

## **It only hurts when I laugh Doc!**

### Potential problems with winter paddling.

Below are a few musings on the potential, (non-traumatic) injuries one can experience whilst paddling in winter. As a point of reference for these, refer to the National Outdoor Leadership School (NOLS) "Wilderness Medicine" book written by Tod Schimelpfenig, "White Water Safety and Rescue" by Franco Ferrero, The BCU "Guide to Coaching and, the Internet.

Slalom paddlers tend to work over a very short period over a very tight area of river and at a fairly high intensity. Most slalomists I have encountered tend to don adapted summer wear, even when working in the depths of a hard winter. It is a practical solution to working very hard, producing enormous amounts of energy and heat. This article explores what can happen when energy production is sub maximal, sporadic and over a sustained period; "The winter river run and cold injuries"

There are essentially four types of cold injury which might concern us on a river trip; Drowning, Hypothermia, Frostbite and Non Freezing Cold Injury.

#### Drowning:

This can be as a result of failure of technique, low skill level or failure to read a line correctly ending up with a swim. In most cases these are only slightly irksome but, in the wrong place at the wrong time could be serious.

Importantly there is a misconception that people tend to die of hypothermia in cold water. Generally this is not the case. What tends to happen is; as one exits the boat and is enveloped in cold water, one takes a sharp intake of breath, and breathing instantly becomes laboured. If the initial sharp intake happens to be as one is still under water then you are in big trouble. If you want to understand this first hand, have a hot shower, take a step back from the spray and turn the faucet to cold (for full effect do this in February) then step into the flow with face turned up to the spray, hold onto something solid and make sure the bathroom door is unlocked. See if you can make a minute whilst you imagine tanking down the Graveyard, submerged for part of the time out of your boat!!

Note: DON'T DO THIS, IT'S A STUPID ACTIVITY AND MAY KILL YOU IF YOU HAVE A HEART CONDITION.

Actually, the best types of training for this eventuality are:

- 1). Practice your roll technique
- 2). Practice your roll at the start of your day's activity (on the river you are paddling).
- 3). Learn to overcome the gasp reflex on entering very cold water. Unfortunately there appears to be only one way of doing this; hold on tight, think of England and turn that faucet to cold.
- 4). Wear adequate protective clothing for the prevailing conditions.

5). Practice your team scenario management, pack appropriate rescue kit and set up a rescue point, if a weak member of the team wishes to run a rapid which may be on the edge of his/ her ability.

### Hypothermia:

The body requires fuel (food and fluid) to drive it forward. Insufficient fuel and the engine does not function properly, efficiency is lost, errors of judgement made, it is harder to get through the day. Increased energy output requires an increase in fuel input. Sprinting down a river through a few gates is one thing but it is unlikely to take much more than 120 seconds and is unlikely to, in itself, cause hypothermia. Running down a river for a few hours, no matter how exciting the short bursts are, will necessarily be a slower activity causing the participant to be subjected to long periods of exposure to the prevailing, energy sapping elements; cold water; convective heat transfer from hands in direct contact with the water and, conductive heat transfer via contact with the hull of the boat, air temperature and movement; drawing heat away from exposed skin. Evaporation from sweating will also cause heat loss. All of these are very effective ways of letting the body burn fuel unnecessarily. As you can begin to see; we need to top up the "tank" more frequently and protect the engine (you) from freezing. We burn, store and use fuel in different ways depending on our activity levels (see appendix). Suffice to say, for the moment, if you are not well nourished when you start a day out in winter and you do not regularly eat and drink, you will start to suffer. As energy levels drop body temperature reduces. A lowering of body temperature causes a pooling of blood towards the vital organs (brain, heart, lungs, liver, and kidneys). This reduced perfusion of blood to the periphery cools the extremities. When high demand is put on the limb muscles, paddling a particularly vicious rapid for example, warm blood is forced to the cold limbs, warming them up and powering the muscles but returning to the core (vital organs) cooled, thus the core temperature drops. The fun does not stop here, increased activity causes sweating, cooling the body further and a higher demand for the provision of fuel. Cooled core organs do not function well below their normal temperature of 37°C. So how do you know if you are suffering from hypothermia- well you are unlikely to take much notice of the symptoms because you are:

- 1). Male and too macho to comment/ make a fuss.
- 2). Have been cold and tired before many times 35°C
- 3). Suffered from numb hands and or feet all the time. Hands are stiff and clumsy and, you have goose bumps. Well it is winter what do you expect?
- 4). your lips are tinged with blue. So what?
- 5). Of course I am shivering it's bloody cold. Look shut up I can't think straight.
- 6). Look for heavens sake stop getting at me. I nearly tripped over then because of you. Where the Hell did I leave my sandwiches. Sod it I've just dropped my knife again 34°C
- 7). Well at least I've shtoppedd schiverring. That feelsh sbetter. No leave me alone I want to go for a swim it's warm now.
- 8). I can't get my PFD off my arms feel stiff 32°C
- 9).Tired now shleep well waat yu sa? "Fred, Fred WAKE UP – Christ I cannot get a pulse" 29°C

10). "Quick somebody do something. Hello, Ambulance I cannot wake Fred, I think he's dead!" 24°C.

If you find yourself facing a buddy with whom you have paddling, who complains of cold, has numb hands and/ or feet, appears to be becoming clumsy- fumbling a toffee wrapper is a good one to spot, is beginning to shiver and may be becoming tinged with blue around the lips – Then you are his very best friend. You have spotted the early stages of hypothermia AND YOU CAN TREAT IT, all by yourself!

Here's how:

PLAN A:

- 1). Stop – reduce fuel usage. DO NOT make your buddy run around.
- 2) Cover – put a lid on it, keep the heat in, insulate. If he/ she is wet get them out of the wet kit and into the spare dry stuff you will no doubt have in your boats. Make sure the head is covered
- 3) Warm SLOWLY . If you can provide shelter all the better – a group shelter, space blanket, bivi bag are all good. Keep your buddy off the ground – sit them on the upturned boat if you must.
- 4) Get heat and fuel into them – a thermos of sweet tea, toffees, mars bars. AVOID COLD DRINKS- this only serves to reduce core temperature even further.
- 5) Back up the fast energy foods with something more substantial; sandwiches and cereal bars.
- 6) If you can get a stove going, warm an aluminium water bottle and put it under the victim's pullover- remember; if you cannot hold it he will not thank you for stuffing it down his shirt. (Once warm you might try getting them to move around but I suggest that if they demonstrate symptoms further down the line than item 3 / 4 you should wait some time.)
- 7) Job done? No – if your buddy is experiencing mild hypothermia then there are two further things to consider; first how is the rest of the group, do they/ you need attending to? After all everyone is in the same situation, sweaty and rapidly cooling because you are all standing around waiting for your friend to recover. Second, what are you going to do now?

**NOTE: Late stage hypothermia requires cardiovascular observation and may necessitate the need for CPR. It very definitely needs evacuation.**

There are essentially two types of hypothermia; immersion and exhaustion. Both are treated in the same way in the acute phase. The tough call comes later. If your buddy has simply fallen in early in the day, has been lucky enough to be your friend and subjected to the above scrutiny and action plan then, it is possible that he / she will be able to paddle out (consider also the other members of your party who have been waiting around too). If however

they are tired, exhausted, run down, psyched out, scared or remain in a state whereby they demonstrate any of the symptoms of hypothermia, or are deteriorating, despite your best efforts, then you must not proceed any further. The victim would likely as not deteriorate once back on the water and possibly rapidly. The safest course of action would be casualty evacuation (casevac) or rescue. Remember if you get the victim to walk you are causing warm blood from the body's core to perfuse cold limbs thus returning cold blood to the vital organs. This could take us back to the top of the previous page!! So be certain of your actions. If in any doubt go to PLAN B:

#### PLAN B:

Draw help to your location. Get the fittest/ warmest (kitted up) to head for high ground or a road and 'phone for help. If you can get a mobile signal the emergency services can find you. If you find yourself in a position where you are beginning to observe items 5 and onwards, then you should be humanely drowned. Once you begin observing these symptoms it is quite obvious that you have been chatting up the opposite sex and not keeping an eye out for your best friend. At this point all the books I have read state that you can no longer offer help on your own. You need to evacuate NOW. Do not leave the victim lying in an incoherent soup of gibberish. Execute PLAN A and PLAN B simultaneously.

Note: unless you are travelling fully kitted up on a multi day trip with sleeping bags, it might be unwise to put two people together to sandwich the victim. There is a chance you could cool the helpers more than warm the needy. - Double trouble!

Essentially if you are not generating enough energy to maintain normal body temperature you will start to suffer from hypothermia so:

- 1.Be fit enough for the task in hand ( long term plan)
- 2.Make sure you use a buddy system, take ownership of the task and the people around you but especially look out for one person.
- 3.Know what you are about to do, understand the consequences of failure to run a rapid. Set up safety if its need is anticipated.
- 4.Eat enough to maintain energy levels whilst on the move.
- 5.Insulate yourself from the elements, wear kit appropriate for the activity and weather.
- 6.Carry enough group and personal kit to cater for the obvious.
- 7.Have an exit strategy.
- 8.Expect the unexpected.

#### Frostbite:

How refreshing!

The freezing of water in human tissue, usually fingers, toes, ears and nose, causing mechanical damage as the ice crystals stab you. The lack of available water causes blood to become thickened and thus likely to clot

causing damage to tissue through reduced blood perfusion. Phase two of the injury happens on re-warming of the involved extremity as cellular damage releases prostaglandins and clotting factor causing the blood vessels themselves to constrict.

Frostbite prevails in situations where low temperatures, poor circulation, poor insulation moisture and dehydration occur. The clothes we wear for paddling in are tight at neck and cuff, our feet are squashed into tight spaces so that we are “one with our boat”, our hands are constantly wet and grip paddle shafts re-enforcing poor circulation to the hands, so the warm blood does not get to the periphery.

In a short river trip of three hours it is unlikely, in this country, that one would experience frostbite however, here are symptoms one should be aware of;

Skin cold, waxy, mottled and pale.

Possible tingling pain or numbness in the affected extremity.

Partial freezing could show as the tissue being soft

Full depth frozen skin will be hard.

Frostbite is a progression from frostnip and can be caught at the nip stage by looking out for waxy, grey, mottled skin and stuffing your affected digits into something warm, like your armpits or between your legs. Anything that has developed into frostbite (see list above) needs rapid warming by immersion in water at 38°C – 42°C and is best done in hospital so there is no danger of it re-freezing, which means you have to keep it cold until you get there. A fantastic prospect if you are already suffering from hypothermia, so don't get cold in the first place!

And finally:

Good old Trench Foot:

Yes, Trench Foot or yer communal gardin “Non Freezing Cold Injuries” or “NFCI's”, which according to NOLS (another four lettered three letter acronym) results from prolonged exposure of foot (or hand) to cold wet conditions and was well documented during World War One.

This condition is very similar to frostbite, in that it results from reduced blood perfusion to an extremity caused by heat loss (removal of heat via the local environment or pooling of blood to the body core, to protect vital organs-hypothermia). The lack of perfusion reduces nutrient and oxygen supply to the area creating an environment within the tissues whereby cellular damage may occur within muscles, vessels and nerve supply leaving the recipient of this injury with pain for several months. In extremis, the limb may need amputating however, usually one is left with a soreness in the hands and/or feet for a few days. It does not take long for the NFCI to begin and, it is possible for its effects to be felt after as little as 3-4 hours. One might expect this to happen if long periods are spent in the cold and wet over several days. Symptoms (and sign) of NFCI might include swelling of digits, tingling and or numbness, cold,

pale skin and poor capillary refill (see appendix for an explanation of this). What you are unlikely to feel is pain, well not until the blood returns then; Oh boy, you will know it's your Birthday.

