3M Transcript for the following interview: Ep-61 Managing Heat Stress Part 2

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Welcome to the 3M Science of Safety podcast presented by 3M Australia and New Zealand Personal Safety Division. This is a podcast that is curious about the signs and systems of all things work, health and safety, that keep workers safe and protect their health. I am Mark Reggers, an occupational hygienist, who likes to ask the questions Why, How, and Please Explain. Whether you are a safety professional, occupational hygienist, or someone with any level of WHS responsibility in the workplace, maybe you are a user of safety products or maybe you are a bit of a safety nerd who finds this stuff really interesting, then this is a podcast for you.

(R) Today, we're continuing our conversation, talking about managing heat stress, with Dr Ross Di Corleto. Welcome back, Dr Ross.

(D) Thank you, Mark. Thanks for having me back again.

(R) Well, last time we spoke quite a bit about the environment and some of those risk factors and some of the risk assessment approaches, but today I really want to focus in on the controls about heat stress in the workplace. Now, our listeners should be all very very familiar with the hierarchy of controls, so let's get into what are some of those controls using the hierarchy to manage heat stress in the workplace.

(D) Excellent, so using the hierarchy, you can actually go through the various controls that can be used when it comes to heat stress in the workplace. However, it is important that you have done some assessment of the scenario, because you want to make sure that you're using the most appropriate control.

(R) Are you saying that some controls are not appropriate for heat stress?

(D) Well, yes and no. Some controls can improve the exposure, but they are not always the most effective for the situation. As we mentioned last time, there can be a tendency in some situations to go straight to the work-rest regime and admin control, when in actual fact, there are other controls that might be better suited, higher in the hierarchy of controls and easier to manage and even more productive.

(R) I think that's certainly the case for most controls where people attempt to jump down to the bottom. But when it comes to managing heat stress, so what do you need to look for at some of this higher controls?

(D) I think first off you need to try and determine the source of the heat. Sometimes, it's quite obvious. You're doing a particular task in the hottest part of the day. You change it to a cooler time. But sometimes, it's not, and it requires a closer look. Is it a radiant source such as a hot surface or the sun or is it the hot air or the task itself? Or for that matter, is it a combination of these factors? Each one will require a different control type. Our radiant sources such as hot pipes for example, you could insulate them while other hot surfaces can be screened using radiant shields. And of course, if you're working in the open sun, a simple thing like a shade cover can be quite a significant impact. Sometimes, the control may be increasing the air flow, which will do what? And this will test if you were listening last time, Mark.

(R) I certainly was listening last time, but that will increase the evaporation of sweat, as we've all been out on a nice windy day. Yeah, it gives us a cooling effect.

(D) That's right. So, it increases the evaporative cooling of the skin and hence the blood, and eventually the individual. But having said that, if the air temperature is getting into the mid-40s and you increase the air flow, you could actually make the situation worse because you're increasing the heat load so that it is too high for the evaporative process to compensate and as a result, you're actually going to increase the temperature of the individual.

(R) You hinted at, last time we spoke, about the impact, the task or the worker themselves. How big an impact can that actually have on heat stress?

(D) You know, Mark, I think this is probably an area that is the most neglected, but it can play a major role in the heat stress equation. When our body does work, it generates internal heat and that heat has to be dissipated or the body has to lose that heat. And we saw that in the car engine example last time. The harder we work, the more heat we generate, and this adds to the heat stress from the work environment. So, when we're planning tasks, we need to think about the level of output as well. Someone doing heavy manual labour will generate a lot of internal heat. To give you an idea, someone doing office work will generate about a hundred watts of heat, now about the same as one of the old incandescent bright light globes. Compared to the heavy labourer who can be generating around a thousand watts, similar to a small heater. So, there's quite a significant difference. So, when we plan those tasks, think about the level of output.

(R) So, previously when you mentioned the work-rest regime, you seemed a little big negative towards it. Did I pick up a couple of vibes you're not a big fan of the work-rest regime control approach?

(D) Don't get me wrong here, Mark. There is a time and a place for the work-rest regime and in some cases, it may be the only viable control. But my concern is that we need to start looking more closely at the environment. There's really two approaches you can use in managing heat stress. You can modify the exposure by limiting the time in the environment or you can modify the environment to better

protect the worker. Wherever possible, I believe we should look to the latter. We need to think a bit harder to see what we can do to improve the environment rather than admit defeat and limit our time.

(R) To balance out those controls and maybe the higher focus on the work-rest regimes, are there other controls that I guess in your travels are probably underutilised or people don't actually know they actually exist?

