shoemaker
DIAGNOSIS • TREATMENT • RESEARCH • EDUCATION • GENOMICS

The Biotoxin Pathway

In genetically susceptible people, biotoxins bind to pattern receptors, causing continuing, unregulated production of cytokines.

Body acquires biotoxins or toxin-producing organisms from food, water, air, or bug bites

Biotoxin (HLA susceptible)

Surface Receptors (Toll; C-type lectin; mannose & others)

Dendritic Cells

HLA-DR

Capillaries HIF

High cytokine levels in the capillaries attract white blood cells, leading to restricted blood flow, and lower oxygen levels. HIF stimulates VEGF and TGF B-1. Reduced VEGF leads to fatigue, muscle cramps, and shortness of breath (may be over-ridden by replacement with erythropoietin). TGF B-1 changes cell type and interacts with Treg cells.

Increased Cytokines

Immune System Symptoms

Patients with certain HLA genotypes (immune response genes) may develop inappropriate immunity. Most common are antibodies to:
-Gliadin (affects digestion)
-Cardiolipins (affects blood clotting)
Treg cells: Pathogenic T cells

Split Products of Complement Activation

C4a: capillary hypoperfusion
C3a: bacterial membranes

Increased Cytokines

Increased Leptin

Fat cells then produce more leptin, leading to obesity (which doesn't respond to exercise and diet).

Excessive cytokine levels can damage leptin receptors in the hypothalamus.

Leptin receptor

Hypothalamus

VIP

MSH

AVP

Damaged leptin receptors lead to reduced production by the hypothalamus of MSH, a hormone with many functions.

Biotoxin (HLA susceptible)

Nerve cell/ axon

Biotoxins have direct effects, including impairment of nerve cell function.

Biotoxin

Removal from the body

In most people, biotoxins are either removed from the blood by the liver or attached by the immune system, broken down, and excreted harmlessly. In people who don't have the right immune response genes, however, biotoxins can remain in the body indefinitely.

Reduced MSH

Inflammation-related symptoms

High levels of cytokines produce flu-like symptoms: Headaches, muscle aches, fatigue, unstable temperature, difficulty concentrating and more. High levels of cytokines also result in increased levels of several other immune-response related substances, including TGF B-1, MMP-9, IL-1B, and PAI-1. MMP-9 delivers inflammatory elements from blood to brain, nerve, muscle, lungs, and joints. It combines with PAI-1 in increasing clot formation and arterial blockage.

Resistant Coag-negative Staph Bacteria

Colonies of MARCoNS with resistance to multiple antibiotics may develop in biofilm or mucus membranes. The bacteria produce substances that aggravate both the high cytokine levels and low MSH levels.

Sleep Disturbance

Production of melatonin is reduced, leading to chronic, non-restorative sleep.

Chronic Pain

Endorphin production is suppressed. This can lead to chronic, sometimes unusual, pain.

Gastrointestinal Problems

Lack of MSH can cause malabsorption in the gut, resulting in diarrhea. This is sometimes called "leaky gut" and resembles (but is not) celiac disease. IBS is often present.

Prolonged Illness

White blood cells lose regulation of cytokine response, so that recovery from other illnesses, including infections diseases, may be slowed.

Changes in Cortisol and ACTH levels

The pituitary may produce elevated levels of cortisol and ACTH in early stages of illness, then drop to excessively low levels later. (Patients should avoid steroids such as prednisone, which can lower levels of ACTH)

Reduced ADH

Reduced MSH can cause the pituitary to produce lower levels of anti-diuretic hormone (ADH), leading to thirst, frequent urination, and susceptibility to shocks from static electricity.

Reduced Androgens

Reduced MSH can cause the pituitary to lower its production of sex hormones.