee Lamont Guidotti

Learning Objective:
Describe the standard of certainty in workers' compensation to which experts are held. Describe four common interpretive issues encountered in assessing causation in firefighters. Describe the epidemiological principles behind presumption as a policy.

Background: The evaluation of causation in cancers associated with firefighting presents problems in causality common to other applications of occupational epidemiology in adjudication of individual claims for workers' compensation. A global trend to establish legislated presumptions for compensation of firefighters has created an opportunity to reevaluate the literature applying standards of certainty based on the "weight of evidence" ("50% + 1") rather than elusive and, for many cancers, unattainable scientific certainty. Such standards are the norm and are required to be used in workers' compensation, which is also required to take into account individual factors.

Methods: We have exhaustively and repeatedly reviewed the epidemiological literature (to which we have also contributed) on cancer risk among firefighters based on the weight of evidence rather than scientific certainty. Generalizable frameworks were formulated to define recurrent issues in assessing the evidence from epidemiological studies.

Results: We have identified four analytical frameworks describe the problems in analysis encountered:

1. Rare cancers. "Rare" (in biostatistical sense) cancers are prone to inadequate statistical power in individual studies (e.g. testicular). Misguided response is usually to aggregate cancers into biologically meaningless groups for analytical convenience (e.g. "non-Hodgkin lymphoma").
2. Aggregation, one tumor type dominates. Dilution of the risk estimate by misclassification bias introduced by aggregation into rubrics (e.g. brain, when Grade 4 astrocytoma, "glioblastoma", is the tumor of interest at 34% of total). Elevation in tumor type of interest is easily missed.
3. Aggregation, no one type dominates. Epidemiological studies tend to promote illogical groups (e.g. "leukemia, lymphoma, and myeloma"). Elevation in tumor type of interest is diluted and variable among studies.
4. Potential confounding by smoking. Fletcher has provided a method for correcting for smoking prevalence.

Conclusions: Epidemiological studies do not, by themselves, answer all the important questions about the etiology (cause) of occupational disease that are required to make a judgment for compensation. They inform conclusions about "general causation", which refers to evidence for an elevation of risk and the connection between disease and possible causes in general. Workers' compensation and other compensation systems require individualized evaluation of each case, called "specific causation", taking into account the individual circumstances, risk factors, and health risks for the claimant. Epidemiology can also inform specific causation by indicating whether risks are disproportionately elevated in certain job assignments, after a certain number of years of exposure, or against a background of other, non-occupational risks (such as cigarette smoking). This requires interpretation.

POSTER 21

Title:
Association of inflammatory markers with firefighters activity and sleep disorder in Korean firefighters: a cross-sectional study

Authors:
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Submitting Author Affiliation:
Hallym University Sacred Heart Hospital, Anyang, Republic of Korea

Learning Objectives:
Evaluate relationship with shift work related sleep disturbances and inflammatory markers in firefighters.
Evaluate job (fire suppression, rescue, fire investigation) and inflammatory markers in firefighters.

Background: Firefighters are exposed to various harmful factors such as exposure to fire and shift work. There is a study that reported an increase in TNF-αand IL-6 levels after exposure to high temperatures in firefighters and a meta-analysis of sleep disturbances, sleep duration, and inflammation markers has shown a link between sleep disturbances and CRP and IL-6. We evaluated the relationship with shift work related sleep disturbances, job (fire suppression, rescue, fire investigation) and inflammatory markers (CRP, TNF-α, IL-6 and GM-CSF).

Methods: 516 firefighters randomly sampled from fire departments in Korea were surveyed about sociodemographic and occupational characteristics. Blood was collected from 411 firefighters for inflammatory markers. In shift work firefighters, we measured twice each before and after shiftwork. Insomnia severity index and the Epworth sleepiness scale were measured for sleep disturbances. CRP, IL6, TNF-αand GM-CSF in each group were compared.

Results: There was no significant difference in CRP, IL-6, and TNF-αbefore and after work, and by firefighters' activity. In the analysis with sleep disorders, only excessive daytime sleepiness (EDS) group showed higher GM-CSF level compared to normal group. The concentration of GM-CSF was correlated to presence of EDS after adjustment for confounding factors (α=0.217, 95% CI=0.005~0.4283, $p < 0.05$)

Conclusions: There was positive relationship with excessive daytime sleepiness with GM-CSF. GM-CSF may be biological marker for EDS. This research was supported by the Field-oriented Support of Fire Fighting Technology Research and Development Program funded by National Fire Agency.

