FEVER, IMMUNITY, AND MITOCHONDRIAL STRESS: IMPORTANCE OF ACCURATE TEMPERATURE MONITORING

Executive Summary

New research from Vanderbilt University Medical Center reveals that fever, a sign of infection, plays a more complex role in the immune system than previously understood. Fever can boost the body's ability to fight infection, but it also puts stress on immune cells, potentially causing harm to them.

At fever-range temperatures (~39°C or ~102°F), certain immune cells called T cells become more active and effective. However, a key type of T cell, called Th1, also experiences stress at the cellular level, particularly in its energy-producing structures (mitochondria). This stress can lead to damage and even cell death.

These findings show why accurate and frequent temperature monitoring is critical in modern medicine, especially in vulnerable patients. Tools like Exergen's Temporal Artery Thermometer can help clinicians not only detect fever early but also track trends that can influence treatment decisions and patient outcomes.

Fever and the Immune System

Fever isn't just a symptom, it's a signal that the immune system is responding to something. But how the body responds to elevated temperature depends on many factors, including how long the fever lasts and the person's overall health.

This white paper looks at how fever affects T cells, the immune system's "foot soldiers." It highlights new insights that could change how clinicians interpret and manage fever in:

- Infections
- Cancer
- Autoimmune diseases
- Elderly or chronically ill patients

Takeaways

A 2024 study explored what happens when immune cells are exposed to fever-range temperatures. Using both lab models and human cells, researchers found the following:

1. Fever Activates Immune Cells

- A mild fever (around 39°C) makes T cells more active and ready to fight.
- It increases their metabolism and ability to release infection-fighting signals.

2. Fever Also Stresses T Cells

- A specific group of T cells (Th1) showed damage to their mitochondria—their energy centers.
- This stress created harmful molecules (ROS) that damaged both mitochondrial and nuclear DNA.

3. Cells Respond in Two Ways

- Some Th1 cells died due to this stress.
- Others adapted, changing how they function and increasing mitochondrial mass to protect themselves.

4. Long-Term Immune Effects

- The surviving Th1 cells were more powerful in the short term.
- But their long-term health and function might be compromised due to cellular stress.

5. Real-World Relevance

- These stress markers were also found in older adults and people with chronic inflammation.
- This suggests even mild, lasting fevers can speed up immune aging and burnout.

What This Means for Patient Care

Understanding how fever affects immune cells can guide how we manage patients in various clinical settings:

1. Infections

- Fever helps fight infection, but prolonged high temperatures can weaken key immune cells.
- Accurate, ongoing temperature tracking helps doctors maintain the right balance.

2. Cancer and Immunotherapy

- Th1 cells help fight cancer and are key targets of modern treatments.
- Too much immune stress from fever may reduce the effectiveness of these therapies.

3. Autoimmune Diseases

- Fever-related stress might worsen autoimmune flare-ups in sensitive individuals.
- Monitoring low-grade fevers can help fine-tune treatment.

4. Older or Chronically Ill Patients

- These groups already have stressed immune systems.
- Even mild fevers may trigger further immune decline—making early detection critical.

Why Thermometer Accuracy Is Essential

To make smart clinical decisions based on body temperature, tools need to be:

- **Accurate:** Especially important for detecting low or early-stage fevers.
- **Non-invasive and gentle:** Particularly for infants, cancer patients, and the elderly.
- **Fast and reliable:** Allowing frequent checks with minimal disruption.

Exergen's Temporal Artery Thermometer meets all of these needs. It gives core-temperature-level readings with a quick, gentle swipe across the forehead by gently touching it, making it ideal for routine use in hospitals, clinics, and home care.

Conclusion

Fever is not just a symptom. It actively changes how the immune system works. New research shows that while fever can help the body fight off infection, it also puts stress on important immune cells. This makes temperature monitoring a key part of modern medical care.

Accurate thermometry is more than a diagnostic tool; it's a window into immune health. Using trusted tools like Exergen's thermometers allows clinicians to respond earlier, treat smarter, and support better outcomes for patients of all ages and conditions.

Sources:

Vanderbilt University, https://news.vumc.org/2024/09/20/fever-drives-enhanced-activity-mitochondrial-damage-in-immune-cells/
Science, https://www.science.org/doi/10.1126/sciimmunol.adp3475

About Exergen

Exergen Corporation, the leader in non-invasive temperature measurement technologies for industrial and medical applications, delivers non-invasive temperature meters with higher accuracy, lower costs, less process control, and higher reliability than previously possible. Known in both healthcare and consumer markets for its award-winning arterial thermometer, Exergen was founded by MIT and Harvard educated and Harvard researcher Dr. Francesco Pompei, who holds more than 100 patents supporting Exergen products. Exergen Corporation is headquartered in Watertown, Massachusetts, United States.

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