1) 논문

a) 수술환자의 체온변화에 관한 연구
Body Temperature Change in Adults During General Anesthesia and Recovery
(성인간호학회지 제 2 권 1 호, 1990.3, 88-106 (19 pages))

b) 심장수술시 저체온 저체외순환과 정상체온 저체외순환의 전신 효과에 관한 연구
The Systemic Effects of Hypothermic and Normothermic Cardiopulmonary Bypass in Cardiac Surgery

c) Glucose-insulin interactions during cardiopulmonary bypass. Hypothermia versus normothermia. (PMID:3512920)

d) Association of glucocorticoid with stress-induced modulation of body temperature, blood glucose and innate immunity
Author links open overlay pane
Eisuke Kainuma, Mayumi Watanabe, Chikako Tomiyama, Masashi Inoue, Yuh Kuwano, Hong Wei Ren, Toru Abo


e) Far infrared radiation (FIR): its biological effects and medical applications

Vatansever F, Hamblin MR.

Abstract

Far infrared (FIR) radiation (λ = 3-100 μm) is a subdivision of the electromagnetic spectrum that has been investigated for biological effects. The goal of this review is to cover the use of a further sub-division (3-12 μm) of this waveband, that has been observed in both in vitro and in vivo studies, to stimulate cells and tissue, and is considered a promising treatment modality for certain medical conditions. Technological advances have provided new techniques for delivering FIR radiation to the human body. Specialty lamps and saunas, delivering pure FIR radiation (eliminating completely the near and mid infrared bands), have became safe, effective, and widely used sources to generate therapeutic effects. Fibers impregnated with FIR emitting ceramic nanoparticles and woven into fabrics, are being used as garments and wraps to generate FIR radiation, and attain health benefits from its effects.

Wellman Center for Photomedicine, Massachusetts General Hospital, Boston, MA, USA; and Department of Dermatology, Harvard Medical School, Boston, MA, USA
f) Hypothermia and Infection Three Mechanisms of Host Protection in Type III Pneumococcal Peritonitis*

B. Eiseman, Roger S. Wotkyns, and H. Hirose

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1408862/bin/annsurg00940-0062.tif

g) Hypothermia and infection. II. Endogeneous peritonitis and bacteremia in hypothermic mice.

TUNEVALL G, LINDNER T.


PMID: 13994774

h) Hypothermia and infection. III. Influence of hypothermia on the course of experimental pneumococcal infection in mice.

LINDNER T, TUNEVALL G.


i) Relationships between body temperatures and inflammation indicators under physiological and pathophysiological conditions in pigs exposed to systemic lipopolysaccharide and dietary deoxynivalenol.

Tesch T1, Bannert E1, Kluess J1, Frahm J1, Hüther L1, Kersten S1, Breves G2, Renner L3, Kahlert S3, Rothkötter HJ3, Dänicke S1.

j) Elevated body temperature helps certain types of immune cells to work better, evidence suggests

Date:December 13, 2011 Source:Federation of American Societies for Experimental Biology

With cold and flu season almost here, the next time you're sick, you may want to thank your fever for helping fight off infection. That's because scientists have found more evidence that elevated body temperature helps certain types of immune cells to work better. New research demonstrates that elevated body temperature plays a vital role on the generation of effective T-cell mediated immune response.

Credit: © diego cervo / Fotolia

With cold and flu season almost here, the next time you're sick, you may want to thank your fever for helping fight off infection. That's because scientists have found more evidence that elevated body temperature helps certain types of immune cells to work better. This research is reported in the November 2011 issue of the Journal of Leukocyte Biology.

"An increase in body temperature has been known since ancient times to be associated with infection and inflammation," said Elizabeth A. Repasky, Ph.D., a researcher involved in the work from the Department of Immunology at the Roswell Park Cancer Institute in Buffalo, New York. "Since a febrile response is highly conserved in nature (even so-called cold blooded animals move to warmer places when they become ill) it would seem important that we immunologists devote more attention to this interesting response."

