Cold Weather Clothing For Paddlers

The principals of three combined with Heads and Feet and Hands

There are a few basic principals, which are used in general outdoor pursuits clothing if followed will keep us warm and comfortable when paddling.

The principal of three works on the principal of wearing 3 layers under the top wind /weatherproof layer.

Layer 1 Base layer (next to the skin)
This layer is the most important as this will give immediate effect, any layer worn next to the skin needs to have wicking qualities. Wicking garments have the ability to draw away moisture from the skin into the other layers worn on top. This make us feel dryer and warmer.

Layer 2 Mid layers
This layer needs to have thermal qualities (i.e. warming) these mid layers tend to be thicker in nature and retain warm, these layers some times have a slight wicking effect as well.

Third layer
Again with thermal retaining qualities this layer also insulates us from any cold transference from the outer layer.

Outer layers
This layer needs to be waterproof and more importantly wind proof. Additional benefits some of these materials have are to be breathable. These materials keep out the elements yet can to a degree allow internal moisture wicked away by the base layer to escape

By wearing clothing layered you keep warm by trapping air between the layers.

Wet suits
Wets suits work as the name suggests by warning up the thin layer of moisture / air trapped between the skin and the suit when a swim has taken place. Wet suits worn in a cold **dry** environment without some form of layer with a thermal / wicking qualities can be cold and uncomfortable as neoprene has no natural inherent thermal qualities of it own.

Heads, Feet and Hands

Head
You can lose a large % of body heat through you head so a tight fitting warm hat or under helmet skull cap can have a massive benefit in the fight to keep warm. If not worn whilst paddling having one to hand when stopped for lunch or break is is a good idea, as this is the time when you will chill down the quickest.

Feet
We can loose heat from out feet as well so a pair of thermal socks / football socks worn under any paddling footwear is beneficial. If you think about it our feet have the least amount of flesh along with our hands, and our feet are generally in direct contact with the boat nearest the water, along with any water sloshing around in our boats.

Hands
Gloves can be worn but please bear in mind you need good grip between the paddle loom and your hands. The key principal here is to try and keep the wind or cold air away from the hands one way which some people find successful are poggies (A retained mite secured to the paddle, these can feel odd but once got used to have benefits some paddlers)

Conclusion

Above are basics principals which can benefit us on the water please try them and see what works for you as every one is different and has different heat retention issues. But by applying the above you will generally have a better chance of enjoying the paddle more. But remember we also need to be able to move and remain flexible so don't go over the top.

Hypothermia

Below I have sourced and proved some information about hypothermia, which provides a detailed back ground to the problem. Use what is usefull to you and what you feel you can do **practically** and **safely**. ***Extreme hypothermia need professional treatment in a controlled enviroment***. But if we can spot early signs and halt the problem there with simply remedies that are within your level of competence you have done something worthwhile. Also remember importantly the last person to notice Hypothermia is your self (brave face syndrome ie I don't want to to look a sissy with my mates ?). If you are starting to chill down say some thing to somebody, use a buddy system (look out for each other) don,t just relay apon the trip leader or person organising the day as they might not have spotted the problem yet. Paddle safe

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Hypothermia - Physiology, Signs, Symptoms and Treatment Considerations

SARBC

Search and Rescue Society of British Columbia

Hypothermia
Physiology, Signs, Symptoms and Treatment Considerations

As you know, hypothermia is a temperature related disorder. Therefore, it is necessary to understand human physiology as it pertains to temperature stress.

Man is considered to be a tropical animal. Normal functioning of the human animal requires a body temperature of 37 degrees Celcius (98.6 degrees Fahrenheit). Comfortable human survival using only that protection from temperature stress which is provided physiologically at birth would therefore require an environment providing a temperature of 37 degrees Celcius, plus or minus perhaps 1 degree.

The body can self-compensate for small upward or downward variations in temperature through the activation of a built-in thermoregulatory system, controlled by temperature sensors in the skin.

The response to an upward variation in body temperature is the initiation of perspiration, which moves moisture from body tissues to the body surface. When the moisture reaches the surface it evaporates, carrying with it a quantity of heat. The explanation for a person becoming thirsty when exposed to a hot environment for a period of time is that fluids lost due to perspiration must be replaced.

