Therapeutic Options for Transdermal CO2

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The paper discusses the use of transdermal carbon dioxide and offers a list of resources documenting positive therapeutic outcomes including enhanced endurance, cancer therapy, fractures, and blood flow disorders related to peripheral vascular disease, skin flaps, and Raynaud’s

Medical therapy through the skin is a well-described practice. Specifically, transdermal applications of patches containing medicine for treating pain, nausea, heart failure, and dementia are commonplace. All these regimens permit the prolonged transfer of drugs into the body, so there is a continuous amount of the drug in the bloodstream. An alternative option for transdermal therapy is to use a gas, instead of a patch. The use of gas is less common due to the difficulty in transporting the gas and administering it in a controlled fashion. A new device is now on the market that will allow providers to offer this new therapeutic option.

Carbon dioxide gas is the most recent entry into the gas therapy market. Hyperbaric oxygen is probably the best recognized. Carbon dioxide therapy has been around for over one hundred years. It has been identified as one of the most significant therapeutic components of popular natural bath springs. This natural therapeutic option has been the focus of many studies. Studies include those performed in the natural baths, as well as those performed in laboratories using baths with controlled concentrations of carbon dioxide.

Laboratory studies in animals and humans clearly demonstrate that carbon dioxide will increase tissue blood flow, increase tissue oxygenation, and increase the number of small blood vessels. It should also be noted that carbon dioxide gas is bacteriostatic, which means that bacteria will not grow or multiply in a CO2 environment. This leads to many therapeutic possibilities to treat diseases burdened by poor blood circulation.

Studies of patients or animals partially immersed in water containing carbon dioxide have shown positive therapeutic effects including:

• Reduced fluctuations in blood pressure (calming effect)
Increased swimming endurance \(^1\)

Increased oxygenation, blood flow, and blood vessels in ischemic limbs \(^5,15\)

Treatment using baths is of limited practical utility because it is so cumbersome. Investigators have therefore looked at other methods for transcutaneous carbon dioxide therapy, namely the use of carbon dioxide gas itself. To investigate the therapeutic effect of CO\(_2\), it has been applied in chambers and in plastic reservoirs that enclose limb(s), the lower body, or the entire body of a human-or animal. Some of the studies are a case series while others are more controlled studies using placebo controls. I will only discuss studies with appropriate experimental controls. These studies have shown many positive therapeutic responses including:

- Reduction of symptoms from peripheral vascular disease including claudication \(^2,4,10\)
- Increased oxygenation, blood flow, and blood vessels in ischemic limbs \(^5\)
- Enhanced endurance \(^14\)
- More rapid healing of fractures \(^8\)
- Suppressed metastasis of oral squamous cell carcinoma \(^13\)
- Induced tumor cell apoptosis and suppressed metastasis \(^3\)
- Improved Raynaud’s disease \(^11\)
- Repaired skeletal muscle \(^9\)
- Increased blood vessel formation in skin flaps for plastic surgery \(^12\)
- Stimulation of immune responses and raised endorphins \(^7\)
- Increased skin blood flow \(^6\)

Thus, there are many possibilities for the therapeutic use of CO\(_2\) on large and small animals and there remain a lot of opportunities for clinical studies of transdermal CO\(_2\) therapy.
References:


