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Background

This report, the 12th in a series, reviews activities related to the Missoula Technology and Development Center (MTDC) project on wildland firefighter health and safety. The project focuses on three areas:

Work, rest, and fatigue: Determine work/rest guidelines, assignment length, and fatigue countermeasures for crews and overhead teams.

Energy and nutrition: Improve the energy intake, nutrition, hydration, immune function, and health of wildland firefighters.

Fitness and work capacity: Use work capacity and medical standards to ensure the health, safety, and productivity of wildland firefighters.

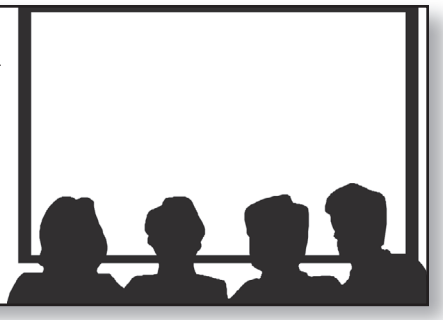
Human Factors

The Featured Topic of this report focuses on incident management teams and the influence of job-related stress on the health and performance of their members. These teams provide the organization and structure that underlie effective wildland firefighting operations in the United States. The teams also coordinate and manage the responses to a broad category of other natural and manmade disasters. Team members work in highly charged, emotionally demanding conditions. MTDC is documenting job-related stress, identifying ways to manage the stress, and evaluating ways to improve the health and performance of team members.

The Research section reviews project-related field studies of wildland firefighters during the 2007 fire season, including shift food (intermittent feeding), hydration, and health risks for members of incident management teams. The Risk Management section reviews recent data on the causes of wildland firefighter fatalities. The Field Notes section previews the forthcoming third edition of "Fitness and Work Capacity."

An incident management team member conducts a morning briefing.

Featured Topic



Incident Management Stress

MTDC and its cooperators at the University of Montana (UM) have been conducting field studies on wildland firefighters for several decades. During this time, incident management team members have requested MTDC to focus on issues related to their activities. Members of these teams have much of the practical institutional knowledge about wildland firefighting. Agencies need to promote good health habits to help these team members stay healthy and effective on the job.

2006 Studies—During the summer of 2006, we gathered data to evaluate the health status and the risk of coronary artery disease (CAD) in a sample of incident management team members. An e-mail survey was sent to team members in the Northern Rockies. The survey asked respondents about their risk factors for coronary artery disease, including lack of physical activity and use of medications that might indicate increased risk. The survey response rate was 72 percent.

The responses of 66 team members were evaluated (52 males and 14 females). The members were 51.2 years old on average and had served an average of 8.5 years on a team. Overall, the team members mirror national demographics in terms of cardiovascular risk factors relative to their age. They had an average of 2.6 risk factors (table 1).

Table 1—Risk factors for coronary artery disease (CAD) reported by 66 incident management team members.

Risk factor	Percent reporting the factor
Overweight	35
High cholesterol	41
High blood pressure	39
Sedentary	39
Family history of CAD	17
Diabetic	3

Respondents reported above average levels of physical activity overall, with 22 percent reporting musculoskeletal problems. Members whose jobs required more physical activity reported fewer risk factors for coronary artery disease than did those in more sedentary positions. When evaluated by age (younger than 48, 48 to 55, older than 55), team members in the youngest group had few coronary artery disease risk factors and were more aerobically fit, while those in the two older groups were not statistically different from each other.

Incident management team members whose job positions require little or no physical activity have higher risk for coronary artery disease than members whose positions require extended walking and fireline activities (table 2). While this survey represents a small sample, there are clear trends in the risk for coronary artery disease associated with the positions held by members of incident management teams.

Table 2—The likelihood of risk factors for coronary artery disease and the physical activity required for an incident management team member.

Incident management team position	Average number of risk factors	Sedentary (percent)	Overweight (percent)
Requires extended activity	2	30	20
Requires little activity	3	54	46

2007 Studies—During the 2007 fire season, the UM-MTDC research team collected additional data on incident management team members, including a blood profile and fitness test. To further evaluate the current health status, activity levels, and risks of coronary artery disease, we:

- Determined daily physical activity of team members at fire camp using electronic activity monitors
- Measured aerobic fitness of team members
- Evaluated blood samples to determine team members' risk for heart disease, as indicated by the presence of inflammation markers and blood lipids associated with coronary artery disease
- Evaluated the level of stress associated with the duties of team members

This project should provide data on team members' fitness and risk for heart disease. It may help identify strategies for reducing the risk of coronary artery disease and improving the health of team members and camp personnel involved in wildland firefighting (for a review of the 2007 study, see the Research section on page 7). Of 56 team members who responded, 17 reported above average or severe stress associated with their position on an incident management team.