The response to a downward variation in body temperature is shivering, which is the body's attempt to generate heat. Shivering is an involuntary contraction and expansion of muscle tissue occurring on a large scale. This muscle action creates heat through friction.

Now that the necessary groundwork has been laid we can delve into the intricacies of hypothermia and it's treatment.

THE DISORDER

Hypothermia is defined as a core temperature of less than 35 degrees Celcius. Hypothermia is also considered the clinical state of sub-normal temperature when the body is unable to generate sufficient heat to efficiently maintain functions.

Many variables contribute to the development of hypothermia. Age, health, nutrition, body size, exhaustion, exposure, duration of exposure, wind, temperature, wetness, medication and intoxicants may decrease heat production, increase heat loss, or interfere with thermostability.

The healthy individual's compensatory responses to heat loss via conduction, convection, radiation, evaporation and respiration may be overwhelmed by exposure. Medications may interfere with thermoregulation. Acute or chronic central nervous system processes may decrease the efficiency of thermoregulation.

Let's look at the definitions of the aforementioned causes of heat loss.

> Conduction:
> direct transfer of heat by contact with a cooler object - conduction of heat to the cooler object
> Convection:
> cool air moving across the surface of the body, heat transferred to the cool air, warming it and cooling the body
> Radiation:
> heat radiated outward from the warm body to the cooler environment
> Evaporation:
> the loss of heat through the process of removing water from the surface of the body through vaporization
> Respiration:
> inspired air raised to body temperature and then exhaled
>
> Each of these causes of heat loss can play a large or small role in the development of hypothermia, depending on clothing, head cover, wind, weather, etc.

Once hypothermia develops, the heat deficit is shared by two body compartments, the shell and the core. The shell consists of the outer 1.65 mm of skin and has an average area of 1.8 square meters. This constitutes approximately 10% of a 70 kg mass. The remainder of the body is the core.

However, when we speak of Core Temperature it is the thoracic, or critical core we are concerned with, mainly the area of the heart, lungs and brain.

RECOGNITION OF SIGNS AND SYMPTOMS

Impending Hypothermia:

Due to physiological, medical, environmental, or other factors the person's core temperature has decreased to 36 degrees Celcius. The person will increase activity in an attempt to warm up. The skin may become pale, numb and waxy. Muscles become tense, shivering may begin but can be overcome by activity. Fatigue and signs of weakness begin to show.

Mild Hypothermia:

The person has now become a victim of hypothermia. The core temper-ature has dropped to 35 - 34 degrees Celcius. Uncontrolled, intense shivering begins. The victim is still alert and able to help self, however movements become less coordinated and the coldness is creating some pain and discomfort.

Moderate Hypothermia:

The victim's core temperature has now dropped to 33 - 31 degrees Celcius. Shivering slows or stops, muscles begin to stiffen and mental confusion and apathy sets in. Speech becomes slow, vague and slurred, breathing becomes slower and shallow, and drowsiness and strange behavior may occur.

Severe Hypothermia:

Core temperature now below 31 degrees Celcius. Skin is cold, may be bluish- gray in color, eyes may be dilated. Victim is very weak, displays a marked lack of coordination, slurred speech, appears exhausted, may appear to be drunk, denies problem and may resist help. There is a gradual loss of consciousness. There may be little or no apparent breathing, victim may be very rigid, unconscious, and may appear dead.

TREATMENT PREFACE

Treatment of cold injuries has long been controversial.

Hippocrates, Aristotle and Galen mention various cold injury treatments. Cold has had major impacts on military history. Hannibal lost nearly half his army of 46,000 crossing the Alps in 218 BC. Baron Larrey, Napoleon's chief surgeon, reported only 350 of the 12,000 men in the Twelfth Division survived the cold. He observed that those soldiers placed closest to the campfire during that retreat from Russia died. The winter of 1777 took its toll on Washington's troops. There were large losses to cold injuries in the Crimean and both world wars. About 10% of the United States casualties in Korea were cold related.

Be aware that hypothermia may masquerade as a variety of conditions, including death, in a variety of situations and seasons.

Always act on the premise that **"no one is dead until warm and dead"**.

