

CREATOR

VOLUME 19

NUMBER 1

I Am Fearfully and
Wonderfully Made

IN JENNY'S DEFENSE

*"A thousand may fall at your side,
ten thousand at your right hand,
but it will not come near you." (Psalm 91:7).*

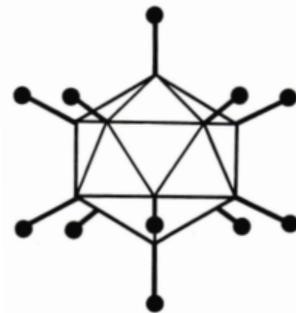
Jenny's temperature is 100° F (38° C) and she has been in bed most of the afternoon. Being an enthusiastic eight-year-old, it is rare for Jenny to be apart from her friends on a Saturday. Today, however, she doesn't feel like venturing outside her bedroom. She was fine last night, but this morning she woke up with a sore throat worse than she's ever had before.

Despite her misery, Jenny finds comfort through all the attention she is receiving from her parents. Deep down inside she suspects that I am taking care of her, too, even though we have never met. What she does not know is that without me she could not survive a simple cold—not that I can take any credit. My wonderful Creator, Jesus Christ, placed me inside Jenny months before she was born to faithfully watch over her, day and night. You see, I am Jenny's *immune system*.

Actually I should say, "*We are* Jenny's immune system." Like all the organs and tissues of her body, I am composed of billions of cells. I am unique though, among her many organs, because I am scattered throughout Jenny (unlike my friends, the heart and the liver, whose cells are gathered into one place). My cells roam tirelessly throughout her body looking for germs to destroy.

My best buddy, the stomach, once said that I reminded him of the wild beasts of Africa. Innocently, I asked him, "Which ones?" He tersely replied, "Well, lots of them, don't you know?!" He occasionally gets cranky. I would too if I had to digest the kind of food Jenny sometimes eats. She once ate a peanut butter and sweet pickle sandwich. *Yuuucckk!* That'd make anyone grumpy.

I've been working pretty hard the last couple of days, and my gastric friend is wise to compare me to hunting animals. You might say that my cells have been *on the prowl*. Most of



A common
cold virus

the time, however, I'm not exactly sure how these cells of mine work together to protect Jenny from infection. But *I do know* that we are marvelously coordinated by Creator Jesus.

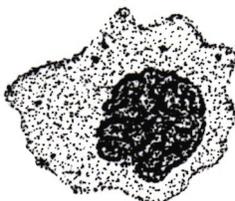
Here's what has been taking place *inside Jenny* over the past several days. Earlier this week, Jenny came in contact with another girl who had a cold. Unfortunately for Jenny, some of the cold viruses from her friend decided to "camp" in Jenny's throat. As soon as those nasty viruses got inside Jenny, I kicked into high gear. Without delay, I sent a slew of special white blood cells called *polys* (POLL - lees)¹ to deal with those viro-nasties. My polys act like a pack of fast-moving, spotted hyenas defending their rightful territory.

By the time the polys got to Jenny's throat in sufficient numbers, the viral hordes had already invaded the cells of her nose and throat. Not long after, white patches started developing on her tonsils.² These white spots are the graveyards of the viruses and the polys that have fallen in battle. The good news is that I was able to contain most of the cold viruses in Jenny's throat, but I had not gotten rid of them all . . . at least, not yet.

I was not deterred! God has given me an arsenal second to none, so I sent my mega-hunters to the scene—my *macrophages* (MACK - row - fa - juz), another type of white blood cell. Macrophages are like ravenous crocodiles, because they're relentless and will eat almost anything, dead or alive. In Jenny's blood, macrophages are called *monocytes* (MON - o - sites),



Polys
A germ "eater"



Macrophage
A germ "eater"



T-cell
A germ killer



B-cell
A small antibody factory



Plasma cell
A large antibody factory

and we might think of them as the roaming "reptiles" in the "rivers" of her bloodstream. Monocytes are most dangerous, however, when they "come ashore" and mature into macrophages in the tissues surrounding her blood vessels. Within three or four hours of the arrival of polys, the macrophages were on the scene at Jenny's throat and able to clean up a lot of the mess. These virus guys were tough little critters, however, and not yet ready to give up.

