

Pre-Hospital Burn Care Information Pack

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Facts about Burns

Every seventeen seconds someone suffers a burn injury. Many of these burn injuries are minor in both depth and size. They may result from brief contact with a small and low temperature heat source, but dependant on age, these minor burns have serious consequences for the patient. For example, the very young and the elderly.

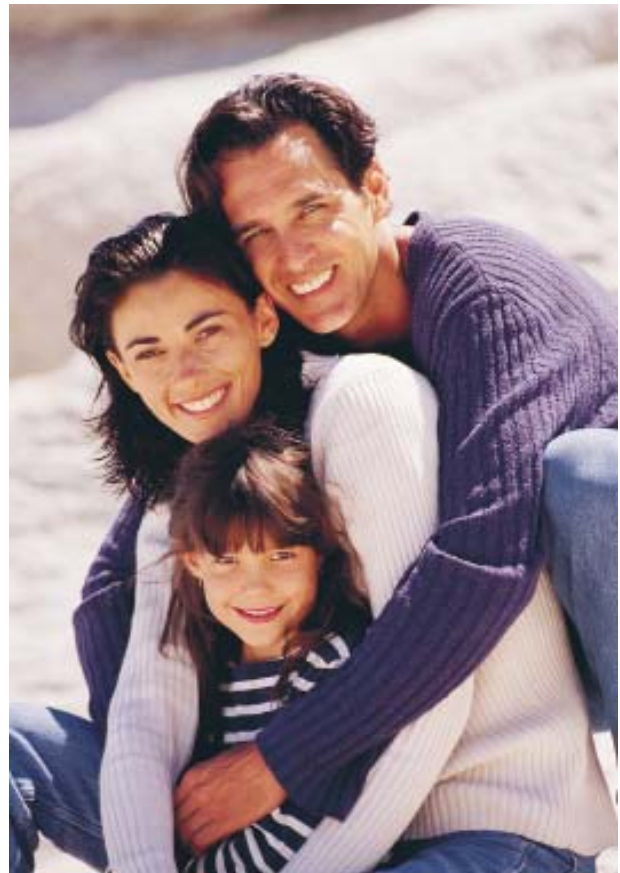
A large percentage of burn injuries both minor and serious occur in the home, where 80% of the victims are children, burns are the primary cause of death with children in the 1 – 14 age group. There are two other categories of concern in the home environment, namely the elderly, and the disabled. The work place represents the next largest area with potential for serious burn injuries. It is worth noting that line workers and electricians are particularly prone to serious burn injuries as they work daily in the environs of domestic and industrial electricity.

Other areas of concern are general industry, the motor trade, the chemical and refinery industry, and last but certainly not least the catering industry.

Burn injuries should be cooled immediately, otherwise the heat will continue to destroy the surrounding and underlying tissue, and may progress a partial thickness (2nd degree) burn into a full thickness (3rd degree) burn injury. This in turn will present with serious consequences for the patient and considerable extra cost for the receiving hospital / burns unit.

A useful guide as to the extent of a burn injury is to compare the area of the burn against the size of the patients extended hand, this equals approximately 1% of the Total Body Surface Area (TBSA).

Blisters are always an indication that the body is seriously not happy with the heat it has absorbed. If the blisters rise immediately it is almost certain that the burns are partial thickness (2nd degree) and if they take a longer time to appear, say one to two hours or more, the burns are more than likely superficial (1st degree). All blisters should be seen by a doctor, and preferably not de-roofed before attending the doctor.



High Risk Categories for Burns

Careless smoking with alcohol or drug intoxication
Children
The Elderly
The Disabled

0-4 yrs.	Scalds (spills or bath related), residential fires, household chemicals, household electrical injuries (cord bites)
5-15 yrs.	Residential fires, risk taking behaviours (fireworks, firesetting etc.)
15-24 yrs.	Automobile related, work related
25-64 yrs.	Work related, industrial burns, hot liquids, chemicals etc.
>65 yrs.	Scalds, careless smoking, cooking, accidents.

