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## Review & Commentary

### The Erdman Therapy A Treatment Utilizing Hot and Cold Therapy

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Applying therapeutic heat and cold is a common practice in physical medicine and rehabilitation.<sup>1–3</sup> Despite its widespread use, however, relatively little is understood empirically or theoretically about why certain patients benefit from either hot or cold therapy for acute ailments or chronic conditions.<sup>4</sup> Lacking an evidence base, hot and cold therapy is mostly a trial-and-error process. The medical literature reveals that therapeutic heat and cold has been used to treat a variety of clinical conditions, most notably with patients suffering sports-related injuries and arthritic conditions (e.g., rheumatoid arthritis) and joint disorders (e.g., neck, back pain).<sup>5–9</sup> Recognizing in advance who would benefit from which modality, and who might be harmed, would represent a major step forward in understanding the mechanism and efficacy of therapeutic heat and cold.

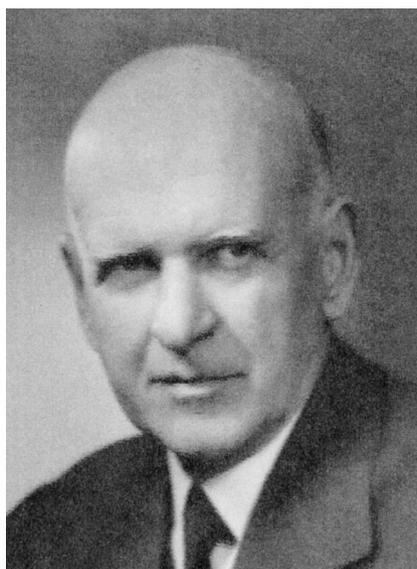
An obscure, virtually unknown therapy in use for almost a century—known as the Erdman therapy—may yield insight into why some patients are helped by therapeutic heat and cold modalities. The basic premise of the Erdman therapy hypothesizes that patient groups respond to heat *vs.* cold therapy on the basis of arterial “tone”—the elastic qualities of the smooth muscles in the vessel walls. Arterial tone, in turn, heavily influences the rate of blood flow, and practitioners of this therapy consider blood flow the primary factor in maintaining good health. Using measurements of the rate of blood flow and arterial tone, the Erdman therapy suggests that the use of therapeutic heat and cold can be used to relieve discomfort and even reverse certain illnesses and conditions. Based on use of this therapy by trained practitioners, it is estimated that between 5% and 10% of the general population responds best to cold therapy and the rest to heat therapy. Practitioners have developed an indicator device—the Erdman indicator—to identify the two classes of patients. The theory supporting the categorization structure and its practical application has not been scientifically proven using traditional strength of

evidence ratings. However, as in most therapeutic customs in medicine, we often provide care such as therapeutic hot and cold, massage therapy, and other physical modalities based on anecdotal experience rather than scientific evidence, while simultaneously striving for empirically oriented evidence for treatment efficacy. Within the context of complementary and alternative medicine today, the Erdman therapy is a historical example of this approach. With a continuing stream of patients for >90 yrs, accompanied by anecdotal evidence from patients and those who have cared for them, the Erdman therapy is a therapeutic modality worthy of a strength of evidence rating of “C” under current evidence rating schema.<sup>10</sup> The purpose of this article is 2-fold: first, to call attention to this therapy and its historical significance to the field of physiatry and, second, to stimulate further research into its efficacy in hopes of extending its use for patients who may benefit from it.

### History and Development of the Erdman Therapy

The Erdman therapy was conceived, developed, and refined over the course of a lifetime by Frederick Erdman (Fig. 1). Erdman, born in Fort Wayne, Indiana, in 1874, was the son of a pastor and “lived a healthy, normal life until the day in 1890, when he strained his back at the age of sixteen.”<sup>11</sup> After this event, Erdman suffered general physical deterioration and growing weakness, which in short order rendered him an invalid. His parents took him to a series of medical specialists and clinics, without success. Even surgery was tried to no avail. “There were days when he could only sit up for a few minutes at a time, and otherwise he was confined to bed. His eyes were affected and reading was difficult.”<sup>11</sup>

