



PRINCIPLES & PRACTICES OF TRANSDERMAL MEDICINE

By Dr. Mark Sircus Ac., OMD

Transdermal medicine is ideal for pain management as well as sports and pediatric medicine. In fact it is one of the best ways of administering medicines quickly and effectively. Transdermal methods of delivery are widely used because they allow the absorption of medicine directly through the skin. Gels, emulsion creams, sprays and lip balm stick applicators are easy to use and are effective in getting medicine into the blood stream quickly.

“Transdermal medicine delivers medications to the exact site of injury/pain.”

Traditional methods of administering medicine such as tablets or capsules get watered down and become much less effective due to stomach acids and digestive enzymes, before they eventually get into the bloodstream. Bypassing the stomach and liver means a much greater percentage of the active ingredient goes straight into the bloodstream where it's needed. In many cases, transdermal methods are used to help avoid potential side effects such as stomach upset or drowsiness. The full potential for transdermal medicine has not been explored by modern medicine though it has been practiced for thousands of years in hot springs around the world.

The most common ways to administer drugs are oral (swallowing an aspirin tablet), intramuscular (getting a flu shot in an arm muscle), subcutaneous (injecting insulin just under the skin), intravenous (receiving chemotherapy through a vein), or transdermal (wearing a skin patch). It is not a surprise, when you consider the large surface area of the skin, that when you apply a substance to the entire body, rapid absorption and resultant effect is sufficient to put transdermal administration on par with other ways of administering drugs.

Transdermal medicine takes us back to medical basics, back to substances that cannot be patented, and cannot be sold for obscene profit. People who live near the sea where the water is clean and warm (not too many of us) have an advantage over the

rest because they have access to free and quite powerful transdermal medical treatments at the sea shore.

“Hidden in each cubic mile of ocean water is enough healing power to put the pharmaceutical companies out of business.”

That's right; at the beach you receive the full benefits of the sea with its high concentrations of magnesium in the water and iodine in the air, which is taken up by the lungs. It actually takes quite a bit of magnesium chloride flakes in a bath to bring bathwater up to the concentration of ocean water, but it is well worth the effort and expense for the health benefits are spectacular.



MAN BATHING IN THE DEAD SEA

Before her first trip to the Dead Sea, 40-year-old Rhonda Dupras didn't even own a pair of shorts. Suffering from severe psoriasis over her entire body, Dupras normally cloaked herself in long sleeves and long pants, hiding her red, flaky, scaly skin from curious stares and prying questions. But after three weeks of soaking up the Dead Sea and sunshine under a doctor's care at her health hotel in Israel, Dupras' skin was tanned, glowing, smooth and virtually clear of flakes and patches. She cried like a baby, she says, and promptly bought shorts to celebrate. "I ended up showing off my skin to everyone. I just couldn't help myself," she says. Her remission lasted four giddy months. She did not know that one can recreate the conditions of the Dead Sea in her own bathtub!

In fact, our ideal transdermal treatment includes the healing radiation of the sun with all the resultant increases in Vitamin D levels via the skin. This is transdermal medicine at its best and at its cheapest unless you have to fly yourself into the dream beach of your choice. Dermatologists have destroyed the image of healing at the beach because of the sun. They would have you do transdermal medicine practiced at its worst by having you apply toxic sun screens that block vitamin D formation while synthetic pharmaceutical chemical substances seep into the body. The sun is more important to health than we would suppose and is in reality one of the best anti cancer agents we have. The truth is exactly 180 degrees opposite to what the doctors would have us believe and that makes dermatologists into terrific liars.

Transdermal medicine is a versatile form of medicine everyone can use and benefit from. With transdermal medicine we can address systemic nutritional deficiencies, act to improve immune, hormonal and nervous systems, protect cells from oxidative damage, open up cell wall permeability, reduce the risk of cancers, shrink tumors and do just about anything else we do with oral and intravenous drugs. Now, imagine receiving your medical treatment

right in the comfort of your own home if you cannot get to the warm sea water.

“Transdermal is the ultimate way to replenish cellular magnesium levels. Every cell in the body bathes and feeds in it and even DHEA levels are increased naturally.”

- Dr. Norman Shealy

Transdermal magnesium therapy *is ideal for pain management*. The combination of heat and magnesium chloride increases circulation and waste removal. The therapeutic effect of magnesium baths is to draw inflammation out of the muscles and joints. Magnesium chloride, when applied directly to the skin is transdermally absorbed and has an almost immediate effect on pain.