Patients cold, stiff and cyanotic, with fixed pupils and no audible heart tones or visible thoracic excursions have been successfully resuscitated. One patient recovered completely in the morgue.

The only certain criterion for death in hypothermia is irreversibility of cardiac arrest when the patient is warm.

Conclusions regarding the potential reversibility of coexisting conditions should be withheld until the patient is rewarmed. Resuscitation, including CPR if necessary, should be continued until either failure after hospital rewarming to 35 degrees Celcius or danger through exposure to rescuers exists.

The sole consensus regarding prehospital treatment is that all patients at some point should be rewarmed.

Initial management principles emphasize prevention of further heat loss, rewarming as soon as is safely possible at a **"successful"** rate and rewarming the core before the shell, in an attempt to avoid inducing lethal side effects during rewarming. This treatment goal is important, since hypothermia itself may not be fatal above 25 degrees Celcius core temperature.

Hypothermia causes several reactions within the body as it tries to protect itself and retain its heat. The most important of these is *vasoconstriction*, which halts blood flow to the extremities in order to conserve heat in the critical core area of the body.

When core temperature exceeds 30 degrees Celcius the major source of heat production is shivering thermogenesis.

This maintains peripheral vasoconstriction, which minimizes the severity of vascular collapse during rewarming. Induction of vasodilation in these patients may precipitate rewarming shock and metabolic acidosis.

Rapid shunting of cold blood from the periphery to the core as the direct result of vasodilation may cause the core temperature to drop. This phenomenon of a drop in temperature after initiation of therapy is termed core temperature after-drop.

Prevention of vasodilation is the reason why it is imperative that the patient's extremities not be rewarmed before the core. If vasodilation occurs, cold blood returning to the heart may be enough to put the patient into ventricular fibrillation.

The patient must also be handled very gently and not be allowed to exercise, as muscular action can pump cold blood to the heart.

Certain assumptions permit safe treatment. If the patient is unresponsive and not shivering, one should presume severe hypothermia.

At temperatures below 32 degrees Celcius, one should expect an irritable myocardium, a temperature gradient between the core and periphery, and relative hypovolemia (abnormally decreased volume of circulating blood in the body).

The patient is in a **"metabolic ice-box"**, and sudden thawing may be disastrous to the cardiovascular system.

TREATMENT FOR THE DIFFERENT LEVELS OF HYPOTHERMIA

Impending Hypothermia:

Seek or build a shelter to get the person out of the cold, windy, wet environment.

Start a fire or get a cookstove going to provide warmth. Provide the person with a hot drink (no alcohol, coffee or tea).

Halt further heat loss by insulating the person with extra clothes, etc. This person should recover from the present condition quite quickly.

Mild Hypothermia:

Remove or insulate the patient from the cold environment, keeping the head and neck covered. This prevents further heat loss and allows the body to rewarm itself.

Provide the patient with a warm, sweetened drink (no alcohol, coffee or tea) and some high energy food. Limited exercise may help to generate some internal heat, but it depletes energy reserves.

Moderate Hypothermia:

Remove or insulate the patient from the cold environment, keeping the head and neck covered. Apply mild heat *(comfortable to your elbow)* to the head, neck, chest, armpits and groin of the patient.

Use hot water bottles, wrapped Thermo-Pads, or warm moist towels.

It is possible that you may have to continue this treatment for some time. Offer sips of warm, sweetened liquids (no alcohol, coffee or tea) if the patient is fully conscious, beginning to rewarm and is able to swallow. Patient should be seen by a physician.

Severe Hypothermia:

Place patient in a prewarmed sleeping bag with one or two other people. Skin to skin contact in the areas of the chest (ribs) and neck is effective. Exhale warm air near the patient's nose and mouth, or introduce steam into the area.

Try to keep the patient awake, ignore pleas of "leave me alone, I'm ok". The patient is in serious trouble, keep a close, continuous watch over the patient.

Apply mild heat, with the aim of stopping temperature drop, not rewarming.

If patient has lost conciousness be very gentle, as by now the heart is extremely sensitive. Always assume the patient is revivable, do not give up.

Check for pulse at the carotid artery. If, after *two minutes* you find no pulse check on the other side of the neck for two minutes.