While the hyena-like polys and scavenging macrophages were defending the territory of her throat, I decided to release further reinforcements—ferocious cells "caged" in Jenny's lymph nodes and her spleen. Like large predatory cats, these special fighters, called *T-cells*, came to the rescue. There are several kinds of T-cells: helper cells, memory cells, suppressor cells, and one so fierce that doctors have dubbed it a "killer T-cell." The attributes of the killer T-cell are a cross between the ferocity of a lion and the lethality of a scorpion. Once the T-cells came in contact with virus-infected cells, they pounced on them, showing no mercy. They grabbed these cells by the neck and held them down. (I know, cells don't really have necks, but you get the idea.) Next, the T-cells "injected" the infected cells with their own brand of deadly poison, killing them.

Creator Jesus also directed Jenny's T-cells to release chemicals (cytokines) into her bloodstream, which then caused her body temperature to rise. Many people see fever as a bad thing, but small elevations in temperature may slow down invading viruses and make my immune system cells more efficient in fighting foreign microbes.

While the T-cells were engaged in battle, their sibling *B-cells* worked feverishly in Jenny's lymph nodes, cooking up yet another surprise attack. B-cells are one-of-a-kind cellular factories that produce an arsenal of deadly weapons known as *antibodies*.³ Antibodies are skillfully crafted protein

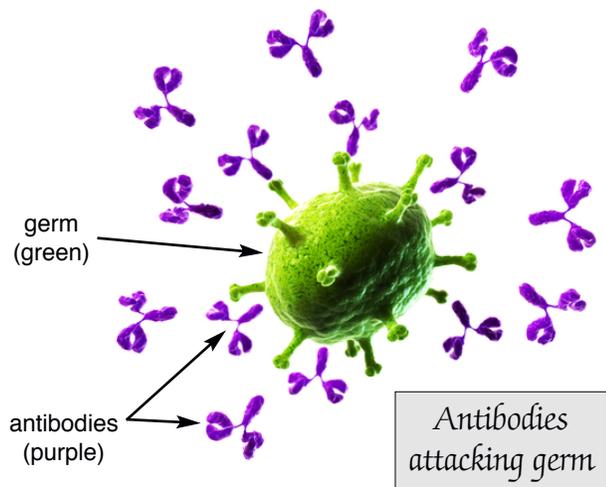
1 "Polys" is short for *polymorphonuclear leukocytes*. They are also known as *neutrophils*, one type of white blood cell Jesus placed inside you.

2 White patches on tonsils may indicate infection with bacteria or a virus.

3 B-cells must mature in the lymph nodes and become *plasma cells* in order to produce large quantities of antibodies.

molecules that Christ Jesus invented to help people fight off infections, whether they're caused by viruses, bacteria, fungi, or parasites. This particular ammunition kills all comers!

Once released into Jenny's bloodstream, the antibodies react to an invading virus like a



colony of driver ants responding to the trespass of a foreign insect.⁴ Just as driver ants know when a locust infringes upon their home territory, antibodies identify the foreign virus and attack it without hesitation. It's not a pretty sight! They attach themselves all over the virus and prevent it from entering any of Jenny's cells. Antibodies also tag the infected cells, making them easier for my macrophages and T-cells to find.

In order to ensure total victory, I release yet another special chemical into Jenny's blood called *complement*. Complement molecules team up with antibodies to make the damaged cells even more "appetizing" to my scavenging cells. Macrophages especially find these antibody-and-complement-coated cells quite "tasty." It's kind of like adding salt and pepper to food.

Ironically, most of the unpleasant cold symptoms that Jenny is now experiencing are not due to the virus itself. Her symptoms are the result of my trying to fight off her cold. (Imagine what it's like during a war between

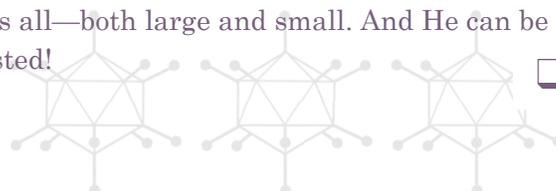
two armies. In the heat of battle, there are countless flashes of blinding light, ear-piercing explosions, and the strong smell of burnt gun powder. It's only when the war is over that the battlefield goes back to what it was before.) In a couple of days Jenny will be feeling much better and will be eating "normally" again. Although this is a great relief to most of my friends, the stomach has been enjoying his vacation. He again became cranky when he heard the news that he would be going back to full-time work soon. "You guys have never had to digest marshmallows so early in the morning!" he protested. He had a point

Jenny's body is a pristine wilderness that Jesus has given me to protect. And I relinquish this territory to no one. I bet most of you didn't know just how much God has done to keep you healthy and safe. The immune system truly reflects the love and concern of Christ's Father for mankind. Although my cells are scattered throughout the body—not neatly packaged like other tissues—God ingeniously coordinates all



Germ's Beware!

my skills to provide ultimate protection. The Lord Jesus, my Creator, is the Great Protector of us all—both large and small. And He can be trusted!



