



# DOA BELAJAR

رَضِيتُ بِاللَّهِ رَبًّا وَبِالْإِسْلَامِ دِينًا وَبِمُحَمَّدٍ نَبِيًّا وَرَسُولًا  
رَبِّي زِدْنِي عِلْمًا وَارزُقْنِي فَهْمًا

“Aku ridho Allah SWT sebagai Tuhan ku, Islam sebagai agamaku, dan Nabi Muhammad sebagai Nabi dan Rasul, Ya Allah, tambahkanlah kepadaku ilmu dan berikanlah aku kefahaman”

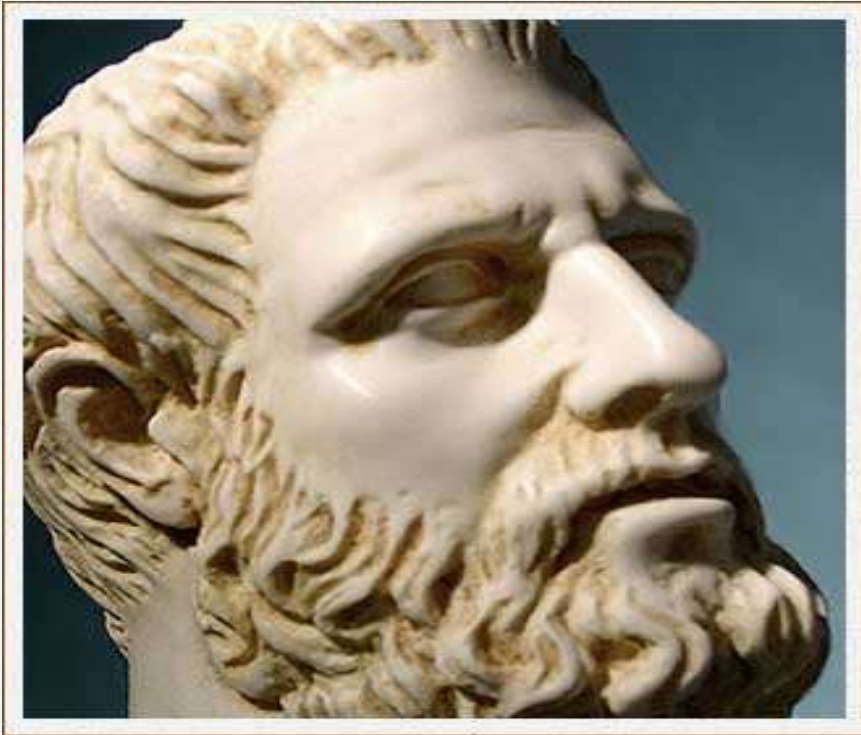


# THERMOGRAPHY

Elika Puspitasari, S.ST., M.Keb



# History of Thermography



- As a medical science, Thermology was first documented around 400BC by **Hippocrates**. He wrote ***“In whatever part of the body excess of heat or cold is felt, the disease is there to be discovered”***.
- Digital Infrared Thermal Imaging was initially developed for military applications in the late 1950's.
- Since the end of the Cold War, Infrared Thermal Imaging has been made commercially available.
- In 1982 the FDA approved medical thermography as an adjunct screening tool in medicine.

***Today, Thermography is a highly refined science with standardized applications in Neurology, Vascular Medicine, Sports Medicine, Breast Oncology and many other specialty areas.***

# Definitions

**Thermology** is the medical science that derives diagnostic indications from the thermal patterns of the human body.

**Thermography** is the process of medical infrared imaging or the mapping of the thermal pattern(s) of the human body.

**Thermogram** is, literally, a “heat picture”. It is the image that is captured by an infrared thermal imaging camera

# What is Medical Thermography?

Medical thermography is the mapping of the heat patterns of the human body using high resolution, thermally sensitive (< 50/1000 degree) infrared thermal imaging cameras, and the **interpretation** of those thermal patterns.

Balance

Patterns

Because of its ability to detect the heat associated with inflammation, Thermography is now being used for Early Detection of developing physiological conditions.

# How is Thermography Different?

1. Thermography “sees” the heat associated with inflammation and is, therefore able to capture real-time physiology, or function of the body.
2. Other imaging modalities (X-Ray, MRI, CAT Scans, Ultrasound) see structure, not function.
3. Thermography can detect changes in physiology before they become symptomatic and manifest structurally.

# PENGGUNAAN TERMOGRAFI UNTUK DIAGNOSIS

Hal – hal yang dapat di diagnosis dan dipergunakan teknik termografi antara lain.

1. Carcinoma Mammae.
2. Vascular Disease (Penyakit Pembuluh Darah).
3. Follow Up pada penderita postoperatif karena diabetes.
4. Cerebral Vascular Disease.
5. Arthritis Acuta.
6. Patello (Nyeri Pada Persendian Lutut).
7. Primary Erythemaalgia.

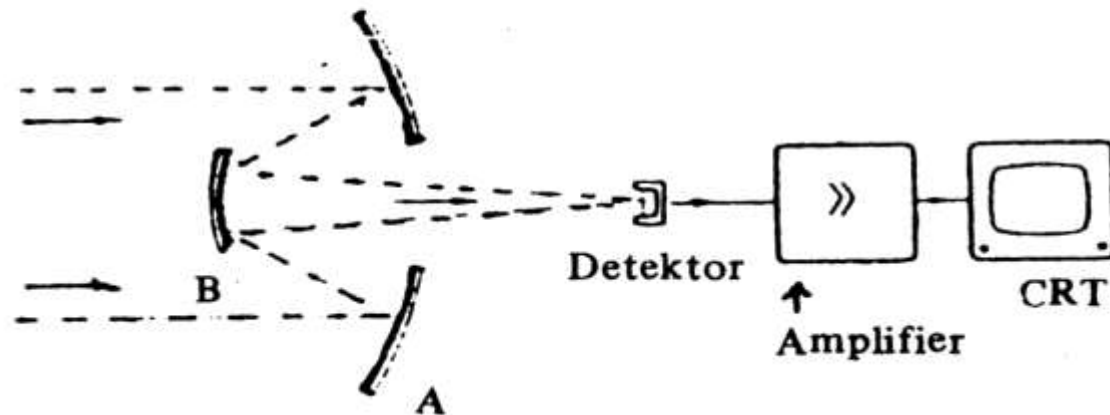


# How Does Thermography Work?



## 5.3. SKEMA SISTEM TERMOGRAFI

Skema dasar termografi terlukis pada gambar di bawah ini.

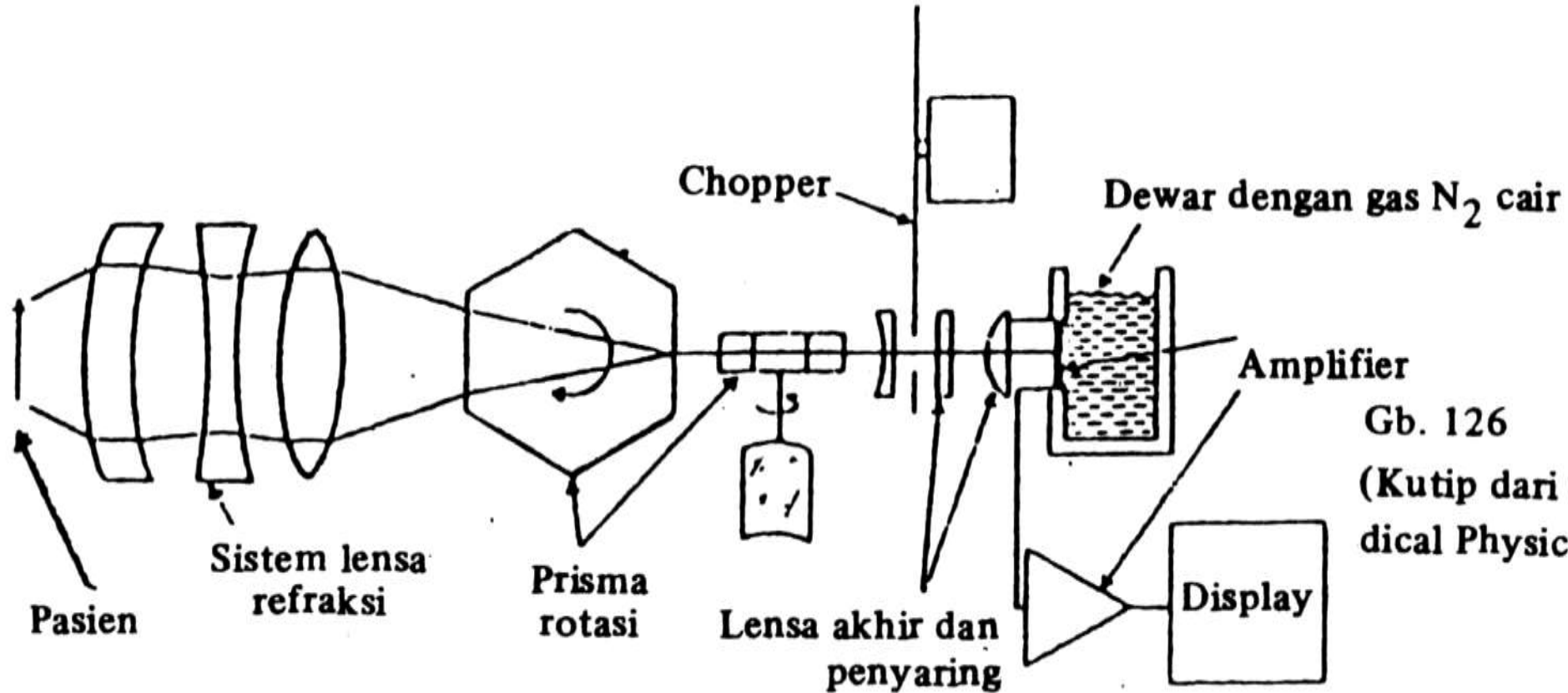


Gb. 125.

Dikutip dari *Journal of Drug Research Thermography*, J. Steketee, 1979, hlm. 4.

Radiasi yang datang dari penderita akan di terima oleh cermin A. Lalu divefleksikan ke cermin B. Dari cermin B, Gelombang radiasi akan diterima oleh detektor dan diteruskan ke alat penguat (Amplifier) sebagai display dipakai CRT (Cathode Ray Tube).

# Unit Termografi Yang Khas Dipergunakan Di Klinik



Gb. 126  
(Kutip dari Cameron "Medical Physics")



Radiasi (5MM) → Susunan Cermin → Chopper → Kedetektor  
(Dilengkapi pendingin untuk memperoleh Sensifitas).

Fungsi: Chopper mengubah radiasi yang kontinyu menjadi sinyal AC sehingga mudah diimplifikasi.

Detektor : mengubah IR radiasi dari panas tubuh menjadi sinyal listrik dan disesuaikan proporsi tempera turtubuh yang memancarkan radiasi.

Syaratnya pada waktu akan melakukan thermografi.

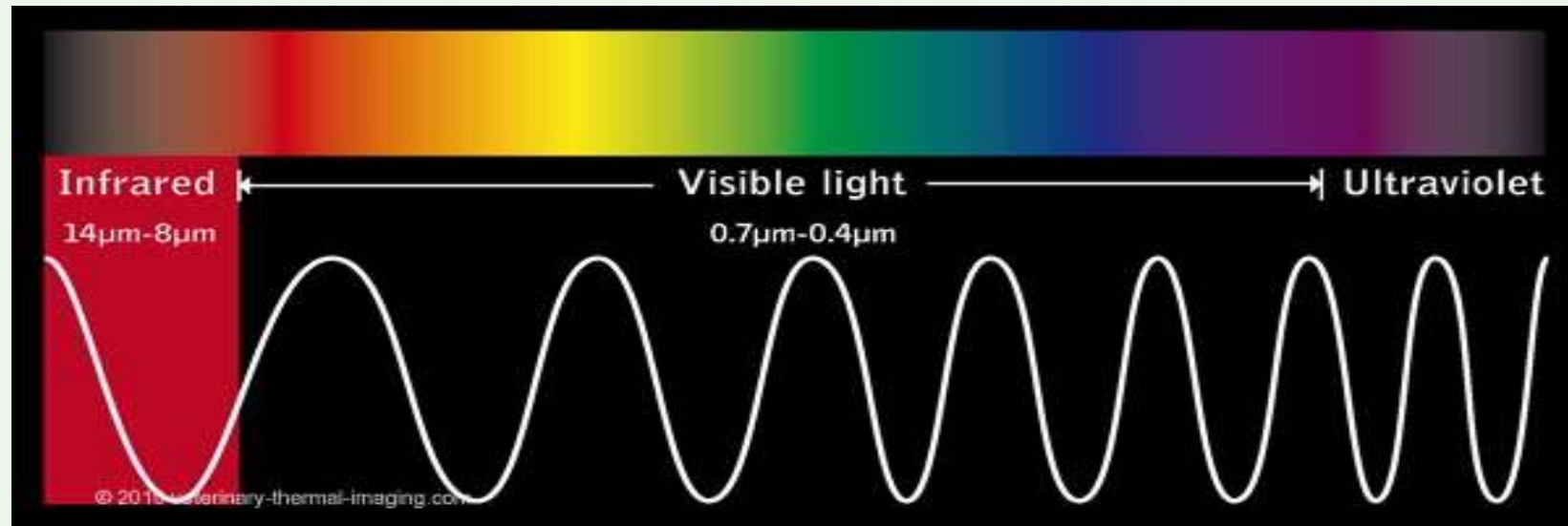
- a. Pakayan penderita harus dilepaskan.
- b. Penderita sebelumnya harus ditempatkan dalam ruang bersuhu  $21^{\circ}\text{C}$  selama 20 menit, agar penderita beradaptasi.

Untuk mendapatkan gambaran Theramograf yang jelas tidak cukup dengan termografi yang monokromatis sebaiknya pakai kolor termografi/termografi yang berwarna.



