

*Originally Published in the Original Internist: September 2010
Formatting and Images Updated October 2010.*

Breast Thermography: Helping Make Breast Cancer Prevention Possible

One out of every eight women will develop breast cancer during their lifetime impacting the lives of their families, friends and communities (1). While countless dollars continue to be spent on finding a cure, women are led to believe that early detection through mammography is their best option for beating the disease. Is this really all that can be done? Something is missing from this picture and desperately needs to be added if we are really going to create a world without breast cancer.

Mammography has been controversial and has come into question in recent years. In fact, the US guidelines for screening with mammography recently changed from annual examinations at age 40 to every other year beginning at age 50 (2). That means women under 50 currently do not have a viable method of screening for breast cancer and women over 50 will be screened less frequently. Women who develop cancer under age 50 tend to have more aggressive and more life threatening forms of the disease so it is imperative they have options for screening. For women over 50, the average sensitivity of mammography is 80-90% (3) which sounds great unless you are one in every 5-10 women whose cancer is missed. Whether or not you approve of mammography and believe in its usage is not the point. Even advocates of the technology admit that the status quo is not good enough.



While it is obvious that our early detection strategies need to be improved, there is a glaring truth that cannot be ignored. Early detection is always too late. For cancer to be detected it must be already present and will require treatment that is generally invasive. We need to do better. When I was a child I remember the motto of medicine was "An ounce of prevention is worth a pound of cure". Complementary health care professionals along with progressive medical doctors are returning to these earlier roots by trying to find ways to help the body function better and prevent disease naturally. While early detection and finding a cure remain important, we must shift our focus to prevention if breast cancer is going to be eliminated.

To this end, enter a 40 year old imaging technology called thermography that has recently made a comeback. Thermography is a non invasive radiation free method of visualizing breast physiology by identifying vascular changes and fever at the surface of the breast. By evaluating physiology, we include an important component that has been missed by anatomical imaging such as mammography.

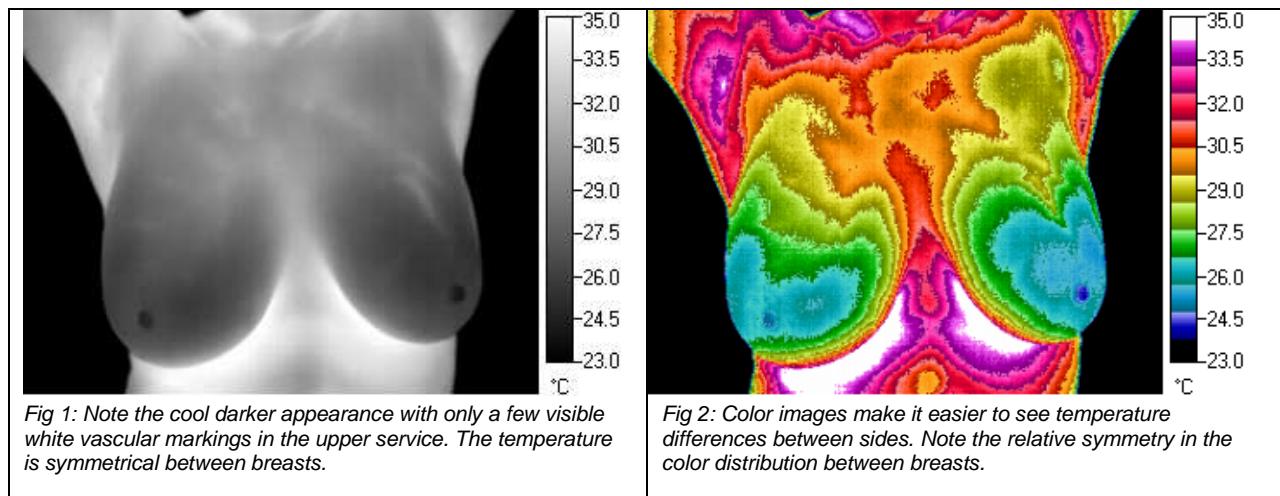
Thermography Basics:

Here is how it works. Heat is produced in the breast by normal tissue metabolism and is carried to its surface by the blood supply. Our bodies naturally release heat to the environment in the form of infrared energy. Thermography uses a camera with a specialized infrared detector that captures this energy and produces an image. The image can then be analyzed allowing an interpreter to accurately measure the temperature of the region of interest to the tenth of a degree.

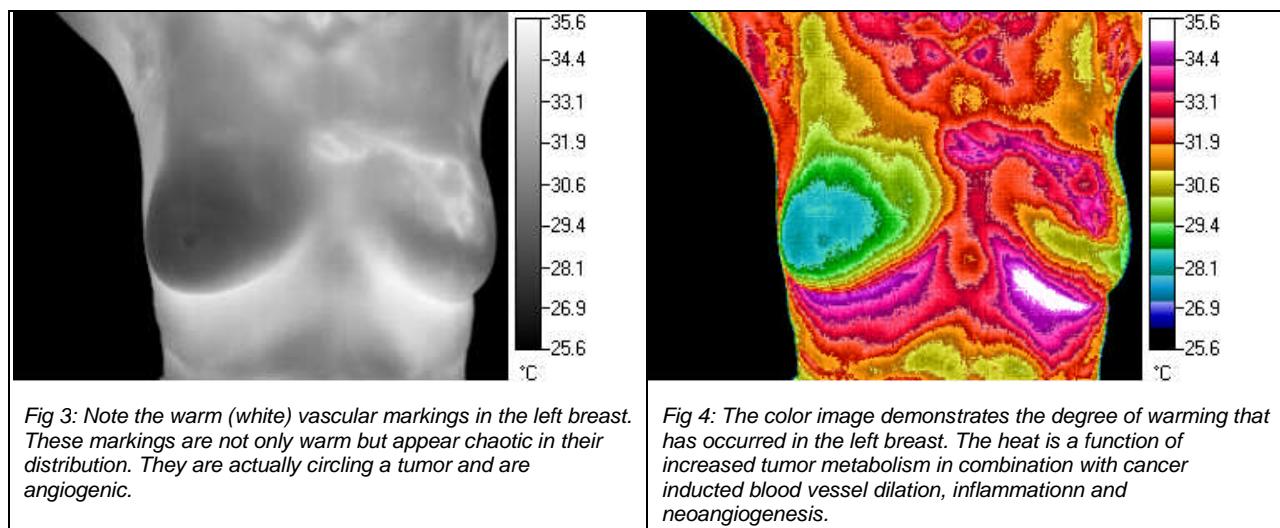
Normal breast tissue will produce a characteristic temperature pattern when visualized with thermography and the measured temperature differences between breasts are within a normal range (fig 1 and 2). Cancer produces heat through a combination of elevated metabolism and inflammation. The heat from a tumor travels through the circulatory system to the surface of the skin where it can be detected using a thermographic camera (4, 5). In addition, cancer will dilate existing blood vessels via nitric oxide production and create its own blood supply via angiogenesis (6). Both of these occurrences can translate into a temperature finding at the surface of the breast and provide a means toward detection (fig 3 and 4).

The thermal findings are less dependent on tumor size and depth and are more directly related with tumor growth rates and metabolic activity (7-9). The more aggressive and metabolically active the tumor, the more likely it will be seen on a thermogram. Thus a very small highly aggressive tumor is more likely to produce findings on a thermogram while it may be missed by mammography because it is too small.

(Normal Grey Scale and Color Breast Images)



(Left Breast Cancer Grey Scale and Color Breast Temperature)



Thermography and Cancer Prevention:

Perhaps more importantly, thermography provides predictive information allowing us to use it as a method to determine risk. Numerous studies have documented the presence of physiological changes consistent with cancer prior to anatomical detection with mammography. Gautherie observed that 38% of the patients with 'false positive' thermograms developed cancer within four years (10). Stark observed that 23% of the patients with 'false positive' thermograms developed cancer within 10 years (11). According to Gautherie, a high risk thermogram is considered to be 10x more significant than a first order family history of breast cancer (10, 12). Hobbins further states that a sustained high risk thermogram carries with it a 22x greater likelihood of developing breast cancer than a low risk examination (13).

This is extremely important if we are attempting to prevent breast cancer. If thermography can be used to identify physiological signs that precede cancer and signal future risk, it can also be used to monitor the ability of therapeutic intervention to effectively lower risk.

Although a scientifically proven method to prevent breast cancer does not exist, there is a growing body of research identifying dietary and lifestyle factors that significantly contribute to risk. More importantly, many of these risk factors are modifiable and can be improved or eliminated through lifestyle, diet and natural treatment. This provides us with a starting point for creating breast cancer prevention treatments. Therapeutic interventions can then be monitored with thermography to determine if the risk has reduced (Fig 5-6).

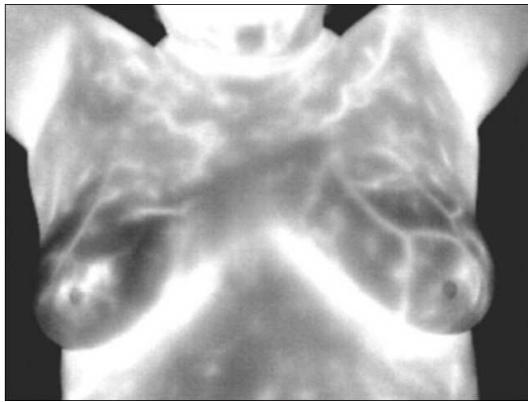


Fig 5: Note the white areas of vascular warming in both breasts. Both breasts are at elevated risk for developing cancer. The left breast is at higher risk than the right.