POSTER 22

Title:
Association of FGF-23, klotho, and serum 25-OH Vitamin D with shift work in Koran firefighters: a cross-sectional study

Authors:
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Learning Objective:
Evaluate association of FGF-23, Klotho, and Vitamin D concentration with shift work in Korean firefighters.

Background: Shift work is known to disrupt the human circadian rhythm and risk factor for sleep disorder, metabolic syndrome and cancer. International Agency for Research on Cancer (IARC) classified shift work as a group 2A carcinogen in 2007. Recent studies found that circadian clock gene controls circadian oscillators in molecular level and may acts as tumor suppressor gene. Fibroblast growth factor-23 (FGF-23) regulating phosphate homeostasis is cancer related gene, which mutation may promote cancer progression. Klotho that making complex with FGF-23 is known as tumor suppressor gene. Homeostasis of phosphate concentrations was regulated by FGF-23, klotho and Vitamin D feedback loop. Previous studies consistently reported that elevated FGF-23 and decreased Vitamin D were related to cancers. However molecular pathogenesis of cancer and shiftwork was not clarified yet. In this study, we evaluated the association of FGF-23, Klotho, and Vitamin D with shift work in Korean firefighters.

Methods: The subjects were 483 firefighters in six fire stations in Korea. We performed questionnaire survey including sociodemographic and work-related characteristics. The subjects' blood was sampled for measuring Vitamin D, FGF-23, and Klotho. Simple and multiple linear regression analyses were performed with VitD3, FGF-23, and Klotho as dependent variables.

Results: The concentrations of alpha-klotho and FGF-23 were correlated to shift work after adjustment for confounding factors (α=0.478 (95% CI=0.002~0.955), α=-1.825 (95% CI=-2.747~-0.903), respectively). However, VitD3 did not show a significant relationship with shift work ($p > 0.05$).

Conclusions: We found that FGF-23 had a positive relationship, and Klotho had a negative relationship with shift work. For monitoring impact of shift work, alpha-klotho and FGF-23 may be potential biomarker. This research was supported by the Field-oriented Support of Fire Fighting Technology Research and Development Program funded by National Fire Agency.

POSTER 23

Title:
The National Fire Operations Reporting System
Authors:
Lori Moore-Merrell and Craig Weinschek
Submitting Author Affiliation:
George Washington University, Washington DC, USA
Learning Objectives:
Describe the National Fire Operations Reporting System (NFORS) Exposure App
List the data elements captured by the App. Demonstrate the NFORS Exposure App to others. Discuss methods of on-boarding firefighters to the system and accessing data for analysis.

Abstract:

The National Fire Operations Reporting System (NFORS) uses technology to capture data from computer aided dispatch (CAD) systems or records management systems (RMS) and analyze that data to provide operational insights for chief officers and the rank and file. At the policy making level, NFORS is a fire service analytical system and the most comprehensive way to get accurate and real-time information to help fire service leaders assure adequate fire resources; optimize fire operations; reduce firefighter injury and death; minimize civilian injury and death; and minimize property loss.

NFORS does more than just report the details of the incident, it digs deeper into the operations to provide a richer and fuller analysis. NFORS asks, "What was the environment like when fire fighters arrived? What did fire fighters do, what was the engagement with the fire? What toxic materials were encountered?"
To the fire officer, firefighter, and paramedic responding to emergency incidents, NFORS is also a personal database providing a detailed history of their work and exposures in a private, encrypted, secure online environment, all available on a mobile device. The NFORS Exposure App becomes a firefighter career diary to assure evidence of career exposures, should physical or behavioral health issues arise long-term or even in retirement. As more governments enact presumptive legislation providing worker's compensation coverage for firefighters who get cancer, the NFORS Personal Exposure Record will help provide the necessary evidence to show work related exposure. Today many firefighters struggle to gather the evidence that on-the-job toxic exposures are linked to their cancer. Now all the information can be stored in one place.

NFORS is engaged with departments throughout the U.S. and with the CDC and NIOSH on studies tracking firefighter exposures. NFORS can be the tool to assure data consistency for other researchers as well.

