



## Digital Infrared Thermal Imaging (DITI) research

Here is a selection of the growing body of research supporting the use of DITI for early diagnosis of abnormalities and monitoring of healing. Here is just a small sample:

**Gautherie, M., et al. (1983). Thermobiological assessment of benign and malignant breast diseases. *American Journal of Obstetrics & Gynecology*, (8)147, pp.861-869.**

This study analysed the survival rates of 106 patients in whom the diagnosis of breast cancer was established as a result of the follow-up of thermographic abnormalities found on the initial examination when the breasts were apparently healthy (negative physical and mammographic findings). A 61% increase in survival was noted in the patients who were followed-up due to initial thermographic abnormalities. The authors summarised the study by stating that "the findings clearly establish that the early identification of women at high risk of breast cancer based on the objective thermal assessment of breast health results in a dramatic survival benefit."

**Gautherie, M. & Gros, C.M. (1980). Breast thermography and cancer risk prediction. *Cancer*, 45, pp. 51-56.**

Thermography is a useful predictor of risk factor for cancer and as an assessment tool for rapidly growing tumours.

**Wladislaw, V. E. et al. (1989). Screening thermography of chronic back pain patients with negative neuromusculoskeletal findings. *Thermology*, 3, pp. 125-126.**

This blind study indicated that thermograph imaging is effective at detecting neuromusculoskeletal abnormalities.

**Varju, G. et al. (2004). Assessment of hand osteoarthritis: correlation between thermographic and radiographic methods. *Rheumatology*, 43(7), pp.915-9.**

Thermographic scanning was found to be highly reliable at monitoring changes in osteoarthritis of the hand.

**Heyes, G.J. & Mill, A.J. (2004). The neoplastic transformation potential of mammography X rays and atomic bomb spectrum radiation. *Radiation Research*, 162, pp. 120-7.**

This study suggests that the risks associated with mammography screening may be approximately five times higher than previously assumed and that the risk-benefit relationship of mammography exposures may need to be re-examined.

**Parisky, Y.R. et al. (2003). Efficacy of computerised infrared imaging analysis to evaluate mammographically suspicious lesions. *American Journal of Roentgenology*, 180, pp.263-269.**

In January 2003, Parisky and colleagues published their findings in 875 biopsied lesions where thermography had an over 95% predictive value and concluded that infrared imaging was a safe non-invasive procedure that would be a valuable adjunct to mammography in determining whether a lesion was benign or malignant.

**Cavaliere, E. et al. (2000) Estrogens as endogenous genotoxic agents – DNA adducts and mutations. *Journal of the National Cancer Institute Monographs*, 27, pp. 75-94.**

Estrogens induce tumors in laboratory animals and have been associated with breast and uterine cancers in humans. In relation to the role of estrogens in the induction of cancer, we examine formation of DNA adducts by reactive electrophilic estrogen metabolites, formation of reactive oxygen species by estrogens and the resulting indirect DNA damage by these oxidants, and, finally, genomic and gene mutations induced by estrogens. Quinone intermediates derived by oxidation of the catechol estrogens 4-hydroxyestradiol or 4-hydroxyestrone may react with purine bases of DNA to form depurinating adducts that generate highly mutagenic apurinic sites.

In contrast, quinones of 2-hydroxylated estrogens produce less harmful, stable DNA adducts. The catechol estrogen metabolites may also generate potentially mutagenic oxygen radicals by metabolic redox cycling or other mechanisms. Several types of indirect DNA damage are caused by estrogen-induced oxidants, such as oxidized DNA bases, DNA strand breakage, and adduct formation by reactive aldehydes derived from lipid hydroperoxides. Estradiol and the synthetic estrogen diethylstilbestrol also induce numerical and structural chromosomal aberrations and several types of gene mutations in cells in culture and *in vivo*. In conclusion, estrogens, including the natural hormones estradiol and estrone, must be considered genotoxic carcinogens on the basis of the evidence outlined in this chapter.

<http://incimono.oxfordjournals.org/cgi/content/abstract/2000/27/75>

**Keyserlingk, J.R et al. (1998). Infrared imaging of the breast: initial reappraisal using high-resolution digital technology in 100 successive case of stage I and stage II breast cancer. *The Breast Journal*, 4(4).**

There is a general consensus that earlier detection of breast cancer should result in improved survival. Current breast imaging relies primarily on mammography. Despite better equipment and regulation, variability in interpretation and tissue density still affect accuracy. A number of adjuvant imaging techniques are currently being used, including doppler ultrasound and gadolinium-enhanced MRI, which can detect cancer-induced neovascularity. In order to assess the potential contribution of currently available high-resolution digital infrared technology capable of recognizing minute regional vascular flow related temperature variation, we retrospectively reviewed the relative ability of our preoperative clinical exam, mammography, and infrared imaging to detect 100 new cases of ductal carcinoma in situ, stage I and II breast cancer.

While the false-negative rate of infrared imaging was 17%, at least one abnormal infrared sign was detected in the remaining 83 cases, including 10 of the 15 patients, a slightly younger cohort, who had nonspecific mammograms. The 85% sensitivity rate of

mammography alone thus increased to 95% when combining both imaging modalities. Access to infrared information was also pertinent when confronted with the relatively frequent contributory but equivocal clinical exam (34%) and mammography (19%). The average size of those tumors undetected by mammography or infrared mamography was 1.66 cm and 1.28 cm, respectively, while the false-positive rate of infrared imaging in concurrent series of 100 successive benign open breast biopsies was 19%. Our initial experience would suggest that, when done concomitantly with clinical exam and mammography, high-resolution digital infrared imaging can provide additional safe, practical, and objective information. Further evaluation, preferably in controlled prospective multicenter trials, would provide valuable data.

**See the full report here:**

<http://www.mypinkimage.com/articles/Keyserlingk%20Study.pdf>

**Hobbins, W. & Amalu, A. *Beating breast cancer.***

For a very useful article on using Digital Infrared Thermal Imaging for the early detection and monitoring of breast cancer see this excellent article available at

<http://www.breastthermography.com/articles/beating-breast-cancer.doc>