# The Physics Behind The Science of Thermography

- Energy is emitted in the form of a wave. Light is energy.
- The “Visible Light” spectrum is a portion of the continuum of energy



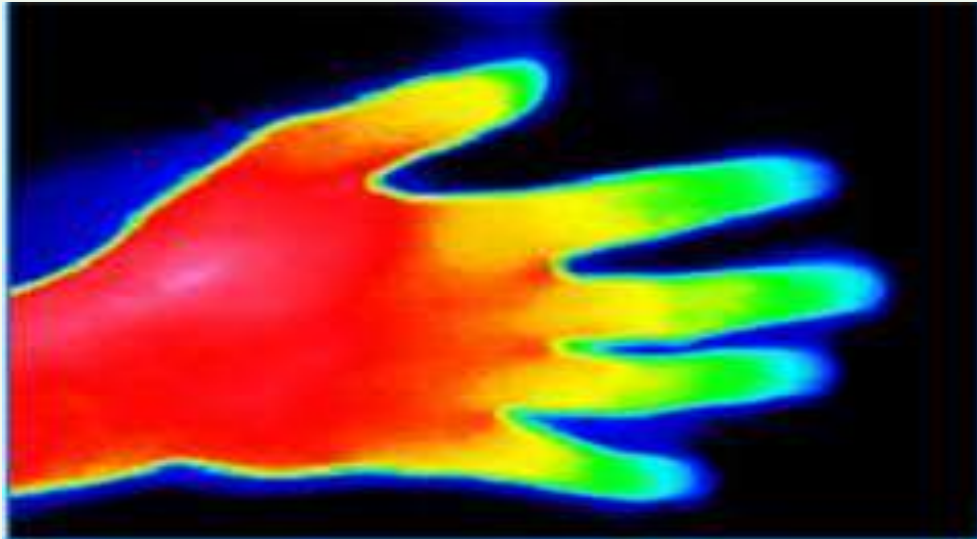
- Heat is also energy and is also emitted as a wave.
- Thermal Energy (Heat) has a longer wavelengths than visible light and, and although we can't see it, we can detect it.



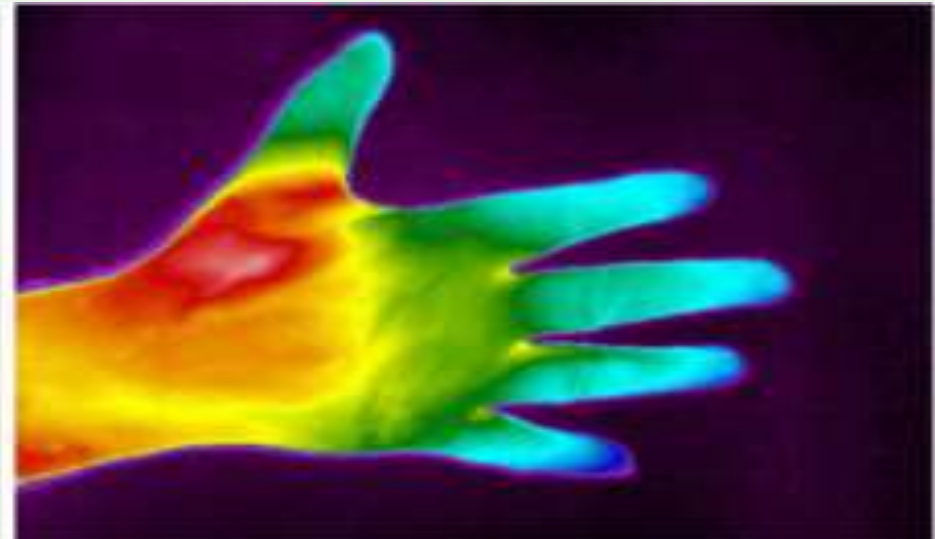
# Precision and Resolution

- or -

(temperature and pixels)



Low Precision/Low Resolution  
(poor thermal sensitivity)



High Precision /High Resolution  
(very good thermal sensitivity)

# Why Is There Increased Blood Flow?

1. The Body is in the process of **REPAIRING /HEALING**
2. The Immune System is **FIGHTING INFECTION**
3. **ANGIOGENESIS**

The physiological changes taking place involve increased (or decreased) blood flow

→ **Increased blood flow manifests as inflammation and increased heat .**

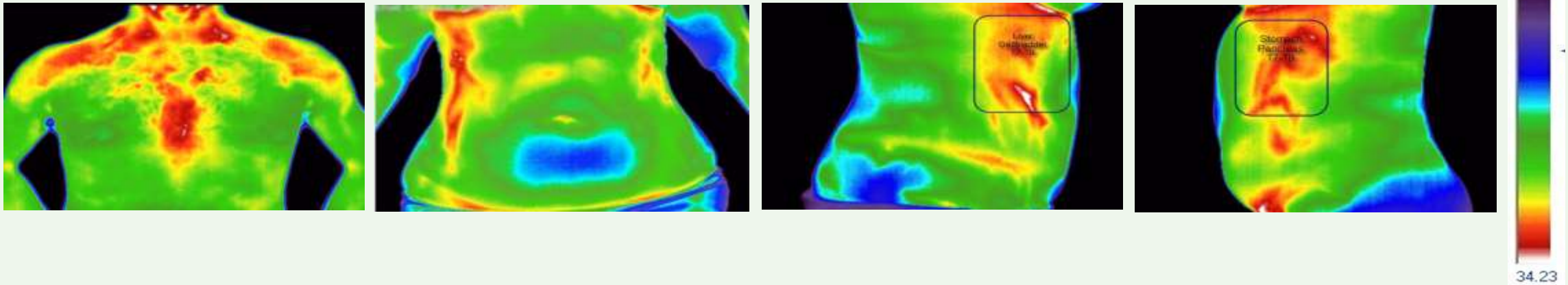
→ **Decreased blood flow manifests as “colder” areas**



# 6 Phases of Disease

## Example: Gastrointestinal System

Organ System	HUMORAL PHASES		MATRIX PHASES		CELLULAR PHASES		
	Excretion Phases	Inflammation Phases	Deposition Phases	Impregnation Phases	Degeneration Phases	Dedifferentiation Phases	
Gastrointestinal System	Heartburn	Gastritis	Hyperplastic Gastritis	↔	Chronic Gastritis, Malabsorption	Atrophic Gastritis, Liver Cirrhosis	Stomach Cancer, Colon Cancer



# Why Is Thermography Effective?

We know that -

1. Inflammation is a precursor to disease.
2. If inflammation is identified in the body, steps can be taken to reduce it and prevent onset or symptoms of disease and potentially even reverse it.
3. Thermography detects the heat involved with inflammation!
  - ✓ **The camera doesn't lie!**

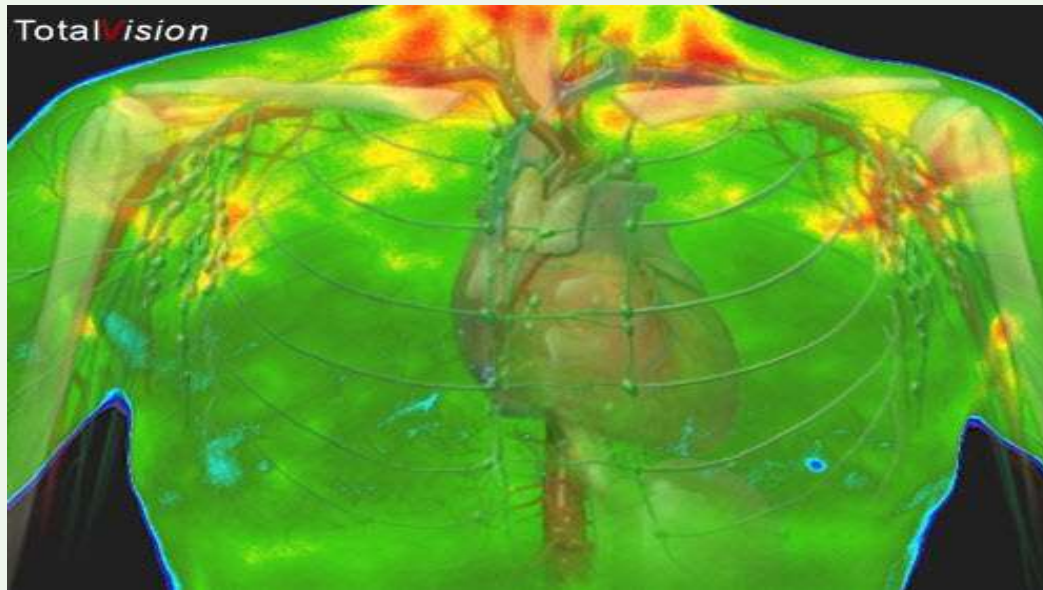


# Thermography Is Used To Detect

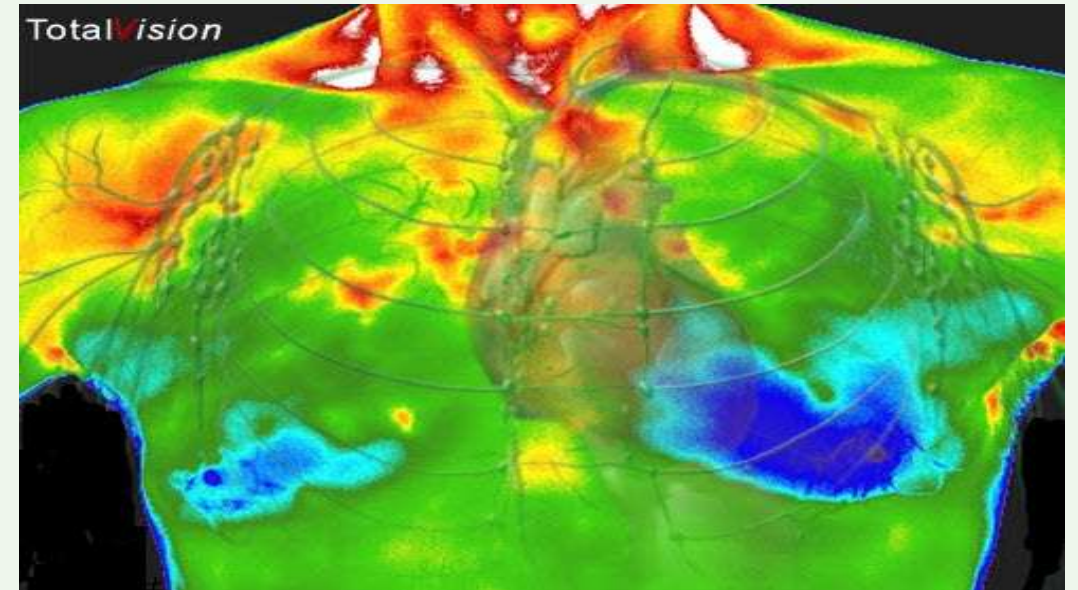
- ✓ Cardio-Vascular/Circulatory Problems
- ✓ Thyroid Disorders/Hormonal Imbalance
- ✓ Digestive Disorders/Food Allergies
- ✓ Lymphatic Congestion
- ✓ Endocrine/Immune System Disorders
- ✓ Breast Health

# Detecting Early Signs of Heart Attack

A “Normal” Image



A Heart Attack Waiting to Happen



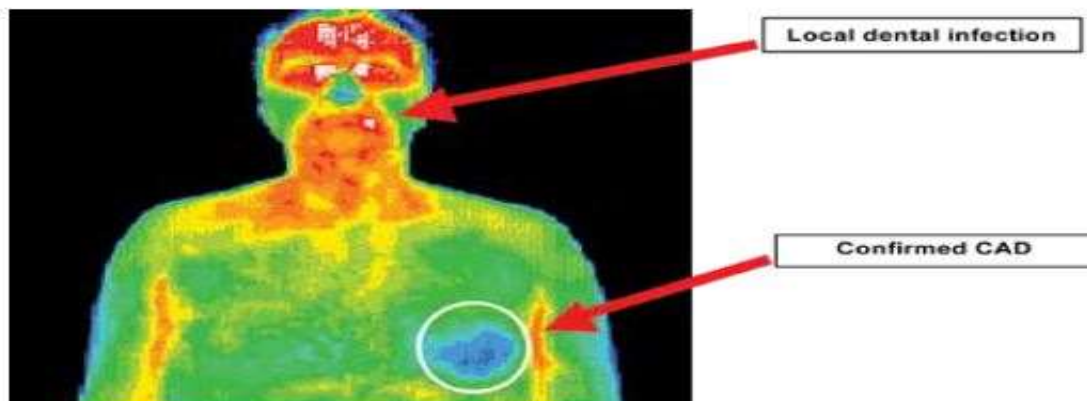


Fig. 1: The asymmetrical hypothermic (blue) pattern over the left chest wall indicates weak cardiac function. This male subject had follow-up testing and it was determined he had CAD.

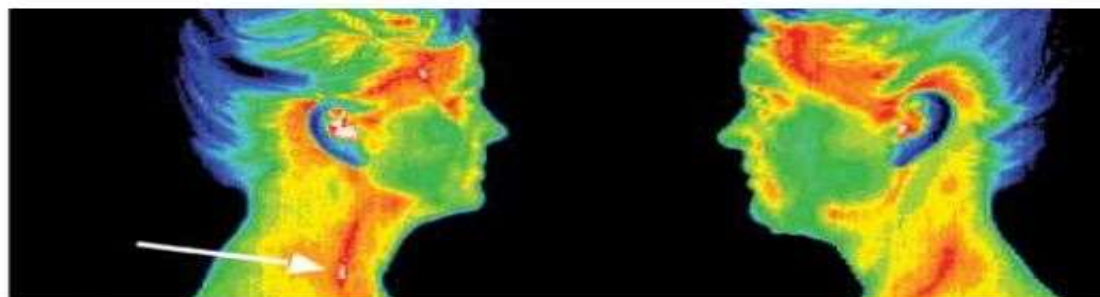


Fig. 2: The asymmetrical pattern in this subject indicated she needed further testing that later confirmed a right carotid occlusion.