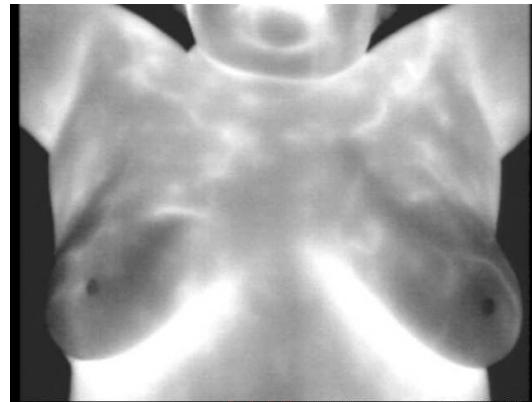


Fig 6: After therapeutic intervention, the vascular warming and hot spots have diminished significantly. These images suggest a low level of risk for developing cancer.

What are the benefits of thermography over other tests that attempt to assess risk? BRCA genetic testing identifies a non modifiable risk factor that cannot be used to determine the effectiveness of treatment. Testing estrogen, estrogen metabolite (2:16 hydroxy ratios) and progesterone levels provide systemic information and do not directly evaluate the effects of these hormones on the breast tissue itself. In addition, the serum levels of hormones may not match the tissue levels. Breast tissue can have up to 50x the estrogen concentration as serum (14). Salivary tests have been used to assess tissue hormone levels but do not take into account that the breasts produce estrogen locally while salivary gland tissue does not. Laboratory tests such as these are still very helpful in determining a therapeutic intervention and monitoring its effects and should not be discounted. Thermography, however is a direct measure of breast physiology and ultimately needs to reflect the desired change.

Thermography and Evaluating the Effects of Estrogen on the Breasts:

In the case of estrogen, thermography offers another unique piece of information. Thermography can help identify Breast Specific Estrogen Dominance. This is different than systemic estrogen dominance in that it occurs specifically in the breasts and may or may not be systemic. Breast Specific Estrogen Dominance produces vascular changes similar to pregnancy and lactation (15) (Fig 7-9). These changes are distinctly different than those of cancer and can let us know whether or not breast specific estrogen dominance exists and whether or not it is currently elevating the risk for developing breast cancer. If identified, thermography can then be used to monitor the effectiveness of intervention.

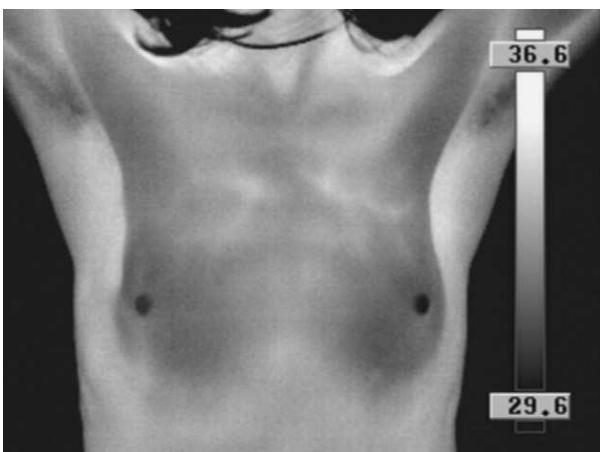


Fig 7: Normal Breast Image With No Signs of Breast Specific Estrogen Dominance: Notice the lack of white vascular markings in the breasts except for a few near the sternal region.

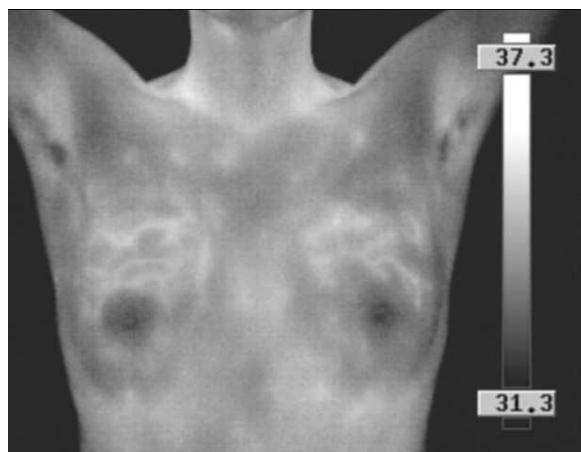


Fig 8: Normal Lactating Breasts: Note the white areas of vascular warming in both breasts. Although the breasts appear highly vascular, the temperature pattern is very symmetrical unlike the vascular signs suggesting risk for cancer. .

