

Heat Stroke

A Self-Monitoring Program for Young Farm Workers

Starting Point

Observations of young workers assigned to hay stacking have confirmed extremely high levels of heat strain. The Regulation respecting occupational health and safety recommends using the WBGT (Wet Bulb Globe Temperature) index to measure heat stress. However, this index is difficult to apply to the agricultural sector, mainly because it requires specialized knowledge and tools. A researcher studied the feasibility of applying a self-monitoring program that young workers could use.

Researchers

Pierre C. Dessureault¹ and Audrey Tellier², from the Université du Québec à Trois-Rivières (UQTR).



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Results

The experiments conducted among young workers showed that the latter help ensure their safety if they can monitor their level of heat strain themselves using a heart rate meter to measure their heart rate. However, during their work, the employer must supply them with appropriate beverages, encourage them to take breaks and provide them with all the necessary information regarding work in a hot environment.



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Users

The Union des producteurs agricoles du Québec, farm workers, as well as construction, landscaping and forestry workers.

There was a time when, for many farmers, “putting up hay” was synonymous with nature, the great outdoors, the main family activity of the summer and, of course, festivity! Today’s reality is quite different.

EVERY SUMMER, many farm producers hire teenagers. Observations of these young workers confirm extremely high levels of heat strain, psychological disorders and even heat stroke. The intensity of their efforts as well as their isolation and dispersion on the farm make the application of the WBGT (Wet Bulb Globe Temperature) index difficult. This situation gave rise to the idea of promoting a heat strain self-monitoring program. Funded by the IRSST, Pierre C. Dessureault and his team from the UQTR studied the feasibility of implementing such a program among young workers assigned to hay stacking.

A UNIQUE CONTEXT

In most cases, it is young people under the age of 20 who put up hay. This physically demanding work is carried out in a hot thermal environment. Outside, it is hot – the haying period extends from early June to mid August – and inside the barn, the air circulates poorly and the steel roof reflects the heat. In addition, these young people, who have just finished the school year, are not necessarily acclimatized to the heat. A person generally needs about five days to become partially acclimatized, provided that the requirements of his job are consistent and the heat remains constant.¹

1. Guide de prévention des coups de chaleur (heat stroke prevention guide) – 2nd edition, Ministère de la santé et des services sociaux and Commission de la santé et sécurité du travail, DC 200-16184-2 (08-05)



Photo: Stockexpert

Stress and strain

HEAT STRAIN is the physiological response of a person exposed to a hot thermal environment.

HEAT STRESS is measured by taking into account a person's thermal environment, work load and clothing. Heat strain monitoring therefore has the advantage of providing a profile of a person's condition, but the disadvantage of being limited to that of one person.

Pierre C. Dessureault's research was therefore aimed at developing a basic self-monitoring program requiring few or no tools. The researchers also wanted this program to be easy to understand - without calculations or charts - and accessible, while providing the same level of safety as the WBGT. "It was necessary that the young people be able to monitor their level of heat strain themselves, in order to prevent heat stroke," explained Pierre C. Dessureault. Heat-related deaths in Quebec no longer occur in steel plants or paper mills, as in the 1950s, but rather in sectors like forestry, landscaping and agriculture, where people are isolated."

NOTHING LEFT TO CHANCE

Data collection began during the summers of 2004, 2005 and 2006 in a dozen farms that used dry hay, shaped into

bales weighing between 15 and 20 kilos each and stacked manually. Forty youths, aged 12 to 35, 69% of whom were 15 to 21 years old, participated in the study. The group included five girls. Each person wore a heart rate meter - like those used by athletes - attached to a belt placed at heart level, to calculate his/her heart beat. In all, 85 work shifts, ranging in length from 36 minutes to 9 hours and 20 minutes, were subject to a monitoring process comprising three steps: first of all, recording the heart rate per five-second periods, then reading the sublingual temperature at the beginning and end of the work shift and lastly, monitoring body mass, beverages and meals consumed as well as urine discharged.

YOUNG HEARTS BEAT VERY QUICKLY

The measurement of cardiac strain produced amazing results. The average heart rate exceeded the limit of 120 beats per minute (bpm) in 71% of cases, or during 60 work shifts. Sometimes, the cardiac strain level proved very high and the rate exceeded the theoretical ceiling in 27 cases, even going up to 220 bpm for certain young workers. These extreme rates occurred most often in the barn when workers were retrieving bales of hay that had fallen off the conveyor and throwing them to

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co-workers. Since throwing bales is more demanding than other tasks, it should have been shared among the young workers. Frequent rotation of tasks and breaks is essential in order to avoid exceeding maximum heart rates. "It was predictable that the "danger level" would be reached quickly, since these young workers were carrying out strenuous physical work in a hot environment, two factors that accelerate heart rate," said Pierre C. Dessureault.

