



The Immunology Of Humor

Recent research confirms the centuries-old belief that humor, mirth, and laughter produce beneficial effects on health.

by Sandra L. Neblsen-Cannarella

A MEDICAL STUDENT IN A HOSPITAL GOWN SITS in a darkened room at the Loma Linda University Medical Center, watching a videotape of a popular episode of "Candid Camera." The student is laughing heartily and apparently enjoying the show. As the movie comes to an end, an intern immediately draws a vial of blood. He sends it, along with a similar sample drawn before the movie started, for analysis, one more piece in a puzzle that may someday reveal whether laughter really is good for our health. The findings, thus far, suggest that the answer is Yes.

In a research trial at Loma Linda University Medical Center in 1986, a team of investigators measured the effects of mirthful laughter by administering psychological tests to, and testing the blood of, five sophomore medical students before, during, and after viewing a comedic videotape. They confirmed the expected fluctuations in neuroendocrine hor-

mones,¹ and found that these correlated with the subjects' perceived humor as defined by their psychological tests.² In addition, there was increased activation and proliferation of lymphocytes and increased destruction of tumor cells by natural killer cells, above the pre-laughter "baseline" levels, suggesting a beneficial effect of specific neuroendocrine hormones on the immune system.³ These data gave support to the thesis that a diversion such as humor was capable of eliciting an emotional response that leads to the release of biochemicals capable of modulating immune system function. Such modulation may then affect an individual's health, an effect that would depend, at least, on the strength and durability of the modulation and the frequency of exposure to the emotion-inducing experiences of similar or different types.

The Physiology of Laughter

For the layperson, these conclusions may seem predictable, even intuitive. Most have

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experienced the emotional “high” that a long, hearty spell of laughter produces (not unlike the “high” reported by runners). But the similarities go much deeper. In both situations—laughing and exercising vigorously—similar neurohormones are produced, including beta endorphins. Beta endorphins, produced by the brain, are our own tranquilizers. They belong to the family of opiates (which includes opium, morphine, and heroin) that can slow respiration, lower blood pressure, decrease sensitivity to pain, lower motor activity, heighten certain immune responses, induce feelings of well-being, and relieve stress.

Biomedical research conducted in the 1970s and 1980s revealed that endorphins influence immune system function. Further, some lymphocytes produce their own endorphins and bear membrane receptors for receiving endorphin signals from the brain as well as from each other.⁴ It has also been reported that endorphins are released when stimulation of the hypothalamus-pituitary-adrenal (HPA) axis leads to release of corticosteroids from the adrenal glands. This phenomenon can be interpreted as the body responding to stress signals by supplying “dope” to make it feel better.⁵

Physiologically, laughter is a respiratory act and results in increased pulmonary ventilation (above-normal breathing cycles); it increases the heart rate proportional to the intensity and duration of the laughter episode. After laughter, the heart rate drops below the pre-laughter baseline rate; it does the same to the blood pressure (systolic and diastolic).⁶ Typical laughter produces musculoskeletal activity and subsequent relaxation in muscles of the ribs, abdomen, diaphragm, neck, and shoulders. In hearty laughter, many more muscles are involved, leading to total body relaxation. These effects stem from stimulation of the central nervous system, resulting first in a release of adrenaline, then of beta-endorphin. Research has shown a direct correlation between intensity of mirth and levels of catecholamines.

Endocrine and digestive functions are also stimulated through laughter.⁷ Many parallels are drawn between laughter and the benefits of exercise, including an enhanced sense of well-being, stress reduction, and relaxation.⁸

But research also suggests that the benefits of laughter and good humor cannot be defined strictly within the context of exercise, in this case, the physical act of laughing. The mental state of humor, or mirth, is beneficial in and of itself. Stanford University’s William F. Fry, Jr., a psychiatrist, is a recognized authority in the benefits of humor and laughter. He has evaluated the physiologic effects of mirthful laughter and, for nearly three decades, employed humor in his practice of psychiatry. In addressing the three major life-threatening disease conditions in the contemporary Western world (heart disease, cancer, and stroke), Fry points out the significance of humor in combating factors contributing to these disease processes:

Stress is antagonized by humor in both its mental or emotional aspect and its physical aspect. Emotional tension, contributing to stress, is lowered through the cathartic effects of humor. Anger demands a serious attitude; humor banishes the tightness and severity which are necessary for anger. . . . With only the exception of the most severe degrees of depression, humor relieves the devitalizing grip of depression. It offsets, opposes, diminishes depression. . . . Mirth opens our minds and raises us above slavery to archaic reflex. Humor precipitates a complex, thought-provoking experience shared with other humans. Humor gives us a choice.⁹

