University of Illinois Fire Service Institute

Course Syllabus

Course Title: Chemical Exposure and Cardiovascular Risk Reduction

Course Duration: 4 Hours

Program: Research

Course Prerequisites: None

Course Description:
This 4-hour course will present exposure reduction best practices for implementation on the fireground. Research efforts at IFSI and other institutions have identified numerous best practices for reducing exposure to common fireground contaminants. This course will discuss the methodology used in research projects, the analysis of the collected data, and the implementation of changes at the fire department level.

All firefighters, including company and chief officers, can benefit from this program. The focus of the course is on the training exposures, but many of the principles can be applied to real-world scenarios.

Course Requirements:

Pre-Course Work – None
Course Work – Attend lecture.
Post-Course Work – None

Course Policies:

Safety Policy: Students shall understand and follow all instructions pertaining to operational safety, as stated by instructors or as written in course materials. Instructors and students shall be mindful of safety at all times. Conduct judged to be unsafe shall be grounds for dismissal from the course.

Academic Integrity Policy: IFSI has the responsibility for maintaining academic integrity so as to protect the quality of the education provided through its courses, and to protect those who depend upon our integrity. It is the responsibility of the student to refrain from infractions of academic integrity, from conduct that may lead to suspicion of such infractions, and from conduct that aids others in such infractions. Any violation of the code of conduct is grounds for immediate dismissal from the course.

American Disabilities Act: As guaranteed in the Vocational Rehabilitation Act and in the American Disabilities Act, if any student needs special accommodations, they are to notify their instructor and provide documentation as soon as possible so arrangements can be made to provide for the student's needs. If arrangements cannot be made at the class site, the student will test at an alternative time and place where the special accommodations can be made.

Course Content:

Module: 1
Title: The Fire Service, Cancer, and Cardiovascular Health
Terminal Learning Objective:

1. At the conclusion of this module, the student will identify cancer prevalence, the impact of firefighting on cardiovascular health, and their significance in the fire service.

Module: 2
Title: Donning and Doffing PPE
Terminal Learning Objective:

2. At the conclusion of this module, the student will identify how to don, wear, and doff firefighting personal protective equipment to reduce contamination.

Module: 3
Title: Post Incident
Terminal Learning Objective:

3. At the conclusion of this module, the student will identify post-incident duties to reduce exposure, prevent cross-contamination, minimize heat stress, and return the firefighter, PPE, apparatus, and tools to service.

Module: 4
Title: Other Considerations
Terminal Learning Objective:

4. At the conclusion of this module, the student will implement practices in their lives to minimize cardiovascular and cancer risks.

Module: 5
Title: Key Take-Aways
Terminal Learning Objective:

5. At the conclusion of this module, the student will explain the impact of cancer on the fire service, methods to reduce exposure during fireground training, and implement the best practices to do one's work safely.

Reference List:

1. Daniels, R.D., et al., Mortality and cancer incidence in a pooled cohort of US firefighters from San Francisco, Chicago and Philadelphia (1950 – 2009). *Occupational and Environmental Medicine*, 2014. **71**(6): p. 388.
2. Dockery, D.W., Epidemiologic evidence of cardiovascular effects of particulate air pollution. *Environmental Health Perspectives*, 2001. **109**(suppl 4): p. 483-486
3. Fahs, C.A., et al., Acute effects of firefighting on arterial stiffness and blood flow. *Vasc Med*, 2011. **16**(2): p. 113-8.
4. Feldmann, R.J. and H.I. Maibach, Regional variation in percutaneous penetration of 14C cortisol in man. *J Invest Dermatol*, 1967. **48**(2): p. 181-3.
5. Fent, K.W. and D.E. Evans, Assessing the risk to firefighters from chemical vapors and gases during vehicle fire suppression. *Journal of Environmental Monitoring*, 2011. **13**(3): p. 536-543.
6. Fent, K.W., et al., Firefighters' and instructors' absorption of PAHs and benzene during training exercises. *Int J Hyg Environ Health*, 2019. **222**(7): p. 991-1000.
7. Fent, K.W., et al., Firefighters' urinary concentrations of VOC metabolites after controlled-residential and training fire responses. *International Journal of Hygiene and Environmental Health*, 2022. **242**: p. 113969.
8. Fent, K.W., et al., *Health hazard evaluation report: evaluation of chemical exposures during fire fighter training exercises involving smoke simulant.* 2013, National Institute for Occupational Safety and Health.
9. Henning, A., et al., Influence of particle size and material properties on mucociliary clearance from the airways. *Journal of aerosol medicine and pulmonary drug delivery*, 2010. **23**(4): p. 233-241.
10. Hibner, B.A., et al., Effect of live-fire training on ventricular-vascular coupling. *Eur J Appl Physiol*, 2022. **122**(3): p. 591-597.
11. Horn, G.P., et al., Core temperature and heart rate response to repeated bouts of firefighting activities. *Ergonomics*, 2013. **56**(9): p. 1465-73.
12. Smith, D.L., et al., Cardiovascular Strain of Firefighting and the Risk of Sudden Cardiac Events. *Exercise and Sports Sciences Reviews*, 2016. **44**(3): p. 90-97.
13. Smith, D.L., et al., Effect of strenuous live-fire drills on cardiovascular and psychological responses of recruit firefighters. *Ergonomics*, 2001. **44**(3): p. 244-54.
14. Smith, D.L., et al., Extreme sacrifice: sudden cardiac death in the US Fire Service. Extrem Physiol Med, 2013. **2**(1): p. 6.

Recommended Reading List:
The following are links to readings and videos regarding decontamination, cardio research, publications, and cancer risk reduction.

https://fsi.illinois.edu/decon/#!/index

https://fsi.illinois.edu/research/cardiochem/#!/

https://fsi.illinois.edu/research/publications.cfm

https://training.fsri.org/course/031-cancer-risk-reduction

University of Illinois Fire Service Institute

Course Schedule

DAY ONE

Event	Duration
Module 1 – The Fire Service, Cancer, and Cardiovascular Health	1 hour
Module 2 – Donning/Doffing PPE and Throughout Training	1 hour
Module 3 – Post Incident	1 hour
Module 4 – Other Considerations	30 minutes
Module 5 – Key Take-aways	30 minutes