(D) I think a classic example here are buildings. This is an area where there needs to be a bit more focus, particularly in the design phase of projects. Too often, I'll go to a site and I'll see a process building or the workshops and they've been designed for the cooler climates, but they're being built or installed in the warmer climate regions. Now, some simple minor additions such as louvres and windows, roof ventilators, these sorts of things can increase the airflow and make a significant difference to a hot workplace. Now, a good example, a domestic example in Queensland, the old Queenslanders. Now, this is a house that was evolved to address to the hotter climate of northern Australia. It allows for maximum airflow under, around and through the house, at a time when air conditioning wasn't really that viable an option. We need to think along those lines a bit better.

(R) So, with those work-rest regimes that's getting used out there, is where they're actually resting, is that an important factor or consideration that can be looked at?

(D) Yes, it is, quite so. There is no doubt that resting under a shady tree is definitely better than resting in the work environment and it can help with the recovery of the individual. However, the same amount of time in an air-conditioned environment is worth more than double that sitting in the work environment. I often hear that it's impractical in some work places to have a cooled environment, but if you think about it, we often drive to our remote worksites in an air conditioned vehicle and I've been on sites where they've developed small portable huts with an air conditioner and a water cooler that can be moved around the site with a forklift.

They simply plug in a power point and they turn on the tap, and they've got a cool environment. It's not rocket science and it can make a lot of difference.

(R) It goes back to thinking about the work you're doing in the planning and what are some of these higher order controls, but if you try and band aid it at the back end of the control process, you're not going to be able to put these more effective controls in place.

(D) That's right and often they'll be a lot more expensive to put in place at that point in time.

(R) So, with the hierarchy of controls, I think most of our listeners would be aware of training and educating our workers. What aspect or what's your workers been getting told about heat stress should be considered for workplaces in this area?

(D) Awareness and knowledge of what the heat can do to an individual's health and how to recognise your early warning signals, and just the simple things you can do to reduce the risk really are quite important and key. Now, it doesn't matter how accurate your monitoring, or your assessment of the situation is. If the individual doesn't fully understand the risks that they are under, then these controls don't always get used in time, and that's when we have an issue. Whether that's as a result of production pressures or peer pressure, or even the fact that someone might be ill or a bit under the weather, that can make all your calculations worthless and it doesn't matter how clever you are at heat stress calculations. These tools we have, they're only guides. Ultimately, it comes down to the individual to be able to recognise that there's an issue and to have the ability and the support to act and mitigate the situation.

(R) I always keep saying, all the training that I do, the worker has the most control of their situation to decide to do something or not to do something and if they don't have that education to support that decision, poor decisions or no decisions will be made.

(D) Yes, and you really do need the support of leadership in these areas as well.

(R) So, now we get to the bottom of the hierarchy of control, the PPE that we spoke about quite a bit on this podcast and we understand why it's at the bottom, because it relies on workers to do the right thing. In the heat stress management side of things, what kind of PPE is available and are they that effective?

(D) We're starting to see quite an increase in this area. These days, things such as cooling vents are becoming more common, particularly what are known as phase change vests. These vests differ from the traditional ice vests in that they're cool to touch. They operate around about 12 to 15 degrees centigrade, rather than the zero to two degrees centigrade of the ice vests. Now, the benefit there is that this is likely to result in what we call vasoconstriction, so that's the narrowing of the blood vessels of the skin. So, if the blood vessel's narrowed, then we've got less surface area and hence the cooling effect is reduced. So, by being at a slightly higher temperature, what happens is those blood vessels don't contract as much and you get a much more effective transmission of that cooling effect. The other benefit too is that you don't have to have a freezer or a refrigerator close at hand to cool these vests. There are little inserts which can be frozen in an ice slurry, in an esky or as our New Zealanders colleagues call them, chilly bins. The other thing too is active cooling vests are very effective. Now, they use chilled air. Unfortunately, the restriction there is that you've got a connection to an airline, so that can be a bit of an issue, particularly when you've got a lot of, as we say, furniture in the work area and you're also tethered. They're often connected to what we call a vortex tube. Now, these vortex tubes are great little additions. They take compressed air and they spin the compressed air and split it into two streams; a hot stream and a cold stream of air. That cold stream of air is then diverted, and you can run that through air fed respirators or welding helmets to cool the worker, but also vests of course. You can also get much larger versions which can be hooked into the system and they can provide a cooled air stream that can cool the work environment. So, there's quite a number of things out there.

(R) We also spoke last episode about hydration and drinking. Does that fall under the administration control level?

(D) Yes, it does. I think the last episode, I indicated that whilst it is a control, an important control we need to bring up front and yes, it's very important that you have access to clean, potable water at the worksite and that word 'potable' is very important. If you provide water and it doesn't taste very nice, your workers aren't likely to drink it. So, if you're going to provide water, make sure it is potable, easy to drink. If you think there is going to be a significant amount of sweat loss as a result, electrolytes loss, then it's probably a good idea to have a provision of some electrolytes that the workers may have access to during the day, normally before they go out or at their crib breaks or rest breaks, they can have some electrolytes. So, very important; they need to have ready access to water. They need to be able to stop whenever they believe that they need to have a drink and to bear in mind that thirst is not a good indicator of hydration. By the time you become thirsty, you are already starting to dehydrate, so you need to catch it before then. My rule of thumb is drink until the thirst is satisfied and then have one more drink. And we're talking water here.

