Beginner's Guide to Tropical Trekking

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Preface

The tropics is geologically defined as the region between the Tropic of Cancer in the Northern Hemisphere at 23.43706°N and the Tropic of Capricorn in the Southern Hemisphere at 23.43706°S. Does this sound too technical to the layman? It is basically places that are near to the equator with hot and wet climate all year round. This book is all about trekking in the topics with a focus on pre-trip preparation and things to take note of (environment and safety aspects) during the trek. Included in this book are also some pointers to assist you in choosing the right apparels and equipment and some tips to make your trek a more enjoyable one. The targeted trekking destinations can be rainforests in Malaysia, cave complexes in Thailand, volcanos in Indonesia, high peaks of the Crocker Range or even scrubby lowlands in Northern Australia Outback. Although references are predominantly made to destinations in South East Asia, this book should also be useful for those seeking adventures in tropical areas in India, Central Africa, Central America, South America and Oceania islands that experience similar hot and moist climate. This book is an aggregation of experience from our past trekking trips and knowledge which we picked up over the years from fellow trekking mates, books, magazines, etc. Considerable efforts have been made to render the book error free; we apologise for any errors that may remain. Any suggestions concerning errors, omissions or other shortcomings are very much welcomed.

Trekking Attire for the Tropics

A good trekking attire for the tropics is long sleeve shirt and pants. The attire should be made of *wickable synthetic material like polyester or nylon and not natural material like cotton which takes a very long time to dry when wet. Tropical terrains are usually lush with vegetation and infested with mosquitoes especially at low altitudes; sometimes leeches can be a problem as well. A long sleeve shirt and pants help to cover and protect your forearm, shin, and calf from abrasion or brushes against vegetation, mosquitoes, and leeches. They also provide some shield against the sun's harmful UV rays. A pair of arm sleeves comes in handy to protect your forearm if you are wearing a short sleeve shirt. Of course, short sleeve shirt and shorts are perfectly fine if you do not mind scratch marks, itchy bites, and sunburn.

It can rain anytime in the tropics especially in the mountains even if your weather forecast station says otherwise. You should always bring along a poncho (an umbrella is not recommended if the trail is narrow or some scrambling is required) to wear over when it rains. Poncho is good for trekking under a short burst of rain but not so ideal for trekking under prolonged rain. Poncho is usually made of waterproof but non-breathable fabrics so after 1-2 hours of trekking underneath it, your whole body will be drenched with your own perspiration even if no rain water gets through you. If you regularly trek in the tropics, you should consider getting a good pair of waterproof-breathable rain jacket and rain pants which will help to keep you dry in bad weather conditions. Our bodies lose heat more readily through our head and torso than legs; if you only have enough budget to buy one waterproof-breathable apparel, get the jacket rather than the pants.

Atmospheric temperature decreases with an increase in altitude - about 6.4°C per 1000m. If the day temperature at the base of the mountain (assuming 0m ASL) is 30°C, then the temperature at the top of the mountain (assuming 2000m ASL) would be around 17°C which is like the lowest air conditioner temperature. The perceived temperature could be lower if you take into consideration the wind-chill effect. Therefore, you might need to dress in layers if you intend to trek high up in the tropics. An ideal layered clothing for the top would be a wickable synthetic long sleeve shirt as the base layer, a fleece jacket as the mid layer and a waterproof-breathable rain jacket as the outer layer. For the bottom, a pair of wickable synthetic water resistant pants is usually sufficient unless the temperature is below 10°C (rough guideline), then you might need to put on a base layer under your pants.

I commonly encounter trekkers asking me whether insulated jackets (either down-filled or synthetic-filled) are needed for some of the highest treks in the region like Mount Kinabalu (4095m), Mount Kerinci (3805m), Mount Rinjani (3726m), etc. I do not think insulated jacket is necessary for two reasons. Trekking especially climbing up a slope is a strenuous activity, you will constantly be burning calories and generating body heat which together with a good layered clothing should keep you warm enough even without an insulated jacket. Sometimes, you might want to remove some layers when you start to feel hot, but it will be very cumbersome to remove or hand-carry the bulky insulated jacket while you trek (your daypack might not be big enough to hold it). If you are really scared of cold or prefer to be in optimal warmth, try to get a light weight and compressible one as opposed to those heavy types which you wear for your winter travel.

**The terms "wickable" and "breathable" should be understood as having the same meaning, i.e. the ability to transmit moisture. In this book, in line with the apparel industry's usual usage, the term "wickable" and its derivatives are used predominantly for inner layer clothing while the term "breathable" and its derivatives are used predominantly for outer layer clothing.*

Inner Layer Clothing

In this book, for simplicity's sake, we will use the term “inner layer” to refer to the long sleeve shirts and pants in single-layered clothing system for low altitude treks and the base layers in multi-layered clothing system for higher altitude treks. The inner layer clothing should be made of wickable synthetic material like polyester or nylon and not natural material like cotton which takes a very long time to dry when wet. Merino wool (from a special breed of sheep called Merino) is one exception of natural material which is commonly used to make base layers. Unlike common wool, Merino wool is light, wickable, fast to dry, and with excellent temperature regulation properties.

Wicking is probably the most important fabric properties for inner layer clothing. It helps to remove sweat from the skin and keep the fabrics dry and comfortable for the wearer. It is especially critical in cold weather to prevent hypothermia as moisture trapped underneath or within the fabrics will conduct heat rapidly away from the body. Wicking refers to the property of the fabrics that pulls moisture or sweat away from the skin. A piece of fabrics is made up of millions of tiny porous fibers which act like capillary tubes that draw moisture upwards from your skin (region of higher humidity) to the exterior of the fabrics (region of lower humidity) where it evaporates into the air. There are two important fabric properties that relate to wicking; hydrophilicity and hydrophobicity. Hydrophilic fabrics have high affinity for water and can absorb and retain a great amount of water relative to their own mass. For example, cotton – the most hydrophilic fabrics – can absorb up to 25 times its weight in water. Hydrophobic fabrics have low affinity for water and absorb only a small amount of water. For example, polyester which absorbs less than 1% of its weight in water. At this point, you may wonder how it is possible to create a good wicking fabric that is both hydrophilic on one side and hydrophobic on the other side. In the past, wicking fabrics were created by applying a hydrophobic finish to a hydrophilic fabric like polyester. However, these treated fabrics tend to lose their ability to wick moisture with each washing. The next generation of wicking fabrics was created by combining hydrophobic fibers with hydrophilic fibers. Examples of bi-component fabrics are Polartec Power Dry (from Polartec) and Drirelease (from Optimer Brands) which are used by a number of outdoor apparel companies like Marmot to make inner layer clothing. There are also specialty polyester fibers with unique surface construction that aids water adsorption on one side and water desorption on the other side. Examples of specialty polyester fibers are Coolmax (from Invista) and Dri-Fit (from Nike). There are also some natural fibers which possess natural wicking properties. For example, wool fiber has a hydrophobic exterior and hydrophilic interior. However, wool is generally coarse in texture (with the exception of Merino wool), more expensive than synthetic fabrics and require special care and cleaning. Therefore, they are usually not used for inner layer clothing.

For trekking pants other than its wicking property you should also consider its durability and stretchability. A durable material is needed to withstand the wear and tear effect from the long and continuous hours of trekking. A stretchable material will allow the fabrics to stretch accordingly to your legs movement as you scramble up steep slopes. Nylon is the most common material used in trekking pants due to its durability and high abrasion resistance. A small amount of spandex is usually added for better stretchability. Spandex (aka elastane or Lycra) is a synthetic fiber known for its exceptional elasticity. Some commonly encountered compositions are 93% nylon, 7% spandex; 86% nylon, 14% spandex. In general, a higher spandex content will impart more stretchability but less durability to the pants. Polyester is sometimes used in place of nylon for making pants which are quicker in drying and more wickable but at a slight expense of durability. The best fit to look for in trekking pants is one that is not too tight or too loose. A baggy fit will lead to extra material flapping round while a tight fit will resist movement and might cause chafing. Two desirable design features to look for are articulated knee and gusset. Pants with articulated knee design have extra material around the knee area for greater freedom of movement. A gusset is a patch of triangular or rhomboidal fabric inserted into a seam to add breadth and reduce stress within the apparel. As with an articulated knee, the extra fabric improves range of motion and provides better fit and comfort. Some trekking pants also come with a roll-up or zip-off feature that allows you to roll up the hem to capri length or zip off the legs to convert it to knee level shorts. Trekking pants are usually coated with a DWR (Durable Water Repellant) layer for water

resistance enhancement. The DWR penetrates into the fabrics and reduces its surface tension, causing water to bead up and roll off its surface instead of being absorbed. However, the effectiveness of the DWR reduces over time by exposure to contaminants like dirt and sweat. If you notice water soaking into the fabric instead of rolling off it, it is time to restore the DWR via a wash-tumble dry-heat process or re-apply the DWR with a spray-on or wash-in product. For full waterproofing, you can put on a rain pant that comes with a waterproof-breathable membrane over your trekking pants.

Mid Layer Clothing

The mid layer clothing here refers mainly to fleece jackets which keep your body warm in higher altitude treks. In 1979, a company called Malden Mills (now called Polartec) made a huge contribution to the world of cold weather clothing with their invention, Polar fleece. The material now referred to simply as "fleece" is generally made from Polyethylene terephthalate (PET). PET is also the material used in making clear plastic for mineral water. Fleece is hydrophobic, holding less than 1% of its weight in water, it retains much of its insulating powers even when wet which is not possible with wool or cotton jackets. Fleece's excellent insulating properties are matched by its breathability – the ability to wick moisture out of itself. Unlike jackets made from wool or down materials which usually have to be washed by dry cleaning, fleece jackets are water and machine washable. It is also comfortable and soft to the touch. These qualities make fleece an ideal material for making jackets used for a strenuous physical activity like trekking; perspiration is able to readily pass through the fabrics. But fleece is not waterproof; you will still be soaked to the skin in a downpour if you are not protected with a waterproof outer layer. Fleece jackets usually come in three different weight ratings; 100g/m2 (simply called 100 grams), 200 g/m2, and 300 g/m2. The weight rating refers to the loft and thickness of the fleece material used in the jacket's construction. A jacket with a higher weight rating will be loftier, heavier and warmer but stiffer and less breathable than one with a lower weight rating. As a general guide, a 100-200 grams fleece jacket is usually warm enough for mid-altitude treks (1500-3000m) while a 200-300 grams fleece will be good for higher altitude treks (above 3000m) in the tropics.

Outer Layer Clothing

The outer layer clothing here refers to rain jacket and rain pants which keep your body dry in wet weather. An ideal rain jacket is one which is waterproof from the outside and breathable from the inside. It is one which does not allow water (from rain, dew, etc.) to seep through it from the outside but allow perspiration to escape through it from the inside. This will allow the wearer's body to remain dry in rainy or sweaty conditions (assuming water does not seep through the cuff and collar openings). The first company that came up with a waterproof and breathable fabric for a rain jacket is Gore-Tex. The waterproof-breathable fabrics consist of an extremely thin layer of stretched ePTFE (expanded Polytetrafluoroethylene) membrane called Gore-Tex (same name as the company) sandwiched between a face fabric and a liner. The ePTFE membrane contains many tiny pores– there are more than 9 billion pores per square inch. Each pore is too small for water droplet from rain or dew to pass through but big enough to let water vapor from sweat to go through (this is a layman explanation, a more technical explanation has to do with the fabrics' surface energy which is not covered here). Gore-Tex is the oldest and most popular membranes used in rain jacket construction. A number of fabrics and apparel companies have also come up with their own waterproof-breathable membranes since Gore-Tex's patent expired in 1997. Some examples are eVent (from Clarcor), MemBrain (from Marmot) and DryVent (from Northface). Some of these membranes' performance and quality are on par with Gore-Tex, but due to historical and market share reasons, they are not as well-known as their big brother.

2-, 2.5-, or 3-layer Construction

All rain jackets are constructed based on a 2-, 2.5-, or 3-layer design, all of which involve a face fabric, a membrane and a liner (or coating). The face fabric is the outermost layer of the jacket that protects the underlying layers from the elements and makes it look stylish. It is usually made of synthetic material like polyester or nylon. The membrane is the layer in between the face fabrics and the liner, and it imparts waterproofing and breathability properties to the jacket. It is the most expensive and critical layer and it is made of a high-tech synthetic material like ePTFE or polyurethane. The liner is the innermost layer of the jacket that protects the delicate membrane from abrasion and allows the jacket to drape comfortably over the skin. It can be made of polyester, nylon or fleece. The 2-, 2.5-, or 3-layer design are named accordingly to how the various layers are fused together to make the final jacket.

2-layer jackets have a waterproof-breathable membrane bonded to the outer face fabrics. The inner liner is a separate fabrics (usually in mesh form) that hangs on the inside of the jacket. Its purpose is to protect the membrane from contaminants like sweat and oil from the skin. They are considered 2-layer as the liner is not bonded to the membrane. This was the original and most basic design for waterproof-breathable jacket. But they are bulkier, heavier and less breathable than the 3-layer design.

3-layer jackets consist of the waterproof-breathable membrane bonded between a face fabric and a liner to form a three ply laminate. They are more compact, lighter and more breathable (less clammy) than the 2-layer design. The membrane is completely protected by the seal-in liner and the tight interface allows moisture to escape out easier. However, laminating three layers together results in a stiffer and less comfortable fabric. The 3-layer design is used in high end jackets for more demanding treks in heavy rain or snowing conditions.

2.5-layer jackets have a waterproof-breathable membrane (usually polyurethane instead of Gore-Tex material) bonded to the outer face fabric. However unlike the 2- or 3-layer design, an inner coating (usually printed or sprayed onto the membrane) instead of an inner liner is used as the innermost layer. The inner coating (aka the 0.5 layer) which often looks like a texturized pattern on the inside of the jacket protects the membrane from abrasion and contamination. It offers the cheapest, lightest and most flexible construction among the three designs but it loses out in terms of durability or breathability. It is ideal for light trekking in drizzling condition.

You might notice that only the middle layer – membrane – is waterproof, so how about the face fabrics? The face fabrics though made of water resistant material like polyester or nylon is not waterproof and will be saturated with water and impede the jacket's breathability after constant exposure to the elements. To prevent this from happening, all jackets are treated with a layer of DWR before leaving the factory.

Windproofing Layer

When cold air penetrates clothing, it displaces the insulating layer of warm air between your skin and the clothing and removes heat away from your body giving you a numbing chill. This phenomenon called wind-chill makes you feel colder than the actual air temperature and its effect is stronger at higher wind speed. A windproof or wind resistance jacket can help to prevent or reduce this wind-chill effect. A 100% windproof fabric is one which does not allow any air to flow through it. A 100% windproof fabric only exists in the ideal world. In the real world, some air will always seep through the fabric especially under very windy conditions. The degree of windproofing (wind resistance or air permeability) is usually indicated in cubic feet per minute (cfm). The most common test (but not standardized) in the apparel industry for measuring wind resistance in fabrics is the Frazier Air Permeability Test. The Frazier Test measures the amount of air (in cubic feet) that can pass through 1 square foot of a fabric's sample in 1 minute at a certain pressure differential (or wind speed). The pressure differential used is typically 0.5 inch of H20 which more or less equates to a wind speed of 30mph. A fabric with a lower CFM has a lower air permeability and is therefore more windproof than one with a higher CFM. A normal non-branded fleece jacket has a CFM rating of

about 200 which translates to almost no wind resistance at all. Cold air can penetrate through the fleece jacket easily and makes you feel cold even under breezy conditions. Good quality fleece jackets (from Northface, Marmot, etc.) typically have CFM rating that varies from 60 (low wind resistance) to 10 (high wind resistance). Good quality softshell jackets (non-waterproof-breathable membrane based) usually have very high wind resistance of about 5-10 CFM. Jackets with CFM of 1 are considered to be windproof. Jackets with waterproof-breathable membranes like Gore-Tex, eVent (from eventfabrics), NanoPro (from Marmot) etc. typically have CFM rating of 1 or less and are therefore considered as windproof as well. Interestingly, Gore-Tex has come up with a completely windproof fabric called Windstopper with a CFM rating of zero which is also breathable but not waterproof. Though not waterproof, they are more breathable than traditional Gore-Tex fabrics. Windstopper garments are typically coated with DWR to provide them with a modest degree of water resistance.