Scientists found that the generation and differentiation of a particular kind of lymphocyte, known as a "CD8+ cytotoxic T-cell" (capable of destroying virus-infected cells and tumor cells) is enhanced by mild fever-range hyperthermia. Specifically, their research suggests that elevated body temperature changes the T-cells' membranes which may help mediate the effects of micro-environmental temperature on cell function. To test this, researchers injected two groups of mice with an antigen, and examined the activation of T-cells following the interaction with antigen presenting cells. Body temperature in half of the mice was raised by 2 degrees centigrade, while the other half maintained a normal core body temperature. In the warmed mice, results showed a greater number of the type of CD8 T-cells capable of destroying infected cells.

"Having a fever might be uncomfortable," said John Wherry, Ph.D., Deputy Editor of the Journal of Leukocyte Biology, "but this research report and several others are showing that having a fever is part of an effective immune response. We had previously thought that the microbes that infect us simply can't replicate as well when we have fevers, but this new work also suggests that the immune system might be temporarily enhanced functionally when our temperatures rise with fever. Although very high body temperatures are dangerous and should be controlled, this study shows that we may need to reconsider how and when we treat most mild fevers."

Story Source:

Materials provided by Federation of American Societies for Experimental Biology. Note: Content may be edited for style and length.
k) **Low body temperature, a frequently observed manifestation of patients with adrenocortical insufficiency that can recover with glucocorticoid administration: case series of 15 patients**

**Abstract**

We first report whether adrenocortical insufficiency causes low body temperature in human subjects. We also examined the effects of inflammation on body temperature. Furthermore, we examined whether glucocorticoid administration can increase low body temperature. We examined 15 patients with adrenocortical insufficiency who were admitted to the department of endocrinology in our hospital from October 2007 to August 2011. The mean (SD) patient age was 67.4 (8.2) years. Of the patients, 3 (20.0%) were women and 12 (80.0%) were men, and 8 (53.3%) had inflammation and 7 (46.7%) did not. The numbers of patients in the inflammation group and the non-inflammation group whose body temperatures were <36.0°C upon admission were 5 (63%) of 8 and 5 (71%) of 7, respectively. Inflammation had little effect on body temperature. However, in the non-inflammation group, glucocorticoid significantly increased the mean (SD) body temperature from 35.7 (0.37)°C to 36.4 (0.23)°C (P=0.01). The patients with adrenocortical insufficiency exhibited low body temperature but were able to recover. To prevent adrenal crises, medical practitioners should be aware that low body temperature can occur in patients with adrenocortical insufficiency though the patients have inflammation.

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l) **Hyperthermia in combined treatment of cancer**

Author links open overlay panel Professor P Wust a, B Hildebrandt b, G Sreenivas a, B Rau c, J Gellermann a, H Riess b, R Felix a, PM Schlag c
**Summary**

Hyperthermia, the procedure of raising the temperature of tumour-loaded tissue to 40–43°C, is applied as an adjunctive therapy with various established cancer treatments such as radiotherapy and chemotherapy. The potential to control power distributions in vivo has been significantly improved lately by the development of planning systems and other modelling tools. This increased understanding has led to the design of multiantenna applicators (including their transforming networks) and implementation of systems for monitoring of E-fields (eg, electro-optical sensors) and temperature (particularly, online magnetic resonance tomography). Several phase III trials comparing radiotherapy alone or with hyperthermia have shown a beneficial effect of hyperthermia (with existing standard equipment) in terms of local control (eg, recurrent breast cancer and malignant melanoma) and survival (eg, head and neck lymph-node metastases, glioblastoma, cervical carcinoma). Therefore, further development of existing technology and elucidation of molecular mechanisms are justified. In recent molecular and biological investigations there have been novel applications such as gene therapy or immunotherapy (vaccination) with temperature acting as an enhancer, to trigger or to switch mechanisms on and off. However, for every particular temperature-dependent interaction exploited for clinical purposes, sophisticated control of temperature, spatially as well as temporally, in deep body regions will further improve the potential.