Classification of Burns depth

Superficial (1st Degree)

Minor epithelial damage of the epidermis

Red

Tender

Dry

No Blisters

Example: Sunburn

Heal in 3 - 6 days

AGE IS VERY IMPORTANT (VERY YOUNG / OLD)



Superficial

Superficial Partial Thickness (2nd Degree)

Involves epidermis and superficial (papillary) dermis

Thin walled, fluid filled blisters

Pink

Moist

Blanche with pressure

Extremely tender to touch

Heal in 2 - 3 weeks, usually without scarring



Partial Thickness

Deep Partial Thickness (2nd Degree)

Extends into reticular dermis

Blisters are thick walled and sometimes ruptured

Color is mixed red and white

Sensate when pressure is applied

Heal in 3 - 6 weeks, with potential for scarring,

may require skin graft

Contractions are common sequelae

Full Thickness (3rd Degree)

Destruction of both epidermis and dermis

White leatherly and charred

Dry

Insensate

Will require hospitalization and skin graft

Heal in month to years depending on age



Full Thickness

Adult burn patients with burns to their body in excess of 10% TBSA will more than likely be admitted to the hospital for further treatment. The exception to this percentage rule is children if the area of burn is in excess of 5% TBSA. As the complications presented by children are considerable.

All burns to the face/head, hands, feet, flexion points, and the groin area (perineum), are considered serious burns and will require hospitalisation and possible referral to a burns unit.

Carbon monoxide inhalation injury is the silent killer, you cannot see it, smell it, or taste it, these injuries account for 80% of all deaths at the scene of a fire, all suspected inhalation injuries should attend the hospital trauma room as soon as possible.

Electrical injuries are extremely damaging to the human body, depending on the source of power, either single phase or three phase, as in AC (alternating current) or if it is DC (direct current), serious cardiac complications could be presented in the form of VF / AF (ventricular / atrial fibrillation) or asystole. Added to this, the concern for involuntary tetanic spasm (>1000 volts) resulting in broken bones and dislocations, diaphragmatic tetany, and hypoxia. The entry and exit wounds will be insensate and full thickness. **Spinal immobilisation should always be considered with electrical injuries.**

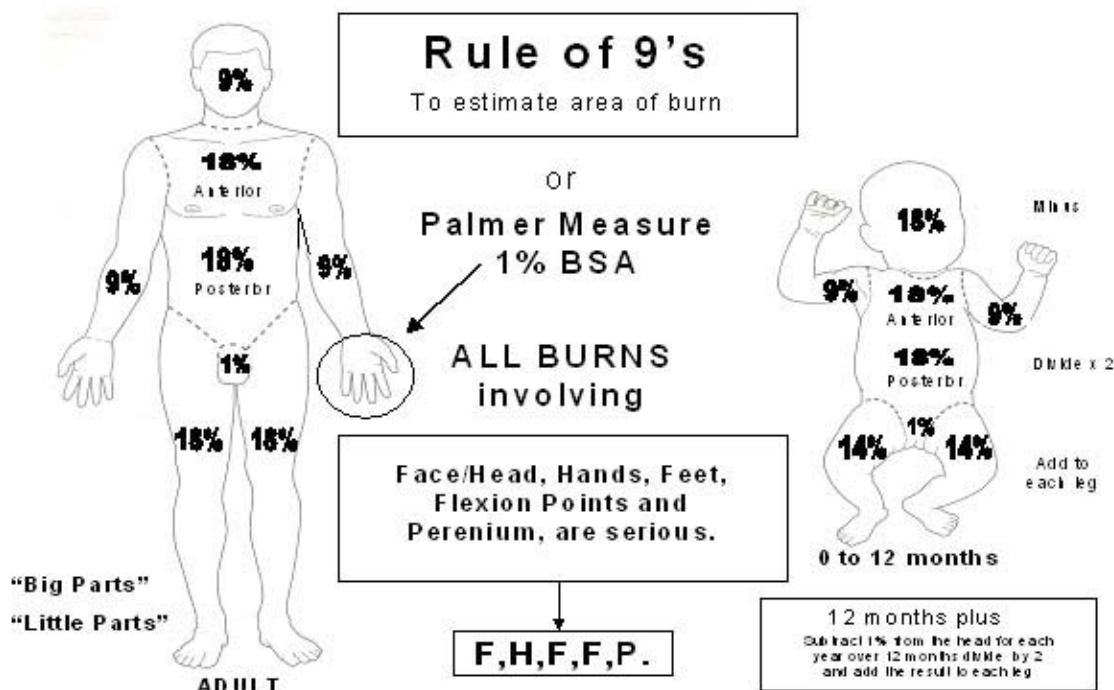
Chemical burns are as a result of a tissue reaction to noxious substances and is dependant on the

concentration and quality of the agent, the duration of the exposure and the mechanism of the chemical action. Chemicals will continue to damage the skin until they have been neutralised. Irrigation with a copious amount of gently flowing water is recommended in the Pre-Hospital setting for all liquid chemicals and all powder chemicals should be brushed off site, it is very important to note that all chemical must be removed from the injury before any static dressing is put in place or dermal necrosis will continue to occur.