Trekking Shoes for the Tropics

Shoes are undoubtedly the "most-difficult-to-choose" apparel for most trekkers. You may do well with a slightly bigger or smaller sized shirt or pants, but shoes that are of the wrong size albeit marginally will badly affect your trek and result in incessant complaints. Based on my personal experience, I find the questions below extremely useful in helping trekkers to choose the right shoes for themselves:

1. Does the shoes fulfill its **function** with regards to the terrain that you will be trekking on?
2. Does the shoes **fit** your feet? Is it too big or too small for your feet?
3. Does the **form** (appearance) of the shoe appeal to you?

I called this the **3F (Function-Fit-Form) criteria** for trekking shoes selection.

Function

You should take some time to consider where and how you intend to use the shoes even before you start to browse for them in the stores. Factors like terrain types, weather conditions, trekking duration, backpack load etc. will determine the kind of shoes that you would need. Trekking shoes/boots are generally divided into 4 categories below based on their intended use.

Light Trekking Shoes (for day treks on non-steep and non-muddy terrains): They resemble running shoes (in fact, running shoes can be used for this purpose), and are low-cut with flexible midsoles and non-ruggedized outsoles. As these shoes are mainly meant for day treks, they do not come with waterproof linings. They are usually lighter and made of synthetic materials like nylon and polyester.

Mid-weight Trekking Shoes (for extended day trek): They come in low-, mid- or high-cut with semi-ruggedized outsoles and with quarter or half-length shanks and plates between the midsole and outsole for shock absorption and shielding the wearer's feet from puncture wounds and stone bruises. They are quite flexible and often require modest break-in time but they lack the support and durability of heavy-weight trekking boots. They provide some degree of water resistance but not waterproof protection. Their uppers are usually made of synthetic mesh fabrics (for better breathability) with some leather reinforcement sections. The leather reinforcement sections are usually made of spilt-grain leather (e.g. suede leather). The more expensive ones might come with full-grain leather reinforcement (e.g. nubuck leather), Vibram sole and/or waterproof lining (e.g. Gore-Tex).

Heavy-weight Trekking Shoes (for week-long trekking, non-technical mountaineering): They come in mid- or high-cut with semi-ruggedized outsoles and with three-quarter or full length shanks and plates. They do not flex easily and require longer break-in time but provide excellent support and durability. They are usually waterproof or at least highly water resistant. Their uppers are mainly full-grained leather or spilt-grained leather. Almost all of them come with Vibram sole and Gore-Tex linings or their equivalents. As their name suggests, they are heavier in weight (usually above 1 kg per pair) than the shoes in the former categories. They might be an overkill for day or easy terrain treks, but they will prove to be indispensable for week-long treks over rough terrains.

Mountaineering Boots: These boots have thick and stiff soles designed for the roughest terrains and may be crampon-compatible for winter climbing. You should not consider them at all unless you are going for some mountaineering expedition or glacier exploration (e.g. Carstensz Pyramid in Indonesia West Papua).

Fit

An ill-fitting shoe can lead to blisters, bunions, toenail pain, keen pain and lower back pain. To avoid these problems, you should always consider the shape and size of your feet when buying your shoes. Your shoes should conform to the shape of your feet and not the other way round. Let's look into the 4 main fit factors below.

Length: There should be a comfortable space allowance between your big toe (or your second toe if you have Morton's toe) and the wall of the toe box. A general guideline is one thumb's width of space between the toe and the tip of the insole. Remove the insole of the shoe and place your foot on it to visually determine the amount of allowance. You should also be able to wiggle your toes comfortably inside the toe box.

Width: The width of your shoes is also an important factor to consider when it comes to a good fit especially if you have wider or narrower feet than the norm. The shoes should fit snugly around the sides of your feet with no slipping and should not be too lose or tight. Some manufacturers make shoes with narrower or wider width options to cater for people with this need.

Volume: The "bulk" of your foot should fit securely and comfortably inside a shoe's interior. There should not be uneven pressure, tightness or looseness on any part of your foot.

Arch Type: Our feet generally fall under three types of arch type: low arch, neutral arch and high arch. People with flat feet or low arches tend to over-pronate when they walk. People with high arches tend to under-pronate (supinate) while those with neutral arch usually have normal pronation pattern when they walk. Pronation is the inward rolling motion of the foot to distribute the impact force as it lands on the ground while you walk. Pronation is actually a natural and useful movement of the feet. However too much pronation or supination can cause stress, pain and injuries to your legs and back. A simple wet test (not covered here) can help to determine your arch type. If you have very low or very high arch, try to look for king shoes with design (e.g. supination-pronation system of LOWA) that can help to reduce or prevent over-pronation and supination. Alternatively there are also aftermarket insoles (e.g. Superfeet) which can help to correct this problem.

Form

After narrowing down your selection based on the previous two criteria, you will find that the options available to you are not many. With the additional cost factor and sometimes due to out of stock situation for certain sizes, you might be left with only one or two models to choose from. Therefore it is a blessing in disguise that you do not actually need to worry about this so-called cool criteria.

Trekking Shoes Anatomy and Materials

Now that you understand the 3F criteria, we can zoom into the shoes anatomy and the various terms used to describe them so that you can make sense of the mind boggling specifications seen in the online catalogs. Understanding the various shoe terms and materials used in its construction will help you make better judgement in shoes selection.

Insole: Refers to the removable pad that sits between the mid-sole and your foot. It is usually made of shock absorbing EVA (Ethylene Vinyl Acetate) foam to provide cushion between your foot and the ground. It is common for people to replace the original insoles with aftermarket insoles for better fit and comfort. There are also customized insoles for structural support and stability for people with foot condition like plantar fasciitis, supination, over-pronation etc.

Midsole: Refers to the layer between the insole and the outsole of the shoes. It is usually made of EVA form (for light to mid weight trekking shoes) or polyurethane (for mid-weight to heavy weight trekking shoes). Its main purpose is to provide support and shock absorption.

Outsole: Refers to the outermost sole of the shoes that make contact with the terrain. It is usually made of rubber material with different patterns of indentations called lug pattern to provide traction. Generally, the deeper the indentations, the better the traction. Some shoe manufacturers used third party proprietary high performance durable outsole for example Vibram soles for their shoes.

Shanks and Plates: Refers to the internal supporting structures or inserts between the midsole and the outsole to increase the load bearing stiffness (therefore less torsional and longitudinal flex ability) of the midsole and to protect

the feet against sharp pointed rocks. They are usually 3-5mm thick and vary in length from quarter sole to full sole length.

Upper: Refers to the section above the sole. It can be made of synthetic material like nylon and polyester (usually in mesh form for better breathability), leather (spilt grain or full grain), or a combination of synthetic material and leather. The material used for the upper may not be the determining factor on the waterproof ability of the shoes (see lining).

Heel and Toe Bumpers: They are usually in the form of rubber cap at the heel and toe area of the shoes. Their purpose is to protect your heels and toes from the rocky terrain.

Tongue: Refers to the strip of fabrics under the laces of the shoe. It sits on the top center part of the shoe and above the bridge of the foot. Its main purpose is to protect the top part of the foot from the pressure of the laces and to keep out water and loose rocks. Tongues which are fully attached to the sides of the shoes from the bottom to the top are called gusseted tongues while those which are attached only halfway up the length are called semi-gusseted tongues. A gusseted tongue is more effective in keeping out water and debris than a semi- gusseted tongue.

Scree Collar: Refers to the padding fabrics around the top of most trekking shoes. A good scree collar is one which wraps closely and comfortably around the ankle to provide good ankle support and keep out loose rocks but without causing chafing.

Lining: Refers to the lining material in the interior of a shoe. Its purpose is to provide additional comfort, support and for moisture, temperature and odor management. The lining can be made of synthetic or leather material. The best and most expensive linings are those with excellent waterproofing and breathable properties for example Gore-Tex.

Waterproof Shoes - A myth or reality?

Waterproof shoes is one of the biggest marketing deception employed by the outdoor apparel industry. If you are trekking in muddy terrain or under prolonged wet conditions like incessant drizzling, your feet are definitely going to get wet. There are two reasons why so-called waterproof shoes are not waterproof after all. As of now, no company has invented any practical footwear which can provide a complete and waterproof seal around the foot. There will always be a circumferential gap between the collar of the shoe and the part of the leg where the collar wraps around it. Water is going to seep through it especially if your trek involves any water crossing. Further, it is still possible for water to seep through the stitching and laces. For a shoe to be really waterproof, it has to be breathable from the inside as well – i.e. to be able to wick off perspiration from the foot to outside of the shoe. Otherwise, perspiration will build up and wet the foot. Some of the high tech fabrics for example Gore-Tex, eVent, NeoShell etc. used in shoes lining are able to completely ward off water from the outside (when new) but they are probably not able to wit out moisture as fast as you perspire. Further, their waterproofing performances usually degrade over time by contaminants like dirt and sweat.

Leather versus Non-leather Shoes

Shoes upper made of synthetic material are lighter, more breathable and less expensive than those made of leather. While shoes upper made of leather have higher water resistance (but take longer time to dry if wet), abrasion resistance and durability but they are less flexible and require more break-in time. Higher end king shoes or those meant for rougher terrains are almost always leather made or at least synthetic with leather reinforcement. Water resistance of leather can be enhanced by impregnating it with some hydrophobic chemical during the tanning process. However to be so-called waterproof, both leathers and non-leathers shoes have to be lined with waterproof-breathable membrane like Gore-Tex.

Are All Leathers The Same?

Leather is a natural material made from the hide or skin of animals like cows and goats. There are generally two main types of leather; full-grain leather and spilt grain leather. Full-grain leather is made from the top part of the skin (or the layer nearest to the skin surface where the hairs are). Full-grain leather is very durable, scratch resistant but harder to break-in. Spilt-grain leather (aka suede leather) is made from the bottom part of the skin (or the layer further away from the skin surface). As its name suggests, it is the leftover layer after the top layer has been spilt off from the hide. Spilt-grain leather is not as water resistance and durable as full-grain leather but is easier to break-in. As a general rule, the further you are from the skin surface, the softer and less durable the leather will be. Nubuck leather is a full-grain leather which has been lightly sanded to give it a velvety texture. Rough-out leather is another type of full-grain leather which has had the leather placed rough side out when the shoe is being manufactured. Shoe made of rough-out leather has a rough upper texture but is more resilient to nicks and scratches from rough terrains which will allow water to seep through. Nubuck and rough-out leathers are usually used in the uppers of higher end or robust king shoes while suede leather is more commonly used in the uppers of mid-range king shoes.

Trying Out Shoes

Remember to wear or bring a pair of trekking socks along whenever you are trying out shoes. Most store but not all can provide socks for trying out with shoes but the socks provided might not be the type (thickness might differ) you would wear for your trip. As feet swell during the day, it is better to shop for shoes in the afternoon when your feet are the largest. Always try on both feet as most people have slight size differences between their feet. Try walking for a few minutes on flat ground and ramp (some stores have in-house ramp for walking test) to get a more accurate feel of the shoes.

The Cheap and Good Kampong Adidas

If you trek regularly in Malaysia, you will notice that many local trekkers like to wear a certain black colour Crocs-like shoes. Kampung Adidas is the generic name for these made-in-Malaysia cheap rubber shoes. These shoes usually come with studded soles which provide good traction and being 100% made of rubber are waterproof and easy to dry. This makes them ideal as trekking shoes for tropical muddy terrains. Its name came about because of its popularity among Kampung dwellers and some of the models have stripes on their sides which resemble Adidas stripes. Many Malaysian trekkers swear for its usefulness in tropical terrains however there are some detractors as well who shun them for lack of ankle support.

How to Choose the Right Tents

There are generally four main types of tent structures; A-frame, Dome, Tunnel and Geodesic. A-Frame tents are classic tents common in the good old days when recreational camping was still in its infancy. The tent is supported at the front and back by rigid straight poles or triangular frames and sometimes with a cross pole in between where a fabric is draped over to form the tent. Due to its simple geometrical shape (usually triangular), the useable space is usually smaller than other tent structure of similar weight. Another drawback is its limited head space towards the edge of the tent. It has the most intuitive set up design but it is usually not free standing. It is getting less common as people opt for tents with more appealing structural design and space. Most of the tents you encounter nowadays are likely to be dorm tents. The basic dome features two flexible poles which cross at the peak; each pole runs in a smooth curve from one bottom corner, up to the peak, and then down to the diagonally opposite bottom corner. There are usually special fittings at each corner which fit into sockets at the ends of each pole – pole tension keeps everything in shape. They usually offer more useable space than other tents and are free standing. A basic tunnel tent uses two or more parallel arch poles with a fabric draped over to form a half-cylinder or tapering tunnel. Tunnel tents provide a lot of useable space in relation to their weight but are not free-standing. Geodesic design features 2 or more flexible poles which cross one another multiple times to create a spacious and very strong free-standing structure. They are usually the most pricey and used by mountaineers in high altitude climb due to their excellent wind resistance and ability to support heavier snow loads.

Tent Components

Poles: They provide structural support. They can be rigid or flexible and are usually made of a number of sections linked together by elastic cord so that they can be folded down to smaller size for easy packing. They are usually made of fiber glass or aluminum. The better tents usually come with aluminum poles as aluminum is stronger and lighter than fiber glass.

Flysheet (only for double wall tent): It is used to protect the actual tent from water. A flysheet is waterproof on the outside and also provides a surface to collect condensation on the inside, which then runs down to the ground. When a flysheet is used, it is important that there be no contact with the inner tent it is protecting; this keeps the inner tent dry.

Inner Tent: It comprises the main sleeping area of the tent. For double wall tent, the inner tent is not waterproof since it is protected by the rain fly. For single wall tents, the inner tent is often made of waterproof-breathable material that prevents water from penetrating the inside of the tent, but allows water vapor to be transported out.

Vestibules: This refers to the areas protected by the flysheets, but outside the inner tent. These areas are used for activities that are preferably not performed within the tent itself, such as brushing teeth or cooking and for providing storage for your shoes and backpack.

Guy Lines: They are used by non-free standing tents for anchoring the tent to the ground. One end of the guy is attached to the tent body while the other end is attached to a stake or tent peg which is then driven into the ground. Guy line has to be taut and under tension in order to provide the necessary support.

Doors: They provide entrances and exits to and from the tents. Door usually features a very fine mesh covering that provides good ventilation while keeping unwelcome insects out.

Groundsheet: Refers to the flooring of the tent. It is important for the groundsheet to be as waterproof as the body fabric of the tent as pressure exerted by the campers onto the ground can cause ground water to seep up through it.

Footprint: It is an additional standalone ground sheet that is placed between the ground and the tent to provide additional waterproofing and to prevent wear and tear of the tent against the ground. It is usually sold separately from the tent.

Air Vents: They are little openings with flaps or mesh openings at the tent's body that help to reduce internal condensation by allowing trapped water vapor in the tent to escape through them.

Tent Fabrics Material

Tents are usually made of either nylon or polyester, each with its comparative pros and cons. In general, nylon is slightly stronger, lighter and more abrasion resistant than polyester, but it is very susceptible to degradation by UV rays. Polyester is more breathable and more water resistant (and faster to dry when wet) than nylon and it is very resistant to UV rays. Therefore higher quality nylon tents are usually coated with SilNylon for waterproofing and UV protection. However bear in mind that the above is just a general comparison for the actual fabric properties and is also dependent on other factors like denier rating, weaving methods and coating technologies etc. Ripstop fabrics are fabrics (can be nylon or polyester) that are woven in a special reinforcing technique that makes them more resistant to wear and tear. During weaving, reinforcement threads are interwoven at regular intervals in a crosshatch pattern. The resulting fabric has excellent strength to weight ratio and the small tears do not easily spread. The higher quality tents are usually partially made of ripstop fabrics.