If there is any breathing or pulse, no matter how faint, do not give CPR but keep very close watch for changes in vital signs.

If no pulse is found begin CPR immediately, stopping only when the heart begins to beat or the person applying CPR can not carry on any longer without endangering himself.

Medical help is imperative, hospitalization is needed.

CONCLUSION

Treatment of hypothermia should be approached with knowledge and care.

It is altogether too easy to cause more harm than good by using the wrong treatment. If one can not distinguish the level of hypothermia through visible signs and symptoms then he should assume severe hypothermia.

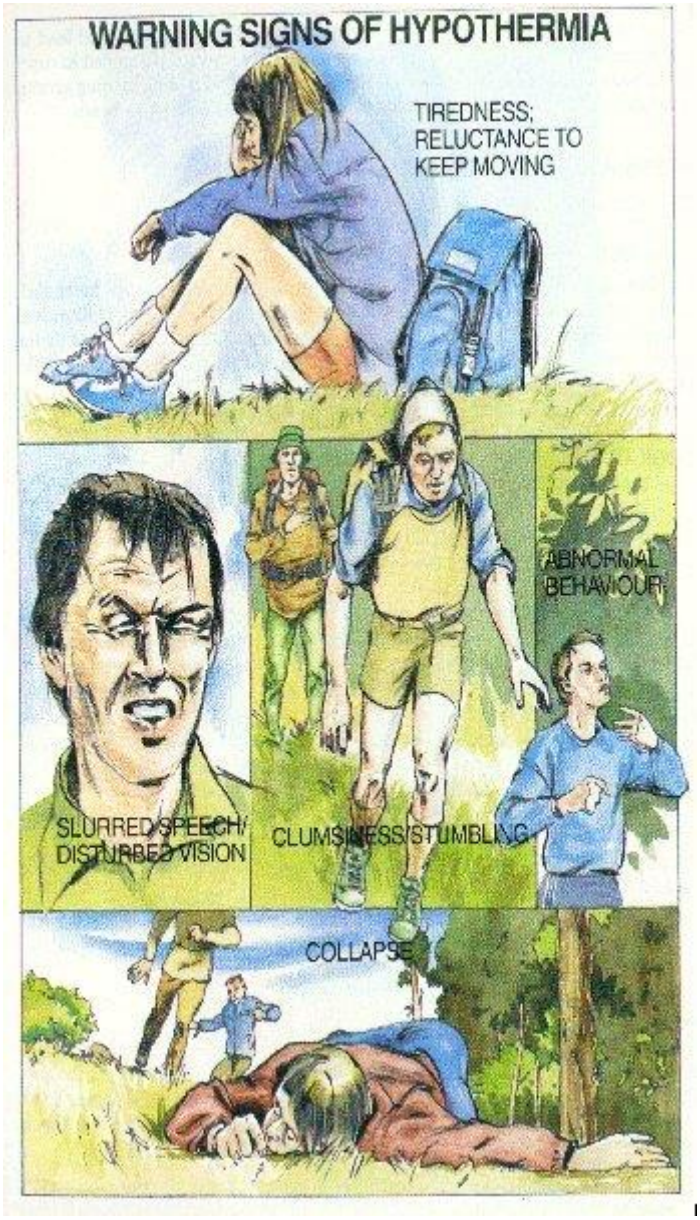
Through recent research and clinical findings it has come to be concluded that the safest and most effective method of treating hypothermia is through inhalation rewarming. The necessary equipment for providing inhalation rewarming therapy in the field is now readily available. However, this equipment may not be available when it is needed and people who may end up in the position of having to provide treatment must know the alternative methods which have been described here.

Always remember, gentle handling, insulation, no alcohol, coffee or tea, and don't try to rewarm a patient in a hurry.

Any method which will rewarm a patient in a hurry in the field will likely cause further complications, if not death.