**m) Body Temperature and Tumor Growth**

William H. Woglom

DOI: 10.1158/ajc.1934.604 Published July 1934

**Abstract**

In the spring of 1924 the effect of fever upon transplanted neoplasms was investigated in a number of mice and rats because it is known that a rather large proportion of the spontaneous cures recorded in man have followed acute febrile attacks—104°-105° for forty-eight to ninety-six hours without remission (Rohdenburg, 1). It seemed at the time not impossible that the chemical activity responsible for neoplastic growth should be adversely affected by temperatures which would not seriously damage the remainder of the body, and there was some encouragement in the fact that Rohdenburg and Prime (2) had been able to inflict the same amount of damage upon animal tumors by diathermy in vivo with low degrees of heat (41°) as with high (46°), provided only that the former were applied for sufficiently long periods.

As the outcome was entirely negative, the experiment was not reported at the time. Now, however, that short-wave therapy has come into prominence, and there exists some doubt whether these waves exert effects over and above those due to mere heating of the tissues (Reiter, 3), or whether their action is to be ascribed entirely to the raised temperature (Schereschewsky, 4, bibliography), a short note may be of some value.

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n) Hyperthermia to Treat Cancer

Hyperthermia usually is taken to mean a body temperature that is higher than normal. High body temperatures are often caused by illnesses, such as fever or heat stroke. But hyperthermia can also refer to heat treatment – the carefully controlled use of heat for medical purposes. Here, we will focus on how heat is used to treat cancer.

When cells in the body are exposed to higher than normal temperatures, changes take place inside the cells. These changes can make the cells more likely to be affected by other treatments such as radiation therapy or chemotherapy. Very high temperatures can kill cancer cells outright (thermal ablation), but they also can injure or kill normal cells and tissues. This is why hyperthermia must be carefully controlled and should be done by doctors who are experienced in using it.

Current instruments can deliver heat precisely, and hyperthermia is being used (or studied for use) against many types of cancer.

How is hyperthermia used to treat cancer?

Treatment can be local, regional or whole-body hyperthermia, depending on the extent of the area being treated.

Local hyperthermia

Local hyperthermia is used to heat a small area like a tumor. Very high temperatures are used to kill the cancer cells and destroy nearby blood vessels. In effect, this cooks the area that is exposed to the heat. And, as with cooking, the higher the temperature and duration of exposure, the greater the effect seen within tissues. Thermal ablation comprises the treatments where very high temperatures cause irreversible damage to cells whereas smaller rises in temperature constitute mild hyperthermia. Radio waves, microwaves, ultrasound waves, and other forms of energy can be used to heat the area. When ultrasound is used, the technique is called high intensity focused ultrasound, or HIFU, sometimes also referred to as just focused ultrasound.

The heat may be applied in different ways:

High energy waves are aimed at a tumor near the body surface from a machine outside the body.

A thin needle or probe is put right into the tumor. The tip of the probe releases energy, which heats the tissue around it.

Radiofrequency ablation (RFA): This is probably the most commonly used type of thermal ablation. RFA uses high-energy radio waves for treatment. A thin, needle-like probe is inserted into the tumor for a short time, usually about 10 to 30 minutes. The probe is guided into place using ultrasound, MRI, or CT scans. The tip of the probe puts out a high-frequency current that creates very high heat and destroys the cells within a certain area. The dead cells are not removed, but become scar tissue and shrink over time.
RFA is most often used to treat tumors that cannot be removed with surgery or for patients who are not able to go through the stresses of surgery. It can usually be done as an outpatient. RFA may be repeated for tumors that come back or start to grow. It can also be added to other treatments like surgery, radiation therapy, chemotherapy, hepatic arterial infusion therapy, alcohol ablation, or chemoembolization.

RFA can be used to treat tumors up to about 2 inches (5 cm) across. It is most commonly used to treat tumors in the liver, kidneys, and lungs, and is being studied for use in other areas of the body. Long-term outcomes after RFA treatment are not yet known, but early results are encouraging.