POSTER 24

Title:
FASNY-- Northwell Health Study of Cancer in Volunteer Firefighters in New York State (NYS):
Research in Progress
Authors:
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Northwell Health, New York, USA
Learning Objective:
Understand why data on volunteer firefighters' cancer incidence and mortality (overall, cause-specific) is needed in addition to what is known from studies of career firefighters. Describe the methods used in this study for recruitment, data collection, and determining how patterns of cancer incidence and mortality among volunteer firefighters in New York State compare to risks in the general population and among career firefighters. Consider how risk factors at the individual level and at the fire department or community level may be associated with increased cancer incidence and mortality among volunteer firefighters.

Background: Carcinogen exposures place firefighters at an increased risk for developing certain kinds of cancers; however, cancer incidence data is only available in the United States (U.S.) for career firefighters. Of the estimated 1.1 million firefighters in the U.S., over 70 percent are volunteers. The largest cohort study to date of career firefighters, conducted by the National Institute for Occupational Safety and Health ("the NIOSH study"), found increased risks for cancer overall and in the respiratory, digestive, and urinary systems. Evidence for career firefighters may not be applicable to volunteers due to varied intensity and amount of exposure. The Firemen's Association of the State of New York (FASNY) is sponsoring the first large-scale all-volunteers study in the U.S. to determine cancer incidence and mortality rates and examine factors associated with increased cancer risks among volunteer firefighters.

Methods: Over 1,700 volunteer and combination fire departments in NYS were eligible to participate in the study. Participating fire departments complete a survey with departmental and training event information and submit rosters of past and present members that include name, birthdate, address, and service details. The Office of Fire Prevention and Control (OFPC) provided 2012-2016 fire run reports for every NYS fire department.

Results: Enrollment will end in May, 2019. Data on recruitment strategies and participant characteristics will be presented.

Conclusions: The final study roster will be submitted in late 2019 for linkage analyses with state cancer registries and the National Death Index. Cancer incidence and mortality in the study population will be compared to expected rates based on NYS and U.S. populations. Departmental factors, including fire runs, will be used to assess community-level exposure indices and evaluate whether exposures from firefighting in the volunteer fire service contribute to increased risks for certain cancers seen in comparable studies of career firefighters.

POSTER 25

Title:
Roadmap to Establishing a Firefighter Cancer Initiative Prevention and Wellness Clinic

Authors:
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Submitting Author Affiliation:
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Learning Objectives:
Discuss the process of establishing a firefighter cancer prevention clinic.
Identify cancers and risk factors that are unique to the firefighter population. List the key steps needed to launch a firefighter specific clinic.

Background: Firefighters have chronic exposure to carcinogenic materials and chemicals. Carcinogens such as benzene and polycyclic aromatic hydrocarbons (PAHs) are present in active burning fires1. This exposure over time has raised concerns about possible occupational associated cancer risks. According to a retrospective cohort study done by Ma, et al (2006), which focused solely on firefighters in the state of Florida, increased findings for cancer included bladder, thyroid, testicular, and cervical.

The Firefighter Cancer Initiative (FCI) launched in 2015, with the purpose of understanding cancer in the firefighter population. As part of ongoing research, the Cancer Prevention and Wellness Clinic was created to provide prevention, screening, and early detection of cancer to active and retired firefighters.

Objectives: To describe one institution's roadmap to establishing a Cancer Prevention and Wellness Clinic.

Interventions: Steps to launch the clinic involved:
- Hiring clinic personnel
- Collaboration with various departments such as marketing, IT, and other key stakeholders
- Meeting with local fire departments to advertise the clinic in the community
- Establishing clinic guidelines and intake processes
- Developing in-services for clinic nurses

Discussion: Firefighters in the community have yearly physicals as a job requirement. If results from their yearly physical are suspicious for cancer, firefighters have no designated specialists for follow-up. The purpose of this clinic is to provide an all-inclusive service to include comprehensive exams, diagnostic tests when applicable, referral to specialists, and follow-up as indicated all within one established comprehensive cancer center.

Conclusion: As the clinic grows, the goal is to help further our understanding of screening practices, as well as create a national standard of care for cancer screening among firefighters. The added benefit for the firefighter population is the availability of clinic trials offered by the center with ongoing collaboration with the FCI research team.