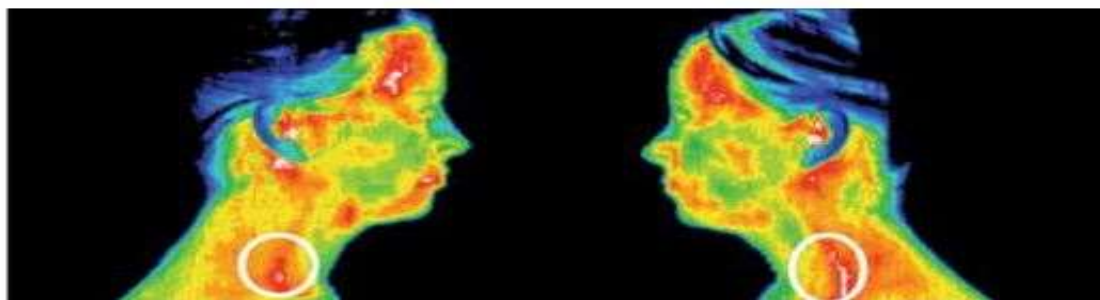
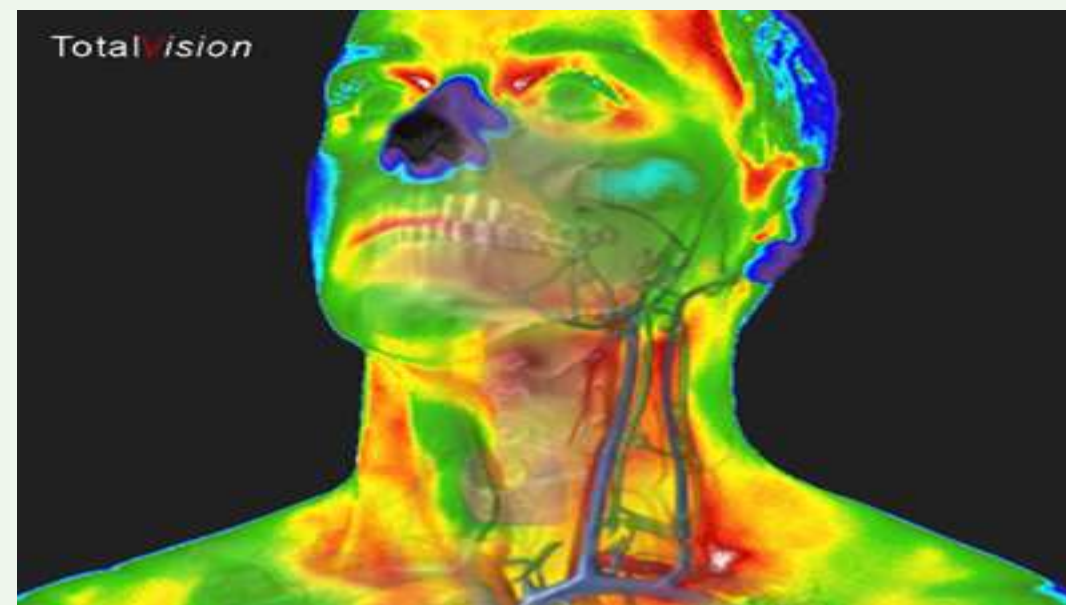


Fig. 3: CRP gives a gauge of the amount of inflammation in the body. When CRP is elevated and the thermal image indicates high activity in the carotid region, there's a very strong correlation to the early development of heart disease.

Images courtesy Proactive Health Solutions, LLC

## Images showing Cardio-Vascular Temperature Anomalies



TotalVision™ software showing cardio-vascular system and dental overlays.



# Circulatory Problems

## Phlebitis In Left Leg

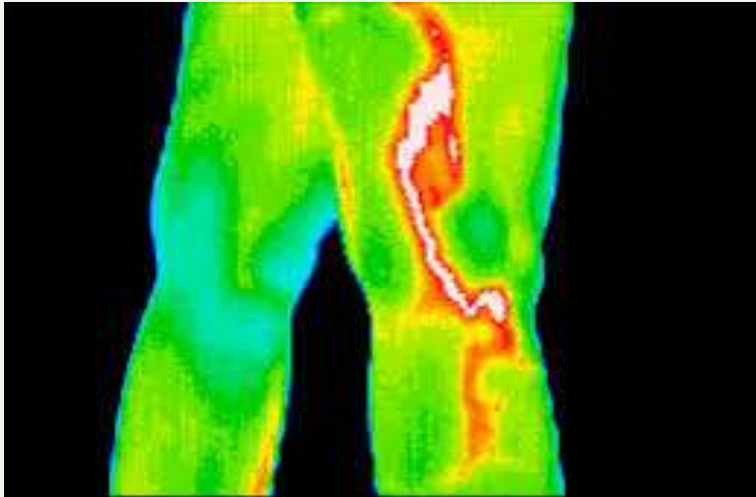
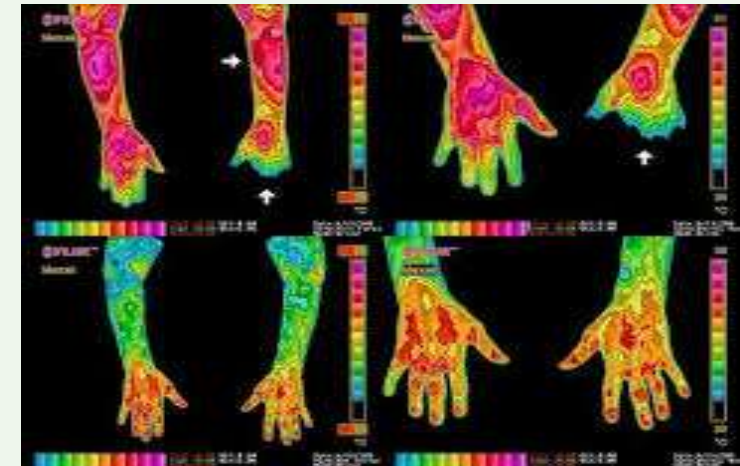
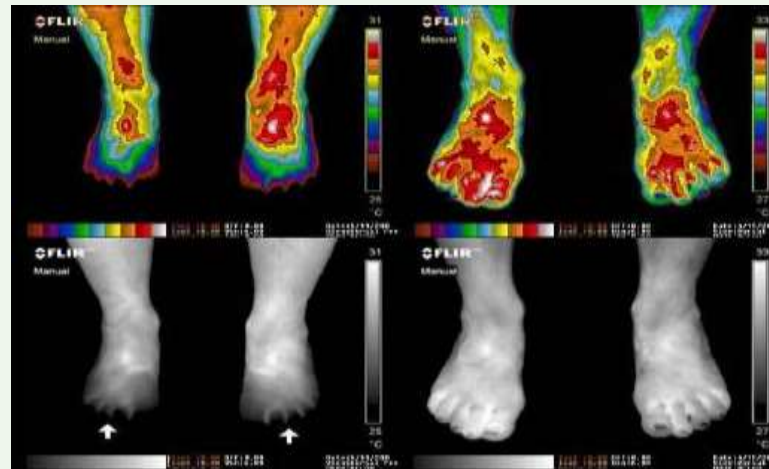


Image courtesy thermographscan.com

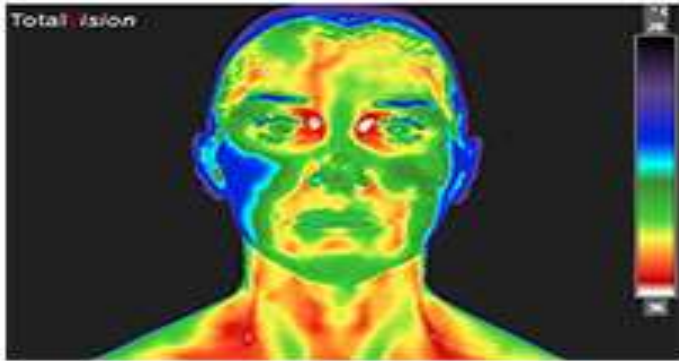
## Circulation In Extremities– Before and After Treatment



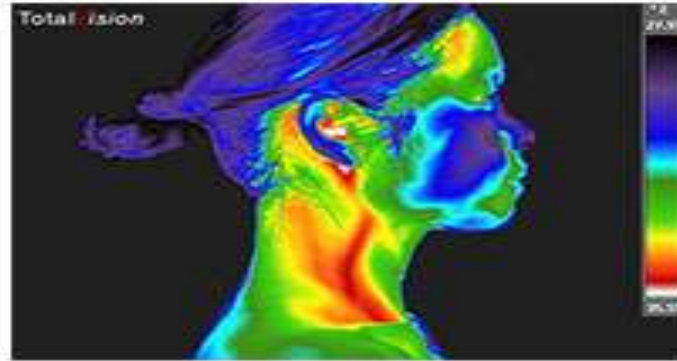
Images courtesy of earthingfairfield.com

**In the images above, we can see the increased blood flow in the hands and feet.**

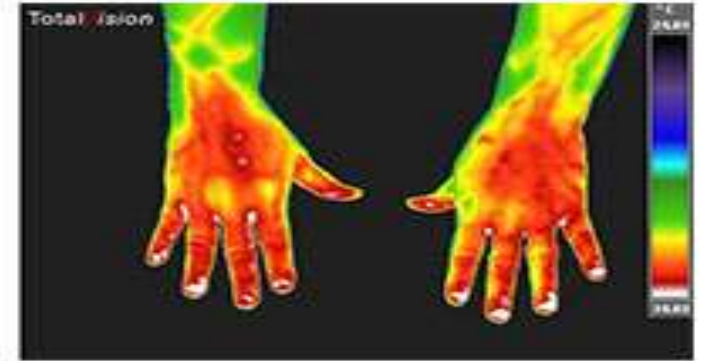
Evidence of Diabetes and or heart disease in the scan will allow the patient to *see for themselves* the inflammation in the body.



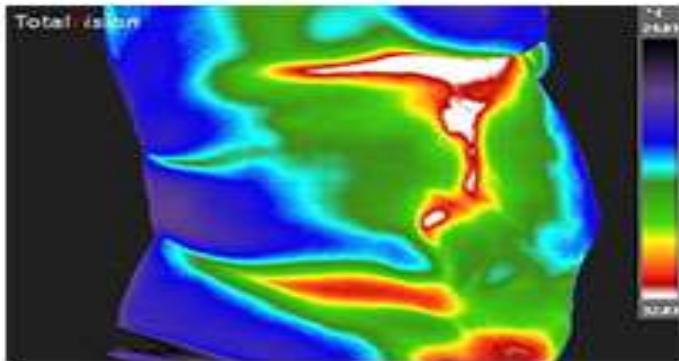
Headache and Sinus



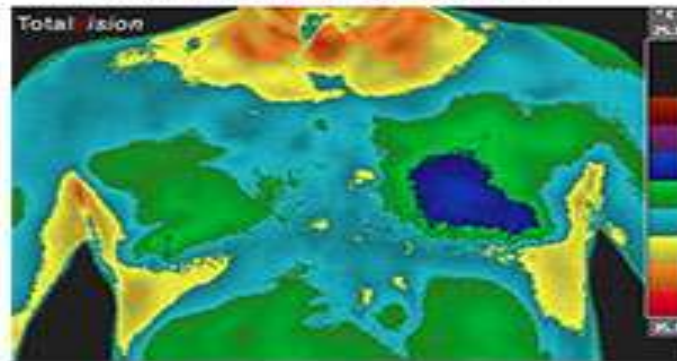
Carotid Artery Inflammation



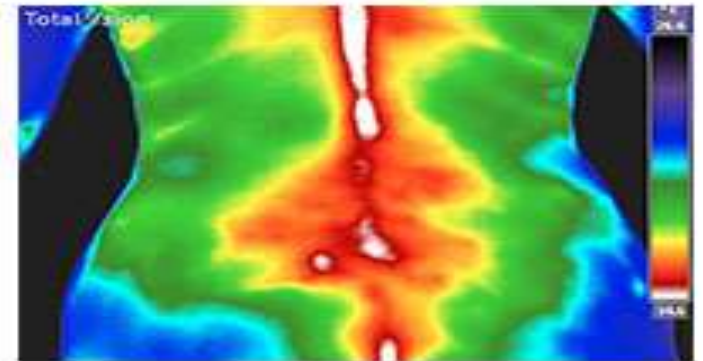
Early Stage Diabetes



Stress in the Liver



Reduced Heart Function

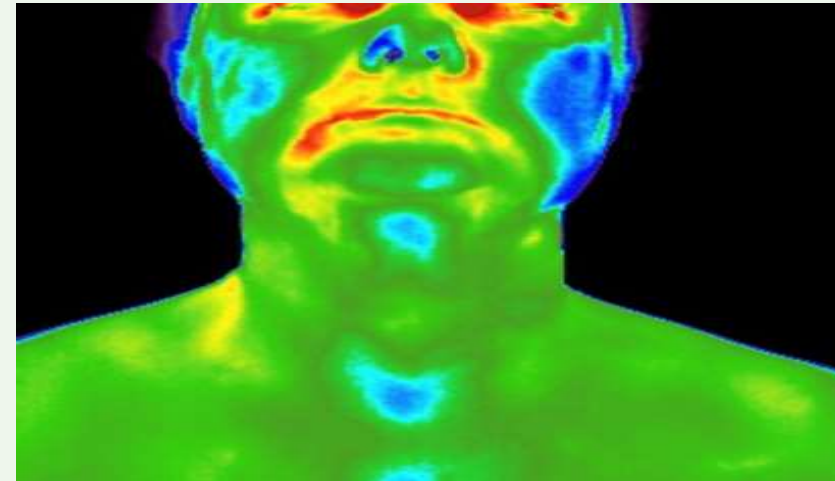
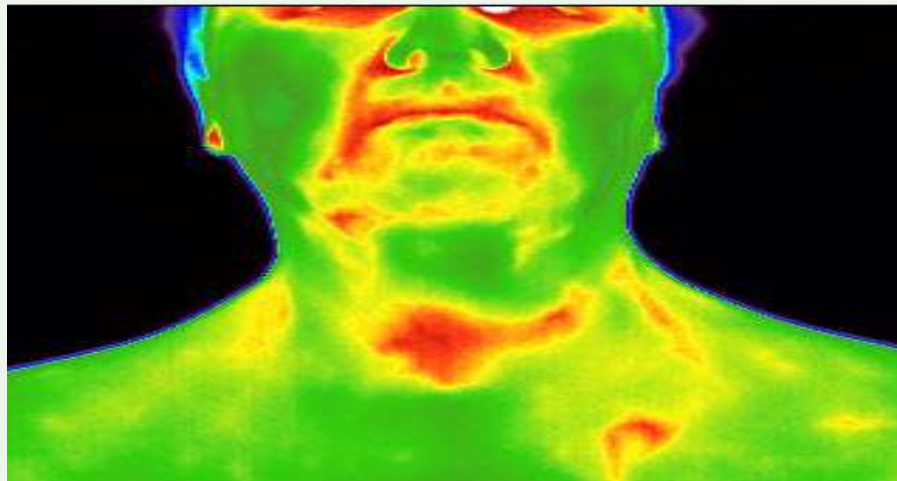
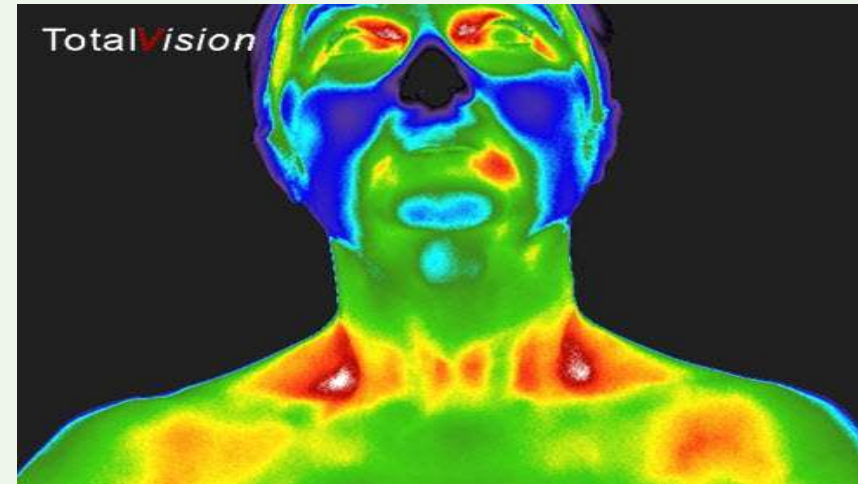
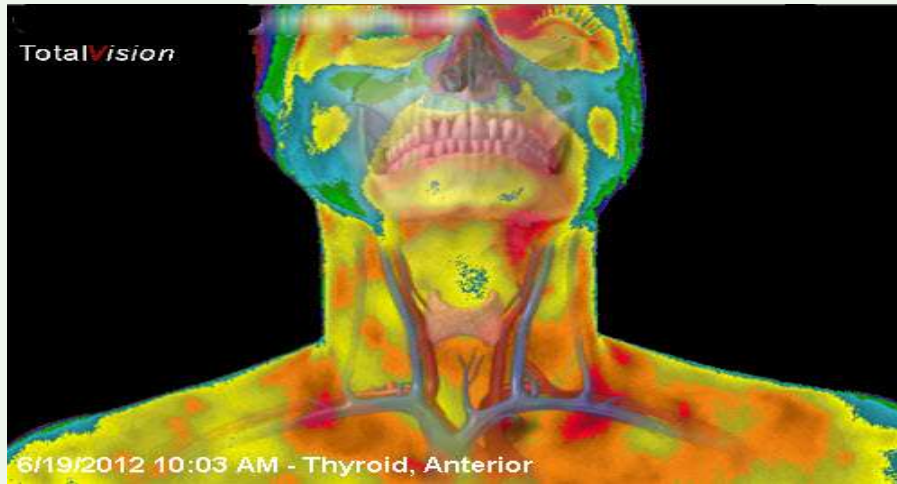