In the Pre-Hospital setting burn dimensions are usually measured by using the rule of nine's, and the palmer measure. The body is broken up into dimensions of 9%, the adult head, and the left and right arms will equate to 9% each (little parts), whereas the anterior trunk, posterior trunk, the left and right leg will each measure 18% (big parts), the groin will measure 1% (this groin measurement is common to all age groups).

The palmer measure is used where random burns are presented, for example your patient has random splash burns on their body, these can be measured against the size of your patients extended hand which equals approximately 1% TBSA, and added up to give you an overall %.

Children are measured differently, 0 to 12 months the head equates to 18% and the legs measure approximately 14% each, for each year over 12 months 1% is subtracted from the head and then divided by two and the result is added to each leg until proportion is achieved. All other area measurements are the same as those of an adults.



The different Causes of Burns

There are five categories of burns:

- Thermal Dry: Flames, Radiant heat, Explosion
- Thermal Wet: Hot liquids, Steam. (+4k)
- Chemical liquid: Acid, Alkali, Organic compounds
- Chemical Dry: Powder, i.e. Cement / Lime etc.
- Mechanical: Friction, Explosion. (+ Blunt trauma)
- Raditation . Sunburn, Radar, Ionising
- Cryogenics : *Cold Burns*

ALL BURNS are TIME CRITICAL !

The leading causes of trauma death in order:

1. Road Traffic Accidents (RTA)
2. Penetrating Trauma (Burns are no. 2 with children)
3. Falls
4. Burns
5. In the home burns are the primary causes with children in the 1- 14 age group

The categories as indicated above have a few points of note, **explosion** appears in the category of thermal dry and mechanical. The reason for this is that when an explosion takes place, not alone do we have the extreme radiant heat, we also have a sheer factor as the blast wave tears tissue from the body as it goes past it (mechanical). Blunt trauma has also to be considered as the kinematics indicate possible dissociation of internal organs.

In the category of thermal wet, it is important to note that steam is mentioned. Steam has the capacity to carry 4000 times more heat than dry air and has the potential to burn the upper and lower airways down to the alveolar sacs.

Cold burns are a distant relation of this group and are shown only for convenience as they also fall into the general classification of burns.

With burn injuries, do not remove any foreign objects adhering to the burn site. If there is a concern that any watches, jewellery, clothing etc may cause restriction, release the tension by opening the watch strap, jewellery clasp, or cutting the clothing at an accessible point. To allow oedema to take place and circulation to continue to the distal sites.

Thermal wet burns are caused by hot liquids such as boiling water, tea, coffee, chip pan oil etc. If the clothing is saturated with a hot liquid it is important to remove them as soon as possible (not over the head). After they have been cooled by gently flowing water or the use of a Water Jel blanket. Use a tough shears and if circumstance allow cut the clothing in such a way as to allow removal away from the body.

Tar / asphalt burns to the face are very difficult to manage, the Water Jel face mask has proven very successful world wide. As it has the capacity to absorb in excess of 1000°C and in the process it turns the tar / asphalt solid and can be removed from the face with ease. It has the capacity to absorb very high temperatures it will not dry out.

Chemical burns are the anomaly as the chemical and any chemical saturated clothing will need to be completely removed from the patient before any other management takes place. If it is **liquid chemical** it must be **fully irrigated** off site and if it is **powder chemical** it needs to be **brushed off** site (time for irrigation and brushing will be decided by local protocol). Do not enter a chemical incident unless the scene is safe and you are wearing the proper personal protective equipment (PPE).

Mechanical / friction burn. These burns are usually caused by the skin moving at speed in the opposite direction to a static surface. For example sliding down a rope or a motor cyclist sliding along the road after falling off his motorbike. A considerable amount of heat is generated even though it may look like a blood injury.

Electrical burns can be described as falling into three general categories, True electrical injury, electric arc burn and electric thermal burn. As explained earlier the sources of electricity are two. Alternating current (single phase and three phase) and direct current (lightning, defibrillators, batteries etc).