Treatment of this, like hypothermia, is SLOW warming of the extremity, without using hot or warm water, in other words ambient indoor heat. Elevate the limb to keep the swelling down and an over the counter anti inflammatory, unless you have a heart condition or suffer from asthma.

Avoidance is once again simple; don't block the blood supply with tight cuffs, don't stuff your feet into tight corners, keep hands and feet warm and dry, avoid becoming hypothermic as the blood pools in the core and, if you can, massage your feet/ hands before this situation arises.

#### In conclusion:

The key to not suffering these problems is, surprise, surprise, to keep warm, dry, fed, fit, and observant. Attend to any little niggles before they become a big niggle and be mindful that every time someone in a group stops, everyone gets cold. Carry the right kit.

Keep fit, stay safe, happy paddlin'

**Maddog Mctavish.**

#### Appendix 1:

Energy in the human body is produced in three ways. This enables fuel to be stored and utilised in a sophisticated manner. As far as energy production is concerned, it is something called ATP ( Adenosine Triphosphate), the end product of digesting glucose, free fatty acids and amino acids, that the body uses to fire up the engine. It takes energy to make ATP but, when ATP is split into Adenosine Diphosphate and free Phosphate, an enormous amount of energy is released and quickly. Unfortunately, the amount of ATP held in muscle cells is not sufficient to keep us running about all day, so there have to be a number of ways to supply power. Hold on to your hats, turn the music up here they come!!

The three methods of energy production are split into two sub groups; The Anerobic system and the Aerobic system. Essentially, the Anerobic system

does not use oxygen in the production of ATP and happens very quickly. The Aerobic system works slower, over a longer period and does need oxygen

### Anerobic Energy:

1. The Phosphocreatine system. Produces ATP very quickly, is developed from within the cytoplasm of the muscle cells and lasts about 10 seconds. It is what pulls you out of the way of that nasty looking raft which is about to collide with you. It works like this: Phosphocreatine (PC) and Adenosinediphosphate (ADP) sit around minding their own business in your body's cells until you look over your shoulder and see the raft. All of a sudden the Creatine part of PC dumps the Phosphate onto ADP, creating ATP and BANG you are safe, energy has been produced to power your muscles.
2. Glycolysis occurs during periods of activity lasting up to a minute and a half, or 90 seconds in old money and tends to be what powers you away from that nasty bunch of hoodlums in the raft when there is no chance of a convenient eddy to duck into. This system produces maximal power for sprinting. The reason this system is slower is because glycogen, (which is how the body stores glucose and the start point for the glycolysis) is stored in the liver and muscles and there are a number of processes to go through from stored glycogen to the production of ATP.

### Aerobic energy:

You will of course noticed by now that glycolysis is a process using only stored glucose in the form of glycogen, which is a carbohydrate. Well, the production of energy using the aerobic system uses any old stuff it can find, carb's, fats and proteins. Energy from this lot is produced in the body's municipal incinerator, the Mitochondria, which exist within the cell just waiting to fire up. Like most council activity mitochondria get things done at a pedestrian rate and produce energy slower than their counterparts but they do it over a longer time. This little baby is the one the one that gets you down the entire course and off to the butty bar. There are a couple of processes which convert fat, carb and protein into something called Acetyl-CoA and on to the Krebs cycle to create ATP directly or on to the Electron Transport Chain, again to form ATP. If you really want to impress your friends at the next dinner party, I am sure that you can find this lot on line- don't forget your Anorak.

### Appendix 2:

Capillary refill is what happens after you clench your fist. The blood is squeezed out and the hand becomes pale, then the blood returns – this is capillary refill. Poor capillary refill is how they used to doc the tails of Jack Russell puppies, don't try it at home.