POSTER 26

Title:
Firefighters exposures to polycyclic aromatic hydrocarbons and other environmental mutagens during emergency fire suppression

Authors:
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Learning Objective:
Define cancer rates in the fire service. Explain how exposures to chemicals may influence one's risk of developing cancer and other illnesses. Explain, with data to back it up, how firefighters are exposed to chemicals during emergency fire suppression. List actions that can be taken to reduce firefighters' exposures to toxic chemicals while on-shift.

Background: Firefighters experience above average risks of cancer and other serious illness. Their exposures to combustion emissions, including polycyclic aromatic hydrocarbons (PAHs), metals, and other products of combustion are a concern. Few studies have examined firefighters' exposures to combustion emissions during on-shift emergency fire situations.

Objectives: To assess firefighters' occupational exposures to combustion emissions during emergency fire suppression.

Methods: We measured exposures to PAHs, antimony, cadmium, and lead using (1) personal air samplers worn by firefighters during emergency fire suppression; (2) wipe samples of skin, personal clothing, and personal protective equipment (PPE) collected before and after emergency firefighting; and (3) urine samples collected before and after emergency firefighting. We examined chemical exposures in firefighters by measuring PAHs and metals in air and surface wipe samples of skin, clothing, and PPE. We determined urinary PAH metabolite concentrations and urinary mutagenicity using the Salmonella mutagenicity assay (Ames test). Urinary Clara Cell 16 (CC16) and 15-isoprostane F2t (8-iso-PGF2α) concentrations were used to assess lung injury and oxidative stress, respectively.

Results: Air concentrations exceeded occupational exposure limits at two fire events for lead and nine for PAHs. After fire suppression, PAH concentrations were significantly higher on skin and PPE ($p<0.001$), antimony on skin, clothing, and PPE ($p<0.001$, 0.01, and 0.05, respectively), and lead on skin and PPE ($p<0.001$). Post-event concentrations of urinary PAH metabolites were, on average, 2.9- to 5.3-fold higher than pre-event values, depending on the PAH metabolite ($p < 0.0001$). Average post-event urinary mutagenicity showed a significant, event-related 4.3-fold increase ($p < 0.0001$). Urinary CC16 and 8-iso-PGF2α did not increase. PAH concentrations in personal air and on skin accounted for 54% of the variation in fold changes of urinary PAH metabolites ($p < 0.002$).

Conclusions: The results indicate that emergency, on-shift fire suppression is associated with significantly elevated exposures to combustion emissions.

POSTER 27

Title:
Perceived Health Risks Among Firefighters; A Survey of the New Jersey Firefighters

Authors:
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Submitting Author Affiliation:
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Learning Objectives:
List the broad categories of disease firefighters attribute additional risk to as a result of their employment. Discuss the importance of understanding both the clinically significant threats to firefighter health as well as firefighter's perception of those threats. Identify knowledge gaps in firefighter preparatory programs and evaluate barriers to addressing them.

Background: Firefighting is an extremely dangerous occupation, placing firefighters at increased risk of injury, illness, disability, and death. While literature on health risks of firefighting, including excess cancer, is extensive, little information exists regarding firefighter's perception of these health threats. We assessed the level of additional risk current and former firefighters attribute to disease onset as a result of their employment.

Methods: Firefighters attending an annual union convention were asked to complete a paper survey. The survey consisted of four domains: demographics / risk behaviors, cancer screening history, firefighting experience (duration of firefighting career/volunteer work) and a 6-point Likert scale assessing additional risk for disease ("0" representing "no additional risk" and "5" representing "a lot of additional risk"). Medians and standard deviations of perceived risk were calculated for each health condition, and all cancers combined. Occupational and demographic risk factors of perceived risk were assessed in bivariate and multivariable analysis.

Results: Of 169 completed surveys one was excluded due to missing data (n=168). Firefighters were predominately male (99%), non-Hispanic White (76%) and 74% had at least some college education. Most were overweight (BMI >25 and <30: 42%) or obese (BMI >30: 47%). Firefighters median perceived risk ranged from 4.0 (colon, hematologic, breast, prostate, and testicular cancers) to 5.0 (cardiovascular diseases, pulmonary diseases, all cancers, lung, and oral cancer).

Conclusion: New Jersey Firefighters attribute "a lot" of additional risk to acquiring various diseases (cardiovascular and pulmonary diseases, any kind of cancer) as a result of their employment. With a firm understanding of the most clinically significant threats to firefighter health and wellbeing, gauging active duty firefighter perception regarding their own morbidity and mortality will help develop future firefighter education and preparatory programs. Future implementation of this survey will be conducted to inform firefighter cancer screening practices.