Around 1902, after more than a decade of incapacity, Erdman consulted with J. P. Arnold, MD, of Philadelphia, assistant professor of physiology at the



**Figure 1:** Frederick Erdman, 1874–1969.

University of Pennsylvania. Dr. Arnold had unsuccessfully tried warm therapy and the application of pressure to specific points on Erdman’s back without success. He discussed Erdman’s condition at length with him and pointed him to the medical and physiology textbooks of the era, starting him on a self-directed journey to understanding and treating his physical disorders. Bolstered by Dr. Arnold’s encouragement, his own increasing medical knowledge, his keen power of observation, and his spiritual faith, Erdman undertook a series of self-experiments in an effort to relieve his discomfort. During that period, and for decades afterward into the 1950s, self-experimentation among physicians and researchers was a standard and accepted practice.

Erdman began his journey of self-exploration by “using a variety of means to stimulate the spinal muscles.”<sup>11</sup> Serving as his own case study, he ultimately came to recognize that the heat and drug treatments he had endured during the long years of illness not only did not help him but made his condition worse. In 1909, after days of intense prayer, he applied cold to his back and “almost immediately he started to feel stron-

ger.”<sup>11</sup> Soon afterward, at the age of 35, he resumed a normal life.

Family and friends, surprised at Erdman’s success, urged him to try his techniques with others. He chose to follow this path and embarked on his lifelong career, spanning six decades, to his death in 1969 at the age of 95. On August 16, 1914, he received a Pennsylvania license (certificate number 25) as a “drugless therapist” (personal communication) and expanded his practice throughout the greater Philadelphia area (Fig. 2). He continued to refine his therapy and the physiologic theory underlying it, publishing a text on the therapy in 1921 that was revised in 1956.<sup>12</sup> In 1923, he enlarged his practice through the purchase of two adjoining houses in Philadelphia, where he housed his clinic. In December 1930, the Frederick Erdman Association was established as a nonprofit corporation to provide a legal structure and name for the clinic, which relocated to a four-story building in the Philadelphia suburbs in 1976.

Since 1914, when Erdman was first licensed in Pennsylvania, he and a succeeding team of trained therapists have treated thousands of patients. Since 1955, the Frederick Erdman Association has engaged licensed physicians to serve as medical directors to provide medical oversight for the clinic. A physician sees all patients on their first visit.

At its height in the 1980s, the Erdman Association employed eight therapists working in 15 treatment rooms, attending to large groups of patients who willingly stood in line for lengthy periods awaiting treatment. Today, three therapists treat patients in a modern clinic in Haverstown, PA. Because many patients come from geographic distances far from the Philadelphia region, an important part of this therapy is patient education; practitioners teach patients how to administer treatments themselves.

The Erdman Association has



Figure 2: Erdman certificate.

seen a decline in patient numbers since the 1980s. Reasons for this decline are many, and not apparently linked to a decline in the perceived efficacy of the therapy. As a nonprofit organization, long accustomed to a steady flow of self-referred patients attracted through word-of-mouth, the Association did not adequately expand its marketing efforts to compete with the explosion of alternative and complementary medicine therapies increasingly available to the American public. Many patients came from the Christian community, the result of relationships developed with Frederick Erdman and the original and succeeding board members of the Erdman Association. Insufficient efforts were made to expand the patient base beyond this loyal group. In addition, the death of Frederick Erdman's son—William J. Erdman, MD—in 1989 deprived the clinic of distinguished medical leadership. Dr. Erdman, who had served as medical director for almost 25 yrs, was a pioneer in the field of physical medicine and rehabilitation and chair of the

University of Pennsylvania School of Medicine's Department of Physical Medicine and Rehabilitation for 33 yrs.

Currently, the Erdman therapy is undergoing a time of transition, with a declining patient base and therapist group trained to administer it. The clinic's last official newsletter was published in 1995, although it does maintain an informative Web site at the following URL: <http://www.erdman.org/index.html>. Other communication with current patients has continued via occasional letters. The experiences of the many patients served for >90 yrs suggest that the disappearance of the Erdman therapy would be perceived by many as a significant loss.

