

Short report

Effects of radiant heat in fire fighting instructors

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In 1974 a purpose built establishment was set up on Tyneside in the United Kingdom to train Merchant Navy personnel in fire fighting. It is staffed by six instructors and an assistant divisional officer seconded from the Tyne and Wear Metropolitan Fire Brigade. Courses are run with emphasis on the practicalities of search and rescue techniques as well as fire fighting in realistic heat and smoke conditions. As part of an investigation into the possible long term effects on health of the working environment effects on the skin were studied.

Working conditions

Before each exercise men were instructed in the use of compressed air breathing apparatus. They were issued with standard fire fighters' uniform including protective gloves. The face was partially covered by the breathing mask but the ears were uncovered to facilitate hearing.

Men were instructed in the layout of a large steel "tank," referred to by the nickname of M V *Superheat*, simulating part of a ship. It measured roughly 9 × 4 m and was 8 m in height. The building was divided into four main compartments with sub-compartments and communication was effected by steel ladders.

Within this system of compartments were two fires, fuelled by wood from crates and pallets, emitting dense smoke and heat throughout the tank. The heat was intense with visibility nil except near the fires, and communication was by sound and touch. The tank could be entered by various routes according to the design of the exercise but exit was at ground level.

After the exercise the trainees showered to remove the yellow staining of their skin caused by deposits of a tarry substance from the burning wood. The smell of this on the scalp persisted despite showering.

The instructors trained men in the tank in batches

of two to seven men according to the type of exercise for an average time of 20 minutes for each batch. The number of batches of men trained varied from day to day. On average the instructors spent about five hours each week in the tank. They were seconded for duty nominally for two years but some men had worked for as long as five to six years. They were extremely fit, highly trained people aged from 31 to 42.

Investigation

On site the conditions were investigated at first hand and later the six men were examined in detail, especially from the dermatological point of view, having completed a questionnaire concerning their health and especially their reaction to hot conditions and to sunshine in the past. Results of a full blood count and urine analysis were normal.

The health record of the six men was excellent. One man, however, had psoriasis which he said had improved since he had worked as a fire fighting instructor. Another man, aged 31, had, before joining the fire service, worked in Africa, where he developed an epithelioma of the lip, presumably due to sun exposure. He noted that the reddening of his skin after working in the tank lasted for up to a week.

Findings

All six men had noted discoloration of the skin by smoke and said that they developed redness and swelling of the ears or neck or both, sometimes with blistering. These changes were followed if pronounced by peeling of the skin resembling the effect of sunburn. These skin changes lasted about 48 hours. Periodically men would notice a singed feeling in the ears when working in the tanks.

Examination confirmed the presence of redness and swelling of the exposed skin on emerging from a period of instruction.

Examination when they had not recently been exposed to fire fighting conditions showed the presence of definite telangiectasia of the pinna in three

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men. Both ears were affected in two and the right ear only in a third. Interestingly the right side of the body is exposed to heat more than the left in the tank as the wall on the left hand side of a fire fighter is used as a guide for movement in blacked out conditions.

Preventive measures

It was considered undesirable that men should be exposed to hot conditions causing redness and peeling of the skin and in three men trivial but definite sequelae in the shape of telangiectasia. Men were, therefore, issued with a flash hood of non-inflammable material but designed to avoid interference with hearing, which was essential for the job. The hood protected from radiant heat but allowed the escape of body heat satisfactorily being of light material.

After the use of these hoods no further symptoms were encountered.

Discussion

There are extensive medical publications on the health hazards of fire fighters. Apart from injuries, it is mainly concerned with toxic air contaminants,¹ the effect on pulmonary function,² and coronary artery disease.³ Davis and colleagues, reviewing the fitness of fire fighters, mentioned only burns when referring to effects on the skin.⁴ Professional firemen's journals have devoted much thought to protective clothing.⁵

Apart from exposure to great heat, the men in this training establishment were also exposed to "tar" from the burning wood fires. Evidence of this wood tar was to be found on the doors of the tank where it could be chipped off and the presence of a tarry

substance was quite obvious from the degree of staining of the men's skin after each operation. No photosensitivity was noted. It would seem that the risk of carcinoma of the skin from wood tars is very low since Shabad and colleagues have shown that the benz(a)pyrene content of wood tars is low compared with coal tars, which contain at least 15 times as much of this substance.⁶

Nevertheless, it was recommended that men working as fire fighting instructors should wear protective clothing to prevent undue exposure to heat and wood tar and that they should have a regular medical check up of the skin annually after working in these conditions for three years or more.

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