(R) How much does or how much can what a worker is wearing, from a clothing point of view or also the amount of PPE they've got to wear, how much does that impact the heat load on a worker?

(D) As we mentioned again last time, the rational indices tend to now take that into account. The clothing has an insulation factor as well as it can impact on the evaporation process. And there's also the colour, so where possible, if you're working in the open sun, to avoid the darker colours and to go for the lighter coloured materials. They need to be loose-fitting to allow that air circulation to assist with the sweat evaporation and these days, you can quite readily purchase clothing with built-in vents under the arms and in the back and they're readily available and that's very useful to help get that air circulation. Thickness of the material can vary, depending on the key heat sources, too, so that's another

consideration. For example, a light material would not be appropriate in a situation where there is exposure to significant radiant heat. For example, in a smelter or somewhere where there were furnaces, in which case you would need thicker insulating material which may be a bit more suitable, so a more thicker cotton drill for example.

(R) Now, I think this is the million-dollar question that always gets brought up in the peak and height of summer; is it possible for a workplaces or areas to have a single temperature stop-work number?

(D) Yeah, you're right. This is the million-dollar question and let's put this one into perspective from what we've already spoken about. We think about the heat stress scenario. There are a number of variables. We've got temperature, humidity, air velocity, the radiant heat. Then we've got the task; how strenuous is the work, how complex is the work? And then you've got the individual; their general health, the blood pressure, BMIs, their hydration levels, medication or other drugs they may be on, alcohol consumption and illnesses. Now, each one of these can impact on how the body reacts to heat stress. So, how can you identify one temperature that will address all these conditions? It may be possible … and I could probably set you a temperature that protects everyone, but it would be so conservative that industry would be massively impacted and would probably grind to a halt. So, in short, I personally don't believe this is possible. The best that can be done at this stage is to improve our workplace assessments so that we know what those key sources are, target those sources with higher level controls wherever possible, educate our employers and employees to increase their awareness and to understand the impact of heat. And importantly, how to address it early in the piece and not wait until we're seeing people collapsing and what to do to look after themselves. So, in summary, no, I don't believe there is one temperature that we could set as a safe limit for everyone.

(R) And that ties up in that every environment, person … and this is the broad concept of all work health and safety situations, you need to assess the risks of that

specific situation and put those controls in place that you're alluding to. Is there anything else you'd like to leave with our listeners before we wrap up our conversation?

(D) Yes, I think as we were talking on controls here, an important one to remember is that when we talk about wet bulb globe temperature, or basic effective temperature, thermal work limit or predicted heat strain, whatever assessment methodology or heat stress index that you use, always remember that they are only guides. They do not give you a definitive safe, unsafe limit because as we've mentioned, there are so many variations. They are very powerful tools if used correctly, but always be aware they are guides only.

(R) So, Ross, as we've covered in our two conversations, there is a whole lot of stuff to know and things to consider. Where can you direct people to get more information from?

(D) I think some of the key areas are sites such as SafeWork Australia or WorkSafe New Zealand. The Australian Institute of Occupational Hygienists produce a guidance note on heat stress, which is quite useful. There are also resources from each of the regulators, the state government regulators. The Queensland Government has a heat stress basic calculator. There are also apps available that you can use. So, there's quite a significant resource out there and just as my own plug, there is also The Thermal Environment blog that you can access at www.thethermalenvironment.com.

(R) I am a subscriber and I do recommend you do go and sign up as you have some quite interesting posts there. And if people do want to get in contact with you directly, is it best to do it through that blog site, or is there another site with your contact details you would recommend?

(D) Look, you can do it through that blog or also on our website which is www.monitorcs.com.au and we're more than happy to answer any questions there.

(R) Thank you so much for your time today, Ross, and doing these two episodes with us. Yeah, thank you once again.

(D) Thanks very much, Mark. It's been a pleasure.

(R) Well, thanks for listening everyone. You can get in contact with the show by sending an email to scienceofsafetyanz@mmm.com. If you have any questions, or topic suggestions or you'd like any assistance in your workplace, 3M are certainly here to help. You can also visit our website, 3m.com.au/sospodcast for further resources on managing heat stress in the workplace and we have a transcript of the chat that Ross and I have just had, as well as links to some of those resources we have mentioned. Be sure to subscribe and share through Apple Podcasts, Spotify or Google Podcasts or wherever you get this podcast from. And as Walt Disney said, "All our dreams can come true if we have the courage to pursue them." Thanks for listening and have a safe day.