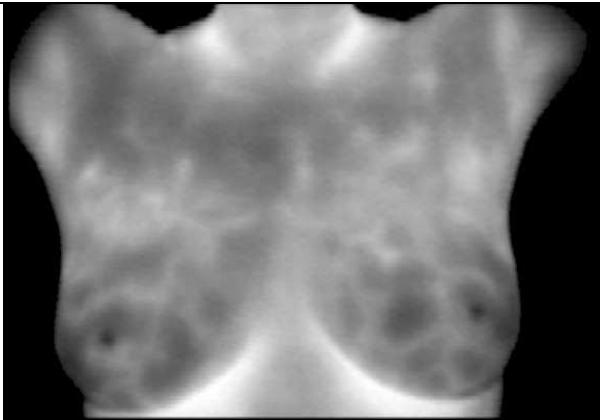


Fig 9: Breast Specific Estrogen Dominance: Note the similar vascular pattern to the lactating breast image with symmetrical vascular warming seen in both breasts. In this case, the patient is on birth control pills but it is possible to have normal or low blood estrogen levels and still have breast specific estrogen dominance.

For breast cancer to be eliminated we must move beyond early detection to the realm of prevention. To create a prevention intervention we must be able to identify the modifiable risk factors and learn to improve or eliminate them. To determine if that intervention is effective, we need thermography to objectively assess the effects of that intervention on the physiology of the breasts.

Robert L. Kane, DC, DABCT is a board certified clinical Thermologist with Diplomate certification through the International Academy of Clinical Thermology and the American Board of Clinical Thermographers. Dr. Kane provides high quality training for thermography technicians and interpreters. He currently maintains a busy thermal imaging interpretation practice in Redwood City, CA. He can be reached at 650-868-0353 or rk@robertkane.com. His website is www.thermographyexpert.com.

References:

- 1) *Breast Cancer Facts and Figures 2009-2010.* American Cancer Society Inc. 2009
- 2) *Screening for Breast Cancer US Preventative Services Task Force.* November 2009
- 3) Ries LAG, Harkins D, Krapcho M, Mariotto A, Miller BA, Feuer EJ, et al. *SEER Cancer Statistics Review, 1975-2003.* Bethesda, MD: National Cancer Institute.
- 4) Yahara T, Koga T, Yoshida S, Nakagawa S, Deguchi H, Shirouzu K. *Relationship Between Microvessel Density and Thermographic Hot Areas in Breast Cancer.* Department of Surgery, Kurume University School of Medicine, 67 Asahi-machi, Kurume, Fukuoka 830-0011, Japan.
- 5) Anbar M. *Quantitative Dynamic Telethermometry in Medical Diagnosis and Management.* CRC Press pp 83-88, 1994.
- 6) Anbar M. *Quantitative Dynamic Telethermometry in Medical Diagnosis and Management.* CRC Press pp 88-93, 1994.
- 7) Head JF, Wang F, Lipari CA., Elliott RL. *The Important Role of Infrared Imaging in Breast Cancer: New Technology Improves Applications in Risk Assessment, Detection, Diagnosis, and Prognosis.* IEEE Engineering in Medicine and Biology: 52-57. May/June 2000.
- 8) Head JF, Wang F, Elliott RL. *Breast Thermography is a Non Invasive Prognostic Procedure That Predicts Tumor Growth Rate in Breast Cancer Patients.* Ann NY Acad Sci 698:153-158 1993.
- 9) Gautherie M. *Thermography of Breast Cancer: Measurement and Analysis of the In Vivo Temperature and Blood Flow.* Ann NY Acad Sci 335:383-413 1982.
- 10) Gautherie M, Haehnel P, Walter J, Keith L.: *Long-Term Assessment of Breast Cancer Risk by Thermal Imaging.* Biomedical Thermology. Alan R. Liss Inc. pp.279-301, 1982.
- 11) Stark AM: *The Value of Risk Factors in Screening for Breast Cancer.* Eur J Cancer 11: 147-150 1985.
- 12) Almaric R, Gautherie M, Hobbins W, et al: *The Future of Women with Isolated Abnormal Infrared Thermogram of the Breast.* Nouvelle Press Med 10:3153 1981.
- 13) Hobbins, W.: *Thermography, Highest Risk Marker in Breast Cancer.* Proceedings of the Gynecological Society for the Study of Breast Disease. pp. 267-282, 1977.
- 14) Jefcoate CR, Liehr JG, Santen RJ, et all. Tissue-specific synthesis and oxidative metabolism of estrogens. J Natl Cancer Inst Monogr (2000) (27):95-112
- 15) Greenblatt RB, Samaras C, Vasquez J. *Mastopathies: Hormonology and Thermography.* Biomedical Thermology. Alan R. Liss Inc. pp.303-311, 1982.