A commonly seen tent specification is the Denier (D) which refers to the weight of the yarn (based on a 9,000-meter length of the yarn) that is used to make nylon or polyester fabrics. The higher the Denier number, the heavier and more robust and durable the material is. The tent fabrics is usually expressed as 20D, 40D, etc. The lightest tent fabric (used in minimalist or ultralight tent) is around 10-20D while the heaviest tent fabrics could be up to 75D. However Denier number only makes sense if you are comparing between fabrics that are made of the same material and woven technique. For example a fabric made of ripstop nylon might be stronger than one made of normal polyester even if it has a lower Denier number than the polyester fabric.

Tent Coatings

Tent fabrics are usually coated with a thin layer of polymer to improve their water resistance or to make them so called “waterproof”. Polyurethane (PU) coating is commonly used for mid-range tents due to its low cost and reasonably good performance while the cheaper ones often use an acrylic coating. However PU is susceptible to hydrolysis (chemical breakdown in presence of water) and will degrade overtime especially if the tent is not dried well after usage. Higher quality nylon tents are usually coated with a layer of silicone elastomer on both sides (the resulting fabrics is called SilNylon); an expensive high performance coating with excellent hydrolysis and UV resistance.

Water Resistance and Breathability

The water resistance of a tent fabric is expressed as 'hydrostatic head', measured in millimeters. This indicates the pressure of water needed to penetrate the fabric. To test a tent fabric, manufacturers clamp the fabric over the bottom-end of a vertical tube. The tube is then slowly filled with water. The water column height at which the fabric starts to leak is specified to be the hydrostatic head of the fabric. The higher the hydrostatic head rating of the tent, the more waterproof it is. A hydrostatic head of about 1200mm or more for the flysheet should be adequate for moderate rain in the tropics. As the groundsheet is subjected to greater pressure due to the weight of the dweller sitting or sleeping on it, it should have a greater hydrostatic head of at least 5000mm. Other than water resistance, you should also consider the breathability of the tent fabrics. Tent fabrics need to be breathable to prevent build-up of condensation within the tent. Human breath, perspiration, wet clothing, etc. contribute to moisture generation within the tent. Without breathable fabrics to allow moisture to wick out of the tent, internal condensation will occur and damp the tent's interior. Therefore a good tent fabric is one which prevents water to get in from outside to inside (waterproof) but allows moisture to wick out from inside to outside (breathable). This is especially critical for single wall tent which lacks a flysheet for moisture management. Breathability is measured by the amount of water vapour in grams (g) that can pass through a square meter (m^2) of fabric over a 24-hour period. The higher the number the more breathable the fabric is. A mid-range tent should have a breathability rating of around 5000 g/m^2. The seams of tents are usually the weakest link when it comes to waterproofing. The stitching used to sew two

pieces of fabric together inevitably creates minute holes that render the area non-waterproof. Manufacturers usually apply an adhesive seal tape over the stitched area to create a watertight barrier. You can buy aftermarket seam sealers in the form of tape or glue to seal-up or repair exposed seams.

Difference between Single and Double Wall Tents

A single wall tent is constructed with a single wall of fabric. The better quality single wall tent uses fabrics that are waterproof on the outside and breathable on the inside. A double wall tent is constructed with two walls of fabric – an "inner tent" (tent body) and an "outer tent" (flysheet). The flysheet is usually waterproof but not breathable while the tent body is usually breathable but not waterproof. These two layers work together to create a tent that is waterproof on the outside and breathable on the inside. A single wall tent is usually lighter and cheaper than a double wall tent but offers less insulation and protection against the elements.

Campsite Selection

No matter your trekking destinations, the three main considerations in campsite selection are always safety, comfort and accessibility. Safety should be the highest priority and must not be compromised with the other considerations. The allure of coziness and shelter tends to attract some trekkers to set up tent under a big tree. However, in a thunderstorm, the tree also serves as an excellent lightning conductor threatening the lives of those underneath it. A spot at the bottom of the ravine might be nearer to valuable water resource but it could also be a very vulnerable spot to flash flood. One should always be aware of the actual and potential dangers within and around the campsite and not be swayed away by the comfort and accessibility that it offers.

How to Choose the Right Sleeping Bags

It can get pretty cold in the tropical forests and mountains at night especially when it rains. A sleeping bag will keep you warm and keep out creepy crawlies from your bodies when you sleep. In this section, we will cover sleeping bag and accessories selection for a good night sleep in the wild.

The two most important factors in sleeping bag selection are the temperature ratings and the fill materials of the sleeping bags. Before you head out to the stores, check out the lowest expected temperatures of your destinations. Your sleeping bag should have a temperature rating that coincides with these temperatures. Otherwise you may end up shivering or sweating inside an underrated or overrated sleeping bag. If your budget is low and you do not mind a heavy or bulky sleeping bag, synthetic filled sleeping bag would be a better choice for you. For long term investment or the need to trek light, down filled sleeping bag would be the ideal choice. There are other factors like sleeping bag construction (shell and lining materials), seam types, shapes, etc., but these are second level consideration which are not as critical as temperature ratings and fill materials. I have purposely left them out in the discussion below so as not to overwhelm the readers. Nevertheless these are factors you should consider as well if you are investing in a high end sleeping bag.

Temperature Ratings

The sleeping bag should be rated for the coldest temperature you expect to encounter. The temperature rating is often part of the model name such as North Face Dolomite 23/-5 (rated to a minimum temperature of +23°F or -5 °C). The temperature rating is based on the EN 13537 Standard, a European standard that specifies how sleeping bags are tested (temperature ratings and suitability) and sold (labeling information). As of now, there are no international standards, therefore reputable sleeping bag manufacturers around the world generally used the EN standard for their sleeping bag testing and specification.

EN testing have repeatedly found that under the same sleeping condition, a woman requires a warmer temperature than a man to sleep comfortably. EN ratings take this into account and designate separate temperature ratings and terms for each gender. To illustrate this, the tag of each EN rated sleeping bag includes the following temperature ratings:

EN Comfort Rating (for Women): The lowest outside air temperature at which a standard woman can sleep comfortably in this bag.

EN Lower Limit Rating (for Men): The lowest outside air temperature at which a standard man can sleep comfortably in this bag.

For the same sleeping bag, its EN Comfort Rating is always a few degrees higher than its EN Lower Limit Rating. To determine the temperature rating of a sleeping bag, men should refer to its EN Lower Limit Rating while women should refer to its EN Comfort Rating. An EN Extreme rating is also provided. It describes the lowest temperature at which a sleeper can remain for six hours without the risk of death from hypothermia.

Bear in mind that EN ratings are based on a sleeper wearing one base layer, a hat and sleeping on an insulating sleeping mat. A "standard man" is assumed to be 25 years old, with a height of 1.73 m and a weight of 73 kg while a "standard woman" is assumed to be 25 years old, with a height of 1.60 m and a weight of 60 kg.

Season Ratings

Some sleeping bags come with a season rating instead of the temperature rating. A season rating is used to inform buyers of the time of year a sleeping bag is most suitable for. There are 5 levels which start from Season 1 for summer months all the way to Season 5 for extreme cold temperatures.

Season 1 – for warm summer nights, typically 5°C or above.

Season 2 – for cool nights in summer or spring, typically 0 to 5°C.

Season 3 – for cold nights in summer, spring or autumn, typically -5 to 0°C.

Season 4 – for very cold nights in summer, spring, autumn or winter, typically -10 to -5°C.

Season 5 – for expedition or mountaineering conditions, for temperatures below -15°C.

This is actually an arbitrary rating as there is no standard method for season rating categorization. However this rating system can be handy for people who find the temperature rating system too technical to understand. As a general guideline, Season 1 rated sleeping bags are good for camping at low altitudes below 2000m, Season 2 rated sleeping bags are good for 2000-3000m ASL while Season 3 and 4 rated sleeping bags are good for 3000m ASL. Season 5 will be an overkill in the tropics unless you are scaling the Carstensz Pyramid.

Fill Material

The fill material of the sleeping bag which provides insulation and keep the sleeper warm is categorized into two main types: down and synthetic. Down is made from the fluffy undercoating of a bird's plumage (goose or duck). While feathers are the outer covering of birds, down lies underneath the feathers usually on the bird's belly and keeps the bird warm and dry. Down works for you just like it works for the bird by trapping air and therefore heat within its tiny clusters. Synthetic fill is usually made of polyester – a man-made fiber. Both types of fill have their pros and cons as shown below.

Pros of down fill

- Warmer than synthetic fill ounce for ounce
- Excellent wicking properties.
- Very durable; retains its shape and loft wel.l
- Highly compressible and lightweight
- Environmentally friendly as it is biodegradable.

Cons of down fill

- Loses its insulating properties when wet and takes a very long time to dry.
- Low quality down may contain allergens and causes allergic reactions. But it is usually not a problem for high quality down as they are cleaned according to strict industry standard.
- Requires special care for cleaning.
- Far more expensive than synthetic fill.

Pros of synthetic fill

- Water resistant and provides insulation even when wet.
- Dries quickly.
- Usually less expensive than down.
- Easy to care for; usually machine washable and dryable.

- Hypoallergenic (less likely to cause allergy than down).
- Offers a wide price range from budget (normal synthetic fill) to high end (high performance synthetic fill).

Cons of synthetic fill

- Heavier and bulkier than down. Synthetic fill requires more weight to get the same warmth as down.
- Less durable; loses its shape, loft and warmth after some time.
- Less environmentally friendly as it is not biodegradable.

Fill Power

Not all downs are created equally; some are of better quality than others. The quality depends on the type and age of the birds the down come from. Goose down tend to be better than duck down (with the exception of Eider duck which produces the best and most expensive down on earth) while older birds tend to produce better quality down.

Fill power is the most frequently used measure of down quality. Fill power measures the space (in cubic inches) an ounce (approx. 28 grams) of down occupies when allowed to reach its maximum loft. For example, one ounce of 800 fill power down will occupy 800 cubic inches under its maximum loft condition. The higher the fill power, the larger the down cluster which translates to a lighter, fluffier and more insulated product. Down fills are typically rated on a scale of 500 to 800+. Downs with fill power in the range of 650-750 are considered high quality downs while anything over 750 can be considered expedition-ready, top-quality down.

Types of Synthetics

Synthetic fills are made of fine polyester fibers which are interwoven to create pockets of air for insulation. All synthetic fills fall under two main categories; short staple fills and continuous-filament fills. Short staple fills are made of short microfiber strands joined together using thermal or chemical bonding techniques. Continuous-filament fills use thicker continuous strands to create interlocking layers of insulation that are lofty, strong and durable. Sleeping bags made of short staple fills are softer and more compressible but less durable (tend to clump together over time) compared to those made of continuous-filament fills. Synthetic fills are sold under a repertoire of trade names like Climashield, Primaloft, Polarguard, Thermolite (Invista), Thinsulate (3M), etc., making comparison among brands is a mind boggling task. However, all the aforementioned trade names are reputable and trustworthy; sleeping bags filled with their fibers are usually of good quality. While cheap and low quality sleeping bags are usually filled with non-proprietary or ordinary fibers.

Closing Argument

Based on the above pros and cons listed, down seems to be a better fill material than synthetic as it wins outright in most competing properties. When it comes to trekking in dry conditions, down is still the preferred choice for its ultra-light weight, high compressibility and durability. However if you camp regularly in the wet tropics or in high condensation conditions, synthetic fill sleeping bag with its fast drying properties and insulation maintenance when wet would make for a better choice. Nowadays it is common to find sleeping bags with a mix or blend of down and synthetic fills which exhibit desirable properties of both fill types but not as pricey as full down ones. With the advance of material science, we are also seeing lighter, loftier and better compressible synthetic fibers entering the markets. Who knows in future, there might be a synthetic equivalent of down.

How to Keep Yourself Warmer and More Comfortable in the Sleeping Bag?

- Use a sleeping mat. It serves as an insulating layer between the cold ground and your sleeping bag. Furthermore it provides some cushion against the hard ground.
- Use a sleeping bag liner. Other than for hygiene purpose, a sleeping bag liner can add some degree of warmth to your sleeping bag.
- Make use of the sleeping bag hood if your sleeping bag comes with one. It can help to prevent excessive heat loss from your head.
- Wear a pair of woolen socks to prevent excessive heat loss from your feet.
- Hug a hot water bottle filled with hot water which can provide additional warmth in the sleeping bag.

Sleeping Bag Liners and Sleeping Mats

Sleeping bag liner is to sleeping bag, as bed sheet is to mattress. A sleeping bag liner helps to keep your bag clean by providing an easily removable and washable barrier between you and your bag. It prevents debris and perspiration from penetrating into the bag's fabric which will damage and shorten the lifespan of the fill. It can also help to elevate the warmth of the bag by a few degree Celsius (albeit psychologically). Liners are usually made of silk, polyester or cotton. A sleeping mat provides padding and thermal insulation for camping. Without a padding underneath your sleeping bag, your back will be punctured by the hard sharp rocks and pebbles on the ground. The mat also helps to prevent the cold moist soil from conducting valuable heat away from your body.

Keeping Your Backpack Dry During the Trek

Backpacks made of high performance waterproof fabrics like Cuben Fiber, Dyneema, etc. and those that utilize waterproofing techniques like welded seams (instead of stitched seams), roll closure, waterproof zipper have very good waterproof-ability but they are usually very costly and not as functional as the regular backpack. For practicality and cost sake, most of us would just go for backpacks made of regular polyester or nylon materials. Rain covers is good for repelling water during a light shower but is hopelessly useless during a downpour. Some waterproof sprays can impart good water resistance to the fabric but the water resistant layer wears off easily and water can still seep through the weak points like seams, zippers, etc. The easiest, cheapest and most effective method is to line your empty backpack with a large tough plastic garbage bag before you pack your things in. The mouth of the plastic bag should then be tightly sealed with a heavy duty rubber band. For added protection, you can also safe keep all your passport, valuables and electronic gadgets (phone, camera, etc.) in separate waterproof pouchs or ziplock bags.

Keeping Yourself Clean During the Trek

If you do not have access to a shower, taking a dip in a river can be refreshing as well. Try to bathe in flowing water as bacteria tends to breed in stagnant water. Refrain from using any soap or shampoo directly in the river. Even so-called biodegradable soap are not really eco-friendly as it requires soil and time to break down into harmless constituents.

Consider using the sponge-and-bucket technique if you would like to use soap for cleaning. For minimal impact on the environment, soap should be used at least 50m away from lakes and river banks. Simply put water with some soap into a bucket and dip a sponge into it and then scrub your body over with the sponge. Pay particular attention to the armpit, groin and feet region and fold and crease area around the knee and elbow.

Alternatively you can use no-rinse body wash and no-rinse shampoo which usually come in liquid form in small bottles. No water is required; simply massage the body wash or shampoo to a lather and towel dry. They can be purchased from any outdoor equipment store or Amazon.

A powder bath is a fast and easy way to dry clean your body in the absence of shower. The powder absorbs moisture, relieves itching, and soothes skin irritation. You can use either Johnson & Johnson Baby Powder or Snake Brand Prickly Heat. Personally, I prefer Prickly Heat over Baby Powder as it provides a cooling sensation after application and is very effective against heat rash which is commonly encountered in the tropics.

Wet wipes are probably the most convenient invention to wipe off dirt and sweat from your body but they are not so environmentally friendly.

