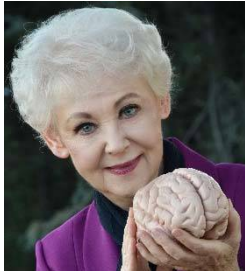


# The Doctor Within - Part 7

## Immune Defense Strategies

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The human immune system and its defense strategies make Star Wars look like a stroll in the park. Each component has specific tasks to perform, some of which were outlined in parts two and three of this series. To be effective, all components must work together in harmony. Each must do its job accurately and pull its own weight to ensure that all aspects of the defense system remain in tip-top shape functioning smoothly, flawlessly, and timely.

The “Doctor Within” is a massive and finely tuned operation with two main lines of defense. The first is generalized and nonspecific. It includes:

- A protective covering—your skin—that (when intact) does a good job of keeping would-be invaders from getting inside.
- A mechanism to trigger coughs and sneezes if something comes in through the mouth or nose that is deemed an “invader.”
- Mucous membrane linings that make it more difficult for invaders to adhere to the surfaces.
- An inflammation component that increases body temperature in an attempt to kill invading organisms. It does not harm immune system cells—unless one’s temperature gets too high.

White blood cells (leukocytes) patrol the body 24/7, continually on the look-out for invaders and constantly communicating with the “samplers” (e.g., appendix, Peyer’s patches, and lymph nodes) if something is amiss. A healthy adult human has between 4,500 and 11,000 white blood cells per cubic millimetre of blood.

Natural killer cells (NKs) aggressively attack virus-infected cells, cancer cells, and some bacteria. They have a special dislike for the *Borrelia* species that cause Lyme disease. Electron microscopy has observed these NKs sideling up to an undesirable cell, shoving in a type of “chemical” grenade—then backing off and watching the cell explode. One after another and another and another. A way to test immune system strength is to place NKs in a test tube, add tumor cells from a laboratory supply, wait three hours, and then count the number of tumor cells that were eliminated.

Another type of white blood cell (macrophages) are sanitation engineers as well as fighters. In addition to directly swallowing cancer cells and other disease-triggering microorganisms, they surround and digest cellular debris—such as in the explosions caused by the NK fighters. That’s the good news. The bad news is that white blood cells are weakened by refined sugar. The sugar in just one soft drink or one candy bar can significantly reduce their effectiveness. No wonder illness rates rise around holidays too often celebrated with an overabundance of high-sugar desserts.

The second line of defense involves some sophisticated “Green-Beret” type hand-to-hand combat with fighters matched to specific invaders. Known as lymphocytes because they are the main type of white blood cell in lymph fluid, they include:

- One trillion T-cells. The CD4 T-cells are the helper cells, responsible for activating or suppressing the function of other immune system cells. CD8 T-cells are cytotoxic, responsible for inducing cell-death in virus-infected cells and tumor cells.
- One trillion B-cells that create and clone antibodies (immunoglobulins—Ig, for short) to fight against specific invaders.
- Ten billion cells that can become specialized antibodies.

There are five general classes of antibodies. It’s easy to remember them with a sentence such as **All Dogs Eat Green Meat**: *All* for IgA, *Dogs* for IgD, *Eat* for IgE, *Green* for IgG, and *Meat* for IgM. Interestingly, IgG is the only class of antibodies that can cross the placenta during pregnancy to offer protection to the developing fetus. If you see one of these five abbreviations on a medical report, it refers to an antibody.

All this—and still only the tip of the proverbial ice burg!

The Doctor Within works unseen, mostly without your awareness or appreciation unless the immune system fails. It can take a lot of abuse from “busters” before collapsing. But if it crashes, it is a catastrophe—impacting both brain and body. Fortunately, the immune system often can be rebuilt, but only by a slow, careful, thoughtful process. Prevention is by far the best policy. Your brain would much rather prevent a catastrophe than suffer the consequences, because when the body suffers the brain suffers, too.

How do vaccines play into this sophisticated healing system?

That’s for part 8.