True electrical is where the electricity enters into the body of the patient presenting upon entry and exit wounds (both insensate), it will travel the route of least resistance through the body usually along the nerves and blood vessels. The injury will present itself with the classical "iceberg syndrome". Small visible wound with considerable damage to the underlying tissue. Note, if the current flows through the heart, brain, or visceral organs, significant damage may be done. If the electrical pathway is parallel to the body. Approximately 10% of the current will pass through these vital structures. Whereas only 3% will pass through if the flow is perpendicular to the body.

Arc burns. The patient is not in actual contact with the electricity. They usually occupy a space where there is a differential electrical potential between the patient and the electrical source. These injuries are usually associated with high-tension current. The usual presentation is scattered spots of injury due to momentary contact as the current jumped to ground. Entry and exit wounds are rare. Extremely deep burns can occur if the arc is close to the body.

Thermal burns are caused by sparks or electrical arcing close to the patient causing the clothing to ignite. But this can occur in conjunction with a true electrical burn.

Fluid resuscitation requirements depend on the size and depth of the burn injury and are indirect measures of the severity of the burn injury. Note that the lungs are affected after a serious burn injury even if there is no evidence of inhalation injury.

Radiation burns

Sunburn is as a result of extended periods of exposure to UV rays of sunlight. Inhibition of DNA and RNA synthesis causes serious damage to skin cells leading to cell death. Damage to the dermis and other blood

vessels can also occur. Excessive exposure to the sun can lead to skin cancer. Natural skin pigment can never give complete protection from the sun.

Ionizing radiation is usually the result of an accident in a laboratory or as a result of radiation therapy, but more seriously from time to time there could be a very serious leakage of radiation due to the failure of a major producer, for example Chernobyl in Russia in 1986, or the detonation of a nuclear device.

Tissue damage is caused by the transference of radiant energy to the body which stimulates the formation of highly reactive chemical products such as free radicals. These chemical products combine with other normally produced body chemicals form cellular toxins that cause intracellular and molecular damage. The most susceptible cells are those that divide rapidly, skin, bone marrow, and the gastrointestinal (GI) tract.

Some of the symptoms of Acute Radiation Syndrome (ARS) are, nausea, vomiting, diarrhoea, fatigue, fever, and headache which begin within hours of exposure. This is followed by a latent period, the length of which is related to the exposure dose. This in turn is followed by hemopoietic and gastrointestinal complications. A significant dose of ionising radiation to the whole body would be in excess of 25 rads. A standard chest x-ray in the hospital exposes the patient to 30 millirads (30 / 1000 rad) of radiation.



Basic Principles for the Treatment of Burns

Pre-HOSPITAL Burn Management

4 primary requirements

Cool the Burn Site

Prevent further contamination

Keep vital fluids on site

Do not induce Hypothermia

Traditionally water has been the primary cooling medium, but a considerable quantity will be required to cool the burn site, eg. Approximately 120 litres of water will be required to cool a 2.5 % BSA partial thickness burn, eg. forearm, (Flowing tap water for a period of 15 to 20 mins).

Tap water is a contaminated medium, flowing through an unclean atmosphere onto a sterile burn site. Water can wash vital fluids off site, and may induce hypothermia, even @ 15 to 20 Degrees Celsius if available.

Tap water temperature is influenced by geographic location and change of season, ie. Alaska, Japan, UK, Russia, Spain, Norway etc. / Summer, Autumn, Winter etc.

Dependant on the burn temperature saline soak dressings will dry out in approximately 23 to 45 seconds and adhere to the burn site. It is likely that dry dressings, sheets etc., will also adhere to the burn site, extending the time required for wound exposure and debridement.

No Creams or Ointments !!

Risk groups for Hypothermia

Babies and Infants
Patients with extensive burns
Patients with Burns to the core area
Elderly patients
Patients with shock
Polytrauma patients

COOL THE BURN NOT THE PATIENT

After much investigation it seems that one of the main reasons for the presence of hypothermia in the Pre-Hospital setting presents itself before the EMS arrive on the scene.

When a person gets burned (especially a child) the immediate reaction is to immerse them in a bath or shower of cold water. As a result a large area of the patients body that is not burnt gets cooled also. This in turn quickly reduces their core body temperature.