Water Purification Methods

Water purification is the process of removing harmful biological, organic and inorganic contaminants from contaminated water. The goal is to produce water that is safe to drink. The concern is not with solid sediments like twigs and sand which can be easily removed by normal sieving but microscopic contaminants can pass through the sieve unnoticed. There are three main kinds of contaminants; biological, organic and inorganic contaminants. Biological contaminants refer to pathogenic micro-organisms which can cause infectious diseases in humans. There are three main groups of micro-organisms; protozoans, bacteria and viruses whose classification corresponds to their sizes in microns. Some of the common waterborne diseases are: bacteria causing - cholera (vibrio cholera), typhoid (salmonella typhi), dysentery (shigella), escherichia coli (e-coil); virus causing - gastroenteritis (norovirus), hepatitis A; protozoan causing – cryptosporidiosis, giardiasis. Organic contaminants refer to agricultural waste (herbicides, pesticides, fertilizers), decayed plant and animal tissues, and plasticizers (made from petroleum products), basically contaminants that originate from animal or plant sources. Inorganic contaminants refer to mineral based compounds such as metals (especially heavy metals like mercury, lead, or cadmium), nitrates (from fertilizers) and asbestos (from industrial waste).

There are 4 main water purification methods for trekking and outdoor camping:

- **Boiling**
- **Filtering**
- **Chemical Purification**
- **UV Purification**

Boiling

Boiling is the most effective method of removing biological contaminants from water. According to the CDC (Centers for Disease Control and Prevention), water should be boiled vigorously for at least 1 minute. At altitudes above 2,000 m, water should be boiled for at least 3 min (to compensate for the lower boiling point at higher altitudes). However boiling might not be feasible if you do not have a heat resistant container or enough fuel to hold and boil the water. Boiling does not remove inorganic contaminants and organic contaminants though some volatile organic compounds with boiling points lower than water can be removed.

Filtering

A water filter removes contaminants from water through a fine physical barrier. Filters are usually rated in microns (diameter of a human hair is about 60 microns) which refer to the particle size that will be trapped by the filter. A 20 micron filter traps particles bigger than 20 microns while a 2 micron filter traps particles bigger than 2 microns. Particles smaller than the micron rating of the filter will pass through the filter unstopped. Nowadays, it is common to find water filters with micron ratings as low as 0.2 micron which is smaller than the sizes of multicellular organisms, protozoans (4-500 micron), and most bacteria (0.2-10 microns). However the micron rating is not the most reassuring method to determine filter effectiveness as it does not tell you how the product will perform with actual contaminants. A more reassuring method is to check whether the product is certified or tested by internationally or nationally recognized third party laboratories (like NSF; http://www.nsf.org/). With the advent of filtration technology, there now exits ultra-filtration products on the market that are capable of filtering out viruses (0.01 – 0.3 microns). As the name suggests, these ultra-filtration products are also much more expensive compared to the micro-filtration ones.

Most filters usually come with a manual mechanical pump that pumps water from the source through the filter medium to the clean water outlet – a water bottle. Others come with a water bag which you need to hold high above

the filter medium for gravity to do its job in place of the pump. Nowadays, there are also “personal” filters called inline straw filters through which you can dip and drink directly from the water source like a normal drinking straw.

The filter medium is usually made of one of three types of materials: ceramics, glass fiber or hollow fiber. A ceramic filter relies on the microscopic pores of the ceramic material to filter out contaminants. The effectiveness of the filter depends on the pore sizes of the ceramic; the smaller the pore sizes, the higher its effectiveness. The smallest pore size of the most effective ceramic filters is about 0.2 microns which means they are effective against multicellular organisms like protozoans and bacteria but not viruses which are much smaller than the pores. Some ceramic filters are impregnated with silver to further incapacitate bacteria and prevent the growth of mold and algae in the filter. Ceramic filters can be cleaned with a brush. A glass fiber filter is made up of densely compacted and pleated strands of glass fibers which fold onto one another to create a large filtering surface within a small area. It relies on the micro-spacing between adjacent fibers to block or trap contaminants. They can filter down to the same micro level as ceramic filters. They are lighter in weight than ceramic filters but are more fragile and therefore cannot be brushed clean. Filters employing ceramics or fiber glass are equally common on the market and there is no significant advantage of one over the other. A hollow filter is made up of a collection of “hollow fiber tubes” with a semipermeable membrane. It relies on differential pressures on opposite sides of the membrane to force the smaller size water molecules through the membrane while keeping the bigger size contaminants outside. This relatively new filter medium is the most expensive and effective among the three; the best hollow fiber is able to filter down to 0.01 micron - capable of filtering out viruses. They weigh less and offer a higher flow rate than both ceramic and glass fiber filters. Examples of filtration products for outdoor use are Miniworks from MSR and Hiker Microfilter from Katadyn.

Chemical Purification

Water purification is usually based on one of three types of chemicals: iodine, chlorine or chlorine dioxide. These chemicals kill or deactivate viruses, bacteria and protozoans by oxidizing (breaking down) their cellular structures. Iodine is one of the oldest chemicals used for water purification. It is effective against a wide range of bacteria and viruses but has limited effectiveness against protozoans like cryptosporidium and giardia. Protozoa are surrounded by an outer hard shell which is very tolerant to iodine or chlorine disinfection. Iodine is not suitable for pregnant women, people with thyroid problems or those with a known hypersensitivity to iodine. Iodine treated water has an unpleasant taste which can be improved by adding a taste neutralizer tablet. It is available on the market in solution (tincture of iodine), tablet and crystal forms. Chlorine is the most extensively used chemicals for water purification. It is a stronger disinfectant than iodine when it comes to killing bacteria and viruses but it is still not effective enough against protozoa. The sodium dichloroisocyanurate (NaDCC) tablet is the most common and popular form of chlorine used for water purification. Unlike chlorine in other forms, it does not leave behind any unpleasant taste after treatment. One reputable brand of NaDCC tablets is Aquatabs from Medentech. Chlorine dioxide is the most potent disinfectant among the three chemicals. It is effective against both cryptosporidium and giardia but requires at least 30 minutes and 4 hours of treatment time to kill giardia and cryptosporidium respectively. Examples of brands include Potable Aqua from Wisconsin Pharmacal and Aquamira Water Purifier Tablets from Aquamira.

UV Purification

UV purification uses an LED that emits Ultraviolet C (UVC) rays that have the ability to kill or inactivate micro-organisms. These UVC rays which have a wavelength of 100-280 nm is also known as germicidal rays. As UVC rays are shone through the water to be treated, living organisms in the water are exposed to the high energy rays which break down the nucleic acids and disrupt their DNA rendering them harmless to humans. It is effective against viruses, bacteria and protozoa including the hardy cryptosporidium and giardia which are tolerant to chemical purification. However its effectiveness depends on the turbidity level of the water. Suspended particles in the water can shield the microorganisms from the UV rays so they remain intact after treatment. This can be overcome by pre-treating the water with a filter to sieve out the suspended particles to improve its clarity. It takes about 1-2 minutes to treat 1 liter of water by UV purification. It is an established water treatment method and has been used for decades by municipal water plants. Its use as an outdoor filtration method is quite recent due to the

past technological hurdle of mass producing UV LEDs. Examples of UV purification products for outdoor use are SteriPEN Adventurer Opti from Steripen and CamelBak All Clear from CamelBak.

Comparison among the Various Water Purification Methods

Boiling is the most effective method to remove biological contaminants like protozoa, bacteria and viruses. However it is also the least efficient method as it requires the availability of sufficient fuel which can be difficult to come by or heavy to carry. Chemical purification by iodine or chlorine is only effective against viruses and bacteria and not protozoa like cryptosporidium and giardia. Though the more potent chlorine dioxide is effective against protozoa, it requires a long treatment time of 4 hours to kill the hardy cryptosporidium. Chemical purification is an efficient, convenient and economic method for day or weekend treks. However, prolonged chemical ingestion over longer duration treks might be harmful to health. Micro-filtration products from reputable brands are highly effective against bacteria and protozoans. If need be, you can perform micro-filtration follow by chemical purification to rid the water of viruses. Alternatively, the more expensive ultra-filtration products (those utilizing hollow fibers) are also effective against viruses. Filtration is the fastest way to produce portable water as there is virtually no waiting or treating time involved. However they can be heavy or bulky to carry and usually require some maintenance (like backwashing to flush out the trapped debris) to maintain the flow rates (typically 0.75 – 3 liters per minute depending on filter type). The filter cartilages also need to be replaced with new ones after a certain usage (cartilage life typically ranges from a few hundreds to a few thousands liters). UV purification is an effective, efficient and chemical free method. However unless the water to be treated is of low turbidity, it has to be used in be used in conjunction with a filter to improve the water clarity before treatment. None of the purification methods are capable of neutralizing or filtering out organic or inorganic contaminants. Some filtration products come with a secondary activated carbon filter (usually made of charcoal or coconut shell) in addition to the primary ceramic, glass fiber or hollow filter to remove organic contaminants from the water. The process by which this occurs is called absorption as the carbon filter has a high affinity for carbon based contaminants. Carbon filters are not cleanable and therefore need to be replaced with new ones more regularly than the primary filters.

Choice of Trail Food

It is easier to determine the amount of calories you eat than the amount of calories you burn; food packaging usually comes with nutrition information but the amount of calories burned during exercise depends on a myriad of factors like age, weight, exercise technique etc. However, based on publications from various reputable sources like Mayo clinic, Harvard Medical School etc., we can roughly say that a 60-kg person burns about 300-400 calories per hour and a 70-kg person burns about 400-500 calories per hour while trekking on a level trail. The burned amount can increase by another 100-200 calories per hour for steeper, rougher terrain and/or a heavier load. Generally, the more challenging the trek, the more calories you burn. For a day trek of 6 hours, you would require an additional 2,400 calories (= 400 calories x 6 hours) on top of your usual daily calorie requirement (approx. 2,000 calories). Therefore to maintain the status quo, you would have to take in a total of 4,400 calories for that day of trekking. It's fine if you don't consume that amount of calories; you would simply lose some weight (probably a few hundred grams at most).

The ideal trail food should be light weight, packable (non-crushable) and calorie-packed so that you will not be further burdened by a heavy or bulky load. For a multiple day trek, your food selection should also be non-perishable and nutrition-packed (not just carbs but also protein, fiber, fat etc.). Avoid food with coconut milk content like Nasi Lemak as they tend to spoil easily in tropical heat. Below are some recommended trail foods with their average calorie loads.

- Snickers Chocolate Bar = 250 calories
- Ygood Museli Bar = 100 calories
- One slice of white bread = 70 calories
- One slice of white bread with peanut butter spread = 140 calories
- Medium Size Banana = 100 calories
- Medium Size Apple = 100 calories
- Magi Instant Noodles = 360 calories
- Ayam Chili Tuna (160g) = 190 calories
- Ayam Tomato Sauce Sardine (120g) = 115 calories
- Ayam Baked Beans (230g) = 210 calories
- Planters Mixed Nuts and Raisins Trail Mix (30g) = 160 calories per serving
- Beef Jerky (100g) = 400 calories per serving

Mozzie Attack

The Wildlife Act "No flora or fauna shall be kill or taken out of..." is blatantly breached when it comes to the detestable mozzie. This tiny creature which dies with a smack is regarded as the most dangerous, irritating but resilient animal on earth. Other than the annoying buzzing and itching bites, they also transmit a number of life life-threatening diseases like Malaria, Dengue, Chikungunya, Yellow Fever, West Nile virus, Encephalitis, and the Zika virus etc. Both mosquitos' sexes feed on nectars but only the female are bloodsuckers as they need the blood for egg development. Mosquitoes use exhaled carbon dioxide, body odors, temperature, and movement to detect their prey. They have a keen sense of smell and can sense their dinner 50m away. Most species are twilight (dawn or dusk) feeders except for the Asian tiger mosquito (Andes mosquitoes) which feed during daytime.

How to Minimize Bites?

Skin-applied mosquito repellents fall under two main categories; conventional repellants (so-called chemical repellants) and biopesticide repellants (so called "natural" repellants). Conventional repellants used active chemical ingredients like DEET (N, N-Diethyl-meta-toluamide), picaridin, metofluthrin etc. to repel mosquitoes. Contrary to popular belief, these repellants do not kill them. They are available in spray, lotion or clip-on forms and generally provide a few hours of protection for each application. DEET is widely acknowledged (by drug administration/disease control authorities) to be the most effective ingredients in repelling mosquitoes. DEET is available in spray or lotion form with concentrations ranging between 7% and 25%. An example of a DEET repellent product is Ultrathon from 3M. Picaridin is purported (by independent studies and user reviews) to be as effective as DEET is also widely used in a number of repellant brands for example OFF! from Johnson and Johnson. Picaridin has a few advantages over DEET - it does not damage plastic or synthetic fabrics, it does not irritate skin and eyes and it is odorless. Products with low DEET or picaridin concentrations are considered safe to use on children as young as two months of age. Metofluthrin is used in OFF! Clip-On, a battery-operated system with a build-in mini-fan to volatilize the refill and circulate it around the body. As metofluthrin-based repellant is pretty new compared to picaridin or metofluthrin based ones, its effectiveness has yet to be firmly established.

Biopesticides repellents use active ingredients which are either derived from or are synthetic versions of natural materials. They rely on the scents of these ingredients to block the mosquitoes' odor receptors thereby making the prey "invisible" to them. Examples of biopesticides repellents are IR3535 (Ethyl butylacetylaminopropionate) and essential oils like lemon, eucalyptus oil, citronella oil, neem oil etc. IR3535 is also purported to be as effective as DEET with many of the same advantages and without the same disadvantages. An example of IR3535 repellant product is Skin So Soft Bug Guard from Avon. Essential oil based repellants are not as effective as and/or longer lasting than DEET, Picaridin or IR3535, but being non-chemical based, they are generally more environmental friendly and psychologically safer to use (essential oils can be toxic at high concentrations). They are available in spray, lotion or sticky patch form and generally need to be reapplied 3-4 times as often as does a low DEET-based repellent to provide comparable protection.

A mosquito coil is essentially an incense in coiled form. The active ingredient is usually pyrethroid a synthetic pyrethrin commonly used in insecticide. When burned, the Mosquito coil releases a vaporized pyrethroid that helps to ward off mosquitoes. Burning a mosquito coil is one of the most cost effective and efficient mosquito repellent methods. A typical coil costing less than a few cents can last more than 6 hours. Mosquito coils made by reputable companies and approved for sales by health authorities are generally very safe for use provided they are not used in enclosed spaces like inside a tent. As the coils can be broken or dampen easily which makes burning difficult, you would have to waterproof and cushion them properly when you carry them in your backpack.

Bloody Leech

Leeches are segmented worms (Annelida) and related to earthworms. They have cylindrical or dorso-ventrally flattened body with suction cups at each end of their bodies and with no legs and no skeletons. They are usually black or brown in color while some species have markings like spots or stripes. The smallest species are no more than 5mm but the largest ones can be more than 20 cm long. Leeches are generally aquatic and live in freshwater but there are also terrestrial and marine species. Most species are predatory feeding on invertebrates like worms, snails etc. while some are parasitic feeding on the blood of amphibians, reptiles, fish, and mammals (including humans). They can be found almost all over the world except at the poles or peaks of the highest mountains which are too cold to be inhabited by their hosts and are especially common in the tropics probably due to the hot and wet environment.

In Peninsular Malaysia, there are two commonly known species of hemophagic (blood feeding) terrestrial leeches; the Brown Leech and the Tiger Leech, neither of them is poisonous or carries diseases (at least not documented). The Brown Leech (haemadipsa zeylanica) is the one you find wriggling on the ground in hordes after rain. They are brown or black in color and about 1-3 cm long. Despite their small sizes, they are the most gymnastically agile; handstanding and somersaulting from the ground to latch onto their hosts for a free meal. The Tiger Leech (Haemadipsa picta) is slighter larger and has a distinctive yellowish stripe across the length of its body. Unlike the Brown Leech which attacks from ground, the Tiger leech climbs low vegetation and latches itself onto bypassers. The bite from the Brown Leech is non-sensational while that of the Tiger Leech has a sharp stinging sensation.