Lower Back Pain





# Thyroid





# Thyroid Imaging

**iScanHD**  
Medical Imaging Systems

## Thyroid Changes

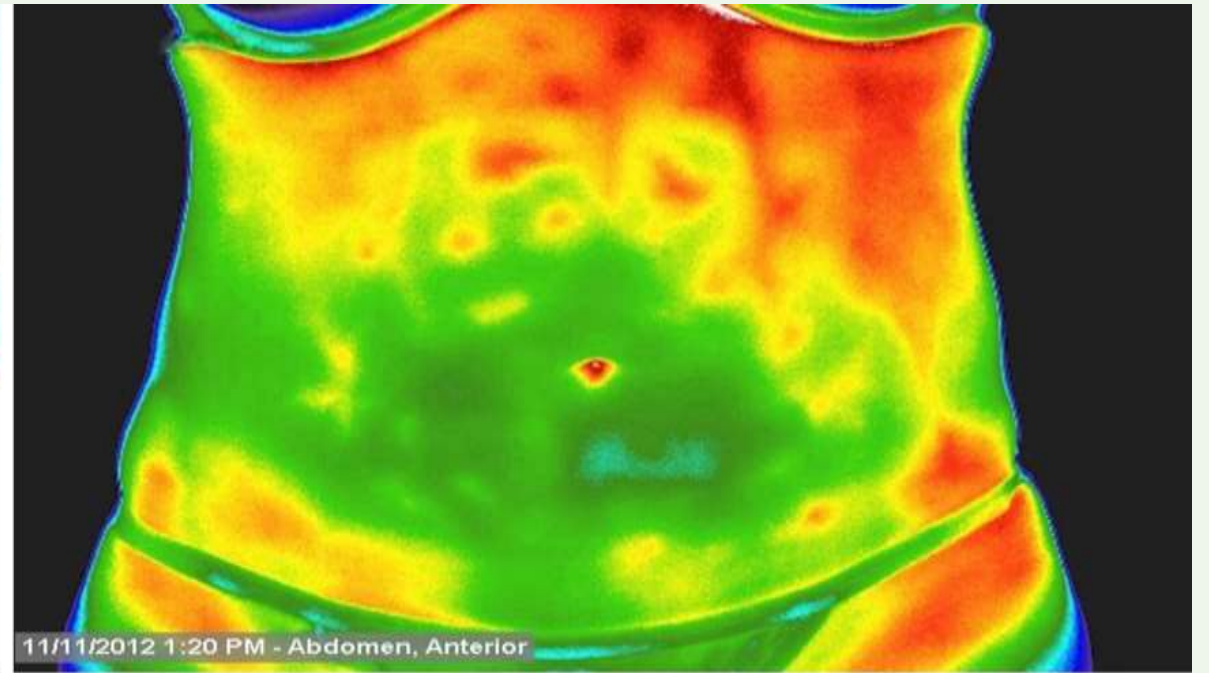
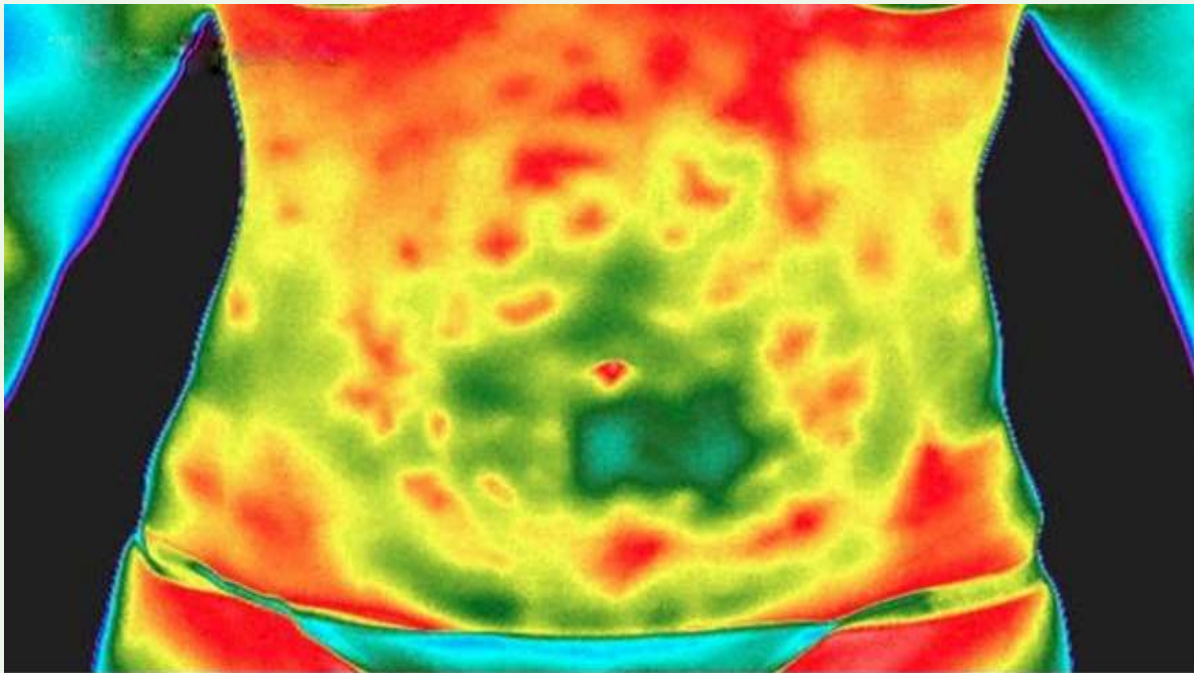
Within accepted range	Beyond accepted range

Thermography is an investigative tool and results may justify further clinical assessment.  
Thermography is not a stand-alone diagnostic test.





# Abdominal



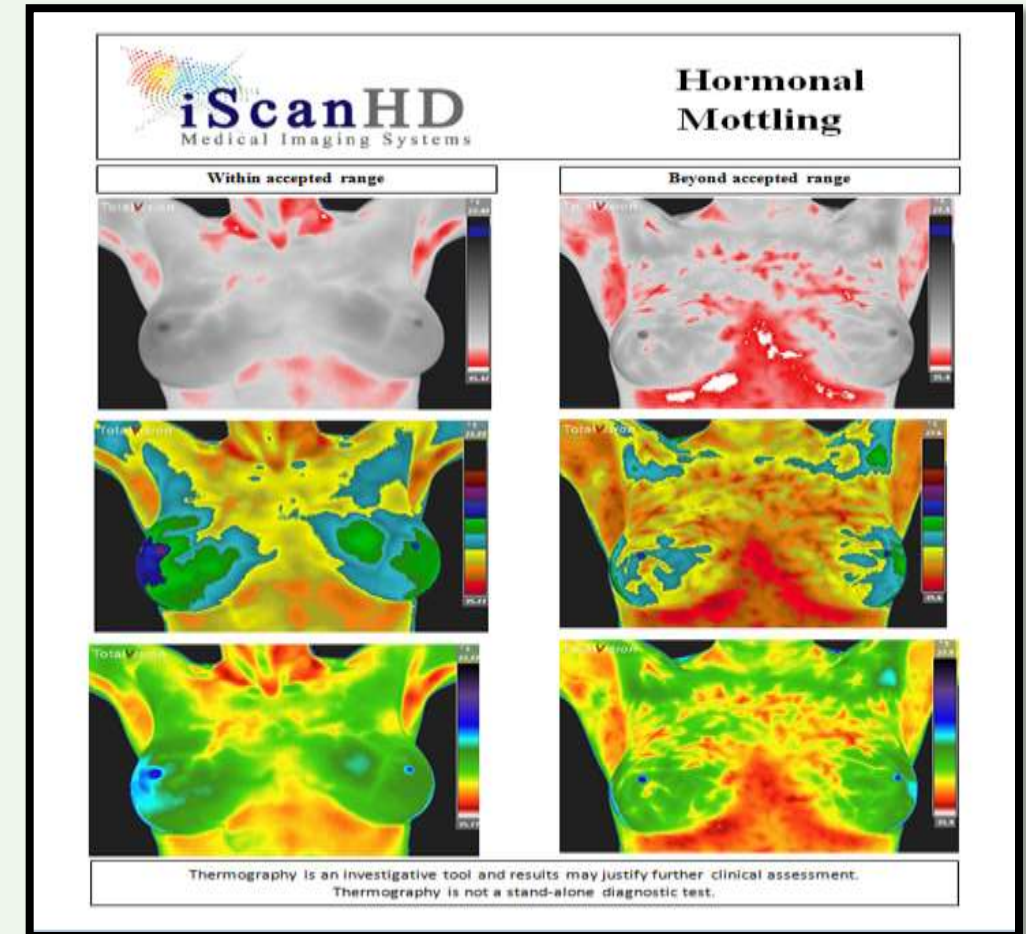
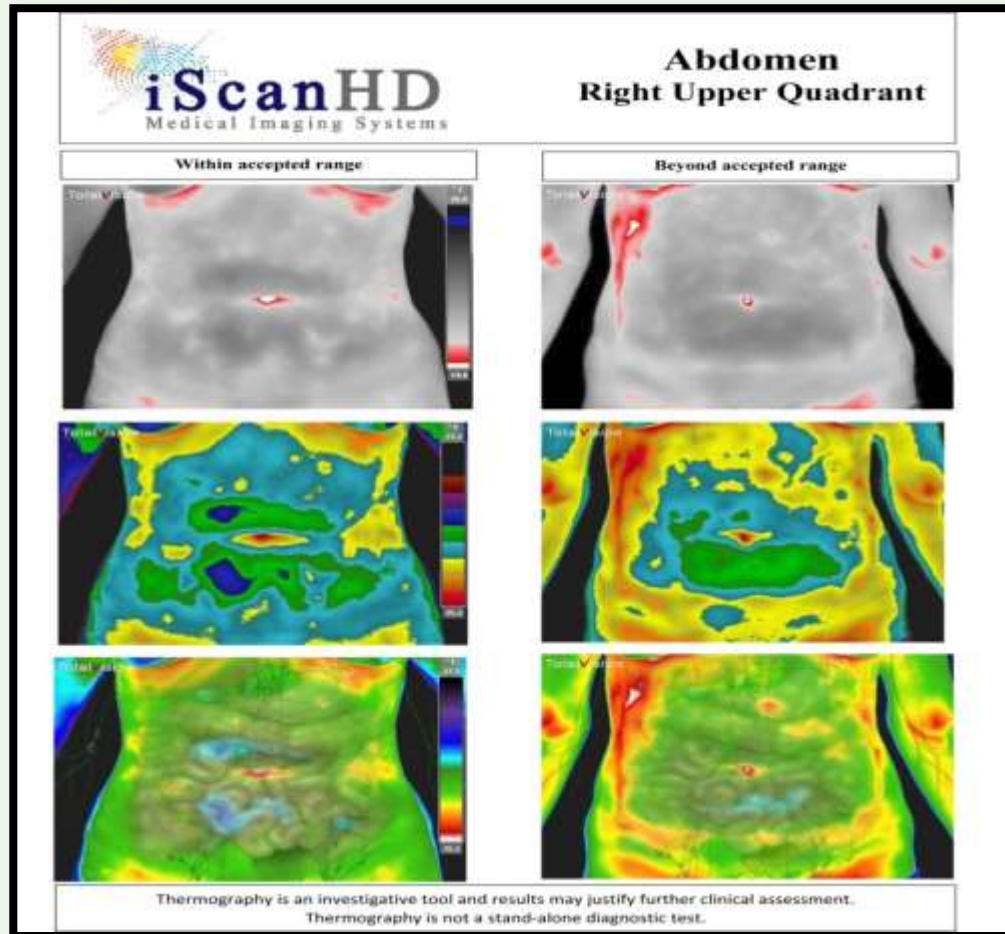