**Regional hyperthermia**

In regional hyperthermia a part of the body, such as an organ, limb, or body cavity (a hollow space within the body) is heated. It isn’t hot enough to destroy the cancer cells outright. It’s usually combined with chemotherapy or radiation therapy.

In one approach, called regional perfusion or isolation perfusion, the blood supply to a part of the body is isolated from the rest of the circulation. The blood in that part of the body is pumped into a heating device and then pumped back into the area to heat it. Chemotherapy can be pumped in at the same time. This technique is being studied as treatment for certain cancers in the arms or legs, such as sarcomas and melanomas.

Another hyperthermia technique can be used along with surgery to treat cancers in the peritoneum (the space in the body that contains the intestines and other digestive organs). During surgery, heated chemotherapy drugs are circulated through the peritoneal cavity. This is called continuous hyperthermic peritoneal perfusion (CHPP), also known as hyperthermic intraperitoneal chemotherapy (HIPEC). In studies, this has seemed helpful in treating certain types of cancer, but it isn’t yet clear if it is better than other types of treatments.

Another approach to regional hyperthermia is deep tissue hyperthermia. This treatment uses devices that are placed on the surface of the organ or body cavity and produce high energy waves directed at a certain area. These devices give off radiofrequency or microwave energy to heat the area being treated.

**Whole-body hyperthermia**

Whole-body heating is being studied as a way to make chemotherapy work better in treating cancer that has spread (metastatic cancer). Body temperature can be raised by using heating blankets, warm-water immersion (putting the patient in warm water), or thermal chambers (much like large incubators). People getting whole-body hyperthermia are sometimes given sedation (medicine to make them feel calm and sleepy) or even light anesthesia.

A person’s body temperature may be raised as if they had a fever, which is sometimes called fever-range whole-body hyperthermia. Studies suggest that this may cause certain immune cells to become more active for the next few hours and raise the levels of cell-killing compounds in the blood. Some researchers take the body temperature higher, around 107°F, for short periods of time. Other studies are testing hyperthermia and chemotherapy along with other treatments that are designed to boost the person’s immune system to help fight cancer.
Pros and cons of hyperthermia

The possible side effects of hyperthermia depend on the technique being used and the part of the body being treated. Most side effects don’t last long, but some can be serious.

Local hyperthermia

Local hyperthermia, such as RFA, can destroy tumors without surgery. Scientists agree that it works best when the area being treated is kept within an exact temperature range for a precise period of time. But this isn’t always easy to do. Right now it is hard to accurately measure the temperature inside a tumor. And keeping an area at a constant temperature without affecting nearby tissues can be tricky, too. To add to this, not all body tissues respond the same way to heat – some are more sensitive than others. For example, the brain is very sensitive to heat, even the lower temperatures used in whole-body hyperthermia.

Doctors are finding better ways of monitoring the temperature at the site being treated. Small thermometers on the ends of probes can be placed in the treatment areas to be sure the temperature stays within the desired range. Magnetic resonance imaging (MRI) is a newer way to monitor temperature without putting in probes.

Side effects of local hyperthermia

Local hyperthermia can cause pain at the site, infection, bleeding, blood clots, swelling, burns, blistering, and damage to the skin, muscles, and nerves near the treated area.

Regional and whole-body hyperthermia

The major advantage of regional and whole-body hyperthermia is that they seem to make other forms of cancer treatment work better. Heating cancer cells to temperatures above normal makes them easier to destroy using radiation and certain chemotherapy drugs. But careful temperature control is a must with any type of hyperthermia.

Side effects of regional and whole-body hyperthermia

Side effects depend on what part of the body is treated and how high the temperature is raised. Whole-body and regional hyperthermia can cause nausea, vomiting, and diarrhea. More serious, though rare, side effects can include problems with the heart, blood vessels, and other major organs.

Since regional and whole-body hyperthermia are often given with other cancer treatments such as chemo and radiation, side effects from these treatments may be seen then or at a later time.