Leeches have incredible senses and can sense heat and movement up to a few meters away. They will be galvanized to get ready to hook themselves onto their hosts when they sense their presence. Leeches secrete an anesthetic and an anti-coagulant (hirudin) when they bite so that their hosts will be unaware of their presence and to prevent the blood from clogging which would block its feeding. They attach to their hosts and remain there for about 20 minutes until they become bloated with blood, release their bites and fall off to ground.

Leech can be easily removed by locating its head (the skinnier end of the leech) where the bite is and use your finger to flick it sideways off the bite point. Washing the wound with clean water and then applying some antiseptic cream is usually all you need to do with a leech bite. They are more of a more of a nuisance than a menace - very rarely do they cause complications or serious allergies in humans.

You might have heard of other methods of removing leeches such as pouring salt, medicated oil or mosquito repellant and even burning (unless you are a sadist). These techniques might cause the leech to “surrender” and fall off but it might also lead to infection as the leech might regurgitate its stomach contents when it is agitated this way.

The most effective way to prevent leech attack is to wear a pair of anti-leech socks. It is just an oversized sock which you wear over your trekking sock and pants. It has a high cuff with elastic strap or string at the end of the cuff which is used to seal the opening to prevent the leech from wiggling through. If you cannot get hold of one, you can improvise one with a long soccer sock or army green sock but it effectiveness is not as good as an anti-leech sock.

Other Creepy Crawlies

Bees

There are many species of bees like honey bees, sweat bees, bumble bees, carpenter bees etc., some species are solitary while others are social. Contrary to common perception, most bees are actually solitary and mild mannered. Social bees like honey bees which live and work together in a colony will only sting when they are provoked or feel threatened. The best way to prevent a bee attack is to stay clear of its nest and do not hit or swat at it when you see one. Never try killing it no matter how annoying you are to its buzzing around you, lest it mobilize its whole colony against you. A threatened bee can rally fellow bees to attack the provoker by releasing chemicals called pheromones that act as an SOS signal. Sometimes, the bee may land on your skin to taste the sweat, but it will fly off peacefully if you let it be and do not try warding it off. Do not venture off non-designated trails unnecessarily to avoid stumbling upon the nest as some species of bees build their nests on the ground rather than on trees.

If you are stung by a bee, you should put the pain aside (easier said than done) and move away from the area as quickly and as far away as possible. If the swam is following you, you should move into deep vegetation so that they might lose sight of you. Running down an open trail will not be effective as the bees can easily overrun you. Do not wave your hands around as it will further agitate the bees.

When a bee stings, it injects venom into the person's bloodstream. Depending on the venom potency (some species are more venomous than others), venom amount, number of stings, bite site and the person's allergy level, the effect can be minor (non-allergic), major (allergic) or adverse (allergic). In a minor reaction (aka minor localized reaction), the sting site becomes a little swollen, red, itchy or painful for a few days. In a major reaction (aka large localized reaction), there might be large swelling and rashes that extends beyond the sting site that takes a few days to heal. For example a person stung on the finger may have swelling of the hand. The person might also experience slight dizziness for a few hours. However both minor and major reactions are non-life threatening and do not require emergency treatment. Over-the-counter antihistamine tablets like Benadryl and Zyrtec can be taken to relieve the symptoms. An adverse reaction (aka systematic reaction) is a life threatening allergic reaction called anaphylaxis which happens when the person being stung is hyper allergic to the venom. It can occurs within seconds or minutes of a sting. The immune system overreacts to the venom by flooding the body with chemicals that can put the person into shock. Symptoms include a sudden drop in blood pressure, narrowing of airways, rapid and weak pulse, nausea and vomiting. Death might occur if the person is not given emergency treatment; injection of adrenaline (epinephrine) and immediate evacuation to the nearest hospital is necessary. The stings of some bees like honey bees are barbed. When the bee stings and flies off, it pulls its abdomen away from the trapped stinger in the person's skin. The immerse force ruptures the bee's body and kills it. The sting that that stays behind is attached to a venom sac that continues to pump venom into the person's bloodstream if not removed. Therefore before any treatment, you should look out for embedded stingers and removed them away by scraping it with a card as quickly as possible to prevent more venom from entering your body.

Wasps and Hornets

A sharp jabbing pain followed by dizziness and a sting site that swelled like a balloon and took days to heal is sometimes heard from trekkers who were stung by wasps. Wasps, hornets and bees belong to the same of order of animal called Hymenoptera ("membrane-winged"). Wasps can be distinguished from bees by their narrow waists called petioles that separate the thoraxes from the abdomens. Bees are vegetarians and feed on nectar and pollen from flowers while wasps are mainly carnivorous and feed on live or dead insects like caterpillars and beetles. Bees are furry while wasps are generally hairless. Bees make their nests from a waxy secretion while wasps make their nests from mud and wood fibers which they chewed into a pulp. Hornets are a sub-class of wasps and their main differences lie in their size and color; they are larger and have back and white stripes while wasps have black and yellow stripes. Both bees and wasps are very important to the ecosystem; one helps in pollination while the other rids the ecosystem of harmful insect pests. Social wasps like yellow jackets and all species of hornets are very defensive of their territories and will strike aggressively and repeatedly when provoked. Unlike the honey bee, a wasp's sting is not barbed so it is able to sting multiple times in a row. A threatened wasp can also rally the entire nest to attack the provoker by releasing pheromones. The preventive measure against wasp sting and the corresponding symptoms and treatments are exactly similar as those for a bee sting.

Centipedes and Scorpions

A centipede "bites" by using pincer-like claws called forcipules which inject venom into its victim. Centipede bites can be extremely painful and take days to heal but serious complications or death are very rare. There are only a few reported cases of death by centipede bites worldwide. All scorpions deliver venomous stings with stingers located at the end of their tails. Scorpions look threatening with their huge pinchers and poisonous tail but most are actually less dangerous than wasps or bees. Only about 30 of the 1500 over species of scorpions can deliver potentially fatal stings and fortunately none of these killer species can be found in the wild of Malaysia or Indonesia. Symptoms of a centipede or scorpion bite are tingling, burning or numbing sensation at the sting site. The pain and swelling usually subsides within 1-2 days. The greatest risk from centipede or scorpion bite is wound infection if it is not disinfected or clean properly. Therefore always clean the wound with antiseptic or water once you have the chance to do so. Analgesics and antihistamines can also be used to reduce pain and itchiness.

Sand Flies

The sand fly is found mostly in the tropics and they inhabit places with high moisture and organic contents like sandy beaches and forested areas. Similar to mosquitoes, only the females feed on animal and human blood while the males feed on nectar and sap. They are most active between dusk and dawn but may bite during the day when they are disturbed. With a body size of only 2-3mm, they are much smaller and stealthier than mosquitoes. The bite is usually not painful and may take hours or up to a day for the skin to develop reaction in the form of small itchy red bumps. These bumps are several times itchier and longer lasting than mosquito bites and will spread and swell up into rashes and blisters when you scratch them. A bite is long lasting and may take more than a week to heal. Sand flies can carry parasites that cause debilitating diseases like leishmaniosis in humans. Disease carrying sandflies are usually only found in poor sanitation tropical countries in South America, Africa and India, etc. Sandflies in more developed South-East Asia countries like Indonesia, Malaysia and Singapore are unlikely to carry diseases. Unlike mosquitoes, sandflies rarely bite at moving targets and they usually attack in a swarm near ground level. Keep moving or find another place to rest whenever you see pesky tiny flies swirling around your resting ground. The most effective method to keep them at bay is to cover exposed skin with clothing or insect repellant. Most importantly check the ground before setting up a tent; you do not want to wake up with zillions of sand fly bites. There are a number of remedies for sand fly bites ranging from calamine lotion and vinegar to baking soda with water whose effectiveness vary from one person to another. If you are out in the wild, an over-the-counter antihistamine cream will come in handy to relieve the itch a bit. You should refrain from scratching the bites (easier said than done) as broken skin can lead to secondary infection.

Heat Related Injuries

A cramp is the involuntary or uncontrollable contraction of the muscle in which the muscle becomes hard with sharp and intense pain. Cramps can occur in any muscle but it usually affect the calf (gastrocnemius), the front of the thigh (quadriceps) and the back of the thigh (hamstrings). It usually happens on a trek though sometimes you can also experience it while resting or sleeping. The muscle contraction and pain usually relieve after a few minutes but sometimes it can last for more than 10 minutes. Sometimes it can come back a few times leaving you with weak or sore muscle for the rest of the day especially if you do not manage the condition well. Although cramps are usually associated with strenuous exercise, no one really understands the root cause and mechanism behind them. Apparently some trekkers are more susceptible to muscle cramps than others, probably due to their physiology or genetic makeup. But there are some preventive measures and treatments which can help to avoid cramps and manage them if they occur.

Preventive Measures

Warm-up and stretch your muscles before a trek.

Keep well-hydrated throughout the trek. Your urine color is an excellent indication of your hydration level; the lighter its color, the more hydrated you are. A good practice is to conduct a water parade just before and after the trek and drink up every 45 min or so during the trek.

Maintain your electrolyte (salt) level. Electrolytes like Sodium, Potassium, Magnesium and Calcium are essential for muscle and nerve functions. Electrolytes are lost from the body through sweat during trekking. A good way to replenish your electrolytes is to snack on nuts and raisins which are a rich source of salts (as well as energy) while you trek. Isotonic drinks like Gatorade and 100 Plus are good sources of electrolytes as well.

Treatments

'Have a break, have a Kit Kat' – rest your muscle and stop moving around if you have any cramping sensation.

Re-hydrate and replenish your lost electrolytes.

Gently massage and stretch your cramped muscle.

Apply tropical pain relief (aka heat rub) to the cramped muscle to relieve the pain. Take note that tropical pain relief like Bengay or Tiger Balm only provide temporary pain relief, they do not address the underlying problem. Therefore the best treatment is still R & R - rest and rehydration.

Heat disorder (aka hyperthermia) is probably one of the most underestimated and dangerous injuries that can strike anyone on the trail. Heat disorders are a group of heat-related illness caused by prolonged exposure to high temperatures, insufficient fluid intake or failure of the temperature-regulating mechanisms of the body. Heat disorders can be classified into one of the following three conditions:

- **Heat Cramp**
- **Heat Exhaustion**
- **Heat Stroke**

A heat cramp is the involuntary contraction of the muscle in which the muscle becomes hard with a sharp and intense pain and is usually experienced in the larger muscle groups like abdomen, thighs and calves. It occurs due to excessive loss of water and salt as the body tries to regulate its temperature in the midst of physical activities and/or hot weather. It is non-critical and the least severe form of heat disorder but it can develop into more severe forms

such as heat exhaustion and heat stroke if it is not keep in check. If you encounter muscle cramps while trekking, you should see it as a possible warning sign that your body might be having difficulty in regulating its temperature. You should find a cool spot to rest and rehydrate and resume the trek only after the cramp goes away.

Heat exhaustion is a more severe form of heat disorder which progresses from heat cramps. Some common symptoms are headache, nausea, vomiting, muscle weakness, rapid but weak pulse and heavy sweating. The skin may also appear pale, cool and clammy. Heat exhaustion is fatal but if left unattended, and can lead to heat stroke which is life-threatening.

Heat stroke is the most severe form of heat disorder which progresses from heat exhaustion. It occurs when the body is unable to regulate its own temperature. A body temperature of 40oC or higher is the main sign of heat stroke. The person might also exhibit some neurological symptoms like irritability, delirium or seizure. Sweating may be present or absent. Heat stroke can cause coma, irreversible organ damage, and even death. Take note that heat stroke can occur suddenly without any prior symptoms of heat exhaustion.

Trekkers tend to underestimate their own vulnerability to heat disorder and do not recognize the symptoms well. It is important to identify the symptoms of heat disorder so that remedy actions can be taken before it escalates beyond control. Prevention is better than cure, you should also apply the preventive actions below to prevent the onset of heat disorder.

Drink up constantly and regularly before, during and after trekking. You should drink about 500ml of water for every hour of trekking. It might not be feasible or practical sometimes especially if you are trekking with a heavy load or when water sources are scarce but you should bear in mind of this rehydration guideline as it can help you to gauge your need for rehydration.

Monitor your hydration level via your urine color. The darker or more yellowish your urine color, the more dehydrated you are. Thirst is not a good indicator of hydration level. Many times, one can be dehydrated but not thirsty.

Wear appropriate clothing. Choose lighter colored clothing or those made of breathable materials to prevent build-up of heat in your body. Do not wear excessive clothing or remain in excessive clothing after descending from a higher altitude.

Be aware of your environment. As the temperature increases, take more frequent breaks and rest under a sheltered area. Take note that you will be more susceptible to heat disorder when trekking above the tree line or in exposed terrain without adequate canopy cover.

Pay more attention to below categories of trekkers as they are more susceptible to heat disorder than others:

- Children or elderly trekkers
- Trekkers unaccustomed to trekking in high temperatures
- Trekkers with previous occurrences of heat disorder

Buddy system – keep a constant lookout for each other for signs of dehydration and encourage each other to drink up regularly.

Lightning Risk

Lightning is one of the most common and dangerous hazards faced by trekkers in the tropics. In tropical Singapore, lightning strikes up to 16 times a year on each square kilometer of land and causes about 0.35 deaths per million each year. Extrapolating this figure to the outdoor setting in the wild, you will see that the hazard posed to trekkers from lightning strikes should not be taken lightly. A single lightning strike carries about 5 billion joules of energy, enough to power a household for a month. The killing or injury apparatus is the extremely high current and heat that pass through the body and the thunderous blast from the rapidly expanding air when lightning strikes. Lightning can strike via five different mechanisms; ground current, side flash, direct strike, streamer and contact.

Ground Current: When lightning strikes an object, the current travels radially outwards from the strike point along the ground surface. Anyone in the immediate vicinity (approx. 30m radius) of the strike point is a potential victim of ground current. More than 50% of lightning injuries and deaths are caused by ground current.

Side Flash: Occurs when lightning strikes an object (tree or person) and portion of the current jumps from the stricken object to the person just beside it (approx. 1-2 foot radius). In essence, the person acts as a "short circuit" (a path of least resistance to ground) for the current. Side flash contributes about 30-35% of lightning injuries and deaths.

Streamer: Streamers are streams of electrical charges that flow upwards (towards the sky) from the ground under the inducement of a downward leader (channel of negative charges) in the clouds. Injury or even death may occur when a person happens to be in the path (or serves as the path) of these upward streamers. Streams usually emanate from high ground or tall objects like communication towers. More than 10% of lightning injuries and deaths are caused by streamers.

Direct Strike: Occurs when a person is struck directly by lightning. Direct strikes are rare but are potentially the most deadly. It accounts for about 3-5% of lightning injuries and deaths.

Contact Strike: Occurs when current from lightning travels along metal conductor like wire fencing and piping and strike someone who happens to touch the conductor when the current flows. It is a rare phenomenon and accounts for about 3-5% of lightning injuries and deaths.

How to Protect Yourselves in a Thunderstorm

The golden rule "When Thunder Roars, Go Indoors" is usually not an option for trekkers who get caught in a thunderstorm while trekking. Fortunately there are a number of sensible actions which trekkers can take to reduce their lightning risk in the wild.

Time your trek with the weather forecast – A knowledge of typical and recent local weather patterns will allow you to schedule your trek and plan your route in way that can minimize exposure to lightning risk. You should avoid summiting a peak or crossing an open terrain during a thunderstorm.

Get away from high risk terrains to safer terrains when a thunderstorm is brewing. Some terrains are more susceptible to lighting strikes than others. Examples of high risk terrains are:

- At or near mountain peaks (high risk of ground current, side flash and direct strike)
- At or near mountain ridges (high risk of ground current, side flash and direct strike)
- On wide open terrain (high risk of direct strike)
- In the vicinity of tall objects like trees and communication towers. Do not be or near the tallest object in any terrain regardless of whether it is open or forested terrain (high risk of side flash and ground current)

- At overhangs or cave entrances (lightning travels along vertical surfaces to seek ground. Any object in between the vertical surface and ground can act as a bridge to conduct the current. Therefore it is very dangerous to seek shelter under an overhang or near a cave entrance – high risk of side flash)

- Inside pavilion (structure might collapse and fall on you if it is struck by lightning. Unless the pavilion is made lightning proof with metal strip earthing that runs from its roof to the ground)

- Lastly you should not set up your tent at or near any of the above mentioned terrains in times of thunderstorms. A tent does not offer any protection from lightning. Vacate your tent immediate if your tent is set up in these high risk terrains.