⁴ Read about driver ants in *CREATOR* Volume 17 Number 1.

THE GREAT SHIELD

"... He is our Help and our Shield."

Psalm 33:20

Protection comes in many forms. The lion raises his head, brandishing his formidable teeth to scare off would-be enemies. A prick from the rose bush reminds us that Jesus has provided this famous flower, not only beauty, but also a means of defense. And the mere sound of a bee sends some people scrambling in panic.

These are examples of how God supplies instruments of protection for His creations. It is, in fact, rare to find a plant or an animal lacking some *obvious* form of external defense. These conspicuous armaments are overshadowed, however, by an almost infinite variety of internal defenses that Christ our Creator has built into *every living thing*. His construction of hidden defense systems—complex means of protecting His creations from deadly microbes—clearly demonstrates the Lord's grace and love (Psalm 145:9). His concern is obvious; He protects life not merely on the outside, but through and through. Our Lord Jesus Christ is most worthy of the title, "The Great Shield."

Jesus created several layers of protection against microscopic foreign invaders in almost all organisms. Throughout creation, germs are met with a myriad of defensive strategies that He has skillfully invented. The roots of plants, for instance, secrete chemicals that act as antibiotics. This makes sense when we realize the incredible number of soil bacteria and fungi surrounding the underground parts of a plant.⁵ Likewise, animals produce a number of substances that have protective properties: the sweat and oils of skin, tears, the mucous of the digestive tract, stomach juices, and saliva.

Would-be germs must also pass through formidable and well-constructed physical barriers. The skin of a horse or an elephant, the thick bark of a tree, and the tough exoskeleton of an insect or spider are all examples of protective armor the Lord has created.

The microscopic intruders that are able to penetrate these outer defenses will then be met by an ever-present army of cells or circulating chemicals ready to destroy anything foreign. Most animals possess swarms of germ-eating cells called *phagocytes* (FAG - o - sights). Vertebrates (fish, amphibians, reptiles, birds, and mammals) have two types of phagocytes: *polys* (POLL - lees)⁶ and *macrophages* (MACK - row - fa - juz). The phagocytes of invertebrates (animals without backbones) are called *hemocytes*. Hemocytes are found in insects, spiders, oysters, earthworms, and lobsters, to name a few. Although different in size and shape, the phagocytes of all animals perform the same basic job—they're "eating machines." They devour anything that appears alien.

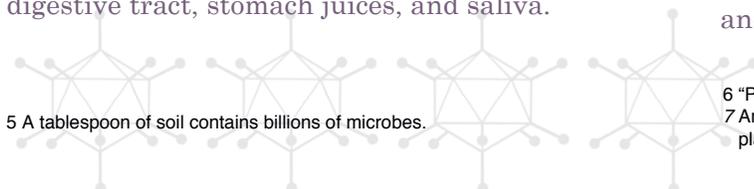
Germs that manage to run the gauntlet of phagocytes aren't off the hook—they will next be challenged by trillions of circulating *antibodies*⁷ or, in the case of invertebrates like insects and spiders, *antibiotics* Jesus created called *antimicrobial peptides* (AMPs). Antibodies and AMPs generally do one of two things: (1) they attach themselves to foreign invaders, "seasoning them" and making them more appealing to the eating cells, or (2) they attack and destroy germs on the spot.

People and mammals also possess strategically placed "forts" to prevent the spread of infection throughout the body. These forts—called *lymph nodes*—are store houses for white blood cells, some of which produce the antibodies just mentioned. They help contain and destroy invaders, filter out dead germs, and coordinate the body's immune army.

⁵ A tablespoon of soil contains billions of microbes.

⁶ "Polys" is short for *polymorphonuclear leukocytes* or *neutrophils*.

⁷ Antibodies are protein molecules produced by special cells (called plasma cells) in people and many animals.



Although fish do not have lymph nodes, they do possess tissues similar to our tonsils, which are located in their gills.

God did not simply create these sophisticated defensive strategies and then leave life to its own devices (no deism⁸ here!). His concern for each creature becomes even more evident when different species of animals are studied. For instance, our Lord Jesus tenderly protects the baby zebra and the young elephant after birth by supplying them with disease-preventing antibodies in their mother's milk. The same is true for human babies. Without these antibodies, babies and infant mammals would easily get sick and die.