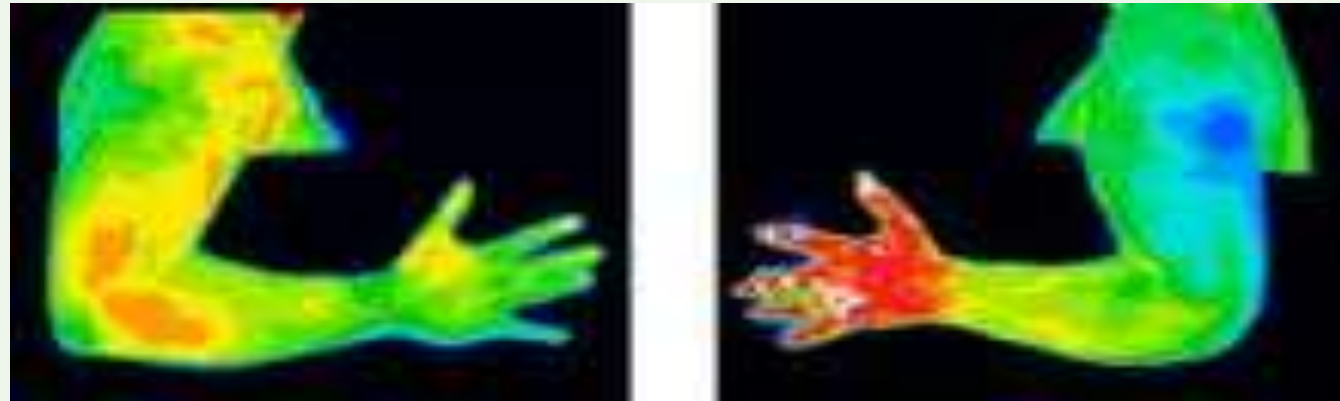
# Hormonal and Visceral Organ Systems

## Visceral and Digestive System Disorders

## Hormonal Imbalances



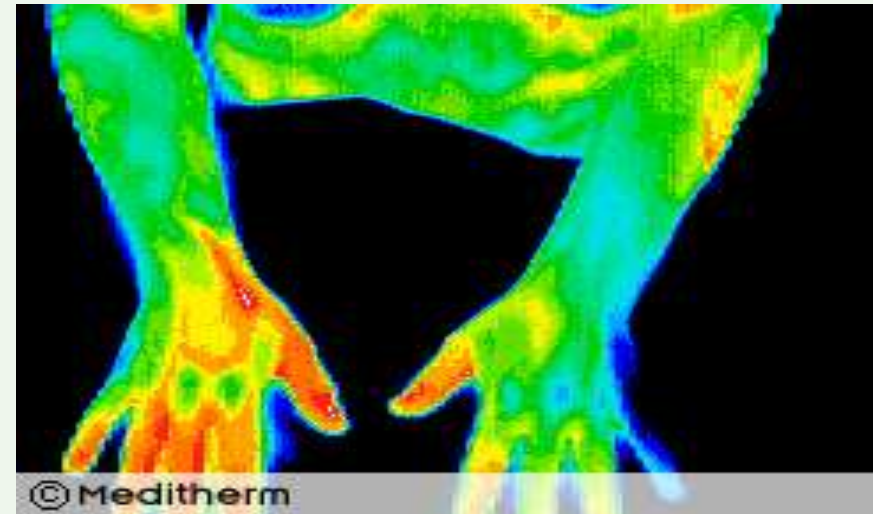
# Hand Pain/Carpal Tunnel Syndrome



Images courtesy of medicalthermography.net



Image courtesy of infra-spection.co.uk



# Neck & Back Pain

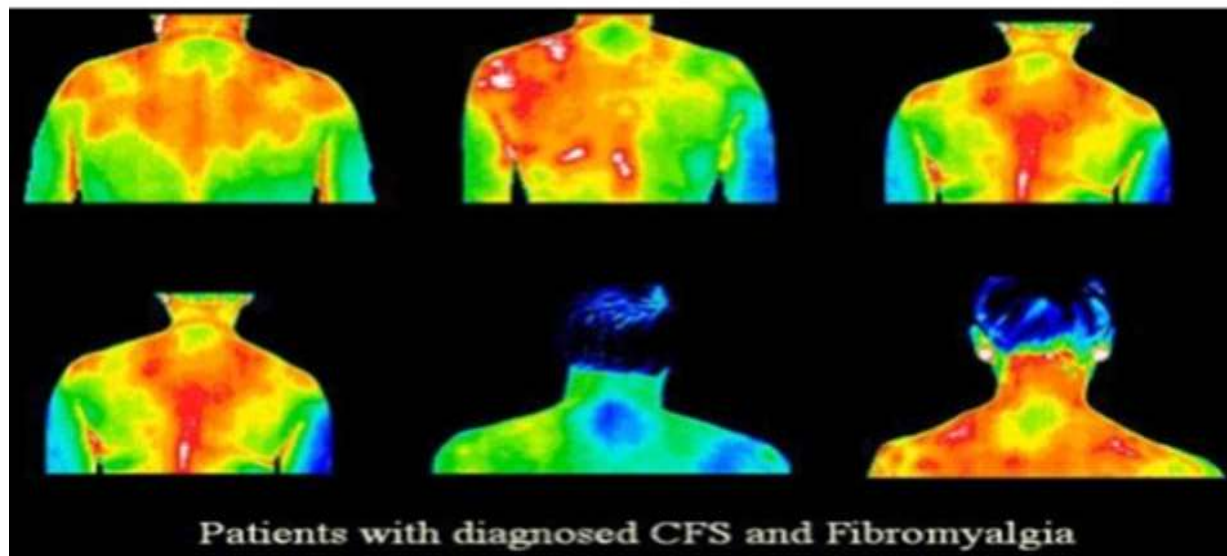
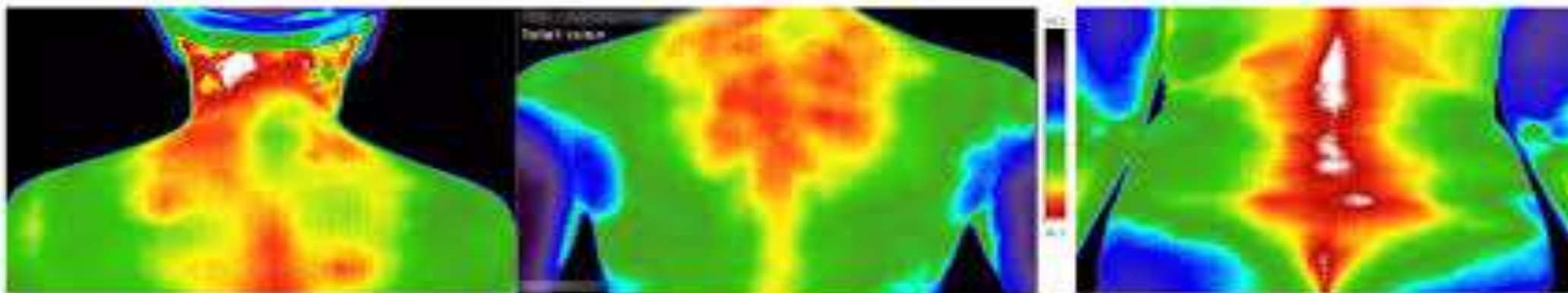


Image courtesy greenhealththermography.com

Images of the back of neck and upper back can identify inflammation common to Fibromyalgia

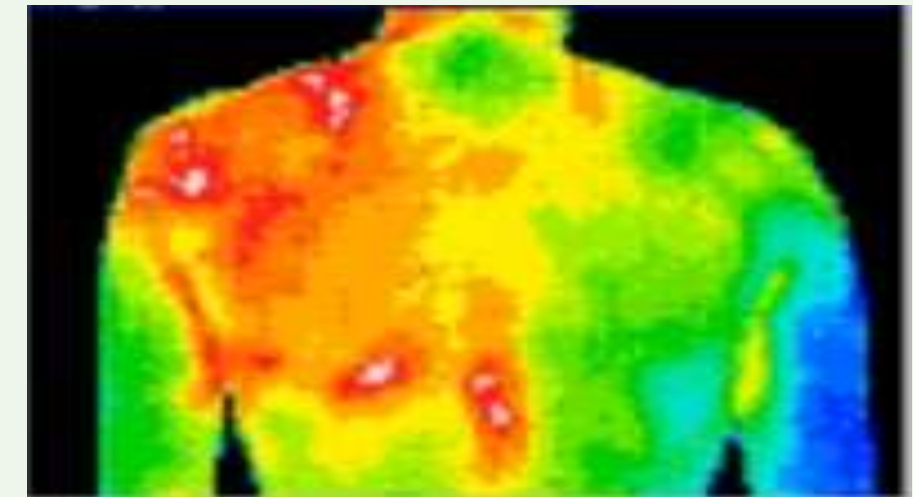
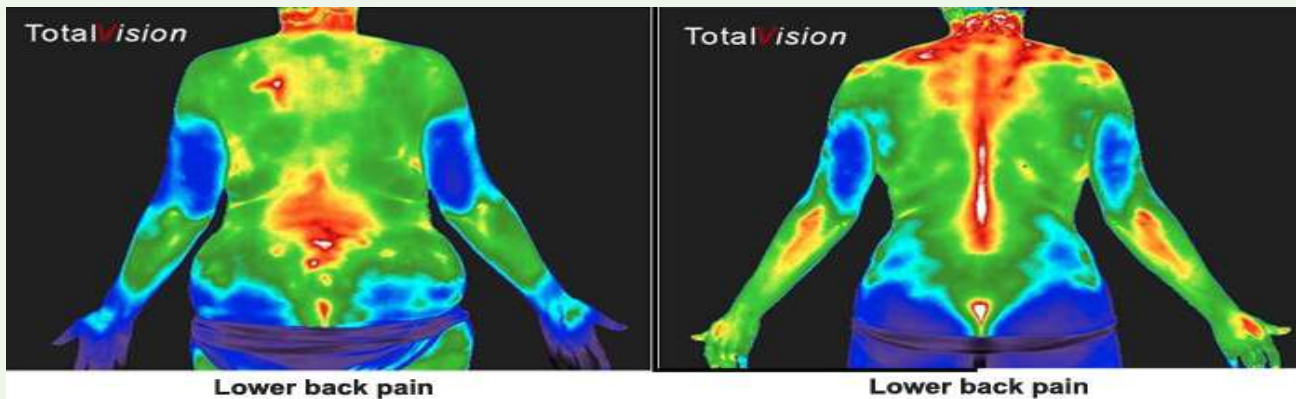
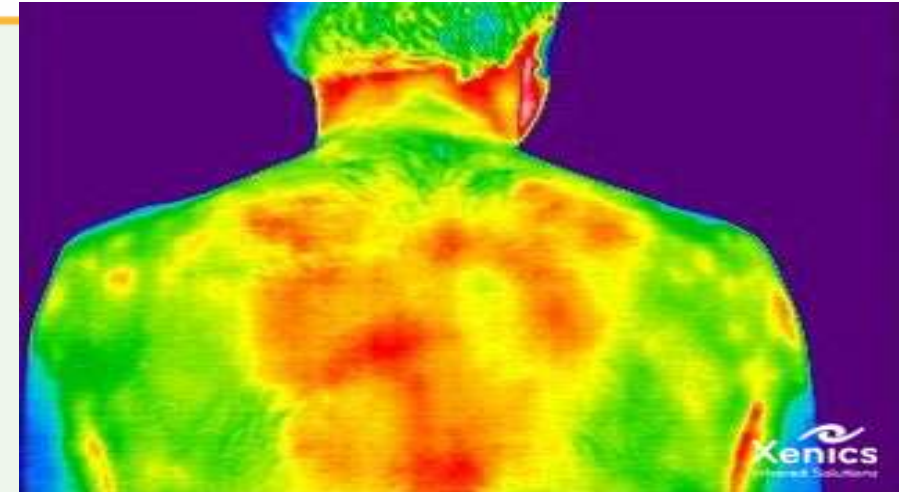
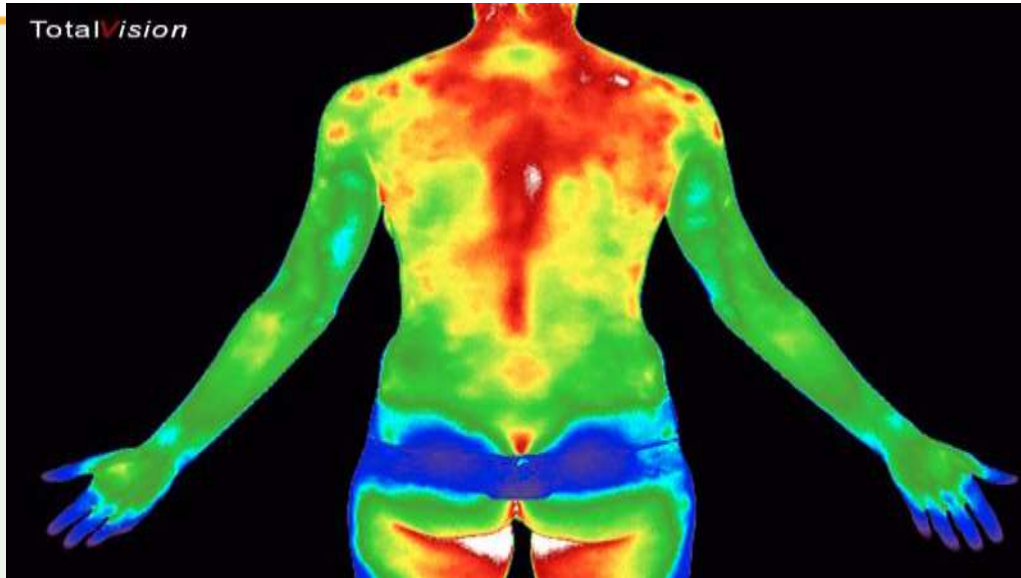