Safer terrains are lower grounds with dense vegetation covers (but make sure you are not near any tall trees that stand high above the others). Ravines, ditches and gullies are considered safer grounds. Do not cluster together. Instead spread out from one another at 7m intervals to reduce the risk of collateral damage if lightning strikes.

If a lightning strike is imminent and you are far away from any safer ground, you should immediately adopt the lightning crouch position. Crouch down as low as possible with your feet close to each other while supporting yourself on the balls of your feet with heels touching. Your hands should not be touching the ground. Theoretically the lightning crouch position reduces your overall footprint on the ground which in turn reduces your lightning risk. Supporting yourself on the balls of your feet with heels touching creates a pathway for the ground current to flow through one of the foot, up to the touched heels and then back to the ground via the other foot. Without the heels touching, the current will flow through your heart and possibly kill you. However theory aside, the lightning crouch position will not drastically reduce your lightning risk as some people have still being killed or seriously injured in this position. Never lie down flat on the ground as this will increase your contact area with the ground and make you very vulnerable to lightning strike.

One telltale sign of imminent lightning strike is when your hair stands on ends (google for Michael McQuilken) or when your skin tingles. Run for safe shelter (if one is nearby) or get into the lightning crouch position immediately if you feel them. However lightning can still strike without any telltale sign.

First Aid for Lightning Victims

Call for Help: Call the national park office for help and provide the specific location and information of the strike victim. It is safe to use cell phone in a thunderstorm.

Assess the Situation: In extremely hazardous conditions where lightning is incessant and the victim is in a high risk terrain, the rescuer should wait for the storm to abate before attempting rescue. If necessary, move the victim to a safer location before performing first aid.

Basic Life Support: Lightning often causes heart attacks. Check the victim for responsiveness. If the person is not responsive and not breathing, immediately perform cardiopulmonary resuscitation (CPR). Continue resuscitation efforts until the victim starts breathing or when help arrives. Lightning may also cause other injuries such as burns or broken bones (unlikely unless the person falls badly when the lightning strikes) etc. Look out for these injuries and treat them with basic first aid till help arrives. The priority should always be maintaining life support (breathing and heart beat) before attending to other injuries.

Evacuate: Anyone struck by lightning should be evacuated to the nearest hospital or clinic soon as possible after administration of basic life support.

Lightning Safety Myths

Myth #01: Lightning never strikes the same place twice.

Fact: It is possible and sometimes even common for lightning to strike the same place repeatedly especially if the target is an isolated tall object like a communication tower.

Myth #02: Wearing rubber soled shoes or boots will protect you from lightning strikes.

Fact: Rubber soled shoes (no matter how thick the sole is) will not protect you from lightning strikes. A lightning strike carries millions of voltage, more than enough to burn off your shoes.

Myth #03: Electronic gadgets and metal objects like phones, watches, jewelers and wired bras attract lightning

Fact: Tall height, pointy shape and isolation are the main attractions for lightning. The electronic gadgets or metal objects you carry around or wear on your body will not make you more attractive to lightning. When a lightning strike is imminent, Seek safe shelter or get into the crouching position immediately and do waste time removing metal belongings.

High Altitude Sickness

High altitude sickness or acute mountain sickness is an illness that can affect trekkers at high altitudes, usually above 2400m. It is caused by reduced air pressure and lower oxygen levels at high altitudes. There are many tropical mountains above 3000m high, therefore it is possible to encounter high altitude sickness even in the tropics. Symptoms from mild to moderate altitude sickness may include dizziness, fatigue, headache, loss of appetite, nausea. Altitude sickness can further progress to high altitude pulmonary edema (HAPE) or high altitude cerebral edema (HACE), which is potentially fatal within hours. These medical terms simply mean 'fluid in the lungs/brain. Personally I experienced high altitude sickness when I first climbed Mount Kinabalu in the 1990s. It was quite a bad experience as I had to struggle my way up the summit at a snail's pace (almost could not make it) and relied on my teammate to carry my backpack. The best way to prevent altitude sickness is to ascend gradually so that your body can become acclimatized to the changing altitude. You can also improve acclimation by staying at the foot of the mountain for one night just before your trek. For example, if you going for a 2D1N climb of Mount Kinabalu, you can consider staying for one night prior to the climb at the base of Mount Kinabalu rather than at Kota Kinabalu city. At an altitude of 1800m, the base of Mount Kinabalu provides a better acclimation environment than Kota Kinabalu city which is only a few meters above sea level. The medication Acetazolamide (aka Diamox) can be used to prevent and reduce the symptoms of high altitude sickness. Acetazolamide forces the kidneys to excrete more bicarbonate which in turn increases the acidity of the blood. The body responds to this increased blood acidity by breathing faster and deeper to get rid of the CO2. This increases the amount of oxygen received by the blood which helps with the acclimatization process. To be effective, the medication has to be taken 1-2 days before you go to altitude and continue for 3-5 days at higher altitude. There are a number of common side-effects like tingling feelings, and increased urine but they are not usually serious. Acetazolamide, which comes in pill form is readily available in most pharmacies. However being a prescription medication you are legally required to obtain a medical prescription from your doctor before the medication can be dispensed. Acetazolamide might not be suitable for people with certain conditions like pregnancy, diabetes, or kidney problems. Therefore it is important to inform your doctor of your pre-existing conditions when requesting a prescription.

First Aid Kit

There is a confusing array of first aid supplies (medications, bandages, and gauges) from different brands (Hansaplast, Nexcare, Smith & Nephew, Band-Aid, etc.) in a typical pharmacy store. For medications like pain killers, fever relievers etc., it does not matter much whether you buy the branded or the generic version (with the exception of some prescription medications) as both versions will contain the important active ingredients. For disposable supplies like bandages and gauges, the branded ones might have better quality (better breathable or waterproof material) than the pharmacy house brands. Overall the choice of brands is not as important as getting the right products and quantities for your trekking trip. Ideally each trekker should carry his or her own first aid kit especially for multi-day treks. For a single day trek, it should be fine for a small group of trekkers to share one first aid kit provided the whole group keeps close to one another during the trek. A basic first aid kit for trekking should include the following items:

Plastic Container: A plastic container (e.g. lunch box container) to store the items together. The container can be further waterproofed by keeping it inside a zip lock bag.

Scissors: A pair of small scissors will be handy for cutting bandages, gauzes, tape, etc.

Plasters (aka Band-Aids): Come in variety of sizes and shapes for covering minor cuts and scrapes. Recommended quantity: A variety of them in your first aid kit.

Gauzes: Used as dressings to cover bigger wounds and stop bleeding. They usually come in rolled or pad (square-shaped) form in sterile or non-sterile packaging. Those in sterile packaging have been chemically treated to prevent germ contamination during usage. Recommended quantity: At least 1-2 medium sized rolled gauzes and a number of different sizes gauze pads.

Triangular Bandages: Mainly for immobilizing fracture injury (e.g. as an arm sling). They can also be used for holding a gauze in place or covering a large wound over the chest or back. Recommended quantity: At least 1 piece of triangular Bandage.

Elastic Bandages (aka crepes or compression bandages): Mainly for muscle sprain and strain injuries at the wrist, ankle, knee, elbow or arm. They help to restrict swelling by creating localized pressure which reduces the flow of blood to the injured sites. Recommended quantity: At least 1 roll of elastic bandage.

Steri-strips (aka butterfly closures): For closure of a laceration wound. They usually come in 3-5 strips per envelope. Recommended quantity: 3-4 envelopes.

Bandage Tapes: These are adhesive tapes used for securing dressings or bandages onto a wound. They come in either paper, fabric or plastic type. Recommended quantity: 1-2 rolls of bandage tapes.

Moleskins: For blister prevention or relief. They usually come in pad form which you can cut to shape to fit over the blister area. Recommended quantity: Blisters are very commonly occurred during trekking. They should be well-stocked in your first aid kit.

Benzoin Tincture: For treatment of damaged skin like blisters and sores. It usually comes in one small bottle. Recommended quantity: 1 small bottle.

Saline Wash: For wound cleaning before plasters or gauzes application. It can also be used as an eye wash. They come in little plastic ampoules of 10ml solution. Recommended quantity: 3-4 ampoules.

Tweezers: For splinter removal and other first aid procedures.

Safety Pins: For securing slings and bandages. Recommended quantity: 3-4 pins.

Thermometer: For body temperature measurement.

Paracetamol (e.g. Panadol/Tylenol): For fever and pain relief. Recommended quantity: 2 strips of tablets.

Antidiarrheal (e.g. Loperamide (Imodium), activated carbon): For diarrhea relief. Loperamide may cause side effects like drowsiness, fatigue, etc. in some people. Recommended quantity: 2 strips of tablets.

Antihistamine (e.g. Claritin, Zyrtec): For treatment of allergies (from insect bites and stings, etc.) and relief of cold or flu. Antihistamines may cause side effects like drowsiness, fatigue, etc. in some people. Recommended quantity: 1 strip of tablets.

Anti-inflammatory (e.g. Ibuprofen): For anti-inflammation of injuries. Anti-inflammatories may cause side effects like drowsiness, fatigue, etc. in some people. Recommended quantity: 1 strip of tablets. Decongestant (e.g. Sudafed PE) – For relief of nasal congestion in upper airway sinuses and nasal passages. Decongestant may cause side effects like drowsiness, fatigue, etc. in some people. Recommended quantity: 1 strip of tablets.

Antiseptic Cream: Used on bites, stings, grazes, scratches and minor skin cuts for protection against infection. Recommended quantity: 1 small tube.

If you are a regular trekker, you should also consider signing up a first aid course to equip yourself with essential skills in first aid and cardiopulmonary resuscitation (CPR). Check out the Red Cross, Red Crescent or St John organizations in your country for course availability. If you are interested in going beyond the basic proficiency, you can look for a wilderness first aid course which covers more advanced topics like risk and crisis management, river crossing, and emergency evacuation in remote mountain terrains. An example of such course is the Tropical Mountain Walking Leader Proficiency (TMLP) course offered by the Singapore Mountaineering Federation.

Sun Protection

Sunlight that reaches us is made up of two types of harmful rays: long wave ultraviolet A (UVA) and short wave ultraviolet B (UVB). UVB attacks mainly the outer layer of the skin (epidermis) while UVA being more penetrating attacks the inner layer of the skin (dermis). Unprotected exposure to both types can lead to premature skin aging, eye damage (including cataracts), genetic mutations and skin cancer. Sunburn and suntan are both the result of DNA damage from exposure to the sun's UV rays.

Clothing is our first line of defense against the sun's UV rays by absorbing or reflecting them. The higher the coverage, the better it is. A long sleeve shirt and long pants offer more coverage and protection than a t-shirt and shorts. The sun protection capability of fabric depends a lot on its properties like type, density, color and texture. Synthetic fabrics such as polyester or nylon offer much better sun protection than natural fabric like cotton. Tightly woven or closely knitted fabric allows less UV rays to pass through it than less dense fabric. Darker color (black and red) and lustrous fabric also provides better protection than lighter color and dull fabric. The sun protection capability of garments can also be enhanced by treating the fabric with special sun blocking coating (titanium dioxide). A certain laundry additive (Sun Guard) is said to be able to increase the UPF of the clothing. Sun protection capability of garments is measured by the UPF rating (Ultraviolet Protection Factor) which indicates what fraction of the sun's UV rays can penetrate the fabric. For example a shirt with an UPF of 30 only allows 1/30 of the sun's UV rays to pass through it. This means the fabric will reduce the UV exposure of the skin underneath by 30 times (96% UV block).

How to Reduce Exposure to UV Rays and Prevent Sunburn?

Sunscreen contains active ingredients that either absorb (oxybenzone and avobenzone) the sun's UV rays or reflect (zinc oxide and titanium dioxide) them thereby reducing the skin exposure to UV rays. Sunscreens are classified by an SPF number (Sun Protection Factor) which is a measure of the amount of UV rays required to produce sunburn on protected skin (i.e., in the presence of sunscreen) relative to the amount of UV rays required to produce sunburn on unprotected skin. There is a popular misconception that that SPF relates to the time of sun exposure. This is not true as SPF is not directly related to time of sun exposure but to amount of sun exposure. The amount of sun exposure is dependent on a number of factors such as sun intensity, skin type, type and amount of sunscreen applied and reapplication frequency. Sunscreen with SPF 15 only allows 1/15 of the sun's UV rays to pass through it. This means the fabric will reduce the UV exposure of the skin underneath by 15 times (93% UV block). As the SPF value increases, sunburn protection increases. Dermatologists generally recommend using a sunscreen with an SPF of at least 30 though the FDA's recommendation is only SPF 15 or higher. Other than the SPF number, you should also consider the spectrum range and water resistance ability of the sunscreen. A broad spectrum sunscreen is one which protects you from both UVA and UVB rays. Sweat can wash off the applied sunscreen readily if it is not of the water resistant type. However, no sunscreen is 100% waterproof, therefore it is a good practice to reapply sunscreen after every two hours or more frequently if sweating heavily. Take heed of the following precautions whenever you are out trekking.

- Apply and reapply sunscreen on your body and face
- Wear a wide brim hat or cap with neck flap
- Wear a long sleeve shirt or hand sleeves, and long pants.
- Wear UV protection sunglasses
- Trek under shelter whenever possible

The higher the altitude, the more intensive the UV rays are, you should take more precautions if you trek covers higher altitudes.

How to Treat Sunburn?

If possible, you should treat your sunburn right away and not wait until you have completed the trek. The following remedies will help you to treat or alleviate your sunburn.

- Take a dip in the river or waterfall (if you are near one) or a cold bath to cool down your skin.
- Drink plenty of water to rehydrate your body.
- Apply a gentle water-based moisturizer to your skin. Avoid using oil-based moisturizer as the oil may trap heat and cause further burn to the skin. Aloe Vera may also help to soothe sun burned skin.
- Take a nonsteroidal anti-inflammatory drug (NSAID) like ibuprofen, naproxen or aspirin for relieving the discomfort and preventing inflammation.

How to Choose the Right Sunglasses

The sun rays that reach your eyes consist of a large amount of invisible high energy rays called Ultraviolet (UV) Rays. There are three types of UV rays which differ in their wavelengths: UVA (315 to 400 nm), UVB (280 to 315 nm), and UVC (180 to 280 nm). The earth's atmosphere blocks out most of the UVC but not UVA and UVB. Prolonged or accumulated exposure to UVA or UVB can cause a number of eye problems like cataracts, pterygium (abnormal tissue growth), photo keratitis (sunburn of the cornea), macular degeneration etc. It is important that you protect your eyes with a good pair of sunglasses while trekking. There are two important factors to consider when buying sunglasses: UV protection level and Fit.

UV Protection Level

There are three major national Standards that set out specifications and testing procedures for sunglasses; the Australian Standards AS/NZS 1067, the European Standards EN 1836 and the American Standards ANSI Z80.3. These Standards exist to ensure that sunglasses manufactured and sold are safe, reliable and of good quality. Although the International Standardization Organization (ISO) has been working on an international standard for sunglasses, it was not yet ready at the time of this writing. All three standards categorize sunglasses based on their UV blocking ability which translates to the level of UV protection offered by their lenses. For example the Australian Standards AS/NZS 1067:2003 categorizes lenses based on 5 categorizations below:

"0" – Fashion spectacles and not sunglasses. Very low sun glare reduction. Some UV protection.

"1" – Fashion spectacles and not sunglasses. Limited sun glare reduction. Some UV protection.

"2" – Sunglasses. Medium sun glare reduction. Good UV protection.