“Medicines taken by oral means pass through the liver before they are absorbed into the bloodstream. Other forms of drug administration bypass the liver, entering the blood directly.”

What better way to reduce or eliminate pain than by simply taking a therapeutic bath or rubbing magnesium chloride substance in liquid form directly onto the skin or affected area of the body? From the pain of sports injuries to low back pain and sciatica, headaches, relief from kidney stones, the pain of restless legs, arthritic pain, and just about every painful condition imaginable will in all likely hood benefit from medicines applied topically.

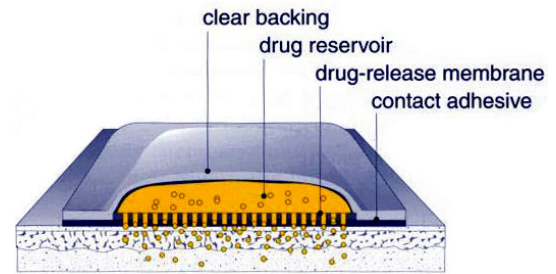


MAGNESIUM OIL CAN BE APPLIED TO INFLAMED AREAS

Transdermal magnesium therapy in particular offers an exciting breakthrough in sports medicine. Coaches can now treat injuries, prevent them, and increase athletic performance all at the same time. Transdermal magnesium chloride mineral therapy enhances recovery from athletic activity or injuries. It reduces pain and inflammation while propagating quicker regeneration of tissues. Topical application of magnesium chloride increases flexibility, which helps avoid injury. It also increases strength and endurance. Transdermal Magnesium Therapy is a boon for athletes, coaches and doctors who practice sports medicine.

The use of transdermal patches^[1] is fairly new. These patches (as shown) contain a drug reservoir that holds an opioid which is delivered through contact with the patients' skin. These can be helpful in delivering a more potent form of pain medication in a more controlled manner, outside of the hospital or to assist in

relieving pain post-operatively, and in post-radiation burns. (tissue burn patients).



When working with transdermal medicine in its more natural forms doctors have to send their patients home to execute the therapies as much as two or three times a day. The patient himself has to feel their way to appropriate doses under their physicians or other health care practitioner's guidance. Not everyone is the same and parents will naturally want to use transdermal magnesium and iodine treatments on their children. Transdermal is a preferred approach for children and young infants.

The value of the transdermal route of drug administration proves itself in the new technology being developed to administer even large molecules like insulin thru the skin. Previously this was not possible as the insulin molecule was too large to pass into the pores of the stratum corneum. Researchers have explored a variety of methods to penetrate this skin barrier - ranging from chemicals to lasers, microneedles^[ii], thermal/electrical energy^[iii], and ultrasound^[iv]. Most methods work by enlarging the pores to a size that would accept these large molecules.

Transdermal delivery of medicines is generally considered safer, more efficient, more convenient and less painful than injections or IV's.

ABSORPTION

Medicines can enter the body in many different ways, and they are absorbed when they travel from the site of administration into the body's circulation. **A drug faces its biggest hurdles during absorption.** Medicines taken by mouth are shuttled via a special blood vessel leading from the digestive tract to the liver, where a large amount may be destroyed by metabolic enzymes in the so-called "first-pass effect." Other routes of drug administration bypass the liver, entering the bloodstream directly or via the skin or lungs.

“Human skin is like a tightly woven fabric, seemingly impervious but porous at the microscopic level. Through its millions of tiny openings, the body oozes sweat and absorbs some substances applied to the skin.”

For a topical agent to be effective obviously it must first be absorbed. The drug must enter in adequate concentration to its proposed site of action to produce the desired response of the skin. This skin is involved in dynamic exchange between the internal and external environments through respiration, absorption and elimination. It is highly permeable even though it has the

ability to maintain its important bacteria-inhibiting barrier with the environment.

“Individuals vary in the amount of medication they absorb through the skin.”

In transdermal medicine substances are applied to the skin's surface and then diffuse out of its vehicle into the stratum corneum. In the stratum corneum they build a reservoir and diffuse through the stratum spinosum. At this point, they can be metabolized and bind to receptors thus exerting their effects. Finally, whatever healing or medical substance is applied is delivered into subcutaneous fat, the circulatory system and achieves systemic absorption.