POSTER 28

Title:
Skin Cancer Screening Using Total Body Photography and Digital Dermoscopy: A Pilot Study Among Firefighters in Florida

Authors:
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Submitting Author Affiliation:
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Learning Objective:
To determine the feasibility and diagnostic accuracy of TBP and digital dermoscopy (DD) as a triage alternative to the initial face-to-face full body skin examination (FBSE) skin cancer screening (SCS) among Florida firefighters.

Background: Early detection of skin cancer remains the most cost-effective means of improving outcomes and reducing associated costs. Dermoscopy and total body photography (TBP) are non-invasive tools that improve early detection, especially for high-risk individuals such as firefighters.

Objectives: To determine the feasibility and diagnostic accuracy of TBP and digital dermoscopy (DD) as a triage alternative to the initial face-to-face full body skin examination (FBSE) skin cancer screening (SCS) among Florida firefighters.

Methods: Cross-sectional observational study with a diagnostic test and concordance analysis. Miami-Dade firefighters 18 years or older were eligible for inclusion. SCS were performed by two dermatologists and two dermatology residents over three days. Participants underwent FBSE by a physician and TBP with DD performed by a non-dermatologist. A physician, blinded to the FBSE, reviewed the TBP images. Physicians documented suspicious findings, confidence level, and management decision. Patients documented sun-related behaviors, skin cancer history, and attitudes towards SCS. Suspicious lesions were biopsied on-site. The study was approved by the IRB at University of Miami.

Results: Overall, 136 firefighters were enrolled with 100% participant survey response rate. Almost half of firefighters (47.8%) had ever had a FBSE performed by a physician and 38.2% regularly perform a self-skin exam. Although only 1.5% reported having TBP in the past, 97.8% would consider TBP for virtual SCS. From the 136 firefighters, 127 underwent FBSE and TBP (110 males). Physicians reported suspicious lesions in 26.8% (n=34) of FBSE versus 33.9% (n=43) of reviewed images, showing a trend towards more skin cancer diagnoses with TBP. When FBSE did not reveal suspicious lesions, the physician would reassure in 96.9% of the cases, compared to 54.3% of cases with TBP.

Conclusions: Our preliminary results demonstrate an opportunity to improve primary prevention efforts for skin cancer among firefighters. Further studies are needed to validate the clinical utility and cost-effectiveness of TBP for virtual SCS.

POSTER 29

Title:

Longitudinal Association between Cancer Diagnosis and Engaging in a Secondary Occupation among Florida's Firefighters: Analysis of the Annual Cancer Survey Cohort Data 2016-2018

Authors:

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Learning Objectives:

Describe the association of second job and cancer diagnosis in a sample of Florida firefighters.

Background: Cancer among firefighters have been associated with their occupational exposures to chemicals and carcinogenic agents. Epidemiologic studies in the U.S. Fire Service suggest that approximately a third of the workforce engages in second jobs that could be contributing other workplace exposures. In this study, using a cross lagged panel model we assessed the longitudinal association between engaging in a secondary occupation and cancer diagnosis among male and female Florida firefighters.

Methods: Data from the 2016-2018 Annual Cancer Survey cohort of Florida firefighters was analyzed using a cross lagged panel model to examine the longitudinal reciprocal relationship between engaging in a secondary occupation in the past 12 months and cancer diagnosis in the last 12 months. Series of regression equations were estimated simultaneously controlling for age, gender, and education.

Results: A total of 244 male and female firefighters, 18 to 65 years old in active service followed up for 3 years (2016-2018) with 9% self-reporting a cancer diagnosis and 69% with a second job. Engaging in a secondary occupation at a prior time is positively associated with both engaging in a secondary occupation (ϕ_{job}=0.822;p<.0001) and with cancer diagnosis at subsequent time (ϕ_{job}=0.312;p<.05) but negatively associated at the 3rd time point (ϕ_{job}=0.216;p>.05).

Conclusion: Firefighters who engage in a secondary occupation are more likely to engage in a secondary occupation subsequently and those who engage in secondary occupation are likely to have a cancer diagnosis at the subsequent time point after which they are no longer at risk.

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FIREFIGHTER CANCER INITIATIVE

RESEARCH > EDUCATION > PREVENTION

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