"3" – Sunglasses. High sun glare reduction. Good UV protection.

"4" – Sunglasses. For special purpose (e.g. glacier climbing). Very high sun glare reduction. Good UV protection.

The other two Standards also categorize lenses into 3-4 categories but differ in definition and stringency level. You should only buy sunglasses which comply with either one of these three standards to ensure that the sunglasses met the minimum quality and safety requirements for usage. Sunglasses which comply with these Standards usually come with an "ANSI Z80.3" sticker, "AS/NZS 1067" label or CE marking on their lenses or bodies. CE is the abbreviation of French phrase "Conformité Européene" which literally means "European Conformity". Sunglasses that fulfill the European Standards will bear the CE Marking symbol. However the Standards and their generic categorizations are not very useful in helping consumers to determine the exact UV protection level offered by the sunglasses. Fortunately the sunglasses industry employs two other product markings or labels to assist consumers to make an informed choice. They are UV400 marking and EPF marking. Lenses that are rated UV400 block up 99.9% (almost 100%) of wavelengths up to 400nm which includes the whole UV spectrum. EPF which stands for Eye Protection Factor is a measure of the level of UV protection offered by the sunglasses. It has a numerical value of 1-10. Sunglasses with an EPF rating of 9 or 10 transmits almost zero UV rays. EPF is to sunglasses what the SPF (Sun Protection Factor) is to sunscreen. For optimum UV protection, you should choose sunglasses that are rated 400UV or with EPF 9 or 10. If neither UV400 marking nor EPF marking is present, look for wordings on the label that mention something like "99-100% UV absorbent" or "block 99-100% of UVA and UVB".

Fit

Ill-fitting sunglasses will allow stray light and UV rays to enter the eyes via the sides of the sunglasses. Choose a close-fitting design or one that wraps around the eyes and temples to minimize rays entering from the sides.

Other Less Important Features

Lens Material: Lenses for sunglasses are usually made of Grown glass, CR-39, polycarbonate or polyurethane. Grown glass (a type of glass) used to be the only lens material before the invention of plastic. They have excellent optical properties (very minimum distortion) and very scratch resistant. However due to its heavier weight and shatterability, it is not commonly used nowadays. CR-39 a plastic polymer used to be the standard lens material before the emergence of other high performance plastics like polycarbonate and polyurethane. Due to its light weight and low cost, it is still a popular lens material for sunglasses. However similar to Grown glass, it does not block UV rays completely so it is necessary to add a UV coating over it. Nowadays the better sunglasses are usually made of polycarbonate which is a natural UV filter (blocks 99% of UV rays without the need for special lens coating), light weight (less than half the weight of CR-39) and is a very high shatter resistant lens material. However it is a soft material so a special coating is needed to improve its scratch resistance. Polyurethane is the latest and most expensive lens material. Other than having all the pros of polycarbonate, it is lighter and has excellent optical clarity.

Polarized Lenses: The main purpose of sunglasses is UV protection. Sunglasses can also help to reduce the eyes' exposure to glare. Glare can be caused by a bright light source (sun or headlamps) or reflection from reflective surface (snow or lake). Glare can strain the eyes and cause discomfort or even temporary blindness. Sunglasses with polarized lenses have a polarization coating or embedded film that reduces glare by only allowing light in one plane to pass through them. Polarized lenses always have a dark tint because of the alignment of the molecules within the polarization coating. But not all dark tint lenses are polarized lenses. You should consider sunglasses with polarized lenses if you are trekking through terrains with many reflective surfaces like snow field, glaciers, lakes etc.

Lens Coating: Lenses can be coated to impart desirable properties to them. Examples of coating are UV coating, polarization coating, anti-scratch coating and anti-reflection coating (reduces reflection to allow more light to pass through and making your eyes more visible to others – more for aesthetic purpose).

Lens Color: Lenses are tinted or colored mainly for aesthetic purposes and to reduce the amount of visible light (not UV rays) passing through them. They can also enhance contrast and depth perception sometimes at the expense of color distortion. Most people find gray color lenses a good fit for trekking as grey is a neutral color – does not cause any color distortion. Lens color is more of a personal preference and does not affect the UV protection level of the lens.

What if I am Spectacled?

For those of you who are spectacled, you can consider either clip-on or flip-up sunglass lenses which can be either pre-manufactured or custom-made. For pre-manufactured clip-on or flip-up, it is important that you choose the right size so that the clip-on or flip-up lenses can cover the entire area of your prescription lenses. If clip-on or flip-up is too old fashioned for you, there are now innovative and stylish sunglasses that can fit-over your existing prescription eyewear. If you have a hard time finding these so-called fit-over sunglasses in your local retail store, you can buy them online from Amazon, eBay or fitovers.com. Lastly there is also an option of prescription sunglasses but it is also the most expensive choice.

Usefulness of Trekking Sticks

Contrary to popular belief, trekking with trekking sticks actually increases your overall energy expenditure (i.e. you burn more calories) because swinging and exerting pressure on the sticks engage your upper body muscles and increase your heart beat. The weight of the trekking sticks also counts even if it is an ultra-light weight one. It sounds counter-intuitive but the real benefits of using trekking sticks are to provide stability, balance, and reduce stress on joints and lower limbs fatigue especially when you are carrying a heavy load. Trekking sticks provide additional contact points between you and the ground thereby increasing stability and balance and reduce the chance of slipping or falling. Going uphill, trekking sticks allow you to use your arms and torso muscles to propel yourself upwards. Going downhill, trekking sticks (especially those with internal shock absorbing springs) help to absorb some shock away from the knees and ankles and help to control the speed of descend over sandy or slippery terrains. They also help you in maneuvering over tricky terrains like streams and dried river beds. It can also help to establish a trekking rhythm by allowing your hands to move in tandem with your feet which in turn helps you to trek faster. Keep in mind that there are also situations where trekking sticks can be more of a hindrance than help. On very steep terrains where your body is almost parallel to the ground or rock surface, it will be easier to scramble on all fours. Trekking sticks can also get in the way on terrains with many ropes and ladders sections (for example towards the summit of Mount Ophir). Using a trekking stick correctly is more important than choosing the right trekking stick. A cheap and heavy $10 made-in-china trekking stick when used correctly will better serve its owner than an expensive and light $100 Black Diamond brand trekking stick. Incorrect usage of trekking sticks not only hinders your trekking progress but can also cause muscle sprains and strains. When it comes to the right usage, nothing is more critical than setting the optimized height for the trekking stick. Standing upright with your feet slightly apart with your arm close to your sides, plant the trekking stick in front of you parallel to your body. At the correct height, your elbows will bend at a natural 90-degree angle while your palm is at the grip of the trekking stick. Do some fine height adjustment till you find the optimized height that suits you most comfortably. As a general guideline, the trekking sticks should be lengthened a few centimeters when going downhill (to prevent overstretching your body) and shortened a few centimeters when going uphill (to better exert pressure onto the ground). Whether to use trekking sticks or not boils down to personal preferences. However bear in mind that less stress on your body can mean enjoying more years of good trekking. Due to the sharp carbide tip on trekking sticks, some airlines do not allow hand carry of trekking sticks on board. If you have to send it as checked-in luggage, do ensure that you pack it with cushioning and label it as “fragile”, otherwise they might be damaged by airport staffs’ rough handling.

How to Choose the Right Headlamp

A headlamp is preferable to a torch for it frees your hands for trekking especially if scrambling is required. Nowadays you can easily get cheap and powerful headlamps for less than $10. I owned a $5 made-in-China LED (Light-Emitting Diodes) headlamp which lasted me for a few treks. I was lucky then, these cheapo headlamps are usually of low quality and reliability and might not survive a robust trek. Therefore it is sensible to invest in a good quality headlamp especially if you are going for a multi-day trek. Due to the advent of LED technology, most if not all headlamps today use LEDs as their light source. Gone are the days where incandescent or halogen bulbs competed with LEDs to be used in headlamps. Here are some factors which you should consider when choosing a headlamp.

Lumens (Im): A measurement of the headlamp's brightness. An output of 100 Im should be sufficient for most trekking condition. Some headlamps come in the range of a few hundred lumens. Most of us will not require such a high lumen output unless you are trekking on a moonless night, have poor night vision or doing caving.

Run Time: A measure of the battery life from new batteries that provides usable light. A run time of at least 5 hours at medium brightness mode is desirable to avoid a dead battery in the midst of trekking. There is no standardized method to measure run time so comparison of run time between different brands might not be accurate.

Lighting Mode: Headlamps usually come with different brightness modes such as low, medium and high. Most also come with red color mode – an energy saving mode – excellent for usage in enclosed area such as a camping ground since it is not so glaring.

Beam Type: Headlamps also come with different beam modes such as flood, spot or strobe. Strobe function can serve as SOS beacons during emergency.

Beam Distance: It measures the shining distance of the beam. For safety considerations, you should get one that can shine beyond 40 meters.

Weight and Size: A bulky or heavy headlamp will be awkward to hang on the head. Together with its batteries, the headlamp should not weight more than 1 kg.

Durability: For enhanced durability and reliability, consider looking for headlamps which are impact proof (tough housing with some level of ruggedization) and/or IP rated for water ingress protection.

Headlamps, especially those with high lumens output, draw a significant amount of current from the batteries. Consider getting lithium batteries rather than the more common alkaline batteries to power your headlamp. Though lithium batteries are more expensive, they are longer lasting, lighter and tolerable to extreme temperatures than alkaline batteries.

Global Positioning System

Global Positioning System (GPS) is a satellite-based navigation system made up of a network of 30 or more satellites placed into orbit by the US Department of Defense. GPS was originally intended for military purposes, but in the 1980s, the US government made the system available for civilian use worldwide. Anyone with a GPS receiver can tap GPS signals (basically radio signals) for their own use 24 hours a day without any set-up or subscription fee. The GPS system consists of three segments: the space segment, the control segment, and the user segment. The space segment refers to the GPS satellites that revolve around earth. The control segment refers to the network of ground facilities like control stations, transmission towers, etc. that track, control and monitor the satellites. Both space and control segments are owned and managed by the US government. The user segment refers anyone who taps the signals for navigational or positional purposes with the help of a GPS receiver.

GPS satellites are constantly transmitting signals towards the Earth. Each transmission contains the satellite's location and the time the signal was sent. A GPS receiver (cell phone with built-in GPS receiver, Garmin GPS unit, etc.), measures the transmission time of the signal and calculates the distance from the satellite to the receiver. Based on distance measurements from a few more satellites and the mathematical principle of triangulation, the receiver can calculate the user's position (latitude, longitude and altitude) and display it on the receiver display. Most receivers also have installed algorithms which can derive other useful information like user's speed, bearing, distance to destination, etc. from the positional data. In order to calculate its position accurately, the GPS receiver must receive signals from a minimum of four satellites. GPS signals may be blocked by dense foliage, mountains or valley walls so occasionally there might not be enough satellite signals for accurate positioning determination. But this can be simply overcome by moving out of the blocked area so that more satellites can be within the receiver's line of sight.

GPS Accuracy and Error Sources

Error sources which affect GPS accuracy can be classified into two main factors; internal factors and external factors. Internal factors refer to intrinsic error sources within the GPS receiver while external factors refer to error sources that are external to the GPS receiver.

Internal Factors

Receiver Clock: The receiver's built in clock is not as accurate as the atomic clocks on board the satellites. Therefore there is always a slight timing error within the system.

Receiver Microprocessor: The quality of the microprocessor and related circuitry used in the receiver can affect the accuracy of its calculation.

External Factors

Line of Sight: The more satellites a GPS receiver can "see", the better the accuracy. Signal blockage or reflection (aka multipath) from physical obstacles like dense foliage and mountains can reduce the accuracy, so does signal distortion due to atmospheric disturbances.

Satellite Position in the Sky: The relative position of the satellites to the GPS receiver can affect the accuracy; the more disperse the satellites from one another, the better the accuracy.

Ephemeris Error: The satellites transmit signal continuously but some sets of data (called ephemeris data) are only updated by the satellites once every 2 hours or so. This causes some difference between the expected and actual orbital position of a satellite which affects the accuracy.

GPS accuracy can also be degraded by Selective Availability – a technological method used by the US government to intentionally degrade GPS accuracy for national security reasons. However it has been discontinued since 1996.

Fortunately all these errors even when added up will not drastically affect the GPS accuracy. New technologies like Differential Global Positioning System (DGPS) and Wide Area Augmentation System (WAGS) can also significantly reduce these errors. DGPS relies on secondary signals transmitted from ground base reference stations while WAGS relies on secondary signals transmitted from ground base reference stations and additional geostationary satellites to correct for GPS error. However we will not cover these two technologies in detail here for WAGS is only supported within the US while cell phone and consumer GPS units (like Garmin etc.) cannot receive DGPS signals unless they are equipped with some special and expensive DGPS adaptors.

The Garmin website lists the accuracy of GPS system as such:

100 m: Accuracy of the original GPS system, which was subject to accuracy degradation under the government-imposed Selective Availability (SA) program.

15 m: Typical GPS position accuracy without SA. (Very good enough for trekking purposes)

3-5 m: Typical differential GPS (DGPS) position accuracy.

< 3 m: Typical WAAS position accuracy.

The widely used GPS system is not the only global navigation satellite system in the world. There is also the Russian owned and operated GLONASS (Globalnaya Navigatsionnaya Sputnikovaya Sistema) whose performance is on par with GPS and is available for public use as well. Some GPS receivers make use of both systems to improve their positioning accuracy.

Size

The unit should be compact and light enough to be carry around.

Screen and Display

Color or Monochrome Display: Nowadays all new handheld GPS units come with color displays (with the exception of Garmin eTrex 10 which only comes with monochrome display). Monochrome display units are cheaper, better battery savers and easy to read in any lighting conditions but provide a less intuitive display of information.

Display Resolution (in pixels): Display resolution is quoted as width x height with the units in pixels: for example "160 × 240" means the width is 160 pixels and the height is 240 pixels. A higher resolution (more pixels) will allow you to see maps in finer details.

Screen Size (in inches): Screen size is based on the diagonal measurement of a screen. You should look for a screen size of at least 2”. Reading will be very difficult for screen size smaller than 2”.

Screen Sensitivity: Some screens take a longer time to refresh or load new pages than others. There is no specification for screen sensitivity, you would have to try it out yourself.

LCD Technology: Nowadays all new handheld GPS units are built with transflective display. A transflective display is a hybrid of both transmission and reflective display technologies, by switching between these two modes depending on the environment it provides good readability regardless of the lighting conditions.

Button or Touchscreen: Buttoned units are less energy intensive, do not freeze up in cold weather and can be used even with thick gloves while touchscreen units usually provide more intuitive menu display and faster typing operation. Touchscreen technologies used in handheld GPS can be either capacitive or resistive based. Capacitive touchscreens are more sensitive and accurate but unlike resistive touchscreens will not work with ordinary gloves unless the gloves come with conductive fibers (so called “touchscreen gloves) at the finger tips area.

Display Flexibility: Other factors to look into are: brightness adjustment (maximum brightness possible), customized menu, dual orientation display (portrait or landscape) etc.

Waterproof and Impact Resistance

The internationally recognized Ingress Protection (IP) rating of an electronic gadget tells us the waterproof capability of the gadget. Most handheld GPS units are IPX7 rated which translates to splash proof and an ability to withstand incidental exposure to water of up to 1 meter for up to 30 minutes. Some units are rated only to IPX6 (is splash proof but does not offer any immersion capability) but are considered good for outdoor use. Impact resistance specification is usually not indicated for handheld GPS units though most units' housings come with some level of ruggedization for impact protection.

Battery Life

The battery life of the unit should be at least 10 hours so that you do not have to replace the batteries very often. Most units use readily available AA batteries while others also support rechargeable nickel metal hydride (NiMH) batteries. For disposable batteries, try to get lithium rather than alkaline batteries as they last much longer especially in cold weather. For rechargeable batteries, you should get one that is rated 2500mAh or higher. You can conserve battery by adjusting the screen brightness to a lower level, setting a faster screen timeout period and turning off the unit when you are in a non-GPS workable condition like under dense foliage or in a deep canyon where the signals are negligibly weak. GPS works harder and drains more battery when it is searching for signals.