“Yesterday I witnessed one of the most amazing benefits of transdermal medicine I have ever seen. It certainly was a demonstration of the absorption properties of the skin. I work with another RN who is afflicted with arthritis, especially in her hands, and frequent muscle cramping/spasms in her legs. Yesterday I received a phone call from her begging me to please bring to the hospital some magnesium oil, as her hands were so cramped up and painful that she could barely stand to continue working. When I got there, her hands and fingers were very contorted in spasm. Her fingers were curled up and stiff and her legs were cramping badly. She reported they had been this way all day, and the pain was driving her to tears. She immediately slathered the magnesium oil all over her hands. We were in report and she wanted it on her hands right away so the entire nursing staff watched and within 5 minutes you could visibly see her fingers extend back to normal and the finger movement return. We could literally see the relaxation taking place. Within minutes her hands were completely relaxed and functional again and stayed that way the remainder of the evening.”

-Claudia French, RN

The concentration of the applied dose, the surface area of the body, and the elapsed time the element is on the skin are the main considerations affecting absorption. As the concentration of a drug is increased, the total amount absorbed into the skin and body also increases. Increasing the surface area of the applied dose also increases penetration.

Penetration occurs over time. The longer the substance is on the skin, the greater the chance for continued penetration. The total amount of a drug absorbed during a 24-hour period may be different for a single application as opposed to the same amount applied in divided doses. In other words, applying a medicine once a day in the morning delivers a different concentration as opposed to applying a medicine 3 times a day 8 hours apart.

Herbal poultices, therapeutic baths, steam and dry saunas, transdermal patches, transdermal magnesium and transdermal iodine therapy rely on the permeability of the skin for either introducing substances into systemic circulation via the skin or mucous membranes, or for drawing toxic substances out of the system via the eliminative channels of perspiration. When using transdermal medicines one has to be aware that: **Applying more of a substance increases the amount absorbed.**

Penetration will stop generally when the skin is saturated. Absorption into the bloodstream is also increased if the concentration of a substance is higher and if more body is covered. Obviously the skin of infants is more prone to absorption than those of adults. Occluded (skin that has been covered) or well-hydrated skin is easier to penetrate than nonoccluded or dry skin.

There are many things that affect skin absorption.^[v] Absorption occurs by distribution around and through the cells that make up the skin. Some absorption takes place along hair follicles or through sweat ducts. Skin thickness and barrier accessibility are different in various areas so absorption rates will vary in different parts of the body. For example, hydrocortisone (a synthetic preparation used in the treatment of inflammations, allergies and itching) is absorbed through the skin 6 times better on the forehead than on the arm, and 44 times better on the scrotum.

The physical condition of the skin at the point of external application is another significant variable. The skin of an infant or child is more permeable than that of adults. The skin over the organs in decreasing order of permeability is genitals, head and neck, trunk, arm and leg.^[vi] Skin abrasion allows a locally applied substance to come directly in contact with subcutaneous tissue and blood vessels. Absorption is at a much higher rate than in healthy skin. Inflammation leaves the skin leaky and allows larger molecules to be absorbed.

TRANSDERMAL ALPHA LIPOIC ACID

Topical application of Na-RLA achieves a one hundred fold increase in concentration (345nmol/g skin) over that achieved by dietary means. Sodium-R-Lipoate (Na-RLA) is provided as a solid light yellow to off-white powder or as an aqueous solution for cosmetic formulations and is prepared from pharmaceutical grade R-Lipoic acid (>99.5%). Na-RLA may protect against and reverses oxidative damage from environmental assaults, (sun burn, pollutants) aging and pathological conditions because Na-RLA recycles, increases and protects dermal antioxidants; including Coenzyme Q10, vitamin C, vitamin E and glutathione.

“ALA is reported to neutralize effects of radiation therapy and the harmful effects of cancer chemotherapy.”

Selenium is much more effective in the presence of alpha lipoic acid because ALA increases the production of selenium's cancer-fighting partner glutathione. Topical application of Na-RLA, due to its rapid absorption kinetics, is useful in protection against skin cell damage from solar radiation; involving the generation of Reactive Oxygen Species (ROS) after the main exposure and subsequent depletion of the major antioxidants of the skin. Na-RLA is a powerful scavenger of destructive free radical molecules in both aqueous and lipid layers of the skin.