The data from 2006 and 2007 suggest the need to reduce the risk of coronary artery disease and reduce stress, especially for team members whose positions require little or no physical activity. Additional work is needed to determine the effects of stress on work performance and health and to identify successful methods to reduce stress.

Stress

Stress has been implicated in the deterioration of job performance and in the incidence and severity of disease. There is little doubt that incident management team members are exposed to stress. They must perform their duties during natural or manmade disasters while living and working in fire camps or other temporary facilities. These conditions present a variety of day-to-day hassles, challenges, and annoyances that combine to create potentially stressful situations for team members. In addition, team members must respond to the demands of increasing fire complexity, both in terms of fire behavior and the challenges of fighting fire in the wildland-urban interface. The possibility that criminal and civil complaints might be filed against fire personnel also adds to stress. Effectively coping with stress plays an important role in maintaining the health and performance of team members.

In the context of incident management, stress occurs when team members conclude there is an imbalance between the demands of the situation and their ability to respond. This definition of stress focuses on individuals' perceptions and appraisals of their environment.

Coping behaviors are the changes individuals make to restore the balance between environmental demands and personal resources. Research on stress in work settings has identified at least three major coping behaviors:

- Changing one's own behavior
- Adjusting the way one thinks about a situation
- Taking direct action to change the environment that poses a challenge to one's resources

If firefighters are going to continue to work in incident management teams, they will need to deal with the stress of those jobs—not only to maintain their performance but to avoid some of the effects of stress.

The relationship between stress and human physiology has been studied for many years. Links between stressors and the hassles associated with particular environments have been linked to upper respiratory tract infections, impaired immune function, and elevated blood pressure. Recent studies of firefighters suggest that decisionmaking may be adversely affected by the demands experienced by firefighters in field command roles. A recent study of incident-related stress and psychological distress among firefighters in Northern Ireland noted the importance of certain coping strategies in mediating psychological distress for incident staff responding to large disasters.

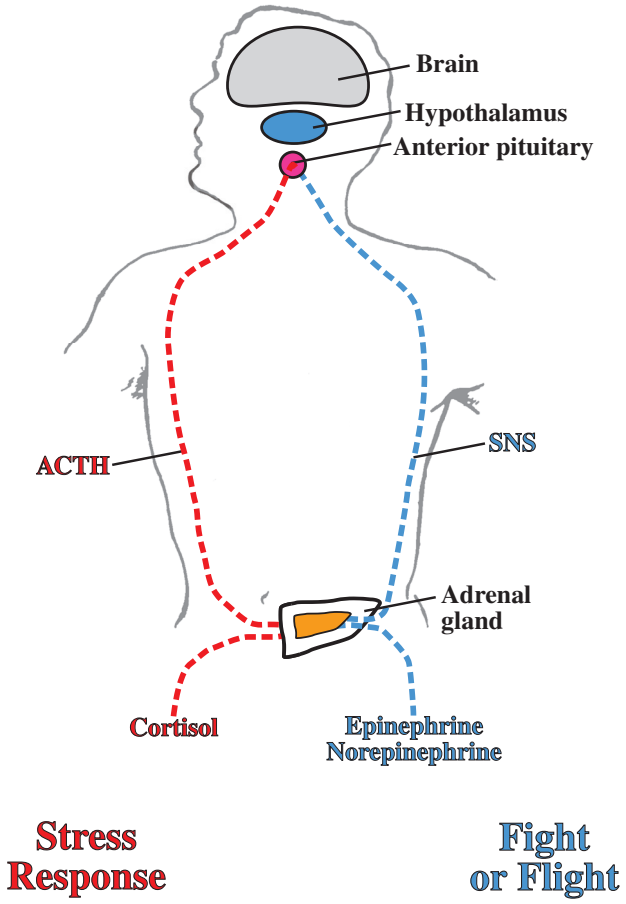
A 1998 study by TriData Corp. indicated the importance of training incident management team members to cope with stress during fire assignments:

"Firefighters, especially those in supervisory and Incident Management Team positions, often have problems with stress, fatigue, and mental overload. There is little training or advice given on how to mentally prepare oneself for what is ahead, how to avoid the impacts of fatigue, or how to mentally "reload" during stress. Ways to mentally refresh have generally not been considered part of training, even for supervisors and senior managers … everyone from firefighters on up needed to be taught how to deal with large amounts of information in the field and how to recognize when critical pieces of information are missing, especially under stress."