Experience, improved technology, and better skills in using hyperthermia treatment have led to fewer side effects. In most cases, the problems that people have with hyperthermia are not serious.

The future of hyperthermia

Hyperthermia is a promising way to improve cancer treatment, but it is largely an experimental technique at this time. It requires special equipment, and a doctor and treatment team who are skilled in using it. Because of that, it’s not offered in all cancer treatment centers.

Many clinical trials of hyperthermia are being done to better understand and improve this technique.
Researchers continue to look at how hyperthermia is best used along with other cancer treatments to improve outcomes.

Studies are also looking at ways to reach deeper organs and other sites that cannot be treated with hyperthermia at this time. Current studies are looking at how it might work to treat many types of cancer, including the following:

**o) Exploring the relationship between fever and cancer incidence**

Date: August 17, 2018

Source: University of Chicago Press Journals

**Summary:**

In a new paper, researchers propose a mechanistic hypothesis that focuses on the potential impact infectious fever has on a particular subset of T cells, known as gamma/delta T cells.

**Abstract**

Recurring patterns in patient accounts suggest the existence of an inverse relationship between personal history of infectious fever and cancer risk, and these patterns are documented throughout decades of medical literature. However, evidence supporting this correlation continues to be primarily anecdotal. In "Toward Antitumor Immunity and Febrile Infections: Gamma/Delta (γδ) T Cells Hypothesis" published in The Quarterly Review of Biology, Wieslaw Kozak, Tomasz Jedrzejewski, Malgorzata Pawlikowska, Jakub Piotrowski, and Sylwia Wrotek propose a mechanistic hypothesis that focuses on the potential impact infectious fever has on a particular subset of T cells, known as gamma/delta (gd) T cells.

Drawing upon previous research and experimental data, the authors argue that repeated exposure to fever enhances the ability of gd T cells to detect cellular abnormalities and to foster inhospitable environments that destroy malignant cells. This paper is the first to acknowledge the role that gd T cells may play as participants in this inverse relationship.

Infectious fever is the defensive and adaptive reaction that occurs when an organism's immune system comes into contact with exogenous pyrogens, or pathogen-associated molecular pattern (PAMP). Upon recognition of these exogenous pyrogens, endogenous mediators -- also known as endogenous pyrogens -- engage the febrile system. According to previous work by Shephard et al., a febrile system is composed of all of the mechanisms responsible for facilitating a fever as well as the various systems the fever affects. Thermoregulatory mechanisms are activated, resulting in the elevation of an organism's core body temperature.

The authors further elaborate on the function of endogenous mediators, like cytokines.

"In short, endogenous mediators of fever redirect metabolic substrates and energy to the immune system during fever. This markedly enhances the frequency of a vast range of immune effectors, including lymphocytes expressing gd heterodimer receptors, which possess a potent anti-infectious and antitumor competence," the authors write.
Gamma/delta T cells possesses receptors (TCRs) comprised of gamma/delta chain heterodimer. In fact, the authors posit that the unique attributes of gd T lymphocytes -- lower TCR variability, fewer gene segment rearrangements, and TCRs with older evolutionary memory -- enable the cells to enact processes that aid in decreasing cancer risk, such as immune surveillance and attacking cancerous cells. Vg9Vd2 T cells are capable of responding to various types of cancer, such as carcinoma, lymphoma, prostate, myeloma, and sarcoma. Exposure to infection significantly expands the quantity of gd T cells. During infection, blood Vg9Vd2 T cells can increase in number until they constitute 60 percent of the total amount of lymphocytes.

While previous research and current cancer immunotherapy practices predominately focus on alpha/beta (ab) T cells, analysis of the interaction between fever and gd T cells may generate further inquiry into the larger impact and the clinical benefits of this relationship.