Topical application of Na-RLA produces a wide range of beneficial effects on skin cells:

- Protects against UV radiation
- Reduces Skin Inflammation

- Reverses Oxidative Protein Damage
- Reduces Lipid peroxidation
- Improves ATP Production in the Epidermis and Dermis
- Chelates Toxic Heavy Metals
- Increases Glutathione skin content, dose-dependently
- Completely protects and regenerates CoQ10, Vitamins C & E from UVA and UVB exposure and destruction

TRANSDERMAL MEDICINE & SKIN CANCER

Dr. Tullio Simoncini states, "Every tumour of the skin can be completely removed with Iodine Tincture 7%, brushed many times (10-20) a day.^[vii] When the crust is formed, don't take it away, but treat the area continuously and wait until it falls without any other intervention except the Iodine tincture. When the crust falls down the third time, the patient is healed."

"In cases where the tumor has invaded a coetaneous-mucous transitional zone like the anus, eyelids, vagina or mouth," Simoncini continues saying, "it is necessary to perform a preliminary treatment of the mucous area with **sodium bicarbonate** and then, after the elimination of the colonies existing there, proceed to treat the cutis with iodine solution. It is appropriate to highlight that the same type of therapy is to be applied also to psoriasis and to the known fungi afflictions. In fact, the difference between coetaneous mycosis, psoriasis and tumors consists only of a variation of aggressiveness and thus of depth of rooting, since the causal agent is always the same: a fungus. Sometimes for the therapy, other corrosive salts can be used in function of the location in the body."

"What gets in through the skin can get out."

Thus it is in a physicians favor to become familiar with the keys to the skin's permeability. In general heat, activity and body temperature facilitate the ease with which these "border exchanges" can take place.

MEDICINAL BATHS

On page 201 of my *Transdermal Magnesium Therapy* book I recommend 2-8 oz (56,6 -226,4 g) Magnesium Oil for a full body bath (ca 100liter) The % Magnesium in the bath is then only 45-180 mg/l magnesium. One has to forgive me the experience of living in the semi-tropics in Brazil where bath tubs are rare. My experiences of the use of magnesium chloride has been, until recently, restricted to direct application on the skin and of course to now using the exceptionally pure Ancient Minerals magnesium oil for oral use, eye washes, aerosol and douches as well as for direct application on the skin.

It is now my professional opinion that my initial recommendations for baths were very low. It is easy to begin to understand when we take normal seawater as a benchmark. Open seawater already has a content of 1300 mg/l Magnesium. Physics clearly tells us

that the driving force behind transdermal intake is the concentration gradient. The concentration of magnesium in the pure magnesium oil is about 80,000 mg/l and when you apply that directly on the skin, intake rate is very high. But in the case of a bath application my new recommendation needs to be brought up to somewhere between 1500 and 5000 mg/l magnesium (1 to 4 times the sea concentration). Dead Sea and other salty lake therapies have a concentration up to 40,000 mg/l magnesium and people bathe every day in these waters.

CLAY AND SAUNA DETOX

We have to help the body detoxify and the skin should be used as a major instrument and avenue of exit for accumulated heavy metals. This is a part of transdermal medicine, using the skin as an exit route for the poisons that are disturbing the body. **Transdermal means through the skin.** It normally refers to absorption of drugs that are either placed directly on the skin, such as creams and ointments, or applied in time-release forms, such as skin patches. Typically transdermal denotes transport through intact skin (cutis) and thus is synonymous with transcutaneous. Strictly speaking, however, transdermal only refers to transport through the inner part of the skin, the sub-epidermal dermis.

"It was reported by National Geographic many years ago that the workers in the Cinnabar mines in Spain used to detoxify themselves using sweat baths after work."

In this work we stick to the most basic definition of *through the skin* meaning any time we use the skin to get something through, whether in or out, we are using a transdermal approach. The skin is analogous to the membranes of each cell; things need to move in both directions. For the cells its nutrition in and wastes out. Adept practitioners of transdermal medicine include the use of clay and sauna because both are instrumental in working the reverse door, using the skin to detoxify the body of deadly chemical poisons and heavy metals.

"Peer reviewed literature shows that sweating during sauna therapy eliminates high levels of toxic metals, organic compounds, dioxin, and other toxins. Sauna therapy is ideal to mobilize toxins from their hiding places."

- Dr. Dietrich Klinghardt

"One of the best passive exercises is the radiant heat of an infrared sauna which causes a profound deep sweat. After about 30 minutes of exposure, the blood vessels of the skin dilate to allow more blood to flow to the surface to support the cooling process. The millions of sweat glands covering the body are infused with fluid from the blood. In turn, they empty to the skin's surface, thereby flushing large amounts of toxins, including toxic acids and heavy metals, from the body," writes Dr. Robert O. Young who found in his research that radiant heat [infrared] sauna provides the following benefits:

- Speeds up metabolic processes of vital organs and glands, including endocrine glands.