LOTS OF SWEAT, LITTLE RISK

The researchers did not observe a significant level of dehydration. Despite profuse sweating, the analysis results were well below weight loss limits, which are 1.5% to 3%. "When they have access to refreshments, replacement fluids or sports drinks, young people completely rehydrate, provided that the temperature of these beverages is about 15°C and



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that the latter are consumed alternately with an equivalent amount of water. In addition, these beverages provide extra energy, due to the glucides they contain, and help replenish depleted sodium and potassium levels,” explained Pierre C. Dessureault.

SELF-MONITORING IS FEASIBLE

The researchers concluded that the monitoring of young workers responsible for hay stacking can be limited to the cardiac field



Photo : iStockphoto

For more information



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young workers assigned to hay stacking) Report R-580, 60 pages.

Free download:
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Attention, coup de chaleur ! (watch out for heat stroke!), DC 100-1113-3, Brochure.

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Travailler à la chaleur... Attention! (working in the heat... watch out!), 2nd edition, Brochure.

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Free download:
www.irsst.qc.ca/files/documents/fr/prev/v20_03/26-27.pdf

Contraintes thermiques – Alerte chaude! (heat stress – red alert!), Prévention au travail, Spring 2004, pp. 7-14

Free download:
www.irsst.qc.ca/files/documents/fr/prev/v17_02/7-14.pdf

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using a heart rate meter, provided that the appropriate beverages are readily available and that the youths are under no pressure, can take breaks between each trailer unloading and, lastly, have access to adequate information. “If we make certain that young workers do not exceed the average heart rate of 120 bpm, we help ensure their safety,” added the researcher. **PT**

BENOIT FRADETTE

Calculating one's limit

In order to avoid exceeding the maximum heart rate, the limit to be respected is 90% of 220 bpm minus the person's age. For example, for a twenty-year-old, the maximum heart rate is 220 minus 20, or 200. It should therefore not exceed 90% of 200, or 180 bpm.

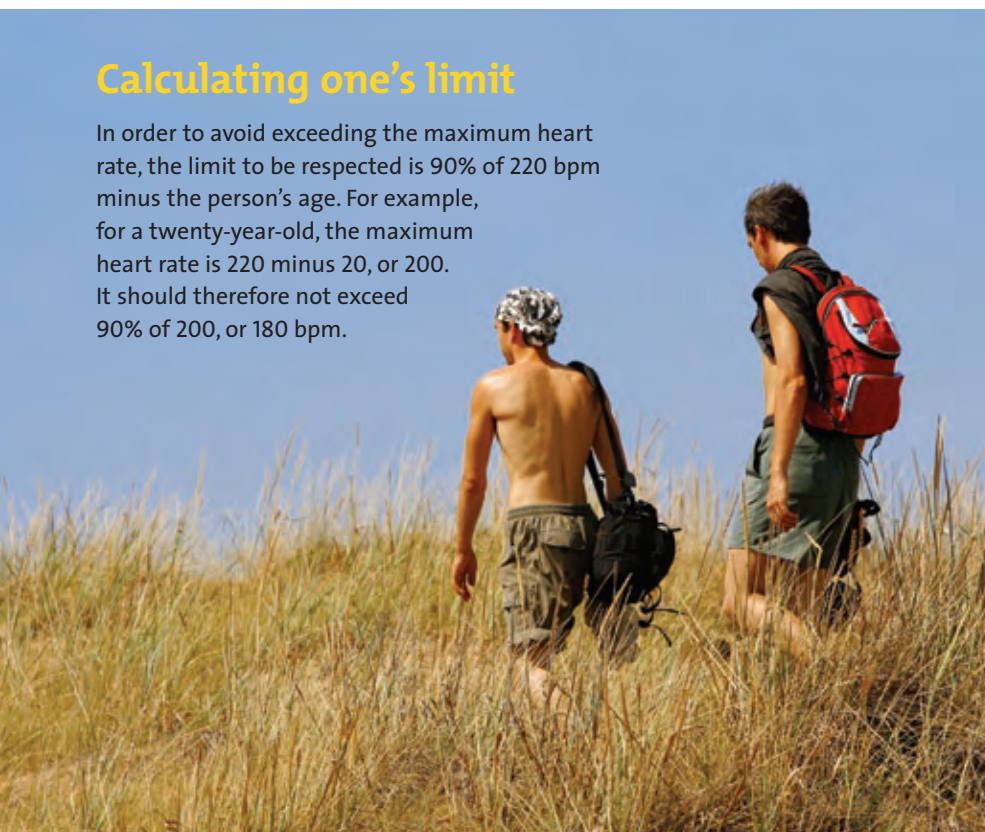


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