### Theoretical Foundation

The premise of the Erdman therapy is that the rate of blood flow—distinguished from blood pressure, pulse rate and regularity, and quantity of blood—is the key determinant of good health. In delivering the nutritive elements contained in blood to the body's cells, the rate of blood flow

has an effect on all of the body's functions. When flowing at an optimal rate, blood nourishes the body, preventing the onset of disease and discomfort. For example, "the normal rate of blood flow is one's chief protection against infection. If the rate of blood flow is slowed, the efficiency of any general bactericidal agent is reduced"<sup>12</sup> (perhaps this is the reason for fever and rapid heart rate during infection). Erdman also found that "in treating all kinds of mental and 'nervous' disorders, it becomes evident that the mental feelings vary absolutely with variations in the rate of blood flow," an early indication of the importance of the mind-body connection.<sup>12</sup>

The principal theoretical foundation of the Erdman therapy is that although the blood flow rate is influenced by many factors, arterial tone is the most important. The thesis of Erdman's major work, *Control of the Circulation*, was "that restoration of the normal cardiovascular tone is the most successful method of restoring health to the body or to any of its parts."<sup>12</sup> The extent to which arteries are dilated or constricted—elastic or tight—is the central characteristic of arterial tone. The action of the heart is significantly helped or hindered by dilation or constriction of the arteries. Optimizing the rate of blood flow through regulation of arterial tone is thus the pivotal objective of the Erdman therapy. Arterial tone, in turn, can be altered by stimulating spinal nerve-muscle combinations—vasomotor nerves—to alter the blood flow rate to the organs these nerves control. Vasoconstrictor nerves contract arteries and arterioles; vasodilator nerves dilate them.<sup>12</sup> In summary then, "the primary function of the vasomotor system is the maintenance of the normal rate of blood flow through the brain and spinal cord, which control every part of the body."<sup>12</sup>

The medical literature reveals a limited number of studies pertaining

to venous capacity, blood flow, and the effect of the application of therapeutic modalities on blood flow and physiologic responses in both human and animal subjects.<sup>13-18</sup> Such studies generally attempt to determine how the rate of blood flow into and out of specific organs or joints is affected by injury or illness. Little, if anything, is said in these studies about the relationship between clinical applications of heat/cold and subsequent physiologic response and healing. We could find no studies using these modalities in randomized clinical trials to help determine the precise nature of their efficacy or whether outcomes are indeed affected positively by the rate of blood flow or arterial tone.

Because the Erdman therapy is based on the rate of blood flow and arterial tone, reliably measuring both in the patient became Erdman's initial challenge. The result determines which patients would benefit from cold therapy and which from heat therapy and which spinal muscles and nerves should be manipulated to best effect. Through a lifetime of experimentation and observation, he articulated a circulatory classification structure and created a method to assign each individual to distinct circulatory categories.

Erdman's classification structure has four classes based on arterial tone, although two of the classes are more-or-less transitory in nature. Class 1 patients, 5-10% of the population, have "relaxed arterial tone," and class 4 patients, the remaining 90%, have "normal" or constricted arterial tension. Class 2 individuals have partially relaxed arteries, and the chief attribute of class 3 individuals is high blood pressure.<sup>12</sup>

Erdman viewed two classes as key, based on vasomotor tone. Class 1 individuals, the minority, benefit from cold therapy that serves to constrict the dilated vessels. These patients are generally harmed by warm therapy, which dilates already relaxed

arteries. In contrast, class 4 individuals (the great majority of patients) benefit from warm therapy, which dilates their normally constricted arteries. Cold or warm treatments applied to the spinal regions of the appropriate class have the desirable effect of improving the rate of blood flow throughout the body and, hence, the health of the patient. The goal of the therapy is to move patients from class 1 to class 4. Erdman considered the move from class 1 to class 4 status "the turning point in the health of a continuous succession of people whom the writer has treated, ranging in disability from some slight handicap to those who were extreme invalids, some confined to bed, a few given only a short time to live."<sup>19</sup> Based on Erdman's experience, patients generally required from 2 to 3 wks of treatment to achieve normal or constricted arterial tone (class 4). For some patients, this "move" is permanent. Others, however, may require continued therapy over many years to maintain class 4 status. Practitioners of the Erdman therapy have not discovered a means to predict which patients require a one-time treatment regimen and which need continued follow-up therapy. This is not unlike the case of predicting the frequency and duration of physical modalities in today's practice environment.