- Inhibits the development of pleomorphic microforms [fungi, yeasts, bacteria and molds] and creates a 'fever reaction' of rising temperature that neutralizes them.
- Increases the number of leukocytes in the blood.
- Places demand on the heart to work harder thus, exercising it and also producing a drop in diastolic blood pressure (the low side).
- Stimulates dilation of peripheral blood vessels thus, relieving pain (including muscle pain) and speeding the healing of sprain, strain, bursitis, arthritis, and peripheral vascular disease symptoms.
- Promotes relaxation, thereby creating a feeling of well-being.

When it comes to using the skin there are many options. Bentonite clay can be used to literally suck the poisons through the skin and this can be enormously helpful while making overall treatments more effective and safe. The proof of this method of drawing poisons through the skin is not in the scientific literature but in the ring around the tub.



BETONITE HILLS UTAH

The essential three words that describe clay are “adsorption,” “absorption” and their root word “sorption.” “Adsorption” is the property of a solid or liquid to attract and hold to its surface a gas, liquid, solute, or suspension. It is an adhesion in an extremely thin layer of molecules to the surfaces of solid bodies or liquids with which they are in contact. The accumulating molecules do not actually penetrate the substance they rest on but represent a surface assimilation.

“Clay, when introduced into the body, enters into a dynamic state of exchange with the environment in the alimentary canal and the tissues that lie beyond.”

“Absorption,” on the other hand, implies an actual movement and uptake of substances into the clay and is a common principle in human physiology. “Sorption” is the process in which one substance takes up or holds another by either absorption or adsorption. **The absorption power of clay is quite intense, pulling toxins into clay’s inner structure and spaces.** So the toxins that were formerly only sticking to the surface of the clay’s outer structure through ionic bonding can be pulled inside the

clay’s molecule. The more substances that are pulled into the clay’s inner structure the more the clay expands and swells.

This same principle can be applied to the internal skin where very pure clay is ingested as a medicine to clean out the digestive tract and pull out toxins. The medical community has some mixed feelings about clay and actually does not deal with it separately from the ingestion of common dirt or soil. In both medicine and psychology we have what is called “Geophagia,” which is the deliberate ingestion of soil. Geophagia is thought to be a complex eating behavior with obscure etiology and numerous health/medical problems. Geophagia has been recorded in every region of the world both as idiosyncratic behavior of isolated individuals and as culturally prescribed behavior of particular societies. The behavior has long been viewed as pathological by the medical profession, and it has been claimed to be a cause of anemia.

Dr. Vesna Humo, who is a surgeon, has all her patients use clay after mastectomy with radiotherapy. She advises patients to use clay directly on the skin to prevent skin damage and has seen excellent results from this. Importantly, she is using clay for bed sores and every necrotic and septic wound also with excellent results. In addition to clay and saunas, which have both been used since the dawn of civilization, we now have new emerging technologies that also use the skin as avenues of toxic escape.

TRANSDERMAL IODINE THERAPY

The most legendary of documentations of **transdermal iodine therapy** applied to a famous person in the American Civil War:

"On September 29, 1862, Colonel John B. Gordon held the center of General Lee's army at the battle of Antietam, or Sharpsburg. The first volley from the northern lines sent a ball through the calf of Gordon's right leg; soon after, another went through the muscles of his thigh; a third pierced his left arm, tearing asunder the tendons and mangling the flesh; a fourth ripped through his shoulder leaving a wad of clothing embedded in its track. Still, no bones were broken; but, while Gordon lingered in the firing line, "with", as he says himself, "but little of my usual strength", a fifth ball struck him squarely in the face."

"Dr. Weatherly of the 6th Alabama Regiment, in charge of medical arrangements, had the Colonel removed to a base hospital, and prescribed tincture of iodine to be painted on the wounds three or four times a day. The case was unpromising. Gordon's eyelids were greatly swollen; one eye was completely closed, the other almost so; his jaw was immovably clenched, and, to make matters worse, erysipelas (staphylococcus infection of skin) had set in on the left arm."

"Mrs. Gordon, his wife, who nursed him - her name was Fanny, and she was then a beautiful girl of 25 - put a liberal interpretation on her instructions and painted the wounds, not three or four times a day, but, as Gordon himself says: **"I think three to four hundred times a day."** Fanny's diligence and devotion were rewarded. Her husband survived, outlived the war, and became the Governor of Georgia, a General, and Commander-in-Chief of the United Confederate Veterans. He died in 1904."