When you think about it, it's hard to imagine why vultures don't succumb to disease, considering their diet of dead things.⁹ But their role in cleaning up the effects of death in this fallen world is integral to our survival—they help prevent the spread of disease. This is the main reason Y'Shua¹⁰ gave these birds what seems to us a disgusting appetite.

Although we may consider vultures grotesque looking, their bald heads and bare

King vulture
Sarcoramphus papa



necks serve a good purpose. Any germ that gets on the barren skin of a vulture is then exposed to the cleansing ultraviolet rays of the sun. In addition, the extremely high acid content of its stomach purifies germ-laden meat. The

immune system of vultures is second to none; even the immunity of sharks fails to surpass it.¹¹ Vultures can even survive eating diseased carcasses infected with botulism, anthrax, cholera, or salmonella.

Our Lord Jesus has provided large animals and humans advanced immune systems, but He also shows kindness toward the lowliest creatures using the built-in safeguards He has given them. In addition to its marvelously-constructed internal immunity, the diving beetle has been provided extra-special protection. God has directed the diving beetle to spend most of its life in water, so it frequently

Diving beetle



becomes coated with the bacteria that commonly reside in ponds. Using built-in “kitchen cleanser,” the beetle rubs a special disinfectant from its hindquarter glands all over its body, killing this slimy coating of germs.

The depth of our Creator's concern is also demonstrated in the humble caterpillar. As it transforms into a butterfly, the caterpillar's internal organs are completely dissolved, releasing a large number of intestinal bacteria into its body. Its wonderfully and skillfully created immune system easily handles the onslaught of germs.¹² If our own intestines were to rupture like this, we would develop a severe abdominal infection (peritonitis) and die! Yet this potentially dangerous event in the life of the butterfly-to-be

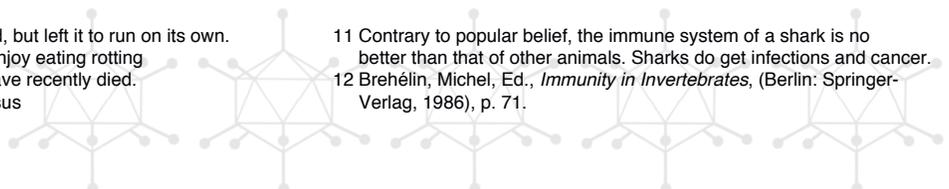
8 Deism is a belief that God created the world, but left it to run on its own.

9 Contrary to common belief, vultures don't enjoy eating rotting carcasses. They tend to eat animals that have recently died.

10 Yah - SHOO - ah, the Hebrew name for Jesus

11 Contrary to popular belief, the immune system of a shark is no better than that of other animals. Sharks do get infections and cancer.

12 Brehélin, Michel, Ed., *Immunity in Invertebrates*, (Berlin: Springer-Verlag, 1986), p. 71.



is a normal part of its development.

The creepy-crawlies of creation are diligently shielded by God, and the magnitude of this protection is phenomenal. Consider this: 1,000,000,000,000,000 insects populate the world; that is, a million times a million times a million insects. And Jesus protects and cares for *each one* 24 hours a day, seven days a week, maintaining within each a complex immune system and many external means of deterrence. Even the defenses of the lowly earthworm are more sophisticated in their construction than any of the weapons of the world's superpowers.

But Christ does not limit His vigilance to animals. As briefly mentioned earlier, vegetation has been supplied with numerous weapons against germ warfare as well. Although plants do not produce antibodies, as we do, they are permeated with several antibiotic-like chemicals, such as *phytoalexins* (fye - toe - uh - LEK - sins), and proteins known as *defensins*. Y'Shua has permeated the bark of trees with these proteins to reinforce their first line of defense. In addition, the *essential oils* and *tannins* found in most vegetation help green plants to resist infection from molds. The heartwood of some trees is saturated with a special group of phytoalexins, known as *stilbenoids*, chemicals that prevent destruction by decomposing bacteria. And God has laced coffee, tea, and cocoa plants with *caffeine*, a chemical toxic to certain kinds of fungus. (This is why it takes several days for mold to grow on a cup of coffee that's been left out on the table.)

The Lord also gave plants a way of limiting disease in case an infection does take hold. When a microbe, such as a fungus, tries to invade a typical plant, it may succeed in killing some of the healthy plant cells. As the plant cells die, however, they release toxins, which then kill the fungus. The fungal infection remains localized and the plant as a whole stays healthy. You may, from time to time,

notice brown spots on the leaves of plants—this may be evidence that the invasion by a hungry mold has been thwarted.