This power of humor as a liberating agent may be of particular importance in light of research by Steven F. Maier, Ph.D., professor and chair of experimental psychology at the University of Colorado, Boulder. Maier advocates the importance of the subject’s sense of control in a stressful situation in overcoming stress. In a 1983 study, Maier and his col-

leagues¹⁰ reported that rats given a series of inescapable shocks, escapable shocks, or no shocks exhibited very different immune reactivity. Those animals not capable of escaping electrical shocks demonstrated suppressed immune activity. There was no difference, however, between the animals that were given the ability to escape the shocks (but still received shocks) and the control animals not receiving shocks.¹¹ The authors' interpretation was that "the extent of behavioral control over the event may be more important than the event itself."

Benefiting From the Distractions of Humor

Based on observations similar to the ones made in Maier's study—that subjects ex-

posed to stress do not always suffer suppressed immune activity, or become ill—some have argued that stress does not, in fact, lead to illness. Using similar logic, others argue that laughter does not lead to wellness. But *perception* is the operative word here; it is responsible for the "placebo effect" and is the go-between (between event and response to the event) of all human emotions. Perception of one's life and life experiences is tied to our sense of control, and it is this sense that tempers much of our emotion and reaction to events.

Marvin Stein, M.D., chief of psychiatry at Mount Sinai Hospital in New York City, has tested the effects of perception and coping, by measuring psychosocial and immune capabilities of the husbands of women diagnosed with terminal breast cancer. For several years, he followed these men through their experi-

A Guide to Interpreting Scientific Studies

by Byron Greenberg and Sandra Nehlsen-Cannarella

In scientific investigation, there are many ways to ask the same question. The manner in which you ask the question will determine the methods you use to answer it. If we look at reports of studies on the relationship of emotions and health, we find three frequently cited papers. One such study is that of S. Cohen and colleagues.¹ The question asked here was, "Does psychological stress suppress host resistance to infection?" To answer this question, the authors gave 394 healthy subjects a stress questionnaire and then administered nasal drops containing either a salt water solution (control) or a respiratory virus. They reported that the rates of respiratory infection increased proportionately to the degree of psychological stress measured in the subjects. Does this study lend any

credence to the notion that "a merry heart doeth good like a medicine"? Some would say Yes. But scientific scrutiny would reveal that the relationship between stress and a merry heart would need to be defined (for example, does the absence of stress ensure joyfulness?). Cohen and colleagues would have to have measured how merry their subjects' hearts were in order to infer the relationship. What this study does tell us is that there is a relationship between psychological processes and resistance to infection. But what about a merry heart?

When do we use medicine? Almost always, after we've become ill, much like the subjects in Cohen's study probably did (a merry heart). Did a "merry heart/medicine" ameliorate the illness in this study? We don't know, because we have neither a measure of the degree of the merriness nor knowledge about the rate of recovery that may have been

due to this merriness.

Another well-known study is the Western Electric Study,² in which 2,000 middle-aged men were monitored for 20 years to determine if depression was associated with the incidence and mortality of cancer. The authors indeed found a significant positive association between depression and cancer mortality, but the increased risk appeared to be minimal. Is depression (or anger, envy, guilt, or hopelessness) the opposite of a merry heart? In order to generalize this study's results to the question, "Does a merry heart do good like a medicine?" we would have to assume that these emotions are the opposite of a merry heart, and then we really would be addressing the question, "Does a non-merry heart do bad?" As mentioned earlier, the methods used by scientists are dictated by the research question. In both of the above studies, the research question had noth-

ence of witnessing various stages of their wives' illness and death. He continued to study them for at least two years after the loss of their spouses. Stein demonstrated impaired immune function in bereavement¹² and depression,¹³ as well as general health and life expectancy. He also clearly demonstrated that positive perception helped these male subjects cope. In another study of mid-life wellness factors, by Harvard's George Vaillant, M.D., humor was again singled out as a major stress-coping mechanism possessed by healthy men. The men in this study understood and used the stress-relieving power of humor—to relieve tensions, break negative feelings, and put their problems in perspective.¹⁴

Perception, not coincidentally, was one of the aspects of mind-body interaction that we measured in our laughter experiment at Loma Linda University Medical Center. Our findings

fit well with Maier's. We first studied the immune responses of our subjects a few days before watching a comic video. Against this background, we compared measurements made immediately before watching the video with the same measurements performed several times throughout the viewing, and after the viewing. Remarkably, an increase in immune capability had developed in our subjects in response to the anticipation they perceived immediately *before* starting the experiment, as compared to an assessment done two weeks earlier (perception was measured by the Profile of Mood States [POMS] assessment questionnaire at each of these time points). The subjects knew that they could anticipate the viewing of a videotape of a comedian of their choice, and would be offered pizza and soda following the final blood drawing. In addition, they were encour-

ing to do with a joyful heart; instead, they were measuring stress (negative) emotions and their influence on the immune system.