Please remember that a child has a larger skin surface than that of an adult. Also the skin will be much thinner as it is not yet fully developed. A pre-cooling history will be very helpful to the receiving hospital trauma room.

Age is a critical factor with burns patients. The opposite end of the scale to children are those patients over 50 (fifty) years of age. The body is not re-generating as it used to and its ability to absorb the stress brought on by burns is decreased, resulting in injuries that are deeper and more complicated.

Pre-Cooling History

on arrival at scene establish

Age of patient are they very old or very young.

Are they conscious or unconscious.

Is the patient indoors or outdoors.

Are they in or out of the cooling medium.

Are their clothes on / off - wet or dry.

Were they / it immersed (bath) or flushed (shower) and for how long time (time of burn).

Approximate temperature of cooling medium.

Were they cooled immediately after the burn occurred (if not how much time elapsed).

Are the patients burns still uncomfortably hot.

Is the patient now cold or comfortably cool (no need to continue cooling).

Consider tympanic thermometry (if guided by local protocols).

Treatment of Burn Injuries with Water Jel®

For more than 25 years Water Jel Technologies Plc as the world market leader have been offering their tried and trusted Pre-Hospital burn care products for the Pre-Hospital treatment of burn injury victims.

Front line EMS, Burn care professionals, and burn victims alike have long benefited from this experience in every area of application for burn injuries, Water Jel has become a firm friend of the Emergency Medical Services, Fire Services, Sea Air Rescue, all areas of the Military Armed forces, Industry, Catering, Formula One, and motor racing world wide, for the management of burn injury victims.

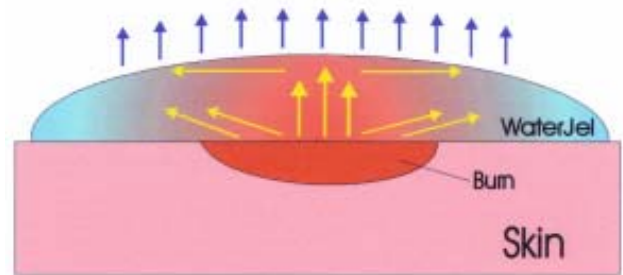
Water Jel is made up of 96% pure de-mineralised water, medical grade tea-tree oil. The addition of a special medical grade gel forming agent makes it possible to form a „viscous heat absorbing film of water“ on the burn injury site. The special gel has no active components, therefore is not classed as a pharmaceutical product, but a class IIb medical device.

Water Jel Technologies have an ongoing programme of advanced research and development which continues to cater to the developing requirements of Pre-Hospital burn injury concerns. Storage and shelf life are always a major factor in the Pre-Hospital setting and time is critical. To this end Water Jel dressings can be stored within a broad temperature spectrum of -5°C to $+35^{\circ}\text{C}$, as a result of this alone, Water Jel dressings do not need to be taken off the ambulances or helicopters and stored in a cool place, possibly in a separate storage place!

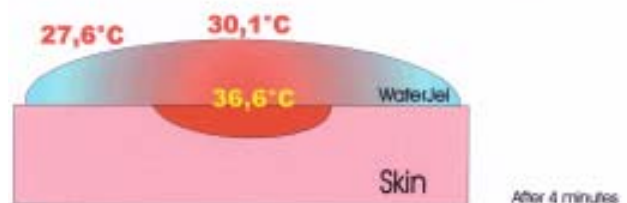
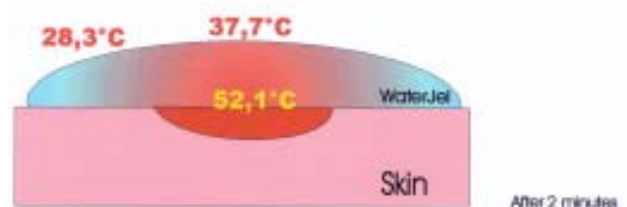
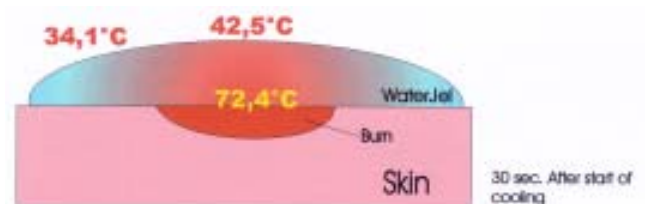
To further ease the use of Water Jel dressings, they have been awarded the maximum of 5 full years shelf life by the FDA.