**p) Hyperthermia: Role and Risk Factor for Cancer Treatment**

Author links open overlay panel Sheetal Jha, Pramod Kumar Sharma, Rishabha Malviya

https://doi.org/10.1016/j.als.2016.11.004Get rights and content

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**Abstract**

Over the past decades, cancer is the major cause of incidence of death increasing every day. Different forms of tumor therapy including radiotherapy and chemotherapy are used to treat cancer. However, hyperthermia is the technique that neglects the use of chemicals or harmful radiations. The elevated body temperature can damage the cancerous cells with minimum injury to the normal cells. Successful therapy method in combination with radiation therapy and/or chemotherapy is provided to the cancer patient which proved to be beneficial to the patients. In this review, different studies of the clinical trials are reported on the patients with tumor and the therapy associated with it.

**q) https://www.health.harvard.edu/images/logo-harvard_health-full-v2-@2x.png**

*When is body temperature too low?*

Published: January, 2018

Q. I am 82 years old and in good health. At my regular doctor visits, my temperature has been around 96.5° F. Is that too low?

A. Normal body temperature is not a single number, but rather a range of temperatures. The average normal body temperature — measured using an oral thermometer, or now more commonly with an infrared thermometer passed across the forehead — is 98.6° F (37° C).
However, recent studies indicate that 98.2° F (36.8°C) is a more accurate average, and in older individuals it may be about 1°F lower. One small study even suggested that in healthy older patients, body temperature ranged from 94° F to 99.6° F, with an average of 97.7° F.

Several factors can lead to a lower body temperature in older people. For instance, as you age, you lose fat under the skin in your extremities and your skin becomes drier; both of these changes cause loss of body heat. Metabolism, which also generates heat, tends to slow as you age. Medications, including beta blockers and antipsychotic drugs, also may lower body temperature, as can an underactive thyroid gland.

Because of their lower baseline temperatures, older people need to be careful to avoid prolonged exposure to the cold, which may lead to hypothermia, which occurs when your body loses heat faster than it can produce it and causes a dangerously low body temperature. Also, they should pay extra attention to fevers. A fever of 99° F, which doesn't sound high, can be serious in an older person whose normal baseline temperature is below 97° F.

— by William Kormos, M.D.

Editor in Chief, Harvard Men's Health Watch

### r) Higher body temperatures speed the bodies' responses to infections and tumors, finds research

May 21 2018

The hotter our body temperature, the more our bodies speed up a key defense system that fights against tumors, wounds or infections, new research by a multidisciplinary team of mathematicians and biologists from the Universities of Warwick and Manchester has found.

The researchers have demonstrated that small rises in temperature (such as during a fever) speed up the speed of a cellular ‘clock’ that controls the response to infections - and this new understanding could lead to more effective and fast-working drugs which target a key protein involved in this process.

Biologists found that inflammatory signals activate ‘Nuclear Factor kappa B’ (NF-κB) proteins to start a ‘clock’ ticking, in which NF-κB proteins move backwards and forwards into and out of the cell nucleus, where they switch genes on and off.

This allows cells to respond to a tumor, wound or infection. When NF-κB is uncontrolled, it is associated with inflammatory diseases, such as Crohn's disease, psoriasis, and rheumatoid arthritis.

At a body temperature of 34 degrees, the NF-κB clock slows down. At higher temperatures than the normal 37 degree body temperature (such as in fever, 40 degrees), the NF-κB clock
speeds up.

Mathematicians at the University of Warwick's Systems Biology Centre calculated how temperature increases make the cycle speed up.

They predicted that a protein called A20 - which is essential to avoid inflammatory disease - might be critically involved in this process. The experimentalists then removed A20 from cells and found that the NF-kB clock lost its sensitivity to increases in temperature.

Lead mathematician Professor David Rand, Professor of Mathematics and a member of the University of Warwick's Zeeman Institute for Systems Biology and Infectious Disease Epidemiology (SBIDER), explained that in normal life the 24 hour body clock controls small (1.5 degree) changes in body temperature.