Another way our Lord Jesus Christ protects all plants and animals from infectious diseases is by giving each species a very unique chemical architecture. As with all organisms, germs need specific nutrients in order to grow and multiply. While an invading microbe may be able to find these essential nutrients in one particular species of plant or animal, they may very well be lacking in another. Even among groups of people, some individuals may get sick with a sore throat, for instance, while others do not.

Christ's ability to create this incredible variety in the chemical architecture of living things prevents the easy transfer of an infection from one species of plant or animal, or a person, to another. Here are some examples:

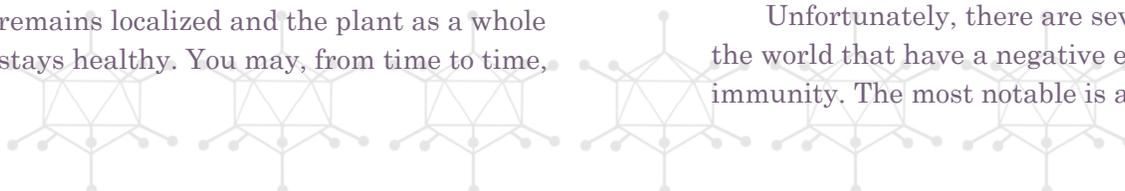
- people, pigs and horses can get the flu, but rabbits do not;

A flu-free
furry friend



- cats can't catch measles;
- cattle die from anthrax infection, pigs get a sore throat, but dogs are immune;
- birds, reptiles, amphibians, and fish cannot get rabies, but mammals and people do;
- leprosy occurs in man; armadillos are the only animal that can be infected.

Unfortunately, there are several things in the world that have a negative effect on immunity. The most notable is age. As a plant,



animal, or person gets older, their ability to fight off infection steadily declines. The apostle Paul bluntly summarized this problem by saying that "our outer self is wasting away" (2 Corinthians 4:16). This is the reality of fallen mankind.

Research has shown that stress, disease, hormones, and diet also affect life's defense capabilities. Poor nutrition or the opposite—overeating and obesity, both decrease the efficiency of the immune system. Extremes in temperature also influence immunity. Fish are more prone to infectious diseases during fall and winter,¹³ and the antibiotic activity in pine trees is much greater in summer than in autumn.¹⁴

Our Lord compassionately counters these negative environmental effects by supplying additional protection to modern society using the very organisms that can cause disease. Did you know that some of the most important antibiotic medications used in human and veterinary medicine come from microbes that live in the soil? In fact, the familiar smell of dirt is produced by a group of mold-like soil creatures that manufacture antibiotics.¹⁵

God's great concern for His creation is reflected in the marvelous ways He protects all living things. It seems that He purposely unleashed germs upon our fallen world to show us just what a fantastic Creator He is! In our Lord's great foresight, He engineered defensive systems that can handle most infectious assaults on plants, animals, and people. Although He has provided breakthroughs in medicine to improve our health, the vast majority of protection was set in place a long time ago. Our Heavenly Father has used creation to abundantly demonstrate that His Son is *The Great Shield*. □

13 Cooper, Edwin L., Langlet, Calude, and Bierne, Jacques, Eds., *Developmental and Comparative Immunology*, (New York: Alan R. Liss, Inc., 1987), p. 44.

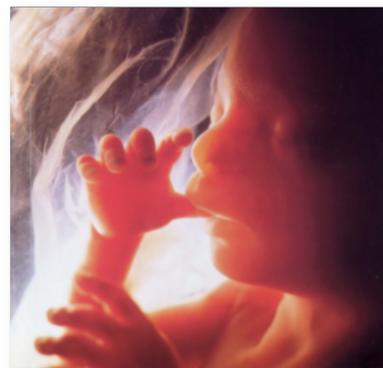
14 L.V. Metlitskii and O. L. Ozeretskovskaga, *Plant Immunity—Biochemical Aspects of Plant Resistance*, (New York: Plenum Press, 1968), p. 19.

