



Lions River Fire Protection Association
By Landowners - For Landowners

FIRE HEALTH HAZARDS

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General Health Hazards

It is vitally important that you are aware of, and know how to avoid, illnesses and problems that may result from vigorous firefighting activity and exposure to smoke, dust and heat.

If you have a medical condition (e.g. asthma, diabetes, heart disease or epilepsy) that may be aggravated by the type of work undertaken on the fire ground, you should seek medical advice to ensure you are able to carry out such work.

The following pages will cover:

- smoke and dust hazards;
- fatigue;
- dehydration; and
- heat related illness –
- heat cramps;
- heat stress;
- heat exhaustion; and
- heat stroke.

Smoke and Dust Hazards

Smoke and dust are ever-present irritants to your eyes and lungs at fires. Prolonged exposure to heavy smoke can be hazardous to fire fighters. In addition to restricting visibility, heavy smoke contains carbon monoxide (CO) which is a poisonous gas.

Inhalation of smoke and dust can:

- reduce your performance on the fire ground;
- bring on fatigue more quickly;
- bring on illness, alter perception and judgement; and
- severe inhalation may result in death due to carbon monoxide poisoning.

Minimise the effects of smoke by:

- avoiding unnecessary exposure; and
- using approved filters, smoke masks and goggles where provided –
- if necessary, use handkerchiefs or other cloth to cover your mouth and nose.

Note: in situations where there is heavy smoke, be aware that fresh air pockets may be found near the ground.

Fatigue

The conditions and work you undertake at an incident can be physically stressful and demanding. Fatigue is a key factor affecting your performance at an incident. Exposure to radiant heat and smoke for a lengthy period of time may increase your level of physical stress and the likelihood of fatigue.

If you are suffering any form of illness on the fire line you should seek medical attention or advice as soon as possible. Even the fittest person will tire easily without enough rest, sleep and appropriate and sufficient food and fluids (e.g. water alternated with sports drinks).

If you are tired, you are more likely to make mistakes, which can cause accidents, injury and put others at risk. It is important to take full advantage of rest breaks.

Note: you should not drive vehicles or operate equipment if you are fatigued.

Signs and symptoms

- Tiredness and lack of energy;
- slowness to react and taking longer than usual to complete tasks;
- impaired judgement and inability to make decisions;
- inability to concentrate and lapses in attention; and
- erratic performance.

Treatment actions

To minimise the possibility of becoming fatigued at an incident, you should:

- take regular breaks to rest and allow your body to recover;
- pace yourself;
- drink regularly; and
- where possible, avoid working in excessive dust, smoke and heat.

During your breaks, you must:

- rest out of the sun;
- cool off (unbutton clothing and remove helmet when away from the fire line if safe to do so);
- drink water, alternated with an electrolyte replacement drink;
- regularly eat snacks;
- avoid strenuous physical recreation; and
- get ample sleep.

It's possible to force tired muscles to keep on working, but your brain cannot function adequately without sleep. Maintain a high level of fitness. If you are physically fit, you are less likely to experience fatigue in the short-term. This, however, does not mean that you can avoid taking adequate breaks and rest. It simply means that you cope better with the physical stress, and recover more quickly than a less fit person.

Dehydration

The body's cooling system involves perspiring. Dehydration will occur if fluids and electrolytes lost through perspiration are not replaced. On days of total fire ban and extreme fire danger, you should increase your hydration in case you get called out. Water and an electrolyte replacement drink should be consumed regularly. You should always drink more than you need in order to prevent dehydration.

Failure to do this leads to the body overheating and the onset of heat illness. Your thirst is not a true indication of how much water your body needs. There is a time lag between the onset of dehydration and feeling the need for water. You may, in fact, begin to suffer the effects of dehydration before you realise it.

You know when you are perspiring – use this as an indication that your body needs appropriate fluids. On the fire line you need to replace fluids frequently. Drink at least 150–200 ml every 10–15 minutes. Water should be alternated with

an electrolyte replacement drink (if in doubt drink a litre per hour). If using hand tools you may need to increase this to two litres per hour.

Note: fluid and electrolyte replenishment is vital for your health and safety – especially so for less fit people.

In the past, emphasis has been placed on drinking beverages such as cordial, tea or coffee and soft drinks as more desirable options to water when working on the fire ground. Medical research now indicates that this is not the best option as the sugar content reduces the rate at which water is absorbed into the bloodstream and caffeine can increase the rate of body fluid loss (i.e. increased urination).