The UM-MTDC preliminary studies, along with anecdotal evidence from discussions with incident management team members, suggest the need to document the stressors that members respond to while on assignment, the level of perceived stress they are experiencing, and the types of coping strategies they use.

Physiological Stress

Stress, tension, and reactive behavior patterns (such as road rage) have been associated with heart disease, hypertension, suppression of the immune system, and a variety of other ills. Emotions are mediated by structures in the brain, including the hypothalamus. When something excites or threatens us, the hypothalamus tells the anterior pituitary gland to secrete adrenocorticotropic hormone (ACTH), a chemical messenger that travels to the adrenal cortex and orders the release of hormones such as cortisol. These hormones allow the body to respond to stressful situations. In the physiological context, stress has been defined as anything that increases the release of ACTH or cortisol.



Physiological systems involved in the stress response.

Stressful situations also elicit a response in the sympathetic nervous system (SNS) that leads to secretion of hormones from the adrenal medulla, including epinephrine (adrenaline) and norepinephrine. These hormones mobilize energy and support the cardiovascular system's response to stress. This aspect of the stress response is called the fight-or-flight mechanism. The hormones prepare the body to fight or run, but they have other effects that can be bad for our health. Epinephrine makes the blood clot faster and increases blood pressure, advantages in a fight but a disadvantage in the workplace, where these physiological changes can precipitate a heart attack or a stroke.

Recent research suggests that some of us are "hot reactors," with exaggerated responses to everyday stressors. Hostile hot reactors become enraged when a driver cuts them off in traffic (road rage) or as a result of other psychosocial stressors. This hostility elicits a flood of hormones designed for combat. Blood pressure and heart rate increase, arteries constrict, clotting time shortens, and blood flow to the heart is impaired, increasing the risk of a heart attack.

While occasional stress is not a threat, prolonged exposure to stress hormones eventually suppresses the immune system and reduces resistance to infection. A recent study correlated subclinical coronary artery disease, as measured by electron beam computed tomography, to depression, anxiety, hostility, and stress.

Summary

In 2008, MTDC will study the relationship of stress to performance and health in incident management teams. We will document the stressors that confront team members and study the strategies they use to help them cope with stress. We will use physiological measures of stress to assess the relationship of stress to health and disease. The goal is to promote good health habits and coping strategies for members of incident management teams. We hope that these strategies also will enhance the team's overall performance by reducing the effects of stress on cognitive function, decisionmaking, team cohesion, and members' ability to take in new information and respond appropriately to changing conditions.

T. Miller and B. Sharkey, MTDC; C. Palmer, University of Montana.

When stress rises among team members, I find it more difficult to obtain the information I need to perform my job.

Being able to detach from the incident is difficult and sleep patterns get very disorganized.

Stress in varying forms is most apparent as it manifests itself in interpersonal relationships.

Comments of incident management team members

Research

This section reviews project-related field studies of wildland firefighters during the 2007 fire season. The studies were conducted by researchers and graduate students from the University of Montana Human Performance Laboratory, in cooperation with MTDC and the U.S. Army Research Institute for Environmental Medicine, with support from the National Wildfire Coordinating Group.