“Delivering medicine to the general circulation through the skin is a desirable alternative to taking it by mouth. Patients often forget to take their medicine, and even the most faithfully compliant gettired of swallowing pills, especially if they must take many each day.”

Over 100 years ago, application of iodine to the skin was used extensively for iodine supplementation. In 1932, Nyiri and Jannitti from the College of Pharmacy of Rutgers University wrote, "Iodine is being used extensively as a prophylactic and therapeutic agent by application to the outer integument, (the skin) and has maintained its place in medicine for many decades."^[viii]

“I had a severe sore throat recently (I could not even swallow) and my good friend suggested painting the inside of my wrist with iodine. I thought she was crazy. But it worked! The pain was completely gone the next morning. Shortly thereafter my son became sick with a bad cold. Although she recommended the iodine for a sore throat, I used it on my 3-year old and the next day he was 100% better.”^[ix]

Dr. Derry says, “Iodine put onto scabs helps to organize total repair of the tissue. All pre-malignant lesions and many other oddities of the skin appear to respond to this regeneration process triggered by topical iodine.” Dr. Daniel H. Duffy said, “I have been using IODEX, an iodine containing paste applied directly to the skin for the past thirty two years to help break up the intercostal pain and palpatory soreness at the sternum often suffered by a high percentage of Midwesterners, especially female hypothyroids.”

surface area of the applied dose also increases penetration. Penetration occurs over time. The longer the substance is on the skin, the greater the chance for continued penetration. Chances for toxicity may occur when high concentrations of a drug are spread over a large area of skin. ^[vi] Marks R M, Barton S P, Edwards C (1988). The Physical Nature of the Skin. Lancaster: MTP Press.

^[vii] “For epithileomas, basalionomas and melanomas, the treatment to choose is iodine solution at seven per cent, as it is capable of precipitating the proteins of the body of the fungus and destroying them completely in a short time. If the lesions are fairly small, they must be painted with the solution 10-20-30 times twice a day for five days and then once for another ten days so that they become very dark. When the eschar is formed and it is higher than the epidermic plane, it is necessary to continue to paint under and above it, even if at first a strong pain is sensed.”

^[viii] http://www.optimox.com/pics/Iodine/updates/UNI0D-02/UNI0D_02.htm#1

^[ix] Quita from Atlanta, GA

^[i] If a drug can exert its effects in minute dosage the small amount absorbed through the skin may be sufficient for systemic effect. A number of drugs can be administered to adults through the skin—namely, nitroglycerine for angina, hyoscine for travel sickness, clonidine for hypertension, and oestrogens for replacement therapy (only nitroglycerin is available in the United Kingdom). The drug delivery system is in the form of an adhesive patch, containing (from the outside to the skin surface) an occlusive backing, a reservoir of the drug, a microporous membrane, and an adhesive. The microporous membrane is less permeable to the drug than the skin and is therefore rate limiting, releasing the drug in a controlled way. Such a method of drug administration is not simply a curious gimmick. It is convenient, requiring less frequent dosage than oral administration, produces more predictable and constant blood concentrations, can be taken by vomiting patients, and can be removed at once. Unfortunately, most drugs given chronically to children (anticonvulsants, antibiotics, and bronchodilators) require too high a dose to be effective through the percutaneous route. Drug absorption through the skin: a mixed blessing; Archives of Disease in Childhood, 1987, 62, 220-221

^[ii] Microneedles: Report Describes Progress in Developing New Technology for Painless Drug and Vaccine Delivery <http://gtresearchnews.gatech.edu/newsrelease/needlespnas.htm>

^[iii] Passport Patch; <http://www.alteatherapeutics.com/>

^[iv] An alternating ultrasonic waveform enlarges the diameter of the skin pores and enables large molecule drugs to permeate through the skin (stratum corneum) into the dermis. From there the drug enters the blood stream. Ultrasound forces the drug through either of two pathways: (1) Hair Follicles or (2) Sweat Pores. Ultrasound is used to “enlarge” the Skin Pathway and then to drive the drug through the opening. Mechanically the drug follows the hair follicles to the bloodstream (near IV injection) or the sweat pores to the fatty tissue (Sub-Q Injection).

^[v] The dose is the quantity of medicine to be administered at one time and the regimen is a strictly regulated program. The concentration of the applied dose, the surface area of the body, and the elapsed time the chemical is on the skin are the main considerations affecting absorption. As the concentration of a drug is increased, the total amount absorbed into the skin and body also increases. Increasing the