15 Read **CREATOR** Volume 17 Number 3.

IMMUNITY LOST

"Though the fig tree should not blossom,
nor fruit be on the vines,
the produce of the olive fail
and the fields yield no food,
the flock be cut off from the fold
and there be no herd in the stalls,
yet I will rejoice in the Lord;
I will take joy in the God of my salvation."
Habakkuk 3:17-18

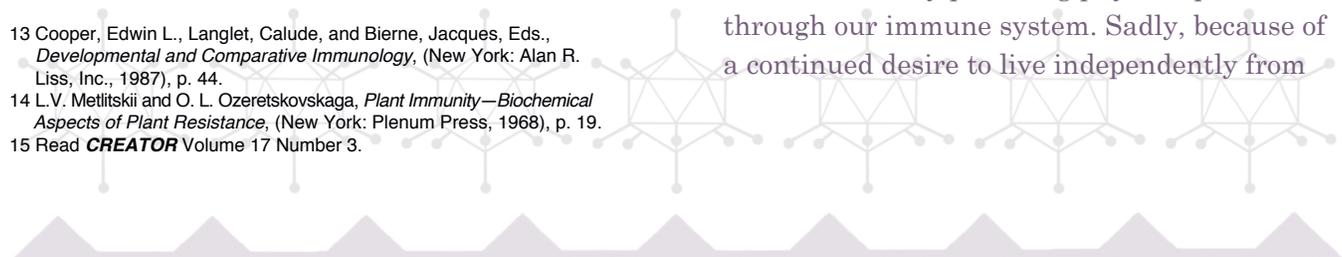
God cares deeply for you. He demonstrates His love to you in the way He marvelously created you (Psalm 139:14). God also allows disease to show us how utterly dependent we are on Him—without His marvelous creation of the body's immune system we would *all* quickly become sick and die. Even before you were born,



Baby in mother's womb

He gave you many shields to protect you from the potentially-harmful elements of this world.

Long ago, people made the conscious decision to rebel against God (please read Genesis 3). As a result, the human race became exposed to disease. Through the amazing design of our bodies, however, God continued to show His concern for us by providing physical protection through our immune system. Sadly, because of a continued desire to live independently from



God, mankind has suffered conditions that result from a weakening of our body's defenses. All diseases are, in one way or another, the result of man's attempt to live apart from God's sovereign rule. Instead of turning back to God, we often look to medicine as *our sole help*. The problem is that doctors may find a treatment for one malady, yet another soon surfaces to take its place because the same basic problem remains: mankind continues to rebel against the Lord God and refuses to obey Him. Many find temporary relief in excessive food, excessive entertainment, excessive work, and attaining excessive possessions. These often become the "gods" that comfort us and give us a false sense of security. But these don't protect us from the myriad of potentially harmful things that our Lord Jesus has placed in the world; ironically, these idols often weaken us and make us *more susceptible* to disease, pain, and suffering.

Jesus told a beautiful story in the gospel of Luke of a son who left home, with all of his inheritance, in search of happiness (Luke 15:11-32). Despite the great amount of money he possessed, he was not spared the hardships and heartaches of the world. In the end he was miserable and destitute. The surprise of this story is that when the son returned home after squandering his father's wealth, his father—without hesitation—lovingly embraced him and gladly accepted him back into his household. It was in his father's arms that the son finally found joy and peace.

Jesus told this story to illustrate His own Father's love for us. With regard to our bodies, we may squander the Lord's *gift* of our immune system through overeating, worry, and the many addictions of life. We may even weaken, damage, or destroy our immunity in such a way that it will never be the same again. Yet, whatever you have done in life, and no matter how much you might have abused your body, *there is good news*. We may never be free of trouble or disease here on earth, but we can experience perfect peace and eternal protection in God's arms. Jesus died on a cross to provide this eternal security, through *the forgiveness of our sins*.

Sin is like a plague that has been spreading throughout the world since the beginning of time, and will terminate in the wrath of God. The only immunity rests in the Messiah of Israel. Two thousand years ago, God demonstrated His love for the world by sending His Son, Jesus Christ, to Earth to lay the infection of sin on the Cross. Christ died on a cross and returned to life, so that we could be forgiven of all that we have done wrong against God and man.

You might improve your immune system through exercise, proper sleep and diet, and by decreasing your level of stress. But some of the things that we do in life may compromise our health in such a way that it cannot be undone. Some folks have lost their immunity, but not their opportunity to be eternally safe in heaven with God. Immunity may be lost, but paradise is not.

For those of us who repent of our sins and trust in the Lord Jesus Christ, and what He has accomplished on the Cross, the things we have done in rebellion against God are forgiven! And our *spiritual health* and eternal relationship with God are restored. Please do not trust in your body's immunity alone; trust in the One who created that immunity and can shield us from the wrath to come.



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