Compiled by: Michael McEwan For: The Search and Rescue Society of British Columbia

WARNING SIGNS OF HYPOTHERMIA



[More articles and information about Hypothermia from SARBC]
Including excellent papers by researchers Hayward and Weinberg
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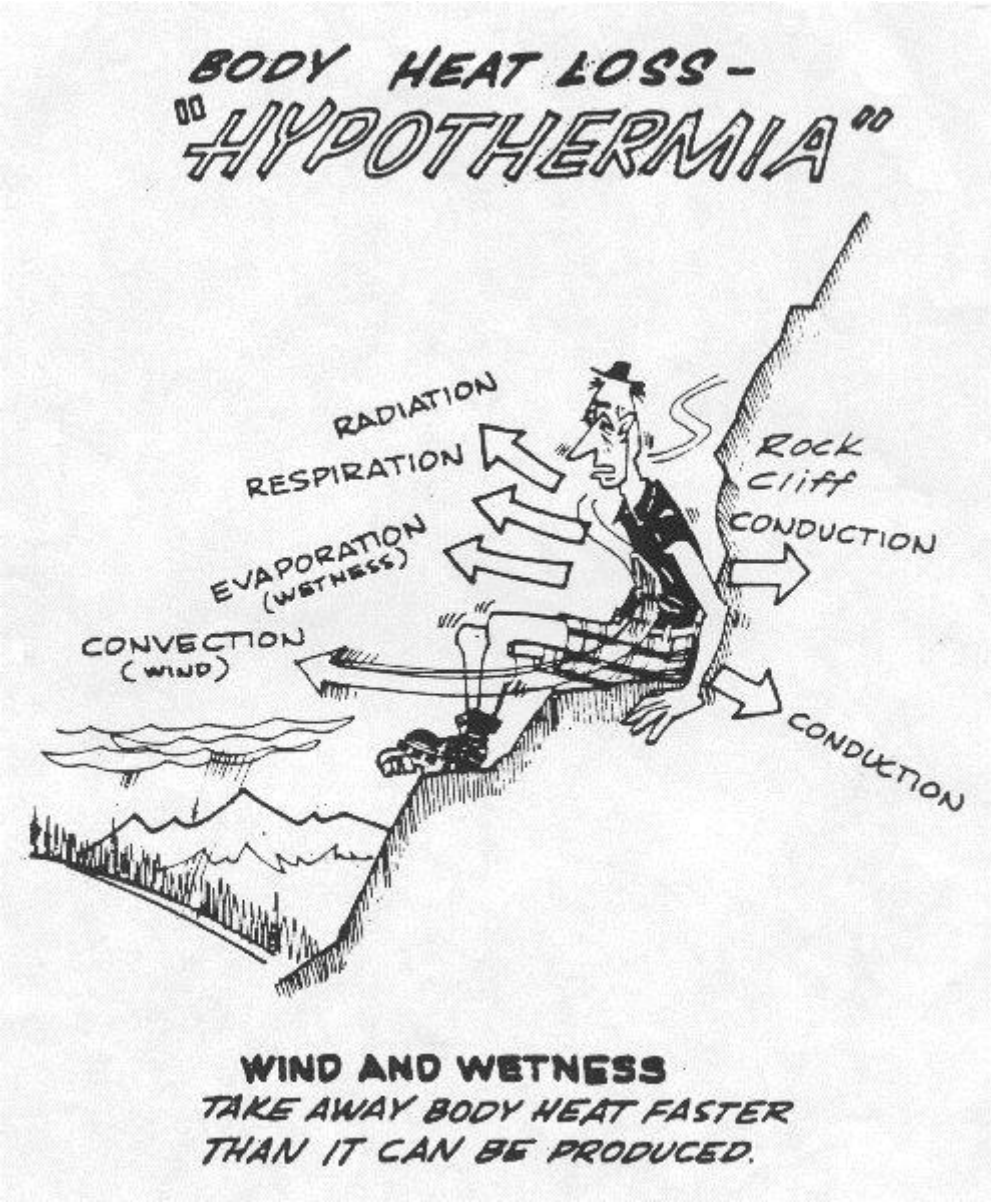
HEAT LOSS - LOSING IT 5 WAYS