Related Stories

• Researchers succeed in building protein nanotubes from tiny scaffolds
• Soy protein equally effective as animal protein in building muscle strength
• New first-line treatment for peripheral T-cell lymphoma approved by FDA

He commented: "the lower body temperature during sleep might provide a fascinating explanation into how shift work, jet lag or sleep disorders cause increased inflammatory disease"

Mathematician Dan Woodcock from the University of Warwick said: "this is a good example of how mathematical modeling of cells can lead to useful new biological understanding."

While the activities of many NF-kB controlled genes were not affected by temperature, a key group of genes showed altered profiles at the different temperatures. These temperature sensitive genes included key inflammatory regulators and controllers of cell communication that can alter cell responses.

This study shows that temperature changes inflammation in cells and tissues in a biologically organized way and suggests that new drugs might more precisely change the inflammatory response by targeting the A20 protein.

Professor Mike White, lead biologist from the University of Manchester, said the study provides a possible explanation of how both environmental and body temperature affects our health:

"We have known for some time that influenza and cold epidemics tend to be worse in the winter when temperatures are cooler. Also, mice living at higher temperatures suffer less from inflammation and cancer. These changes may now be explained by altered immune responses at different temperatures."
s) how body temperature influences ageing and longevity

Abstract

Temperature is a basic and essential property of any physical system, including living systems. Even modest variations in temperature can have profound effects on organisms, and it has long been thought that as metabolism increases at higher temperatures so should rates of ageing. Here, we review the literature on how temperature affects longevity, ageing and life history traits. From poikilotherms to homeotherms, there is a clear trend for lower temperature being associated with longer lifespans both in wild populations and in laboratory conditions. Many life-extending manipulations in rodents, such as caloric restriction, also decrease core body temperature. Nonetheless, an inverse relationship between temperature and lifespan can be obscured or reversed, especially when the range of body temperatures is small as in homeotherms. An example is observed in humans: women appear to have a slightly higher body temperature and yet live longer than men. The mechanisms involved in the relationship between temperature and longevity also appear to be less direct than once thought with neuroendocrine processes possibly mediating complex physiological responses to temperature changes. Lastly, we discuss species differences in longevity in mammals and how this relates to body temperature and argue that the low temperature of the long-lived naked mole-rat possibly contributes to its exceptional longevity.

Article in Biogerontology 16(4) · April 2015 with 109 Reads

DOI: 10.1007/s10522-015-9571-2 · Source: PubMed

t) Evaluation of core and surface body temperatures, prevalence, onset, duration and severity of hot flashes in men after bilateral orchidectomy for prostate cancer

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Abstract

OBJECTIVE: To assess the prevalence, onset, duration and severity of hot flashes in men after bilateral orchidectomies (BO) for prostate cancer, to evaluate body temperature changes during hot flashes and to determine whether an elevated temperature within a few days after BO can be caused by deprivation of androgen.

MATERIALS AND METHODS: Patients (n = 101) were questioned about the characteristics of
their hot flashes after BO for prostate cancer. A subgroup of these men (n = 17) were instructed to record their oral and forehead temperatures during and at fixed intervals between hot flashes daily for 4 weeks.

RESULTS: The mean age was 71.6 years, mean follow-up after BO was 33.2 months. Hot flashes were reported by 87 men (86%) with previous spontaneous remission in 9 (10%). The median time between BO and the onset of hot flashes was 21 days (range 1-730), median number of hot flashes 3 per day (range 1-20), and median duration was 120 seconds (range 5 to 1800). There was no significant difference between median oral (36.4º C) and forehead (36.0º C) temperature in the normal state, but during hot flashes the median forehead temperature (37.0º C) was higher than the oral temperature (36.5º C) (p = 0.0004). Both median oral and forehead temperatures were higher during hot flashes (36.5º C and 37.0º C) than in the normal state (36.4º C and 36.0º C, respectively) (p < 0.0001). During hot flashes, the oral temperature was 38º C to 40º C in only 3.2% of 593 readings in 17 patients.

CONCLUSIONS: The median oral and forehead temperatures are higher during hot flashes than in normal periods. Oral temperature elevation > 38º C within days after a BO is unlikely to be the result of androgen deprivation alone.