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Battling Cold Feet; Keeping Warmer

Prophylaxis against cold environmental conditions is the optimum regime in keeping feet warm. To this end, a lengthy discussion of footwear fabrics and appliances will be addressed.

Socks function to keep feet warm by trapping air. Wearing two sock-layers can do more than wearing one by trapping an additional layer of insulating air. This is dependent on the ability of the sock liner to absorb perspiration and to wick away moisture in combination with an outer sock.

Silk is a natural fiber spun from the cocoon of the silk worm and is super absorbant, capable of soaking up to 30 % of its weight in moisture and still feel dry. Silk works by *abosrbing* a certain amount of perspiration from the skin and continually transferring this moisture away to the outer wool sock.

Fortunately, silk is a poor conductor of cold (as well as heat), so when the feet are not active and heat producing, the liner will not transfer cold from the outside environment to the feet. This material, therefore, keeps the inactive as well as the active person feeling dry and also warm due to its ability to trap air within its tiny air spaces. This fabric, however, lacks durability and is also more expensive than other liners

Polypropylene sock liners are made of a synthetic fiber (petroleum base), which is the least absorbant of all fibers. As such, it has the most active wicking capability. This means that when moisture condenses on the skin surface, it is carried away without absorption, *along* individual fibers to the outer wool sock. Therefore, the feet stay dry and warm.

Polypropylene was designed only for the active person as it is a fairly good conductor of heat and cold. Since the heat of an active foot warms the liner material and outer sock air spaces, it is ideal for skiers, skaters, mountain climbers, etc. However, if for example an individual wears the sock liners on a cold day while sitting at a football game, these liners will conduct cold and the feet will feel this effect. The same may be true for a skier going up the mountain on a chair lift. This individual should wiggle his toes and keep his feet active to stimulate blood circulation so that heat is given off. The inactive individual is better off wearing a silk liner and/or a wool blend sock.

Metallic sock liners have silver threads running through them and produce extra warmth through friction. In addition, since metal is one of the best conductors of heat, it can retain the foot's natural heat. In fact, the foot may sweat more. Another problem with this sock in the cold weather is that when not active, the metallic threads very quickly become cold. A polypropyene sock has a greater wicking capability to keep the foot dry and also feel more comfortable against the skin.

Wool socks contain curly, springy fibers which create massive amounts of air space to trap heat. In fact, up to 80 % of the total sock volume may be air. Also, wool's hairy looking end projections help trap additional air between it and the sock liner.

Wool has the greatest resilience of all sock fibers. This means that after the foot's weight is placed upon it and then released, it will bounce back to its original shape. Since wool is highly absorbent, moisture travels *through* the core of the fibers away from the foot where it can escape through the boot or the top of the sock.

Hence, wool dries from the inside (closest to the foot) to the outside. Wool is unique in that even when soaking wet, the fabric does not lose its resilience and may retain up to 70 % of its insulation value.

There are some disadvantages of wool. This fabric is itchy to the skin, does not stretch, is bulky, shrinks on washing and wears out quickly. For these reasons, many socks are manufactured with nylon spun in, to help make wool an ideal outer sock garment.

Cotton is one of the worst socks for an active person to wear in the cold. This fabric absorbs too much moisture and is slow to dry. In addition, when wet the sock fibers adhere together and not to the foot. This causes the sock to lose its resiliency and ability to trap air between the fibers.

Electric socks are also available and are helpful to those with peripheral vascular disease or inactive feet, as in sitting in the cold at a football game. These socks have electric wires running to the toes which heat up by batteries attached up above. Naturally, care must be taken with insensitive feet so as not to burn them. The wires will be uncomfortable and cause blisters in the active person, but if silk liners with wool outer socks are not effective, this may be the way to go for inactive feet.

Insoles are a worthwhile addition to any cold weather shoes. They function to provide an insulating layer of air under the feet and act as a barrier to prevent heat from escaping through the shoe sole as it prevents cold air from entering. Most felt insoles, other than all cotton, resist compression and provide small spaces to trap air. Lamb's fleece insoles compress when the foot bears weight on it and hence, provide less air trapping than felt. Both insoles, however, are capable of absorbing and transferring perspiration away from the foot. Synthetic fleec compresses as does the natural wool fleece, but does not function as well to wick away the moisture.

Another type of insole is closed cell foam which does not compress or absorb water. These also have plenty of inherent space for trapping air. However, these insoles may cause an increase in sweat around the foot if there is no ability for moisture to pass through. There are also electric insoles which have wires at the toes which produce heat. This is powered by batteries attached to the back of a cold weather boot or even a ski boot. The insole functions to warm up the sock and then your feet. This device is very expensive; try the more conventional insoles first.

Natural herbs are also available to sprinkle on the socks and feet. This supposedly stimulates capillaries to open and create a better blood flow. This may in fact work similar to super hot balms and merely act as a local skin/nerve irritant. However, this may offer a false sense of warmth and prove harmful in cold conditions.

Oil, such as olive, safflower, or mineral, has a lower freezing point than water and when coated on the foot may allow the skin to withstand a lower temperature before freezing. In addition, the oil layer may form a temporary barrier preventing the cold air from reaching the moist skin below. Oil can be utilized better on feet that will not sweat excessively; however, when sweating, this moisture will build up and then drip off into the overlying sock. A polypropylene liner is best used in conjunction with this method.

Other recommendations to keep the feet warm are to dress warmly, wearing layers of clothing. This traps the most air to insulate the body. Also, wear a hat, as from 60-70 % of body heat loss occurs through the head. As the body gets colder, core temperature is maintained by slowing blood flow to the extremities. Likewise, when the core temperature rises, blood is forced to the extremities where the heat can further dissipate.

Also, allow adequate room in the boot for air to circulate. Too many socks inside the boot will cause compression of the sock fibers which reduces the amount of air space. An insole can also add to the tightness of the boot fit. Furthermore, a tight boot fit decreases circulation within foot, especially at areas of bony prominences, thereby, predisposing the individual to induced injury. So, before the feet get cold, pamper them.

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