Shift Food Fire Camp Trial

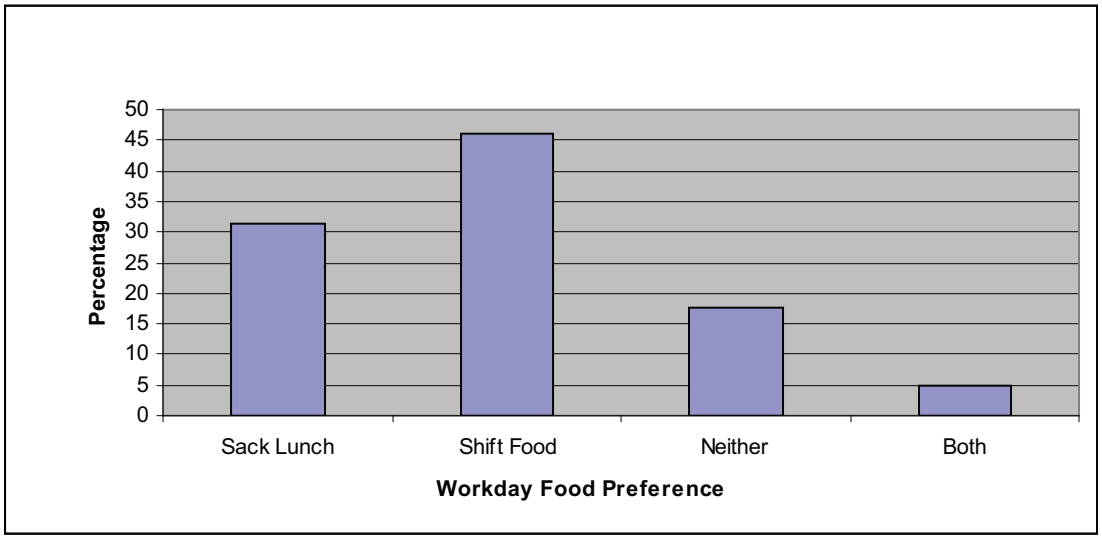
Past UM-MTDC research has shown that eating small items throughout the day (shift food) rather than just eating at lunch enhanced work output before lunch and late in the shift. Total work output increased by 15 to 20 percent. Firefighters also preferred shift food to sack lunches during recent studies. Shift food cost less than standard sack lunches during those studies.

The 2007 study evaluated the use of shift food for wildland firefighters, with emphasis on implementing the program in a fire camp, the caterer's response, overall satisfaction with shift food, and the role of educational materials in changing the way firefighters eat during the workday.

The Big Sky Mobile Catering Corp. provided shift food at the Sawmill Complex and Jocko Lakes fire camps during the 2007 fire season. The shift food included smaller food items (50 to 300 kilocalories) served on a rotating menu. Bilingual educational materials provided in the dining tents included information on the shift food, the benefits of eating some food every hour or two, and the results of past studies. The shift food was served to firefighters for 5 days at the Sawmill Complex and for 6 days at Jocko Lakes. Satisfaction surveys were administered on the last day of each experimental trial.

Combined survey data showed that 46 percent of the respondents preferred the shift food, 31 percent preferred the traditional sack lunch, 17.8 percent preferred neither, and 4.9 percent preferred both (see figure below).

On average, respondents gave shift food a score of above 5.0 (scale 1 to 10, where 1 = strongly disagree and 10 = strongly agree) for convenience to carry (6.8), convenience to eat (6.8), ability to work (5.2), variety (6.5), taste (6.0), appearance (5.8), energy (5.6), and overall satisfaction (5.9). Firefighters preferred shift food based on its convenience, their ability to do work, their energy, and their overall



Food preferences during a study at two Montana fire camps during 2007.

satisfaction. Firefighters wanted additional food items in the shift food.

In general, shift food was well received. However, only 34 percent of the respondents reported reading the educational materials and consuming their food every 1 to 2 hours as recommended. Further anecdotal evidence suggests that firefighters need more information on nutrition and work performance. We recommend using the MTDC nutrition education program "Eating for Health and Performance: The Wildland Firefighter" (Cox and Sharkey 2007).

The respondents' overall satisfaction (5.9) with the shift food was lower than in previous trials, where firefighters selected their own food items from bins. To simplify the process for the caterer during this study, the shift food items were packaged by the caterer. The cost of high-calorie shift food ($17.91) was higher than the sack lunch ($14.85) and the low-calorie shift food ($11.29).

The UM-MTDC research team recommends that the caterers, contract personnel, and specialists at MTDC and the University of Montana collaborate to improve menus, contract language, and educational materials. In the future, the revised shift food system should be evaluated using several caterers in a number of fire camps.

Shift Food Fire Camp Trial. N. Plante and S. Gaskill, University of Montana; B. Sharkey, MTDC.

Conducted under terms of a memorandum of understanding between MTDC and the University of Montana Human Performance Laboratory.

Risk Factors and Stress: Incident Management Teams

Coronary artery disease is the leading cause of death in the United States. A 2006 survey of 66 incident management team members (Wildland Firefighter Health & Safety Report No. 11, 2007) showed that they had an average of 2.6 coronary artery disease risk factors. Physical inactivity and poor nutrition are two risk factors for coronary artery disease that are within an individual's control and can influence other risk factors, such as high blood pressure, high cholesterol, obesity, and diabetes.