In any scientific investigation, certain assumptions are made. The challenge to consumers of the resulting literature is not to make additional assumptions, but to scrutinize the assumptions made by the investigators. For example, in the first article, the authors assumed that the measurement of stress that they used did indeed measure "stress." In the second article, the authors assumed that depression measured 20 years ago was a trait that would occur over time instead of it being a one-time event. It is tempting to make additional assumptions, such as assuming that a lack of depression is the equivalent of joy or merriment; this is not logical. One might also assume that host resistance to an invading organism is indicative of the ability of the system to fight off an infection that has already taken the upper hand. However, it is possible that the inborn

immune system (the "front line defense" for preventing infection) can be affected by a current, acute stress, while the adaptive immune system (the "elite army" responsible for fighting an established infection) can be left intact. Because the immune system is made up of multiple parts—each differently affected by various events—the whole system is not necessarily compromised by the presence of some stress emotion. This is particularly true if the stress emotion emerges from a short-term, acute event.

In the third study,³ A. B. Zonderman, P. T. Costa, and R. R. McCrae considered the risk for cancer morbidity and mortality relative to depression. This study used a nationwide selection of subjects; they showed no significant relationship between depression and risk of cancer and death. This should cause some eyebrows to rise and questions to be asked—such as, "What were the instruments used in this study? Were they the same ones used in the Western Electric study?

Did they measure depression?" The truth is, this study used a different measure of depression from the first. Could this have caused the difference in results? Perhaps, but all we know at this point is that the two studies have differing results. One says that depression and cancer are related, and the other says they are not. If we are going to answer the question, "Does a merry heart do good like a medicine?" then we as scientists would use none of these studies.

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aged to bring a friend or spouse to the event. In other words, we had been able to measure the effect of positive anticipation on immune function, perhaps an extension of the perceived positive anticipation—demonstrated in Maier's experiment—of being able to escape an electrical shock.

Through numerous studies over the past two decades, investigators have demonstrated that during different mood states, substances are released in the mind and body. They have also observed the effects of those substances on immune function, and correlated them with either salutary, unhealthy, or inconsequential effects. The majority of researchers agree that stress, grief, loneliness, pain, and feelings of helplessness may eventually lead to ill health. Now we find growing acceptance of the role humor and laughter can play in diverting the subject from the stress and pain of unpleasant events and conditions.

Recent findings from two studies in pain tolerance management offer further support for this conclusion.¹⁵ It is known that more than one type of cognitive psychological technique can increase pain tolerance. Distractions of several types can achieve this end. To measure its relative effectiveness in increasing pain tolerance, humor was contrasted with repulsive and neutral distractors. In these two studies using large numbers of subjects, repulsive stimuli were found to be as effective as humorous stimuli in successfully increasing tolerance to pain. These studies suggest that it is not a unique quality of humor that mediates pain (and perhaps stress) tolerance, but rather its ability to distract the subject from the experience of pain. While most of us would prefer to be distracted by joyous rather than repulsive subject matter, the fact remains that subjects capable of inducing strong emotional states can be effective pain reducers. Whether all stimuli capable of increasing pain tolerance achieve this effect by the same mechanisms remains to be established.

Treating Stress With Humor

I am ready, then, as a scientist and practicing immunologist, to endorse humor and laughter as beneficial. Indeed, I routinely instruct our patients to bring diversionary activities into their lives such as laughter, music, and hobbies that bring personal enjoyment and satisfaction. Here, though, we encounter one of the more challenging facets of the study of humor—determining what humor is, and how one quantifies it. Jessica Milner Davis, an Australian psychiatrist,¹⁶ and Carolyn Aust, chair of the Colorado Commission on Aging, are among the leaders using humor in their clinical practices. They, and others, have helped define humor as the attributes in a situation or story that lead us to perceive what is absurd, ridiculous, or incongruous. Our perception, in turn, leads us to feel mirthful, or to laugh. I recall reading a newspaper commentary a few years ago by Edward de Bono, a literary commentator specializing in humor, in which he describes humor as arising directly from the process of perception, which allows the mind to “switch over and look at something in a completely new way.” Harvey Mindess, author of *Laughter and Liberation*, agrees: “Humor is an attitude toward life, an ability to be objective, unattached, and see the absurdity of one's plight. Humor is willingness to accept life and oneself.”¹⁷

How does one measure humor? Consensus has been long in coming. About 25 years ago, research psychologists began setting their sights on positive emotions, and humor became a focus of attention.¹⁸ For many years thereafter, psychologists and psychiatrists struggled to develop tools that could measure and define humor in all its many forms. Although great strides have been made toward identifying the “chemical nature” of humor,¹⁹ researchers are limited, primarily, to instruments of self-report. The Situational Humor Response Questionnaire (SHRQ), developed by Martin and

Lefcourt, used in conjunction with the Profile of Mood States (POMS) test developed by McNair, Lor, and Droppleman, have become standards in this field. Other instruments exist, and each one has its peculiar strengths and weaknesses. In most cases, more than one test is required to suit the needs of a particular effort.