Therefore, during fire fighting, plain water alternated with an electrolyte drink is best. Cool water is naturally preferable, if it is available. However, never chill your drinks as this can quickly quench your thirst without providing you with adequate fluid, cause stomach cramps and fool your body into thinking its cooler than it actually is. However, during rest periods, it is a good idea to drink water and sweetened beverages such as weak cordial or tea as they can assist in restoring energy. Milky or fat-containing drinks should be avoided. Alcoholic drinks must not be consumed as they increase dehydration and impair your ability to safely carry out tasks.

Water suitable for drinking may not be available in the area in which you are operating. You should carry containers of fresh water, particularly when assisting out of your area.

Note: never drink water from vehicle tanks or knap sacks as it may be contaminated.

Heat-related Illness

In addition to the health hazards we have just discussed, fire fighters also face the risk of heat related illness such as (in order of severity from lowest to highest):

- heat cramps;
- heat stress;
- heat exhaustion; and
- heat stroke.

The risk for fire fighters is increased due to the nature of the work and the conditions it is performed under i.e. hot, humid and dusty conditions, often within the range of radiant heat and while wearing personal protective clothing and equipment.

Note: illnesses caused by exposure to extreme temperatures are progressive and can quickly become life threatening if not treated immediately.

The human body is built to withstand changes in temperature and has an inbuilt "thermostat" that controls the body's natural heating and cooling systems. The body cools itself by directing additional blood flow to the skin, which is cooled through the evaporation of perspiration.

Under normal circumstances, its mechanisms for regulating body temperature works well. However, when the capacity of this automatic cooling system is overwhelmed, your body starts to overheat and you become susceptible to heat-related illnesses.

The body's natural cooling system may fail if:

- the environment is too hot;
- perspiration cannot evaporate freely;
- you are ill or unfit;
- your body's thermostat malfunctions due to disease, drugs or alcohol;
- you fail to maintain adequate fluid intake; and
- you over exert yourself, particularly in conditions of high humidity.

To minimise the risk, you should:

- take regular rest breaks, preferably in the shade away from the work environment or heat source;
- loosen clothing to allow more air circulation and better evaporation of perspiration; and
- maintain adequate and appropriate fluid intake.

Due to their nature, a person may not know they are becoming affected by a heat-related illness – you need to look out for each other. You need to be able to recognise the symptoms and know the treatments not only for your own wellbeing, but also for your colleagues on the fire ground.

If the heat-related illness is not too severe and is recognised and treated early, it may be possible to continue working at a reduced rate – if the symptoms are not recognised or are ignored, the severity will escalate and may end in death.

Heat cramps

These are common muscular cramps that may occur in the heat, during or after exercise, especially when an unfit person has worked hard and perspired a lot. The onset of heat cramps is caused by failure to maintain adequate intake of fluid and appropriate rest and cool down periods.

Signs and symptoms

- Muscular pain and spasms in the affected area;
- feeling of tightness in the affected muscles; and
- inability to relax contracted muscles.

Treatment actions

- Tell the people you are working with;
- take a rest break;
- slowly drink an electrolyte replacement drink or, if unavailable, plain water;
- consume some food from your ration pack;
- gently stretch the muscles; and
- massage the affected area or muscles gently.

Note: although stretching and gentle massage of affected muscles may assist in relieving muscle cramps, this is secondary to fluid replacement and cooling down.

Heat stress

You are suffering heat stress when your body's cooling systems (perspiration and circulation) are being stressed but are not yet overwhelmed by the heat load. As discussed earlier, the body cools itself by perspiring and directing additional blood flow to the skin so that this blood can be cooled as the perspiration evaporates.

As exercise produces heat internally, it is possible to become heat stressed even in relatively cool conditions if clothing and equipment impair heat loss. A hot and humid atmosphere will make the situation worse. Radiant heat and extremes of air temperatures above normal body temperature (37°C) can add an external heat load to the heat generated internally, further contributing to heat stress.

As heat stress continues to affect the body, internal body temperature will rise and physical performance will drop. If the heat stress is too great or if the body's cooling system becomes impaired by dehydration or exhaustion, continuing heat stress can lead to either heat exhaustion or heat stroke.