### **Clinical Indications and Techniques**

Accurately classifying patients into the two main circulatory classes was considered to be the vital first step in applying the Erdman therapy. For many years, patients were classified through analysis of the size and shape of the pulse (pulse wave form) obtained through palpation, combined with blood pressure readings. Application of a cooling agent (e.g., witch hazel) to the paravertebral area from C7 to the end of the coccyx then allowed the therapist to observe whether the pulse had become stron-

ger and whether there were blood pressure changes. Around 1950, after some years of experimentation and observation, Erdman concluded that class 4 individuals have a stronger right pulse, "the most easily observed difference between the two types of patients."<sup>11</sup> In contrast, class 1 patients present a stronger left pulse.

The process of identifying the proper circulatory class relied heavily on the skill and sensitivity of the therapist's touch, and mistakes could be made, complicating the treatment. To address this concern, beginning in 1980, Frank Erdman, Frederick Erdman's son and a trained engineer, developed a noninvasive device, the Erdman indicator, to provide a more reliable and consistent classification measure. The instrument, produced after 10 yrs of research, uses a colorimeter to measure the changing color of the hands as they are raised and lowered during a roughly 30-min examination period. The color changes correspond to the pulse size and shape and substitutes for pulse readings obtained through palpation. The Erdman indicator produces a precise reading used to establish the circulatory class of the patient. It has been used with 1315 patients since 1990.

The Erdman therapy consists basically of two elements: 1) application of cold to some or all of the spinal area and 2) heat or gentle massage of the spinal regions. Erdman posited that the nerves and muscles surrounding the spinal column controlled the tone in arteries throughout the body. He identified nerves and muscles in specific regions of the spine regulating dilation and contraction of specific arteries. Not only did he specify spinal regions—thoracic, lumbar, and sacral and coccygeal segments—but specific vertebrae as well. This was critical because some patients, particularly those in class 2, have dilated arteries in some parts of their bodies and constricted arteries in other sections. These pa-

tients “cannot be benefited by *any general treatment or medication, because any treatment which is beneficial to two-thirds of the body may be injurious to the other third, and vice versa. These areas are like two separate people and must be treated accordingly*” [authors’ italics].<sup>12</sup> In class 2 patients, some spinal areas require cold therapy and other spinal areas require warm therapy. On the other hand, class 1 patients benefit from cold therapy (vasoconstricting) under all conditions, and class 4 patients benefit from warm or hot therapy (vasodilating) under all conditions. Three factors determine the impact of spinal treatment: 1) the patient’s vascular class, 2) the intensity of the stimulus, and 3) the irritability of the nerves treated.<sup>12</sup>

The Erdman therapy is designed and has been used with patients who present a variety of disabling conditions. Frederick Erdman’s confidence in the therapy to treat a full spectrum of illnesses and conditions was deep, and he included chapters on circulatory, gastrointestinal, gynecologic, respiratory, nervous system, and muscular disorders in *Control of the Circulation*.<sup>11</sup> “My conclusion that all of my symptoms and disorders were due to circulatory disturbances,” he later wrote, “was confirmed by the results of treating other people who had a great variety of chronic and acute disorders which disappeared when circulation was restored to normal by treatment. These recoveries often took place in one treatment in acute attacks and occurred gradually in chronic disorders. They were due to only one factor—restoring the normal rate of flow of the blood.”<sup>19</sup> The Erdman therapy was developed to do just that.