The 2007 study discussed here evaluated the health status, activity levels, and cardiovascular risk factors of incident management team members during the 2007 fire season. Subjects were asked to complete a health history and risk factor questionnaire. After the survey was completed, their height, weight, resting heart rate, and resting blood pressure were recorded. Subjects completed a bicycle test to estimate maximal oxygen consumption (VO_2 max). A blood draw was scheduled before breakfast the following morning for glucose and lipid panel analysis. Finally, subjects were asked to assess the stress associated with their team position.

Fifty-six team members served as subjects (38 males and 18 females). Their average age was 49.5. Overall, the team members mirrored national demographics in terms of coronary artery disease risk factors relative to their age, with an average of 2.8 risk factors—57 percent were overweight, 16 percent were obese, 21 percent had hypertension, 43 percent had low VO_2 max values during the bicycle test, and 62 percent had a family history of heart disease. Additionally, 14 percent had high blood glucose levels, 18 percent had high triglycerides, 9 percent had low HDLs, 20 percent had high LDLs, and 43 percent had high cholesterol. Seventeen respondents (30 percent) said they had above average or severe stress in their position on the team. These data indicate that team members are at risk for coronary artery disease and demonstrate the need for stress reduction, both at fire camp and back at home. The authors recommend further study of job-related stress and its impact on coronary artery disease risk factors, overall health, and job performance.

Risk factors and stress: incident management teams. E. Lieberg, S. Gaskill, and C. Palmer, University of Montana; B. Sharkey, MTDC. Supported by MTDC.

Bacteria and Fungi in Personal Drinking Systems

This study surveyed bacteria, molds, and yeasts in firefighters' personal drinking systems. Personal drinking systems include water bottles and bladders with drinking tubes. Samples were collected from 15 personal drinking systems by taking samples of the water and swabbing the inside of the systems. Several different culture media were used to grow a variety of organisms. Firefighters were asked to complete a short questionnaire about their personal drinking system (how long they had used it, when they last cleaned it, and whether they added sport drink to the water).

High concentrations of molds and yeasts (opportunistic pathogens) were discovered inside several systems. *Legionella*-like bacteria (*Legionella* causes Legionnaires' disease) were detected in one water bottle and in a drinking tube. Most systems were over a year old and had never been cleaned (table 3).

The firefighters' personal drinking systems are unsanitary. Because the systems are rarely cleaned, they develop a microbial film. This film is not necessarily hazardous, but is likely to give the water a bad taste. The molds growing in the film could be causing allergic responses in some firefighters. An inexpensive water purification technology should be tested for sanitizing drinking systems.

Bacteria and fungi in personal drinking systems. P. Ramsey, J. Domitrovich, A. Williams, and J. Gannon, University of Montana. Supported by MTDC.

Table 3—Microbiological investigation of personal drinking systems used by wildland firefighters. Camp crud is the way firefighters describe upper respiratory illnesses that pass through fire camps.

Water container	Seasons used	Time since last cleaning	Addition of drink mix	Mold present	Yeasts present	Sick in the last month
Sipping system	1	Never	No	Yes	Yes	No
Sipping system	Unknown	Never	No	Yes	Yes	Camp crud
Sipping system	1	Never	Yes	Yes	Yes	Camp crud
Sipping system	1	Never	No	Yes	Yes	Sinus infection
Water bottle	5	Never	No	Yes	Yes	No
Water bottle	1	Never	No	Yes	Yes	Camp crud
Water bottle	Unknown	Never	No	Yes	Yes	Camp crud
Water bottle	1	Never	No	Yes	Yes	No
Water bottle	1	Never	Yes	Yes	Yes	No
Water bottle	1	Never	No	Yes	Yes	Sinus infection
Water bottle	1	Never	Yes	Yes	Yes	No
Water bottle	1	Never	No	Yes	Yes	Allergies
Water bottle	1	Never	No	Yes	Yes	Sinus infection
Water bottle	1	Never	Yes	Yes	Yes	Camp crud
Water bottle	1	Never	No	Yes	Yes	No

Purification of Personal Drinking Systems

This study analyzed water purification technology (chlorine dioxide water purifier tablets) for firefighters' personal drinking systems. A bladder with a drinking tube was tested for microorganisms using different culture media before and 4 hours after a tablet of chlorine dioxide was added to the water.