Images courtesy Oregonnaturalmedicine.com





# Neck & Back Pain (con't)

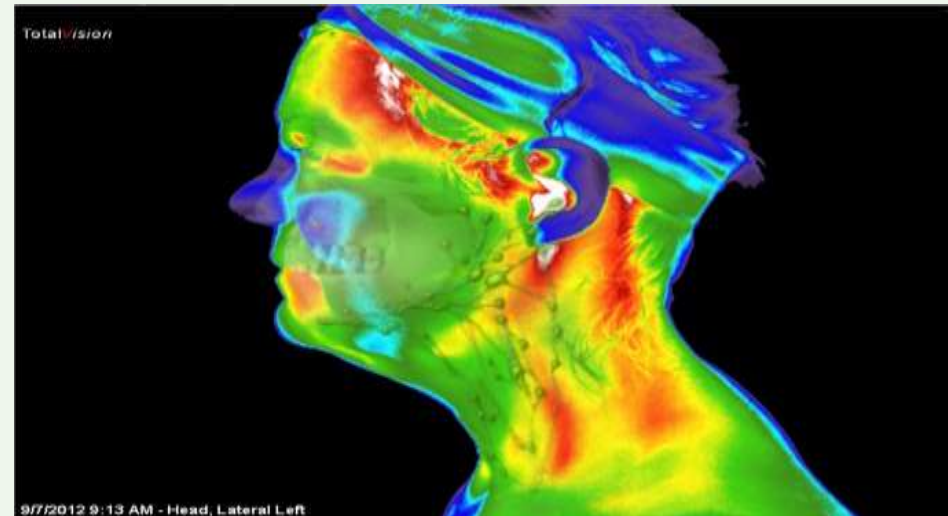
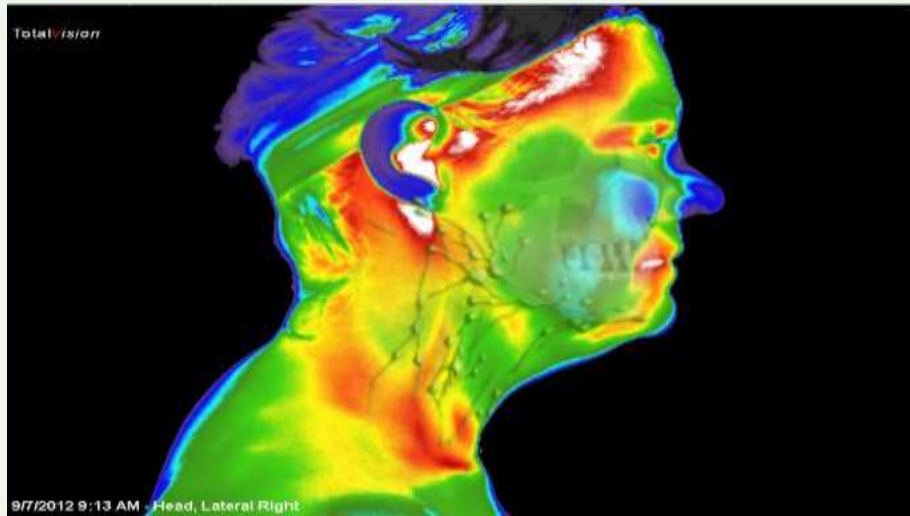
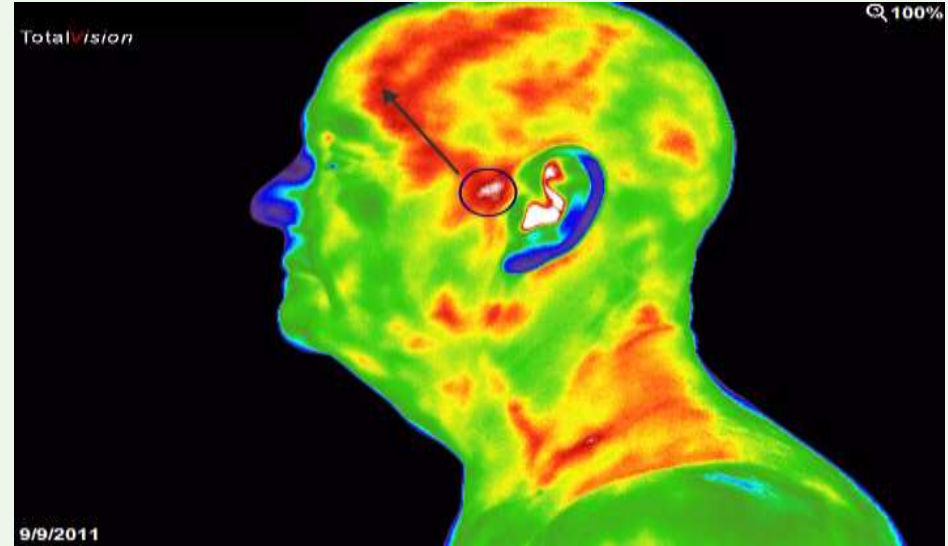
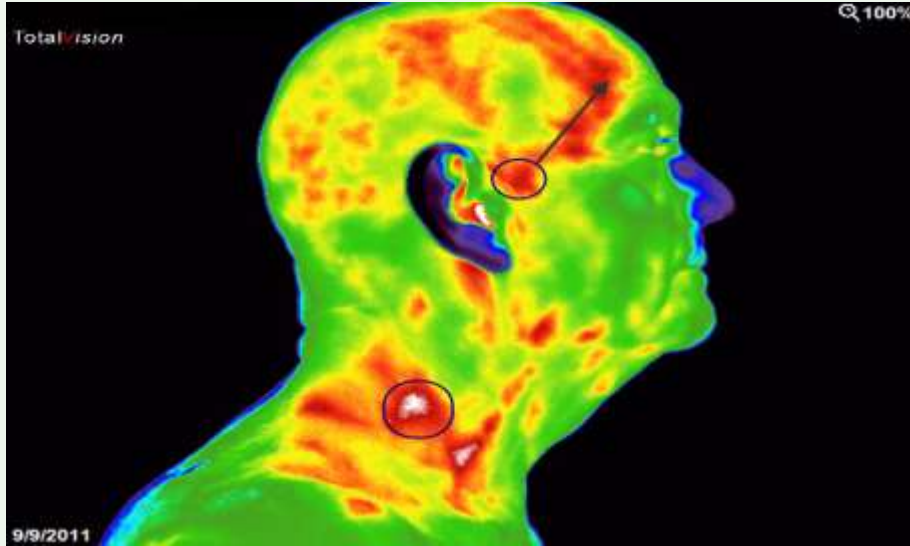


Images courtesy of CMTScans.com

Image courtesy of integratedhealthclinic.com



# TMJ Disorder



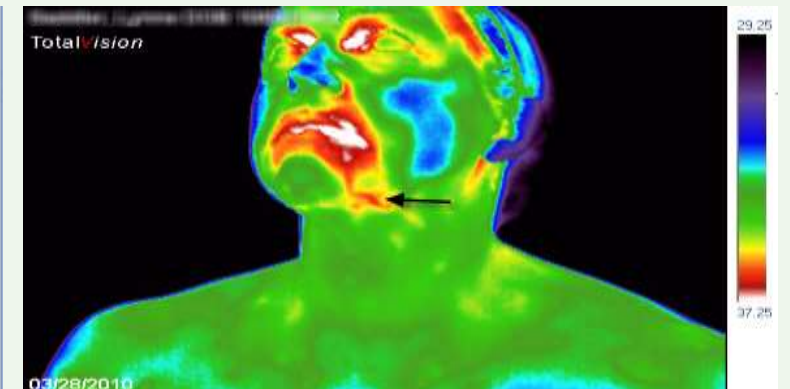
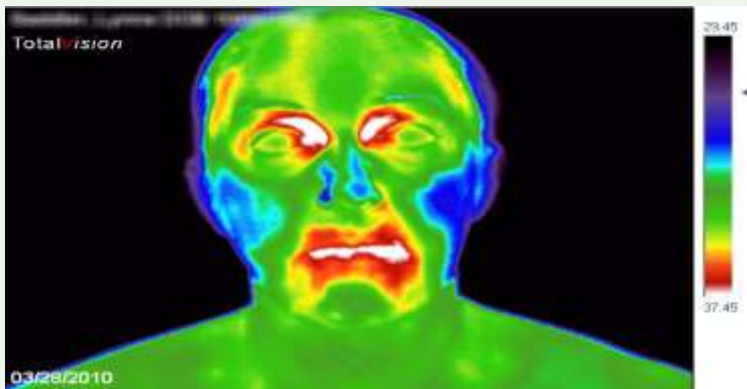
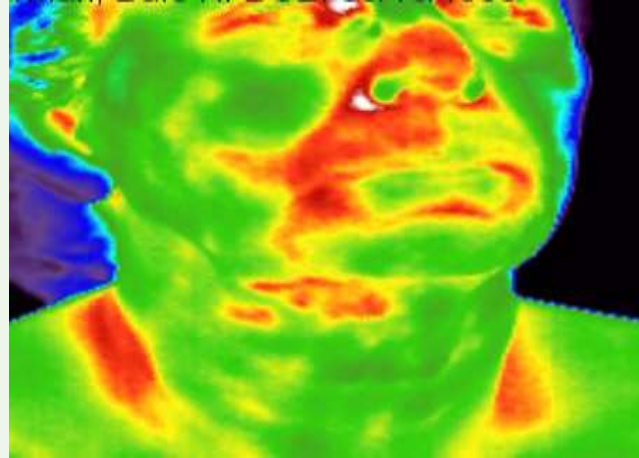
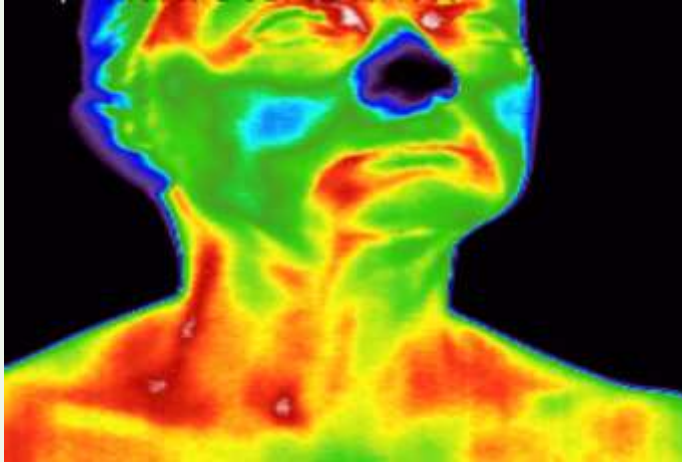


# Oral /Systemic Link



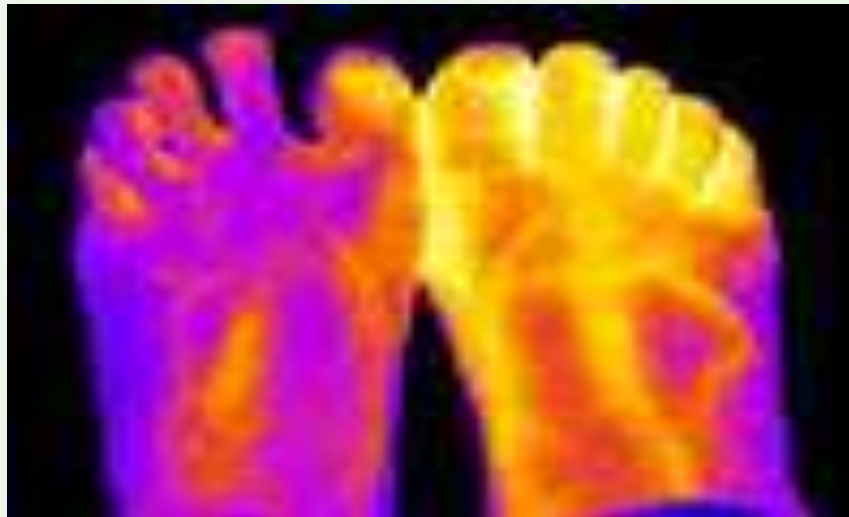
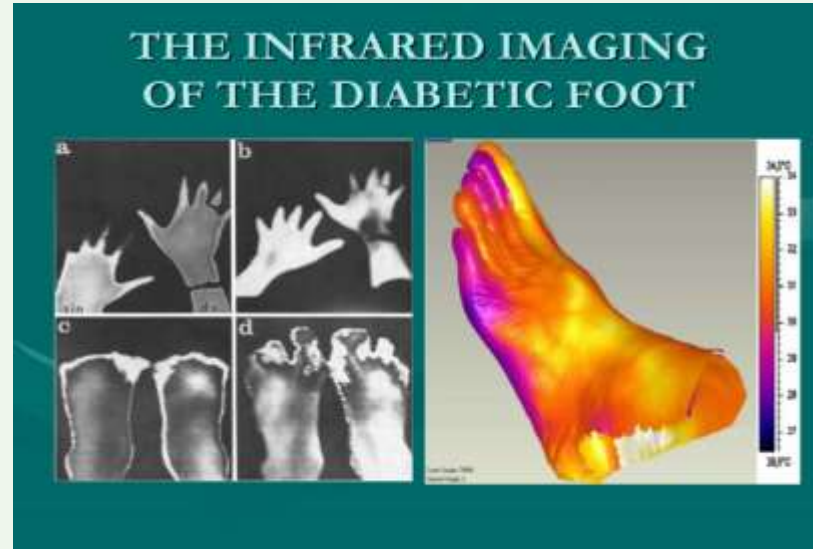


# Tooth and Gum Pathology/Abcesses





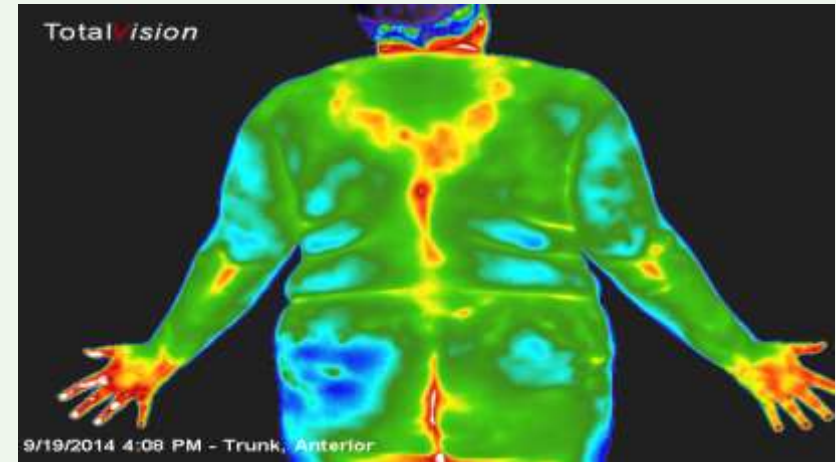
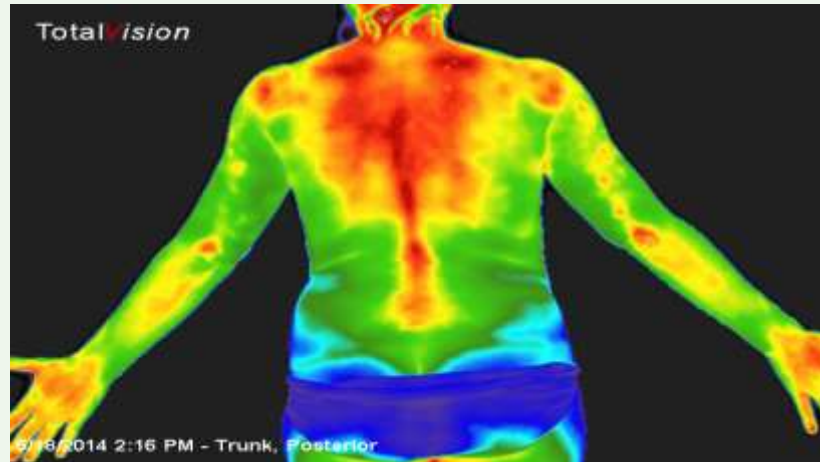
# Diabetes