In recent years, the Erdman clinic has focused on a distinct subset of disorders, those presented by class 1 patients requiring cold therapy: migraine headaches, hyperactivity in children, epilepsy, multiple sclerosis, insulin-dependent diabetes, Raynaud’s

disease, extreme fatigue, depression, hypoglycemia, exhaustion from prolonged standing, allergies, asthma, dizziness and fainting, anxiety, trouble concentrating and thinking clearly, and sensitivity to heat. The Erdman therapy has also been used to assist women in completing full-term pregnancies, resulting in the birth of what are known colloquially as “Erdman babies.” Other conditions—chronic fatigue syndrome, painful neuropathies, and fibromyalgia—have also been treated with the Erdman therapy. The Erdman therapy does not promise cures for these diseases or symptoms, but it does claim that “by carrying out the indicated therapy, a patient’s circulatory condition can be restored to an optimum condition and symptoms can be reduced or alleviated, often dramatically.”<sup>12</sup>

### Anecdotal Evidence

The Erdman therapy is based on two central ideas: that the rate of blood flow is central to human physical health and that arterial tone is the key determinant of the rate of blood flow. The therapy is also supported by experience—>90 yrs’ worth. Records of the Erdman Association reveal that 220,000 patient treatments have been completed since 1970, and an estimated total of 430,000 treatments since 1920. The treatment is noninvasive, involves no medications, and can immediately be reversed if it is observed to produce adverse reactions in the patient. In other words, cold therapy can be quickly and easily substituted for warm therapy with no apparent harm to the patient and vice versa.

Anecdotal evidence of the efficacy of the therapy is contained primarily in the writings of Frederick Erdman,<sup>12</sup> who cites multiple successes for various ailments. These cited cases suggest that in some instances, as in Frederick Erdman’s own circumstance, the therapy brings hope of a cure; in others, relief of symptoms and discomfort is the

optimal outcome. No evidence is presented to ascertain, on a systematic basis in advance, which patients are likely to be cured entirely or to be relieved of temporary distress. Evidence of failure is not presented.

The other sources of documentation of efficacy are the testimonials of satisfied patients. Most are unequivocal in praise, but some recognize the lack of certifiable scientific support for the therapy. One testimonial, written in 1950 by physician David W. Baker, MD, a director of the Frederick Erdman Association for 46 yrs, addresses the lack of proof of efficacy. Dr. Baker notes, “I have not learned anything in school which contradicts his theories—but scores of things to confirm it.” He concludes by saying: “His treatment is by no means the answer to all human woes—and does not eliminate surgery or the use of drugs, but it supplements these—assists them—and often cures those stubborn cases which otherwise none of us can cure. It’s worth a try—and a good try.”<sup>20</sup>

Dr. William Erdman offered a similarly balanced view of the efficacy of the therapy. In the “Foreword” to his father’s *Control of the Circulation*, Dr. Erdman, the Association’s medical director, called the reader’s attention to the theoretical support and experimental success of the therapy, but also referenced the necessity for more study:

The means for applying cold presented within this book provide both a suitable explanation and a practical therapeutic explanation for evaluating, before treatment, the type of therapy to be used. . . . This material is not presented as a panacea, but no matter what therapeutic procedures are necessary, those responsible for the care of patients would do well to consider the principles presented and evaluate present or proposed treatments in the light of these suggestions. . . . This presenta-

tion provides an explanation for many current failures in treatment and should offer a wealth of suggestions for physiologic experimentation, in addition to practical clinical procedures already tested for fifty years.<sup>12</sup>

No “physiologic experimentation” to confirm or reject the theory and practice of the Erdman therapy had been done before Dr. Erdman’s recommendation in 1956, nor since. Only two references to Frederick Erdman’s work can be found in the professional literature. The first occurred in 1923 in the journal *American Medicine* and consisted of a book review by J. Madison Taylor, MD, of Temple University.<sup>21</sup> The second occurred in 1935 in the *Journal A O A*.<sup>22</sup> Robert D. Anderson and Ruth A. Anderson, both osteopathic physicians, present Erdman’s argument that hypertension and hypotension cannot be determined on the basis of blood pressure alone. Arterial tone is also a factor. Ruth Anderson’s article, in particular, describes Erdman’s theory, therapy, and technique, which she utilized in her osteopathic practice and recommends to other osteopathic physicians. Neither author presents independently derived data to support Erdman’s work.