Cooling by Heat Transfer

Unlike the traditional cooling by evaporation (application of water), which may lead to the onset of hypothermia, WaterJel employs the principle of Heat Transfer. This is the principle of cooling the burns by transferring the heat from the damaged skin tissue to the WaterJel medical grade gel, which is forming a viscous film of heat absorbing water over the burn injury. The heat of the burn injury is reduced quickly. This in turn will lead to considerable pain relief and a noticeable reduction of ongoing dermal necrosis (Tissue destruction).



In this gel layer a heat flow (convection) starts, the heat absorbed by the Water Jel (Water Jel has a capacity to absorb in excess of 1000°C) is spread over the total gel surface area and is then released by transfer into the air. The buffer effect of the gel layer leads to rapid heat transfer out of the burn injury without losing temperature around the area of usage. The risk of inducing hypothermia in both adults and children is greatly reduced.



What makes Water Jel® so special?

Water Jel consists of 96 % demineralised water in gel form. Another constituent is medical grade tea-tree oil as a bacteriostatic constituent to protect the wound against further contamination. The other constituents serve solely to provide the retention of effect and good storage life. Water Jel is a Class IIb medical device and naturally bears the required CE marking and number. As Water Jel is completely water soluble it supports the aims of the A+E departments and burn units for initial burn injury wash down procedures.

Why a unique Water Jel® Face Mask?

The head is the most important part of the body to save in the event of serious burns, the brain which is a fluid mass, when heated it has not got the space to expand, as it is inside the skull (a solid box).

The brain controls two primary involuntary functions, namely our diaphragm via the phrenic nerve for breathing, and our heart via the vagus nerve for circulation.

The head also contains the nasal and oral airways. Four of our five senses and our identity to the rest of the world.

For these reasons, Water Jel is the sole supplier worldwide of a unique specially dimensioned tear resistant face mask for the care of burns and scalds to the face and head.

The Water Jel Face Mask measures 30 x 40 cm, with pre-indented flaps for optimum access to the eyes and



nose as well as an „H“-shaped indented flap for oral access and airway management.

These special dimensions of the face mask ensure that the care of a facial burn extends as far as the ears as they are made of cartilage and can be seriously damaged by high temperatures. The Water Jel Face Mask also extends well over the chin, catering for potential burns to the neck. The Water Jel dressings are well saturated beyond their own capacity (13 times their own weight) in liquid gel. Thus allowing for management of the surrounding tissue that may have a burn injury in the lesser zones of stasis and hyperaemia. The gel is entirely harmless to the eyes and mucous membranes. Furthermore it is bacteriostatic, sterile and fully bio-degradable.

In combination with our 20 x 45 cm dressing, the Water Jel Face Mask will create a full helmet for the head of the burned patient.



A Few Words about Tee Tree Oil...

Tea-tree oil is an ancient Australian product which is also much in demand in the rest of the world as a natural healing agent. The Australian aborigines have known about the effects of tea-tree oil and put them to use for thousands of years. Only in the last century did our modern scientific world also devote attention to researching the oil. Today it is highly valued in many households worldwide as a versatile natural healing remedy.

Tea-tree oil is obtained from the leaves of the tea tree by steam distillation. The tea tree (*Melaleuca Alternifolia*), like the eucalyptus and myrtle, belongs to the myrtle family. The natural habitat of the tree which grows to six to seven metres tall is the unique natural landscape of the north-east coast of Australia.

A determinant factor in the amazing effects of tea-tree oil is the unique composition of its etheric substances. This is what determines the quality of the natural product. A balanced combination of the constituents allows for the synergy effects which make tea-tree oil capable of being used in the most widely differing areas of application. According to Australian Standards (AS), the recommended content of terpin-4 oil and cineol is defined as follows:

Terpin-4 oil over 30 %; cineol under 15 %. The quality is determined as early as during cultivation. Best quality derives from controlled biological growth. Without the use of insecticides or herbicides. A basic precondition for highly-effective tea-tree oil is the steam distillation process with its beneficial effects on the constituent substances.

The Use of Tee Tree Oil in Water Jel® Products...

The manufacture of our Water Jel burn wound treatment involves the exclusive use of what is referred to as medically pure tea-tree oil which is gently distilled several times in order to obtain a higher degree of purity. For the use of tea-tree oil in Water Jel, a low concentration in very high quality is selected which allows for optimum

degree of effect in the treatment of burns and scalds to be achieved. Any allergic reaction to the medical tea-tree oil which we use in our Water Jel is excluded. Because during the manufacture of our product it is always only a high-purity quality which is used in a low concentration.

Extract from the Study by North American Science Associates, Inc.:

„Water Jel burn wound compresses were examined in respect of allergic reaction and skin irritation, taking into account the American Guidelines of the Consumer Product Safety Commission. A 0.5 ml sample of the test product was applied to intact and excoriated skin and left for 24 hours. The test regions were examined after 24 and 72 hours for inflammation and oedema.

Under the conditions and rules for this test, Water Jel is categorised as harmless. The Primary Irritation Index has been calculated as 0.00.“

Water Jel® Burn Kits



The Water Jel Burn Kits are available in different sizes and contents for different purposes, e.g. the Water Jel Ambulance Burn Kit is designed for use on a ambulance or a rescue helicopter based on the rule of nines.

Water Jel Ambulance Burn Kit

Water Jel Fire Service Kit

Water Jel Industry Burn Kit

Water Jel Catering Burn Kit

Water Jel Burn Kit XS

Water Jel Standard Burn Kit

For Example:

Water Jel Ambulance Burn Kit

1 x P3630	Burn Wrap 91 x 76 cm
2 x 0818	Dressing 20 x 45 cm
2 x 0416	Dressing 10 x 40 cm
1 x 1216	Face Mask 30,5 x 40,5 cm
4 x WJSCB1	Conforming Bandage
1 x WJTS1	First-Aid Scissor
1 x WJCOVLG	Burn Kit Bag, large

Please ask your local dealer for a detailed content list of every Water Jel Burn Kit listed above.

Water Jel® Dressings



These sterile Water Jel Dressings are available in several different dimensions, in order to be able to cover the most widely differing sizes of burns:

Water Jel Dressing 05 x 15 cm

Water Jel Dressing 10 x 10 cm

Water Jel Dressing 10 x 40 cm

Water Jel Dressing 20 x 46 cm

Water Jel Face Mask 30 x 40 cm

Examples of Application:

Water Jel Dressing 05 x 15 cm:	Finger burn, Ear burn, Wrist burn
Water Jel Dressing 10 x 10 cm:	Hand burn, 1% BSA measure dressing
Water Jel Dressing 10 x 40 cm:	Full hand burn, Forearm burn, Shin burn, Foot burn, Neck burn
Water Jel Dressing 20 x 45 cm:	Head burn, Circumferential arm & leg burn, Thigh burn, Groin burn, Chest burn, Abdominal burn, back / buttocks burn, Leg burn
Water Jel Face Mask 30 x 40 cm:	Face, chest / abdominal region

Water Jel dressings can be used anywhere when a burn occurs and professional wound care is indicated.
(Please note separate recommendations for chemical burns!)

Water Jel® Blankets



The highly practical Water Jel rescue blankets are likewise available in different sizes to allow for use in the most varied of application situations. These can be used for patient care, personal care or even as fire extinguishing blankets.

For safe-keeping you can choose between the foil packing for space-saving storage or the robust transport canister with optional wall mounting.

Water Jel Burn Wrap 91 x 76 cm

Water Jel Fire Blanket 183 x 152 cm

Water Jel Heat Shield 244 x 183 cm

Examples of Application:

Water Jel Burn Wrap 91 x 76 cm:	Upper body of adult / whole body of a small child
Water Jel Fire Blanket 183 x 152 cm:	Whole body of adult
Water Jel Heat Shield 244 x 183 cm:	Whole body of adult +

In addition to this Water Jel blankets can be used to extinguish patients who are on fire and on small fires. They can also be applied to provide protection against high levels of temperature.

The above examples are only a small cross section of the uses for Water Jel Blankets.

Distribution Network

To improve availability and local consultancy, Water-Jel Europe LLP, as the European Distribution Centre for Water Jel Technologies LLC, have established a large number of different specialist dealers as contractual partners for Water Jel in Europe.

We will be happy to send you a list on request of the local dealers responsible for your area. We guarantee that all our contractual partners are always trained thoroughly and comprehensively by us and will support you with Water Jel in all your requirements for pre-clinical wound care.

We are confident that the strict selection procedure applied to our contractual partners will ensure a high and consistent standard of consultation and advice.

If you are looking for a dealer, write to us:



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