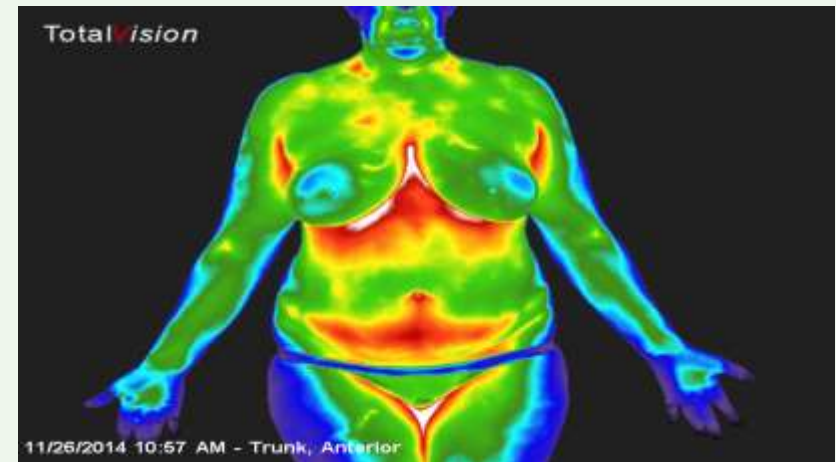
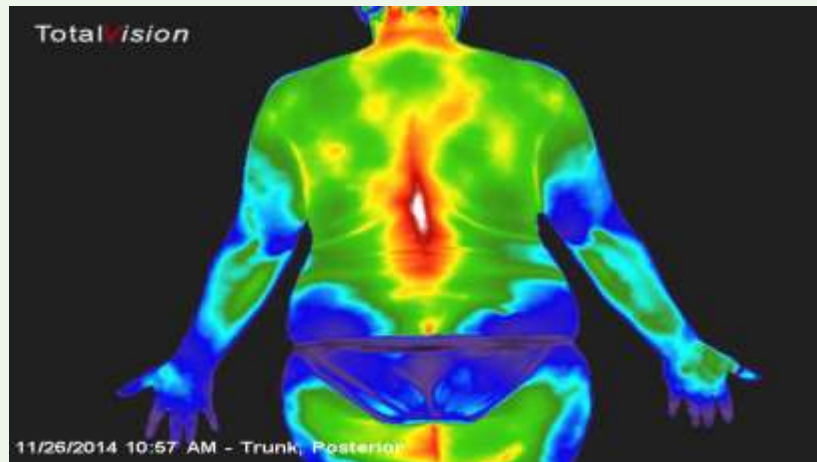
Images courtesy of [integrativehealthgroup.com](http://integrativehealthgroup.com) and [infraredcamerasinc.com](http://infraredcamerasinc.com)



# Pre-Diabetic “Glove” Pattern



Note how the hands are warmer and appear to have gloves on



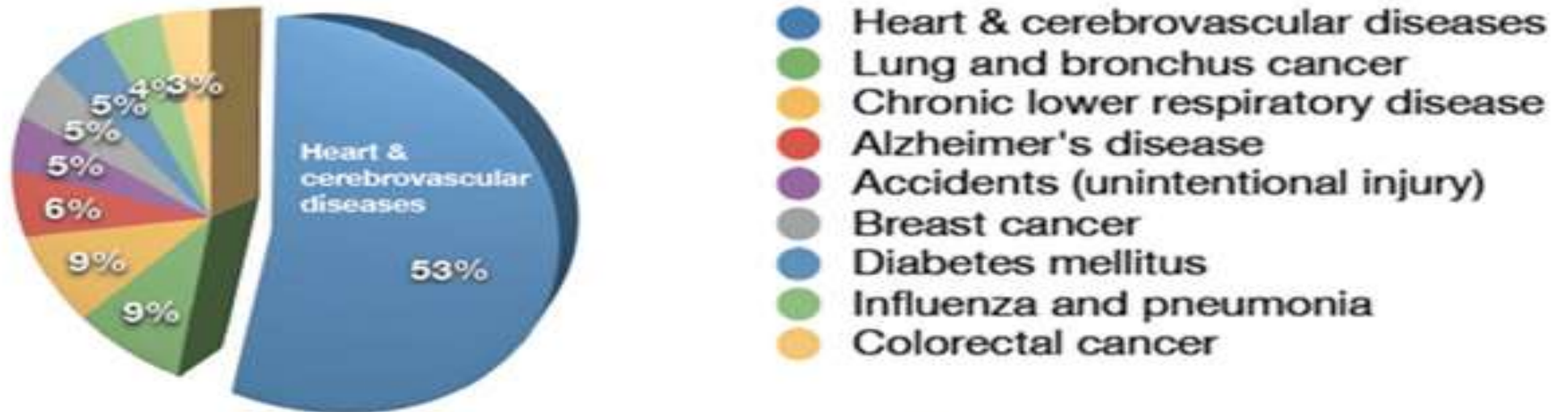
In these patients the hands are cooler than the lower arms



# Top Ten Causes of Death for Women in the United States

Everyone knows about CVD problems for men, but women are also at risk:

Top 10 Causes of Death for Women in the United States\*



\*Source: Surveillance, Epidemiology and End Results (SEER) Program ( <http://www.seer.cancer.gov> )

**Medical Infrared Thermography Cardio-Vascular Screening**  
**Inflammation is the disease...*Early detection is the best solution!***

# Basic Truths of Life...

*Abnormal heat patterns, of the kind seen by thermography, are among the earliest known signs of a forming cancer.*



"I can't wait to have my mammogram done!"

Said no woman ever.

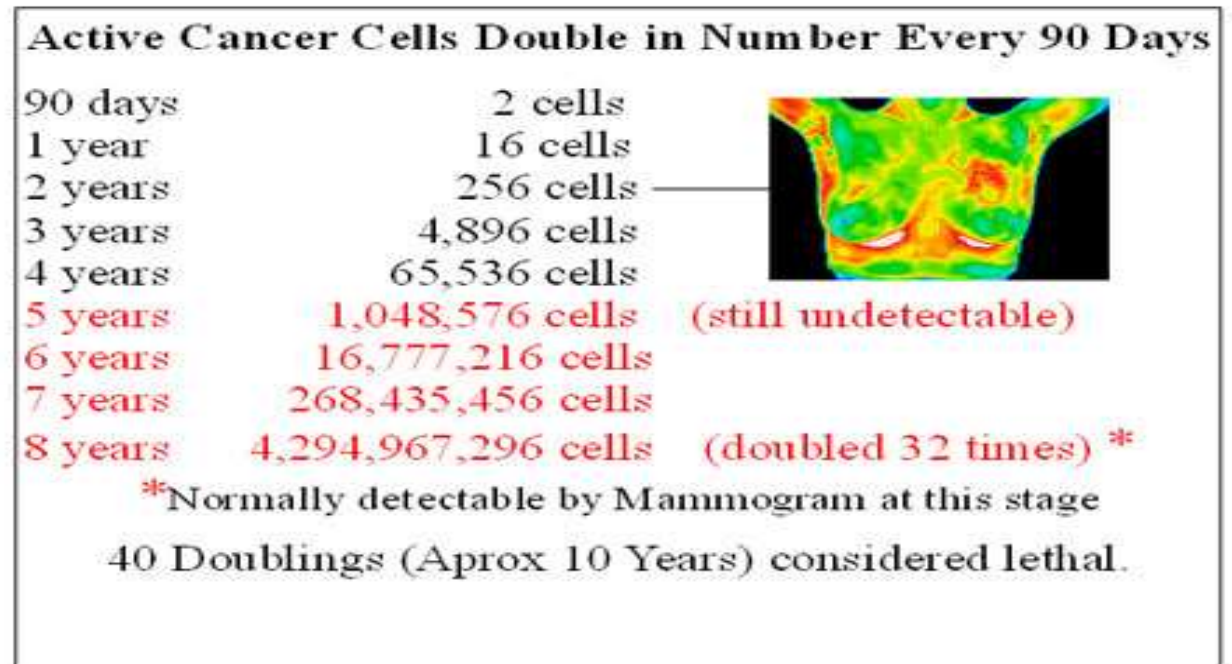


someecards  
user card

# Breast Health

**Thermography is a 100% Safe, Non-Invasive, No Contact, NO RADIATION Screening Method that can detect:**

- ✓ Lymphatic Congestion
- ✓ Fibrocystosis
- ✓ Ductal Carcinoma In Situ (DCIS)
- ✓ Breast Cancer



→ Thermal Imaging Can Detect Breast Cancer 5 -7 Years BEFORE a mammogram.



# Advantages to Using Thermography for Women's Health Screening

## Thermography can be used by:

Small breasted women

Large breasted women

Women with breast implants – thermography won't harm delicate breast implants

Women with Dense Breast Tissue (typically women in their 20's and 30's)

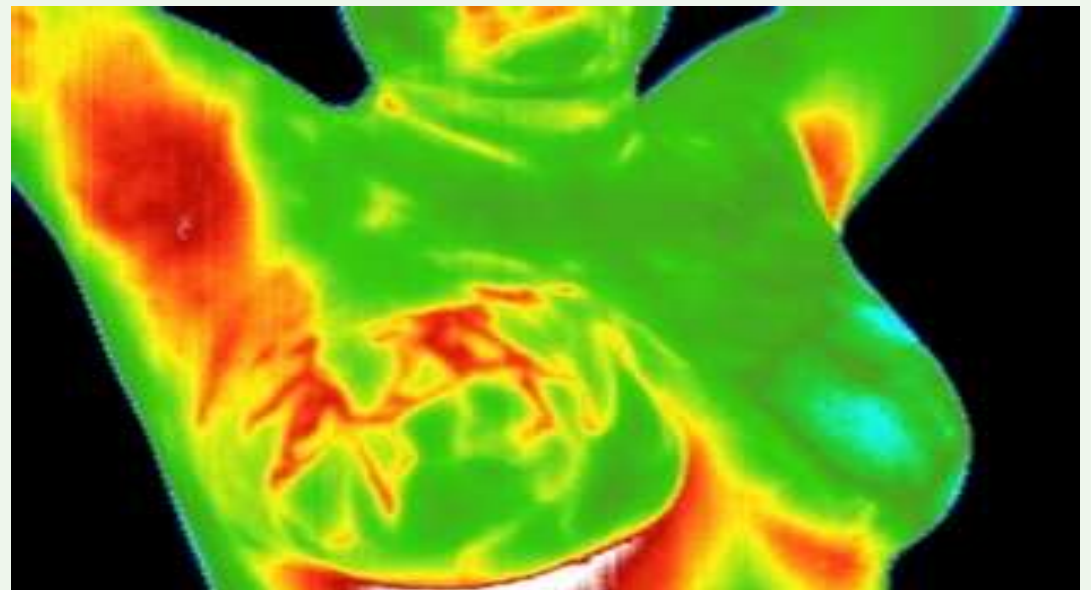
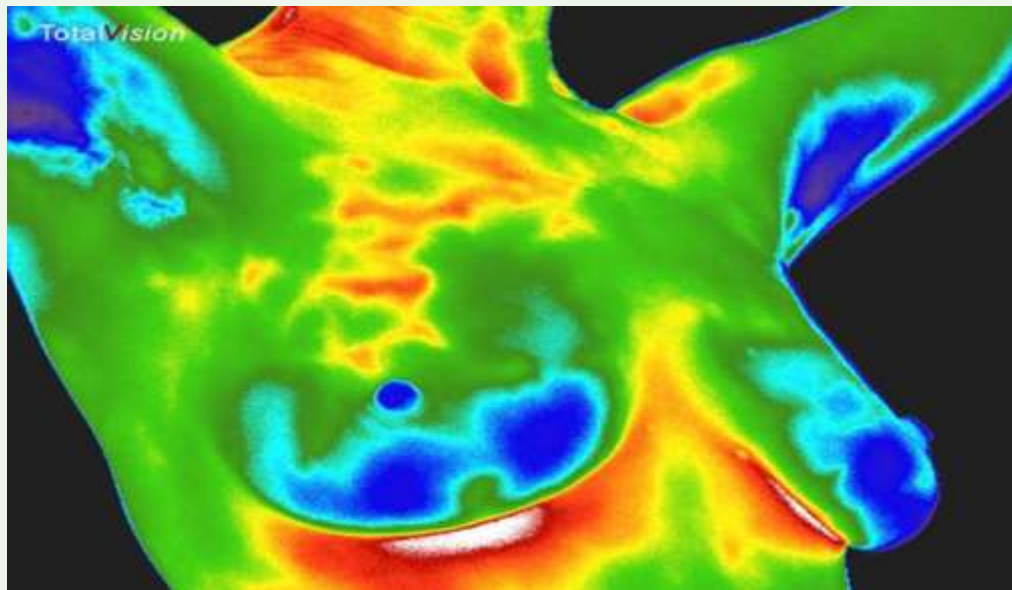
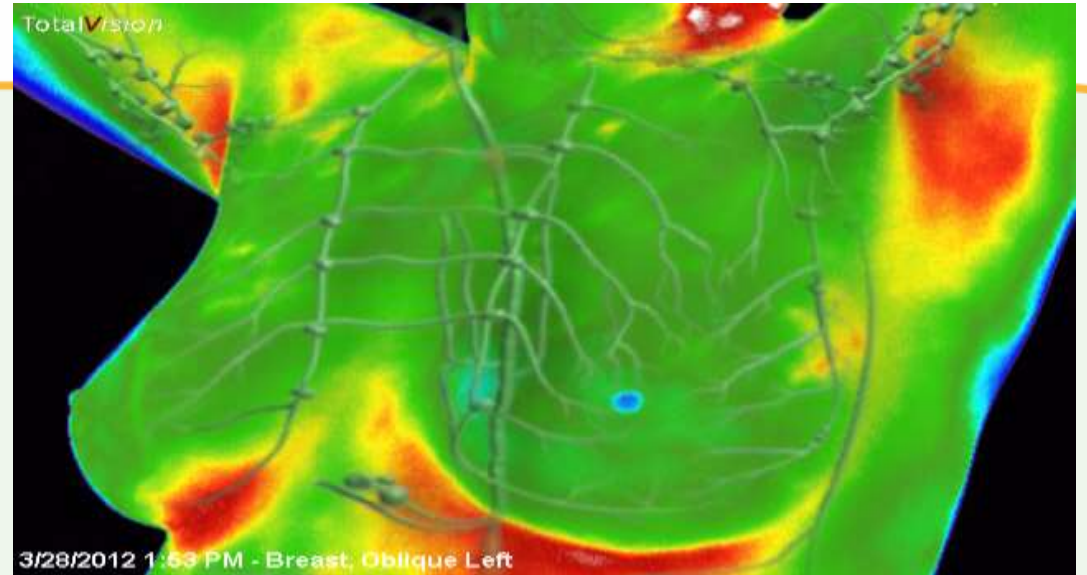
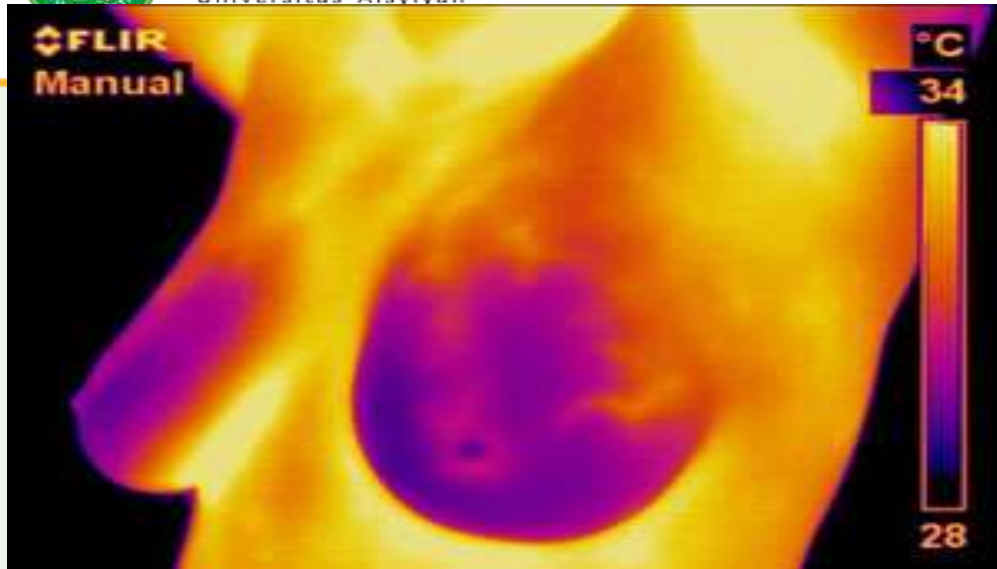
Women with fibrocystic breast tissue