Chlorine dioxide reduced microbes below detectable concentrations in the water inside the bladder and on the inside of the bladder. Firefighters usually fill their drinking systems at night after they return from the fireline. The tablets could clean their personal drinking system overnight. The systems would not need to be flushed afterward, because the tablets create potable water. Future studies could determine how frequently the cleaning tablets need to be used.

University of Montana researchers P. Ramsey and J. Gannon worked with Aquamira Technologies, Inc. (917 West 600 North, Logan, UT 84321) when studying water purification technologies. Aquamira's product uses chlorine dioxide to sanitize drinking systems. (CamelBak Products, LLC, also sells cleaning tablets that generate chlorine dioxide. CamelBak recommends soaking the system for 5 minutes after the tablets have been added, then rinsing the system and drying it).

Purification of hydration systems: a case study. P. Ramsey, J. Domitrovich, A. Williams, and J. Gannon, University of Montana. Supported by MTDC.

Firefighter Fatalities

The latest wildland firefighter fatalities report "Wildland Firefighter Fatalities in the United States: 1990–2006" (NWCG 2007) indicates that aircraft accidents (23.2 percent), vehicle accidents (22.9 percent), heart attacks (21.9 percent), and burnovers (20.6 percent) were the major causes of death. Heart attacks were implicated in 29 deaths from 1990 to 1998 (3.2 fatalities per year) and 39 deaths from 1999 to 2006 (4.9 fatalities per year). According to the report, 11 fire personnel died while preparing for or taking the work capacity test. At least two of those deaths occurred during or after the walk test (1-mile walk without a pack). During 2005 and 2006 there were no reports of firefighters dying while training for or taking any of the work capacity tests. Federal agencies have implemented a medical examination program for firefighters who are required to pass the arduous test (pack test).

Volunteer firefighters are the most likely to die from heart attacks, accounting for 44 deaths or 65 percent of all firefighter heart attacks. The number of volunteer firefighters dying from heart attacks may be attributed to several factors, including the large number of volunteers involved in forest and grass fires and the lack of mandatory medical or fitness requirements in many departments. The National Fire Protection Association estimates that the United States has more than 823,000 volunteer firefighters.

A U.S. Fire Administration report (2002) on firefighter fatalities indicated that from 1990 to 2000, 47 percent of nonwildland firefighter fatalities were due to heart attack, compared to 7 percent of wildland firefighter fatalities. The report cited several reasons for the difference. Wildland firefighters are generally younger than other firefighters and have extremely high standards of physical fitness.

Risks of Exertion

Exertion does not cause heart disease and it is associated with just 10 percent of all heart attacks. The American Heart Association regards lack of physical activity as a major risk factor for heart disease, along with hypertension, elevated cholesterol, and smoking.

Atherosclerosis occurs when damage to arterial walls (from hypertension, smoking, and other causes) leads to deposition of fat and other debris in the lining of coronary arteries. Arteries may not get dangerously blocked for many years. In the general population, 93 percent of persons who die from heart attacks are 55 or older. Plaques develop in the arteries, narrowing them. Unstable plaques may rupture, causing a massive blood clot and a fatal heart attack. Early stages of atherosclerosis can be found during autopsies of teenage accident victims. The progression of the disease is related to family history (genetics) and environmental factors (diet, physical inactivity, body weight, smoking, and other factors).

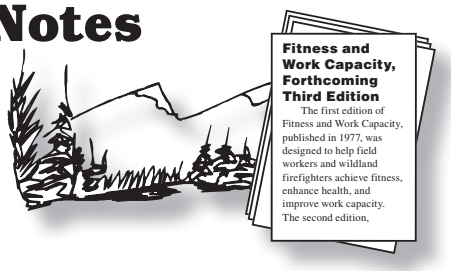
Heart problems during exertion are associated with a number of risk factors, including age (over 45 years), gender (male), obesity, smoking, and inactivity. An ongoing National Institute of Occupational Safety and Health (NIOSH) study of firefighter fatalities indicates that most heart attack victims had multiple coronary risks (hypertension, high cholesterol, smoking, overweight, inactivity) and many had been diagnosed with heart disease. Some had even undergone major medical procedures such as coronary angioplasty or a coronary bypass operation.