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HYPOTHERMIA - TREATMENT IN THE FIELD/HOSPITAL

TREATMENT IN THE FIELD

BODY SIGNS/SYMPTOMS TEMP. (rectal)	
37.5°C NORMAL	
36 FEEL COLD	Seek dry shelter, replace wet clothing with dry including socks, gloves, hat, cover neck, insulate whole body including HEAD from cold. Exercise but avoid sweating. External warmth (bath, fire) ONLY if CORE TEMP. above 35°C. Warm sweet drinks and food (high calories).
35 SHIVERING	
BODY CORE TEMPERATURE BELOW 35°C = HYPOTHERMIA = HOSPITAL	
	NO EXERCISE, HANDLE GENTLY, REST. **NO EXTERNAL WARMTH** (except to chest, trunk, eg. Hiebler Jacket).
CLUMSY	Warm sweet drinks and calories.
34 IRRATIONAL **CONFUSED** **(may appear drunk)**	Internal warming via warm moist air (exhaled air, steam) or warm moist oxygen (40 - 42°C at mask).
33 MUSCLE STIFFNESS	Monitor pulse, breathing. Restrict all activity, lie down with feet slightly raised.
32 SHIVERING STOPS, COLLAPSE. TRANSFER TO HOSPITAL. URGENT.	
31 SEMI CONSCIOUS	Nothing by mouth. Check airway remains open.
30 UNCONSCIOUS **No response to painful stimuli**	May tolerate plastic airway, put in recovery position, check airway, turn every 2 hours to protect skin, monitor pulse and breathing.
29 SLOW PULSE AND BREATHING	Slow mouth-to-mouth breathing, at victim's own rate (may be very slow).
28 CARDIAC ARREST **No obvious pulse or breathing** **Pupils dilated**	Check airway. CPR, with mouth-to-mouth breathing. Aim for normal CPR rates of 12-15 breaths/min. and 80-100 compressions/min. but slower rates of 6-12 breaths/min. and 40-60 compressions/min. may be adequate. Continue for as long as you can.
BELOW 28°C. NO VITAL SIGNS, COLD. DO NOT GIVE UP TREATMENT.	

NOTE: NOT DEAD UNTIL WARM AND DEAD!
Avoid rapid rewarming and **HANDLE GENTLY AT ALL TIMES.**
Core temperature may lag behind skin temperature and continue to drop, so keep monitoring.

HYPOTHERMIA - TREATMENT IN THE FIELD/HOSPITAL

TREATMENT IN HOSPITAL

CAUTION

No re-exposure to cold
Exercise to generate body heat but no sweating.
Warm bath.
Warm sweet drinks, calories
Keep warm for several hours.
Watch for drop in temperature.

DO NOT massage cold limbs.

DO NOT give alcohol or coffee.

CHECK FOR OTHER INJURIES. MINIMUM STAY – 48 HOURS

Watch out for late cardiac arrhythmia.
Warm only trunk, chest.
Give warm, sweet drinks.
Warm moist air or warm moist oxygen, 40-42°C at mask.
e.g. Warm IV fluids e.g. Dextrose/Saline 5% at 37°C, 50% Dextrose, 20ml.
Monitor pulse, respiration, ECG.

NO exercise.
NO external warmth except Hiebler warm water type jacket to trunk and chest.
NO cold air, oxygen.
NO cold drinks.
DO NOT overload with IV fluids.

JOLTING DURING TRANSPORT MAY CAUSE CARDIAC ARREST.

Nil by mouth except glucose jelly.
Check airway, recovery position.
Turn every 2 hours to protect skin.

NO food or drink

Oropharyngeal airway
Slow synchronous mouth-to-mouth or mask. Defibrillate if necessary. Intubate if unable to maintain airway. Ventilate with 50% humidified oxygen at 42°C, CPR at 6-12 ventilations/min. and 40-80 compressions/min. Warm peritoneal lavage (standard dialysate as fast as it will flow), or Arterio-venous by-pass warming.

Endotracheal intubation may precipitate ventricular fibrillation.
NO drugs unless CORE temp. above 32°C. e.g. Lignocaine.

CONTINUE TO TREAT

Monitor Core temp.
Monitor biochemistry (potassium, sugar, acidity) and correct cautiously.

DO NOT GIVE UP

DO NOT defibrillate until CORE temp. above 30°C.

NOTE: CORE temp. lags behind skin temp, watch out for after-drop. Other complications may arise during rewarming (e.g. cardiac, fluid balance).