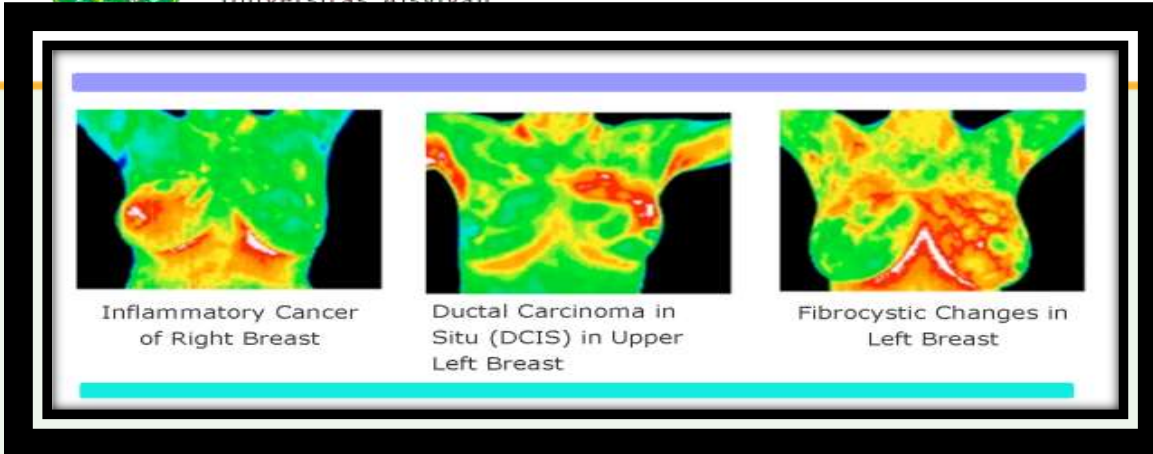
Women who are pregnant and/or breast feeding.

Women who are pre-menopausal/in menopause or post-menopausal.

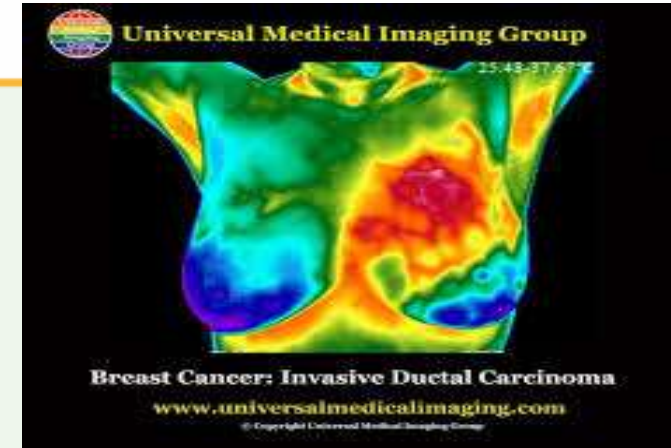
Women who are on hormone replacement therapy

Thermography can be used to monitor hormonal balance/imbalance.

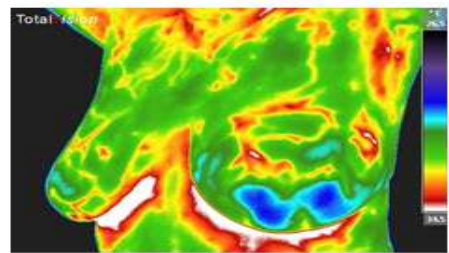




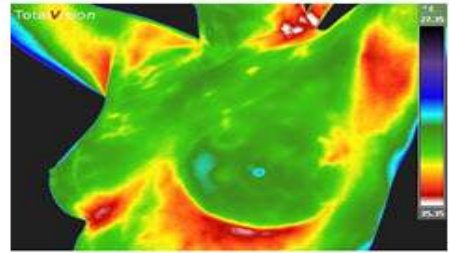
Images courtesy of advancedmedaz.com



**Fibrocystic**  
Significant vascular activity in the left breast which was clinically correlated with fibrocystic changes.



**Normal**  
Good thermal symmetry with no suspicious thermal findings.



Images courtesy of cmtscans.com

**NOTE: Thermography is not diagnostic by itself and is not meant to replace mammography or any other anatomical imaging procedure.**





# Benefits of Use

- **100% Safe – NO RISK!**
  - **NO RADIATION**
  - **Non- invasive**
    - **No Contact**
      - **Fast**
      - **Easy**
      - **Effective**
      - **Inexpensive**
- **EARLY DETECTION!**





There are **NO Risks** to Using Thermography!

The only risk is of what may have been prevented if thermography is not used and disease is not identified

# Conclusion

Thermography is a diagnostic screening that is safe and effective, fast and easy. It is a proactive measure in identifying systemic inflammation.

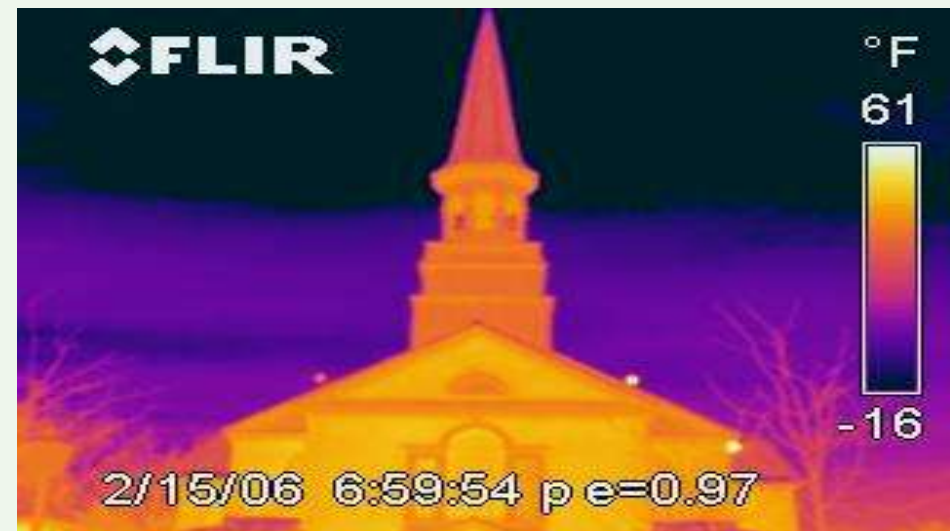
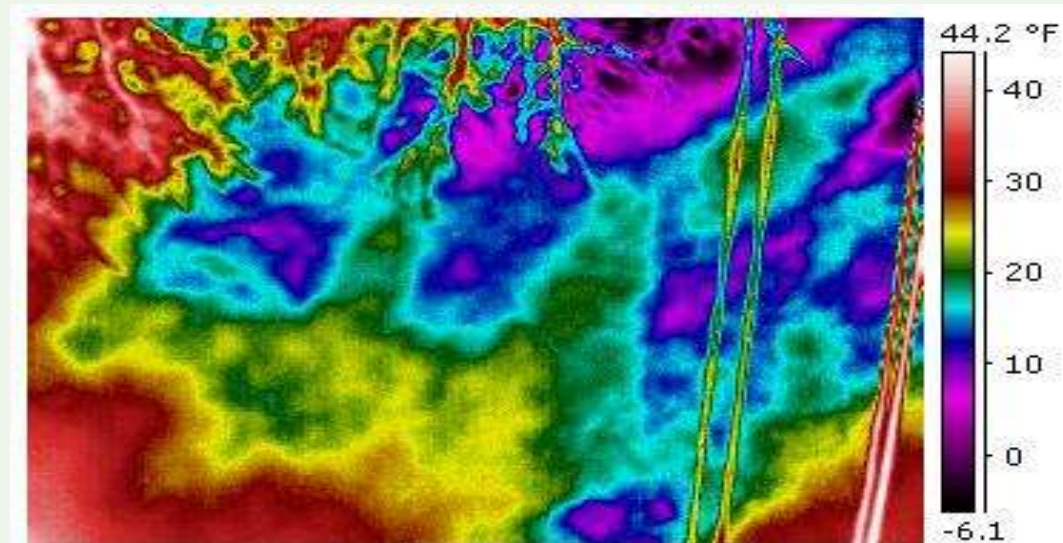
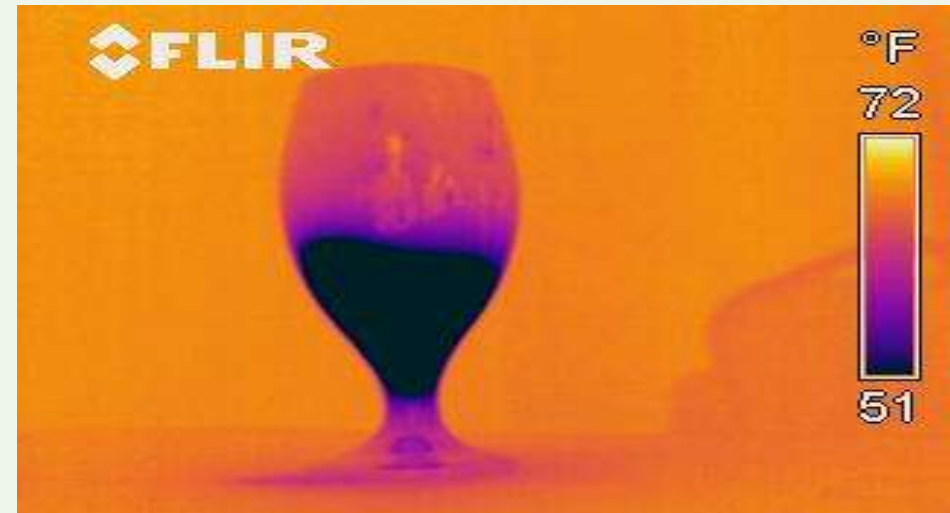
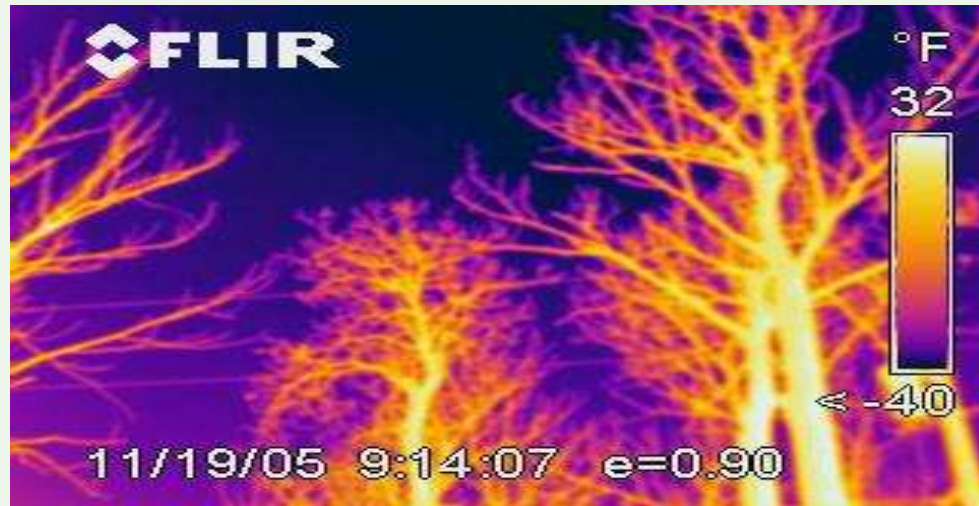
Thermography would confirm the need for further testing and evaluation by physician.

If systemic inflammation is identified, patient and physician can discuss preventive measures that can be taken to reduce inflammation and risk of disease.

# Results

1. “*Whole Health*” treatment enables health care to see “the whole person”.
2. Cost effective – Reduces health care costs.
3. Promote Early Detection
  - Allows for pro-active measures.
4. Potentially Save Lives – A better outcome.

# Then There Is Always Infrared As Art





# DO'A SESUDAH BELAJAR

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

اللَّهُمَّ ارِنَا الْحَقَّ حَقًّا وَارْزُقْنَا اتِّبَاعَهُ  
وَأَرِنَا الْبَاطِلَ بَاطِلًا وَارْزُقْنَا اجْتِنَابَهُ

**Ya Allah, Tunjukkanlah kepada kami kebenaran sehingga kami dapat mengikutinya Dan tunjukkanlah kepada kami kejelekan sehingga kami dapat menjauhinya**



**wnisa**  
Universitas 'Aisyiyah  
Yogyakarta