Once we have agreed on the definitions, how do we put humor to practical, everyday use? Laughter and humor have been used by professionals in treating patients, discussing treatment options, diagnoses and prognoses, relieving stress in the workplace (particularly in emergency rooms,

surgical suites, and intensive care units), and resolving personnel issues, just as persons outside the medical profession have done for decades. More recently, however, humor has become a kind of treatment option in the modern medical setting. Numerous hospitals, medical centers, and rehabilitation cen-

ters have developed humor teams, humor carts that are wheeled through patient areas like the roving library and gift carts, and humor rooms, all intended to assist patients through their recovery process, or to help alleviate anxiety and pain. Dr. David Bresler, director of UCLA's Pain Control Clinic, tells us that "the most common expensive and disabling disorder in the United States is pain, and the key to eliminating pain is to change your mind and attitude—laughter provides that opportunity."²⁰

In addition, humor is being used by the medical profession to improve the workplace setting. For example, nurses use humor to make themselves feel more at ease with their

patients, to lighten both their own and their patients' moods, to encourage their patients to communicate and express emotions, to dispel anger and aggression, and to relieve panic and anxiety. Both patients and staff report benefiting from sharing humor.

But humor—as a treatment—works equally well as "preventative medicine." Joel Goodman, Ed.D., in his quarterly magazine *Laughing Matters*, encourages us to observe good comedians handling hecklers to learn to become "light on our feet"—expert at defusing threatening or stressful situations. He

promotes the idea that we should practice humor—planned spontaneity—so as to prepare us to act with grace under pressure or in an embarrassing moment. He tells the story of humorist Robert Benchley who, when leaving a posh Manhattan restaurant, turned to the uniformed man at the door and asked him to call for a taxi. When the

man replied icily, "I happen to be a rear admiral in the United States Navy," Benchley said, "All right then, get us a battleship."

But, we may ask, what if we don't *feel* humorous, or in good spirits? What good can humor possibly do us then? Not surprisingly, many experts tell us to feign or pretend to be happy if we are having trouble getting into a happy mood. "You have to start somewhere, even if it means going through the motions at first," says psychologist Harry A. Olson, of Reisterstown, Maryland. "[I]f you decide to be healthy, hopeful, and fun-loving, that's what you'll be."²¹ Remember the experiments of Ader and Cohen in which animals were "conditioned"? We, too, are conditioned in many

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ways,²² one of which is to respond physiologically to a feigned smile in the same way we respond when smiling from pleasure—it is a “patterned response.”

Whether humor, mirth, and laughter produce beneficial effects on the immune system, and therefore on health, is no longer in doubt. Humor is an emotion, emotions elicit the release of neurohormones, and neurohormones modulate immune system function. Experienced events are processed by the mind; emotions and reactions to all events are tempered first by emotional reactions and then by cognitive processes that assign attributes. What is critical is each person's own

perception of the situation, the intensity and duration of his or her emotion, and the presence, type, and strength of collateral emotions.

The emotion of happiness has, for many centuries, been equated with health and longevity. Recent research confirms this belief. Future research in this area should establish whether humor elicits the same, similar, or different neurohormonal patterns than other types of stimuli, and determine which stimulus is most effective in a particular clinical setting. Then we will be empowered to use nature's own pharmacopia in a competent manner. Until then, I will continue to laugh—a lot.

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and remain angry at the same time. Another coping function of humor is its use as a means to deny or avoid feeling too frightened to face reality. The tendency of humor to playfully boost morale even when one is not in a playful frame of mind—known as “gallows humor”—was initially studied by A. Obrdlik in individuals about to face death in Nazi concentration camps (A. Obrdlik, “Gallows Humor: A Sociological Phenomenon,” *American Journal of Sociology* 47 [1942], pp. 709-716). Humor is used to normalize or break the ice under tense conditions, facilitate relaxation, establish trust, initiate conversation, achieve consensus, enhance cohesion between persons, and reduce nervous tension. Freud speculated that releases from the obligation to be rational and logical are necessary from time to time.

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