Memory

Most handheld GPS units come with internal memory (range from 750MB to a few GB) while some use external memory (usually microSD card), while others use a combination of the two for storage of map, waypoints, routes and tracking data. Take note that some lower end GPS units have negligible internal memories and do use any external memories; such units only allow you to use their built-in base maps and do not allow any downloading of maps from external sources. An internal memory of 1GB is actually sufficient for most users unless you need to store many maps or you are using a unit with camera function and you need space to store your photographs.

Compass

Two types of compasses are used in GPS units; the differential compass and electronic compass. A differential compass compares the GPS coordinates of its current and previous locations and assumes that it has travelled a straight line between these two locations to calculate the bearing (or travel direction). An electronic compass determines the bearing by measuring the earth's magnetic flux orientation. Due to its operating principle, a differential compass will not work if the user is stationary (or slow moving) or if GPS signal is absent. However its accuracy can be close to that of a magnetic compass if the user is moving constantly under good GPS signal coverage. A differential compass is usually found in lower end or older model GPS units. A magnetic compass is able to determine the bearing even when stationary or out of sight of the satellites. However it requires recalibration before use (easily done by slowly rotating the unit in circles as instructed by its display) and is susceptible to stray magnetic fields from nearby metallic or electronic objects. The more expensive GPS units come with tri-axial (aka 3 axis) electronic compasses which allow you to use the compass in any device orientation. Single axis electronic compasses only work when the device is held flat on a horizontal plane parallel to the ground.

Altimeter

All GPS units are able to provide altitude measurement and they do so via two different methods. Lower end GPS units calculate altitude values based on the GPS coordinates and a reference value called the 'reference ellipsoid'. The reference ellipsoid is simply a model map of sea level on earth. The reference ellipsoid does not always match every point on the real sea level, just as any model is a simplified representation of the real world. It is not uncommon for altitude values derived from this method to deviate from the actual values by a few hundred feet. Mid

and high end GPS units usually come with built-in barometers which derive altitude values directly from atmospheric pressure measurement. Built-in barometers can provide a very accurate altitude measurement if it is well recalibrated before used (this requires you to know the actual air pressure of your starting point).

GPS Maps

There are two types of maps for GPS unit; basemaps and detail maps. Basemaps, as the name suggests, are the most basic maps which are usually pre-installed in the unit by the manufacturer when you buy it. Detail maps are aftermarket maps which you buy from the GPS unit manufacturers or download free online from mapping interest groups like malfreemaps.com, openstreetmap.org etc. A basemap covers a large area (as big as worldwide) but with very little information, usually only major geographical features and main roads are shown. Detail maps covers a smaller area (the area of interest) and includes detailed information like minor roads, streams, campsites, contours etc. There are many types of detail maps for different types of users that range from motorists, and boaters to trekkers. For trekkers, you should be looking for topographical maps (short form topo maps), a type of map which show hydrography and vegetation features and represents relief (height of geographical features) using contour lines.

Difference between Waypoint, Trackpoint, Track, Route and POI

Waypoints are simply coordinate points (latitudes and longitudes) entered into the GPS unit by you. Waypoints are usually saved with names such as "check point 1", "turnaround point", etc.

Trackpoints are simply coordinate points recorded automatically (every few seconds) by the GPS unit as you trek.

Tracks consist of series of trackpoints that are recorded automatically by the GPS unit as you trek. On the GPS screen, a track will show up as a curvy line connecting various trackpoints on the map. Basically it tells you the actual route that you have taken during your trek.

Routes consist of a series of waypoints entered into the GPS unit by you to “tell” the GPS unit that you want to navigate from one point to the next. The GPS unit will tell you the bearing and distance to the next subsequent point as you navigate along the route.

POI (Point of Interest) are coordinate points of places of interest that might interest the user of the GPS unit. Unlike waypoints which are user created, POIs usually come together with the GPS unit (either built-in or as part of the map data). POIs usually show public locations like businesses, monuments, etc. and therefore are more of an interest to motorists than trekkers.

All waypoints, trackpoints, tracks and routes are stored in the memory of the GPS unit, usually of the data format GPX (as opposed to maps which are stored in a different data format). GPX (GPS eXchange Format) is one of the standard formats for creating, importing and exporting GPS data between programs and for sharing GPS data with other users. The great thing about GPX format is that it is an open source and versatile format which can be read and/or written by different bands of GPS loaded with different maps. There are also many free online conversion programs (e.g. www.gpsbabel, gpsvisualizer.com) which you use to convert GPX to other data formats and vice versa. Most, if not all handheld GPS units only allow waypoints, trackpoints, tracks and routes to be stored in the internal memory. External memory are for maps only. There is usually a limited number of waypoints, trackpoints, tracks and routes that can be stored in the unit. For example Garmin eTrex 20x has a memory limitation of 2000 waypoints, 200 routes and 2000 tracks (or 10,000 trackpoints). Therefore it is a good idea to clear or saved your old GPS data before hitting the trail again.

Downloading Detail Maps and Routes from External Source

Basemaps on their own are not very useful as they contain very little detail so trekkers will have to install some detail maps in their GPS units. As mentioned before, detail maps can be purchased from the GPS unit manufacturers or downloaded free online from mapping interest groups like malfreemaps.com, openstreetmap.org etc. Detail maps

sold by manufacturers (so called commercial maps) are usually of good quality and accuracy as they invest a lot of money into getting proprietary mapping data. However, commercial maps can be quite costly and are of proprietary file formats (like .img for Garmin and .imi for Magellan) which are usually non-transferrable and non-sharable between different GPS units especially if the units are of different brands. Detail maps from mapping interest groups are created and updated by volunteers who get their mapping data from publicly available sources like U.S. Geological Survey, Ordnance Survey etc. They are usually free but quality might vary from map to map. The file formats of these free maps can be either img, imi or something else depending on their targeted users. The creators of these free maps actually use third party mapping software to reverse-engineer the proprietary file format in case you wonder how these interest groups are able to create maps with proprietary file format.

How About Using Your Phone as a GPS Device?

Many people have the misconception that a cellular network or WIFI connection is needed in order for a cell phone-based GPS to work. Most phones nowadays come with built-in GPS chips which enable the phones to receive GPS signals directly from the satellites even in the absence of a cellular network or WIFI connection. The GPS chips used in mainstream brands of phones are usually of comparable quality and accuracy to that used in dedicated GPS units. However to use your phone as a navigation unit, you need to install a GPS navigation App from either Google Play (for Android phone) or iTunes Store (for Apple phone). You would also need to pre-download mapping or routing content to your App in order to show your location on a map.

If GPS signal reception and accuracy are not a concern, why are trekkers still spending hundreds of dollars to buy dedicated GPS units? I would say it all boils down to personal preference. Below are some factors to consider when deciding whether to use a phone-based GPS or dedicated GPS unit.

Cons of phone-based GPS:

- Unlike dedicated GPS units, most phones are not built to be waterproof (though we are starting to see IP6X phones on the market) or impact proof. You would have to keep the phone in a protective casing to protect it from the elements.

- Dedicated GPS units have a more reliable and predicable battery life than phone-based GPS units. Nevertheless, it is also technically possible for phone-based GPS unit to run for a few days without a recharge but that would require you to use it in the most prudent way; switching off all mobile data or switching it to airplane mode (in some phones, GPS will be disabled in airplane mode), closing all apps except the navigation app, disabling tracking mode in the app, setting to the lowest possible screen brightness etc. Extra battery banks can be used for power backup.

- A phone can be a life saver in times of emergency, you risk damaging it or draining its battery when you use it for navigation purposes.

Pros of phone-based GPS:

- Due to the hassle-free operating nature of apps and the popularity of GPS navigation apps, it is much easier to find and download maps and share routes via the apps system than to find and download them from manufacturers' websites or mapping interest groups.

- Dedicated GPS units usually have smaller screens with lower resolutions compared to phones.

- In the presence of a cellular network or WIFI connection (which not possible in the wild), a phone-based GPS unit is able to make use of Assisted GPS (A-GPS) to get a fix on its location much faster than a dedicated GPS unit.

What is Assisted GPS?

Unlike dedicated GPS units which can only rely on GPS satellites' signal, a phone-based GPS unit is able to use both GPS satellites' signals and cellular network signals for position determination. A-GPS enhances the performance of phone-based GPS unit connected to the cellular network in two ways:

By helping to obtain a faster "time to first fix" (TTFF). When a GPS is first switched on, it needs to acquire orbital information from satellites to calculate its current position. The data rate of the satellite signals is pretty low so downloading orbital information directly from the satellites typically takes a long time. Instead of trying to contact the satellites directly, A-GPS obtains the satellites' orbital information indirectly from telco cellular network towers. There are GPS receivers onboard network towers which continuously pull orbital information from GPS satellites. Orbital information is readily available and can be downloaded at a faster speed from network towers than directly from GPS satellites.

By helping to position a phone when GPS signals are weak or not available (satellite signals may be impeded by obstacles like thick clouds and tall buildings).

Walkie-talkie

Walkie-talkies allow trekkers to maintain communication with one another in the absence of a mobile network in the wilderness. Unlike cellular phones which require telecommunication infrastructure like radio towers to transmit and receive signals between phones, a walkie-talkie is point to point communication; the transmitter and receiver in a walkie-talkie can communicate directly with the receiver and transmitter of another walkie-talkie without any intermediary infrastructure. Another key difference is that cellular communication is a full duplex system while walkie-talkie communication is a half-duplex system, it means two people using phones can speak to each other at the same time while in the case of walkie-talkies only one of the two people can speak at any one time.

The radio frequency spectrum is divided into frequency bands allocated to various communication services such as cellular, aviation, meteorology, satellite etc. Each country allocates a certain band of frequencies to walkie-talkie communication. This frequency band allocation is usually controlled by a government agency. For example, the Info-communications Media Development Authority of Singapore (the government agency responsible for regulating the infocomn sector in Singapore) has allocated the 446.0–446.1 MHz frequency band for noncommercial low-powered walkie-talkies. These are also known as non-licensed walkie-talkies as you do not need a license to own or operate them. The communication range of these walkie-talkie is usually around 8-10km which is more than enough for most trekking activities. Some popular brands are Motorola, Uniden, and Thomson etc.

As radio spectrum allocation varies around the world, walkie-talkies bought and used in your own countries might not be legally usable in other countries as the frequency emission from the walkie-talkies might cause interference to other services that utilize the same frequency range. Do check that out before bringing your walkie-talkies for overseas use. Some apps allow phones to act as walkie-talkies, however these are not real walkie-talkies as they still rely on cellular network or Wi-Fi for communication.

Insurance for Your Trek

Trekking carries a higher level of inherent risk than your usual sightseeing trips, it is prudent to procure suitable travel insurance before you venture out. In the past, travel insurance companies tended to consider trekking as an adventure sport and excluded it from their coverage. With the increased popularity of trekking, many insurance companies have included coverage on trekking albeit with certain conditions.

There is usually an exclusion on certain height limits which varies with different insurers. *For example AXA SmartTraveller excludes trekking above 3,500m while MSIG Travel Insurance excludes trekking above 3,000m. Insurers also invariably stipulate that the activities must be provided by licensed tour operators or under the supervision of a qualified guide. It is important to check the policy coverage and scrutinize the terms and conditions and fine print before purchasing. Policy coverage may change with time so it is good to recheck it again even if you always subscribe the same travel insurance plan.

An example of an exclusion paragraph extracted from AIG Travel Guard Policy (dated Feb 2017):

GENERAL EXCLUSIONS

This policy will not cover for any loss, Injury, damage or legal liability arising directly or indirectly from:

trekking (including mountain trekking) above 3,000 meters, save that exclusions (m) and (n) shall not apply to organized harnessed outdoor rock climbing, harnessed abseiling and trekking (including mountain trekking) that are: - available to the general public without restriction (other than general health and fitness warnings); and - provided by a recognized commercial local tour operator or activity provider; and - provided that You are acting under the guidance and supervision of qualified guides and/or instructors of the tour operator or activity provider and you wear the recommended safety equipment and follow the safety procedures, rules and regulations of the qualified guides and/or instructors; and - the activity takes place below 6,000 meters.

A policy that provides unlimited emergency medical evacuation is highly preferable especially if your trekking destination is hundreds of miles away from the nearest medical center.

**Information is correct as at Feb 2017. Please refer to the insurers' websites for latest update.*

Training for Your Trek

Trekking is a physical activity (it is a sport) that utilizes all parts of your body. Other than walking long distance on foot, there are occasions where you need to climb up elevations, scramble on fours, bend your body to maneuver through obstacles, wade across streams, balance yourself over uneven terrain, etc. Such taxing requirements on the body call for a multidisciplinary approach to training. There are three main kinds of training each targeting different but complementary aspects of fitness; Aerobic training for Endurance, Anaerobic training for strength and Core training for Stability and Balance.

Aerobic exercise also known as cardio exercise to work out your cardiovascular and respiratory systems by getting your heart pumping faster and making you breathe harder. Good aerobic endurance will allow you to keep up with long distance trekking without feeling exhausted. Examples of aerobic exercises are running, cycling and swimming. A typical training session can be a 5km run, a 1km swim or a 20 km cycle – at an average pace.

Unlike aerobic exercise which builds up endurance, anaerobic exercise builds up strength, speed and power. Good anaerobic strength will allow you to overcome a steep section of trail easier. Aerobic means "with oxygen," as it requires the presence of oxygen to burn calories to produce energy while anaerobic means "without oxygen" as it does not require the presence of oxygen to burn calories to produce energy. Aerobic exercises involve low to moderate intensity activities performed over longer period of times while anaerobic exercises involve high intensity activities performed over a shorter period of time. In fact any aerobic exercise done at a high enough intensity can develop into anaerobic. Examples of aerobic exercises are stair climbing, sprinting and rope skipping. A typical training session can be a climb up a flight of 50 stairs. Instead of taking the lift down, you should also walk down the stairs. Walking down the stairs activates and stretches certain muscle groups and conditions the muscles to take in micro-shocks created during the landing of the feet.

The core is a complex group of muscles predominantly located within the torso and excluding the upper and lower limbs. They include the rectus abdominal muscles (aka abs), transverse abdominal muscles (aka TVA), scapula muscles, multifidus muscles (spinal column), pelvic floor muscles, gluteal muscles (hip), etc. Many of these core muscles are hidden beneath exterior musculatures (for example abs and chest) which people typically train. Unlike exterior musculatures like biceps, triceps, quadriceps and calf muscles which act mainly as prime movers, the core muscles stabilize the spine and help initiate and transfer force from one area of the body to another. Core exercises strengthen your core muscles and help to improve your stability and balance and prevent injuries during trekking. The great thing about core exercises is that you can do them indoors with just a floor mat and nothing else. Some examples of core exercises are plank, bridge, superman, leg raises etc. A typical training session can be a few sets of exercise repeated over a 20 minutes period.

Warming up and stretching should also be a key part of your exercise regime. Warming up increases your body core temperature, loosens your muscles, increases your heart beat and respiratory rate; all of which help to properly prepare your body for exercise. A simple warm up can be a 3-5 min of light aerobic exercises like jumping jacks or jogging on the spot. Stretching helps to increase flexibility, improves the range of motion of your joints and decreases your risk of injury. Other than the usual in-situ stretching, you can also go for a more formal stretching regime like yoga or Pilates which also helps in core muscle build-up.

You should start your training regime at least 4-6 weeks prior to your trek and earlier if you are unaccustomed to exercise or if you are going for a more rigorous trek. As a general guideline, you can start off with a low frequency of 2 sessions per week and progressively increase to 6-8 sessions per week with each session lasting for at least 30 minutes. To achieve the optimal effect, each session can be a combination of aerobic and anaerobic exercises or aerobic and core exercises.