Signs and symptoms

- Feeling very hot;
- flushed, red skin; and
- vigorous perspiration, loss of energy and possibly a headache .

Note: in very hot conditions, especially if windy, perspiration may evaporate so fast that the skin seems dry even though significant perspiration and fluid loss is occurring.

Treatment actions

- Tell the people you are working with;
- take a rest break;
- loosen clothing to allow more air circulation and better evaporation of perspiration;
- seek medical attention; and
- take regular sips of water and occasional sips of a diluted electrolyte replacement drink.

If you believe a colleague is becoming affected by heat stress, assist them to do the above. If heat stress is not too severe and is recognised early, it may be possible to continue working at a reduced rate, with regular rest breaks to cool off. If the symptoms are not recognised or are ignored, serious heat illness may develop.

Heat exhaustion

As its name implies, this condition develops as a result of becoming exhausted from working in the heat. If the body is heat stressed for too long without adequate fluid intake, dehydration develops. This upsets the body's chemistry, leading to weakness as well as reducing its capacity to continue perspiring.

Even if fluid intake is adequate, exhaustion will eventually set in if physical exercise continues beyond a person's normal endurance limits. Heat exhaustion is a combination of physical exhaustion, dehydration and upset body chemistry. If severe, it can lead to collapse and a form of shock.

Fire fighters suffering from heat exhaustion are sometimes unaware of their condition and keep trying to work, even to the point of collapse. It is important that fire fighters keep an eye on each other. If anyone is slowing down, not looking well or speaking or acting oddly, you should presume that person has heat exhaustion and take appropriate action as described on the following page.

Signs and symptoms

- Feeling faint, light-headed and dizzy;
- pale face – a result of lowered blood pressure;
- clammy skin – an indication that there is some perspiration;
- loss of appetite;
- headaches;
- irritability and vagueness; and
- muscular cramps and spasms.

If more severe:

- vomiting;
- confusion, drowsiness and weak pulse;
- shallow breathing and unconsciousness; and
- in severe cases, death can result.

Treatment actions

As stated previously, it is likely that a person suffering from heat exhaustion may not realise it. You need to look out for each other and if you suspect a colleague is being affected by heat exhaustion:

- move the casualty away from the work environment or heat source;
- lay the casualty in the best available shade
- if the casualty is conscious, give frequent drinks of water;
- seek medical attention;
- do not give salt tablets;

- remove or loosen clothing; and
- sponge or spray water on the casualty only if they are hot.

If a casualty is unconscious, position the person on his or her side, ensure the airway is open, clear the airway and attend to breathing and circulation. Seek medical assistance as quickly as possible. It can take many hours to recover from even mild heat exhaustion. It is best for the casualty to have had at least one night's sleep before working again, even if initial recovery is fairly rapid.

More severe heat exhaustion will require medical treatment with intravenous fluids and admission to hospital. If a casualty continues to work on after heat exhaustion develops, one of two things are likely to follow. Either the heat exhaustion will become sufficiently severe for the casualty to collapse or the body will seriously overheat, leading to heat stroke.

Heat stroke

Heat stroke is the least common and most severe heat-related illness. It occurs when the body's cooling systems are overwhelmed and the body's temperature rises to dangerous levels at which time the body starts to "cook" internally. In cases of severe heat stroke, this is irreversible and death will rapidly follow.

Note: this process can occur quite rapidly – it is essential that the casualty be externally cooled as quickly as possible and urgent medical attention is received if life is to be saved.

Signs and symptoms

- High body temperature (often 40°C or more);
- red, hot and possibly dry skin;
- weakness or collapse;
- reduced conscious state or unconsciousness;
- rapid pulse and breathing rates; and
- seizures (fits).

Seizures may occur in cases of severe heat stroke as the brain becomes severely affected by raised temperature. The vigorous muscle contractions involved in seizures rapidly raise body temperature even further. If seizures occur, the person will die unless immediate cooling is achieved.

Treatment actions

This is a medical emergency, immediate, effective cooling is essential.

- Remove the casualty from the work environment and heat source;
- remove clothing down to underwear;
- sponge or spray the casualty with water;
- fan or expose the casualty to a breeze; and
- call an ambulance and get on-site medical assistance while waiting for the ambulance.

If the casualty is unconscious, position the casualty on his or her side and ensure the airway remains open.

Note: it cannot be overstressed, if heat stroke is suspected, urgent medical attention is essential.