Inactive individuals are more than 50 times as likely to experience a heart problem during exertion as those who are active. Anyone who intends to take a work capacity test or begin fitness training should become active before they begin training for the test or the job. Inactive individuals should begin a 4- to 6-week walking program, slowly increasing the distance and pace until they can walk 3 miles in 45 minutes (assuming that they are taking the pack test). Those who are older or have been inactive for very long may need to walk for longer than 4 to 6 weeks before training. See your physician or complete a health screening questionnaire before beginning vigorous activity. More information about training will be included in the forthcoming third edition of "Fitness and Work Capacity" (see the Field Notes section).

Nearly 500,000 people die from coronary artery disease in the United States each year. From 1980 to 2002 the death rates for women fell from 514 to 261 per 100,000 individuals. During the same period, the death rate for men fell from 898 to 430 per 100,000 individuals. Recent evidence shows that the death rate is no longer declining for men and may be rising in women under 45 years of age. These trends may be an early glimpse of the effect of obesity on coronary artery disease death rates (*http://www.cdc.gov*).

People who are older or have been inactive for a very long time may need to walk for longer than 4 to 6 weeks before training.

Field Notes



"Fitness and Work Capacity", Forthcoming Third Edition

The first edition of "Fitness and Work Capacity," published in 1977, was designed to help field workers and wildland firefighters achieve fitness, enhance health, and improve work capacity. The second edition, published in 1997, updated information on fitness, health, and work capacity. It included additional material on nutrition, hydration, the work environment, work hardening (training that prepares the body for specific tasks), and injury prevention. It also introduced a new generation of work capacity tests that replaced the step test. A field-based advisory group helped design the forthcoming third edition to better meet the needs of fire and field personnel. Portions of the booklet were reviewed by crew bosses experienced in firefighter training.

The 2008 edition, which should be available by late summer, will provide specific fitness training guidelines for firefighters, incident management personnel, field workers, and others interested in the health benefits of regular physical activity. It provides new information on nutrition (use of shift food), hydration, injury prevention (core training), and assessment of fitness and work capacity. It reinforces the need for regular, moderate physical activity for all employees.

Brian Sharkey, author of the first and second editions, has been joined by Steve Gaskill of the University of Montana Human Performance Laboratory in preparing the third edition. Sharkey has studied wildland firefighters since 1964. He is professor emeritus at the University of Montana, a project leader at MTDC, and past president of the American College of Sports Medicine. Gaskill was a coach for the U.S. Cross Country Ski Team before earning a doctorate in exercise physiology. His research includes laboratory and field studies of wildland firefighters. Sharkey and Gaskill coauthored "Sport Physiology" (2006) and "Fitness and Health," 6th ed. (2007, *http://www.HumanKinetics.com*).

Core training using the back rise.

New to MTDC

Joe Domitrovich will be joining the team studying wildland firefighter health and safety at MTDC and the University of Montana. Domitrovich is a wildland firefighter with a master's degree in exercise science who has experience conducting field studies of wildland firefighters. He will work part time at MTDC while completing a Ph.D. at the University of Montana.

About the Author

Brian Sharkey, an exercise physiologist at MTDC, has done research and development work on fitness tests and programs, heat stress, hydration, nutrition, protective clothing, tools, fatigue, work/rest cycles, and employee health (wellness). His work has been honored with USDA Superior Service and Distinguished Service Awards, and a Forest Service Technology Transfer Award. He is past president of the American College of Sports Medicine and author of several books, including "Hard Work," 2008, with Dr. Paul Davis, published by Human Kinetics.

Library Card

Sharkey, Brian. 2008. Wildland firefighter health and safety: No. 12. Tech. Rep. 0851–2814–MTDC. Missoula, MT: U.S. Department of Agriculture, Forest Service, Missoula Technology and Development Center. 12 p.

The featured topic in this issue discusses job-related stress and its influence on the health and performance of members of incident management teams. These teams provide the organization and structure that underlie effective wildland firefighting operations in the United States. The research section includes information on studies done in two fire camps of shift food (small food items intended to be eaten throughout a work shift rather than at one sitting). Another study found that bacteria, molds, and yeasts were growing in firefighters' personal drinking systems, but that these microorganisms could be killed in 4 hours by chlorine dioxide cleaning tablets.

Keywords: bacteria, chlorine dioxide, cleaning, coronary artery disease, exercise, fatalities, fitness, heart attacks, incident management teams, meals, molds, newsletters, research, sack lunches, safety in the workplace, sanitation, shift food, stress, water containers, work capacity, yeasts

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