### Future Of Erdman Therapy

The astute insights of Frederick Erdman on a wide range of issues related to his therapy suggest that his claims bear additional scrutiny. Although his experimentation with himself and his patients was not conducted in accordance with current rigorous scientific standards (not unlike the application of heat and cold therapy today), he was an acute observer of physical phenomena, closely focusing on the smallest observable changes. True to the Hippocratic oath, his therapy was founded on a “first do no harm” philosophy, as evidenced in his noninvasive treat-

ments, administered with the understanding that either cold or hot therapy might have to be quickly reversed if proved ineffective or possibly injurious. In all treatments, moderation served as a guiding principle. Treatments were given in short doses, also allowing for easy reversal if required, and were modified as necessary. Erdman wrote, “Each patient should be the criterion of the effect of a treatment, not the treatment itself or the doctor’s expectations. Any other attitude is unscientific.” Erdman further wrote, “If anyone is worse immediately after a treatment, blame the treatment, not the disease or the patient.”<sup>12</sup>

Erdman was far ahead of his time in recognizing the physiologic basis of mental disorders, long before the popularity of antidepressants and other drugs. According to Erdman:

A great variety of mental diseases are essentially the same, because they are due to the most excessive irritability or starvation of some of the billions of nerve cells in the brain. . . such conditions are not psychological. They are entirely *physical*. . . chronic disturbance in part or all of the cerebral circulation may be responsible for all the symptoms of many mental disorders, if we except those due to organic lesions.

Whether Erdman’s proposed physiologic mechanism for mental disease is accurate or not, his insight that mental illness has a physical basis has been demonstrated in subsequent years.

Erdman was also a proponent of customized care for each patient. Long before the advent of pharmacogenetics, he recognized that, although basic principles of care are important, each individual presents a unique case and must be treated with particular attention to the specific conditions presented. For this reason, he believed in his therapy over the use of drugs. Not only does the

Erdman therapy produce few, if any, side effects in contrast to drug action, it can be particularized down to the specific spinal regions to be massaged or treated with heat or cold. Drugs act on the entire body, and although they may improve conditions in one part of the body, they may have adverse effect elsewhere. Medicine and science today have recognized this, as evidenced by the drive to produce more targeted therapeutics.

Empirical testing of the Erdman therapy is beginning at the University of Pennsylvania through the auspices of a bioengineering course (Bioengineering 400), jointly given by faculty in the School of Medicine and the School of Engineering and Applied Science. A group of graduate students will test the reliability of the Erdman indicator in determining the dominant arm as compared with a palpation of the radial arteries manually.

Patients and physicians alike are increasingly turning to alternative or complementary medicine for answers to many chronic health problems. In this context, the Erdman therapy might well represent a useful addition to the healthcare arsenal of the physical medicine and rehabilitation specialist. But its efficacy needs to be demonstrated based on a rigorous standard of scientific scrutiny. With other alternative and complementary medicine treatments now undergoing rigorous testing through federally funded clinical trials, there may be opportunities to empirically examine the value of the Erdman therapy as well. The Erdman therapy deserves a full testing. For >90 yrs, patients have continued to come to Philadelphia to be treated under its regimen and, according to numerous anecdotal reports, have left better off physically than when they arrived. The experiential, if not scientific, evidence recommends a structured study program. Only when this is accomplished can it be demonstrated whether almost a century of experi-

ence will provide a useful therapy for the future.

Much has been written in recent years concerning the need for scientists within the field of physical medicine and rehabilitation to focus more on outcomes-oriented clinical research. Efforts have been made, through training grants and other mechanisms, to broaden the base of such research within our specialty and to develop the next generation of faculty by providing them with training in research methodology. The story of the Erdman therapy is important in its own right, as a further indication of how modern rehabilitation-oriented treatment has historical underpinnings. In addition, it can also serve as an example of how what we do every day within clinical rehabilitation medicine (e.g., the provision of therapeutic modalities) should be viewed as an opportunity for expanded research that will ultimately demonstrate its utility, effectiveness, and necessity. In an evidence-oriented medical culture, such research is no longer optional.

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## CME Self-Assessment Exam

### Answers

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#### CME Article Number 12:

*E. Zemper, et al.*

1. C      2. B      3. C      4. D      5. A