



We naturally view any risk we witness as a personal threat—
even when it is on the opposite side of the globe
and we see it only on TV. Is popping a pill the answer?

By Marc Siegel

Can We Cure

FEAR

In early 2004 my daughter, Rebecca, was taking a bath. She was almost three years old. When the tub's Jacuzzi device turned on, she became petrified. I raced to her side, to find her standing straight up, bright red from crying.

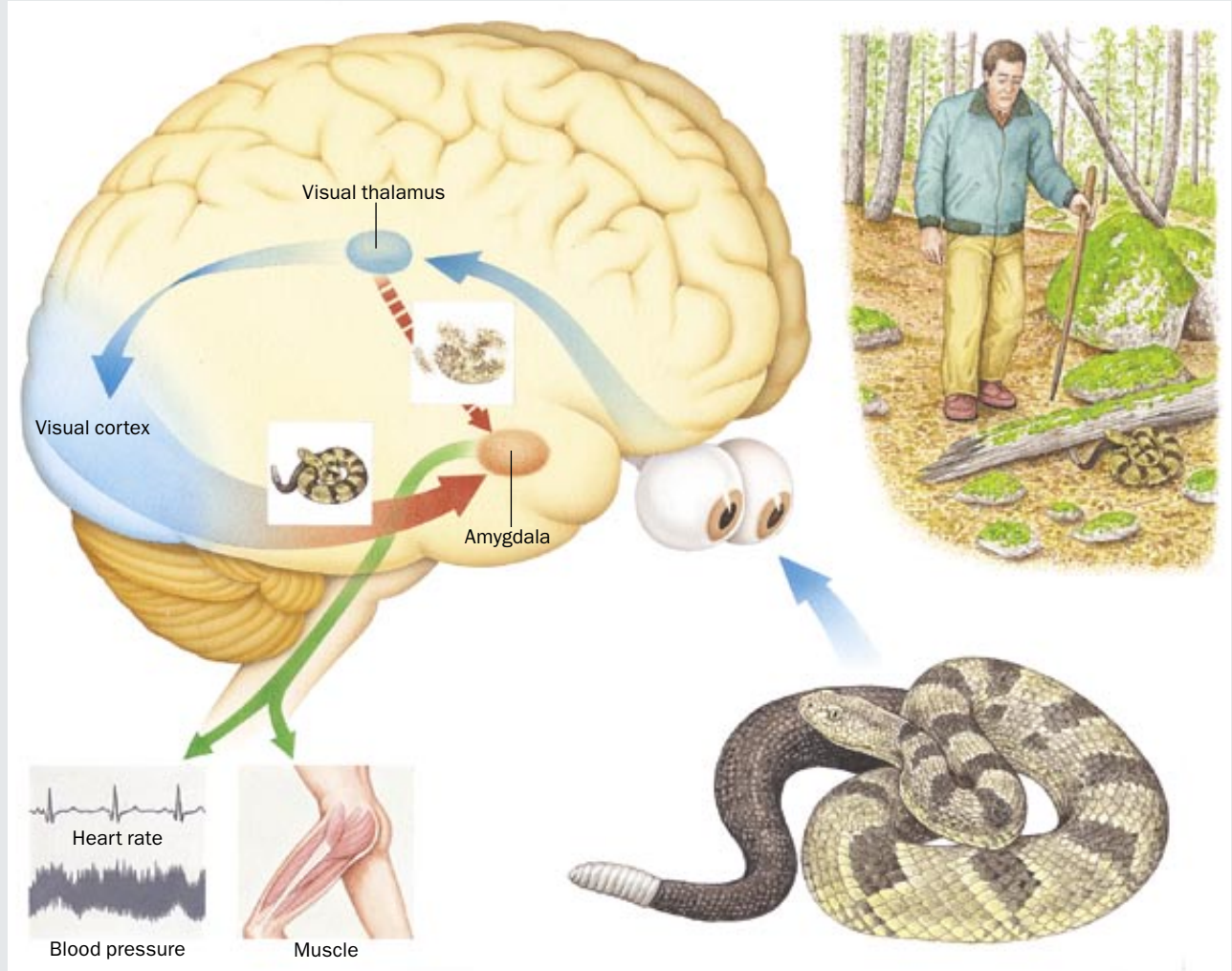
For months afterward, she abhorred baths. As a physician who has studied the neurobiology of fear, I knew that the prefrontal cortex of her young brain had just finished wiring its "safety center," where analytical reasoning can overcome primitive emotions. I tried to appeal to her newly working brain center to suppress the worry that this

Excerpted with permission of John Wiley & Sons, Inc. (www.wiley.com), from False Alarm: The Truth about the Epidemic of Fear. Copyright © 2005 by Marc Siegel.

The Fear Response

Cortical and subcortical pathways in the brain may bring about a fearful response to a snake on a hiker's path. Visual stimuli are first processed by the thalamus, which passes rough, almost archetypal, information to the amygdala (red). This quick transmission allows the brain to respond to the possible danger (green). Meanwhile the visual cortex also receives sig-

nals from the thalamus and, with more sophistication and more time, determines that there is a snake on the path (blue). This information is relayed to the amygdala, causing heart rate and blood pressure to increase and muscles to contract. If, however, the cortex had determined that the object was not a snake, the message to the amygdala would quell the fear response.



tub would always bring the scary bubbles, but her body's innate response was too strong. By starting with showers and diverting the focus of her attention from the tub, I was gradually able to return her to baths. But to this day she is wary of bubbles.

Why is fear so intractable? And what can we do about it? Therapy has provided succor for many people; others have relied on the strength they get from their faith or other support networks. But in a world where we regularly witness hair-raising events—such as the aftermath of suicide bomber attacks in full color on our living-room televi-

sions, on Web sites and on newspapers' front pages—is such verbal support enough? Answering a perceived need, fear-blunting medications are coming onto the scene. Could we—should we—all simply pop pills to ease our anxieties?

Fear is more than a state of mind; it is chemical. The feeling of alarm arises from the circuitry of our brains, in the neurochemical exchanges between nerve cells. Fear is a physical reaction to a hazard. As long as the danger is direct and real, fear is normal and helps to protect us. Fear also has a genetic component. A rat will recoil from

CORBIS (page 44); ROBERTO OSTI (this page)

the odor of a fox, even if that rodent has spent its whole life in a laboratory. Likewise, we humans are automatically apprehensive about situations that once threatened our ancestors.

When one feels threatened, the metabolism revs up in anticipation of an imminent need to defend oneself or flee. “Fight or flight,” or the acute stress response, was first described in the 1920s by Walter B. Cannon, a physiologist at Harvard University. Cannon observed that animals, including humans, react to dangers with a hormonal discharge of the nervous system. The body unleashes an outpouring of vessel-constricting, heart-thumping hormones, including epi-

we have only read or heard about, so we may worry about disasters we may never experience. If we are unable to respond for lack of an appropriate target, we become anxious.

Adding to the problem—according to studies of how humans evaluate risks by University of Hawaii at Manoa psychologists Robert J. Blanchard and D. Caroline Blanchard—is that people often fail to assess the level of threat accurately. We tend to overpersonalize risk and to experience an unrealistic sense of peril when we hear or read of a bad event occurring to someone else.

For example, my mother-in-law has a severe case of multiple sclerosis and has been confined

Once a person has learned to feel apprehensive about something, he or she may always dread it.

nephrine, norepinephrine and the steroid cortisol. The heart speeds up and pumps harder, the nerves fire more quickly, the skin cools and gets goose bumps, the eyes dilate to see better, and the areas of the brain involved in decision making receive a message that it is time to act.

At the center of these processes is the amygdala, an almond-shaped region of the brain. Neuroscientist Joseph E. LeDoux of New York University, a pioneer in the study of the fear cycle, describes the amygdala as “the hub in the brain’s wheel of fear.” The amygdala processes the primitive emotions of fear, hate, love and anger—all neighbors in the deep limbic brain we inherited from animals that evolved earlier. The amygdala works together with other brain centers that feed it or respond to it. This fear hub senses through the thalamus (the brain’s receiver), analyzes with the cortex (the seat of reasoning) and remembers via the hippocampus (the memory-input device).

It takes only 12 milliseconds, according to LeDoux, for the thalamus to process sensory input and to signal the amygdala. He calls this emotional brain the “low road.” The “high road,” or thinking brain, takes 30 to 40 milliseconds to process what is happening. “People have fear they don’t understand or can’t control because it is processed by the low road,” LeDoux says.

Fear Factor

Once a person has learned to feel apprehensive about something, he or she may always feel dread associated with that experience. And unlike mice, we humans can be alarmed by events

to a wheelchair for almost 20 years. Six years ago my brother-in-law developed a mild case of MS, and my wife, a neurologist, then confided in me her fear, practically a conviction, that she would be next. Every time she brings up her perception that MS is her destiny, I try to counter it with the bald statistic that only 4 percent of close relatives are at risk for the disease. “There is a 96 percent chance that you won’t get it,” I say. But for my wife, as for many others, the perception rests with the 4 percent. Empathy for her mother and a natural tendency to personalize her experience create the fear and the conviction, despite her neurologist’s knowledge of the disease.

Recurrent or unremitting fear has the same deleterious effects on the human body that running persistently at 80 to 100 miles per hour has on a car. Many illnesses are more likely to occur as a result, including heart disease, stroke and depression. Thus, we should focus our efforts on avoiding the ordinary killers such as heart attacks that develop as a result of our unremitting worries rather than extraordinary occurrences or exotic diseases. Consider: in 2001 terrorists killed 2,978 people in the U.S., including five from anthrax attacks. That same year, according to the Centers

(The Author)

MARC SIEGEL is an internist, an associate professor of medicine and a fellow in the Master Scholars Society at the New York University School of Medicine. He is also a weekly columnist for the *New York Daily News*, frequently writes for the *Los Angeles Times*, the *Washington Post* and *Family Circle* and appears on CNN and NBC’s *Today Show*.

Fear Not

I learned how to defeat fear from one patient, whom I'll call Joel Enrand. Enrand had an overriding terror of losing everything—his health, his job, his family—leading to depression, weight gain, high cholesterol and elevated blood pressure. Most of all, because of his paralyzing middle-of-the-night bouts of sleepless panic, he was concerned about losing his mind. “You’re not crazy,” I reassured him. The tiny muscles around his eyes then relaxed. Enrand soon embarked on a program of his own design, willing himself to jog three miles a day before work, eat regularly and limit himself to two cigars per week as his “one vice.” After six months he sat, at ease, in my office.

“My courage is back, Doc,” he said. “Things were happening to me. I latched onto the worry. I could feel it, like it was real. It gripped me, and it grew.”

“But you fought it?”

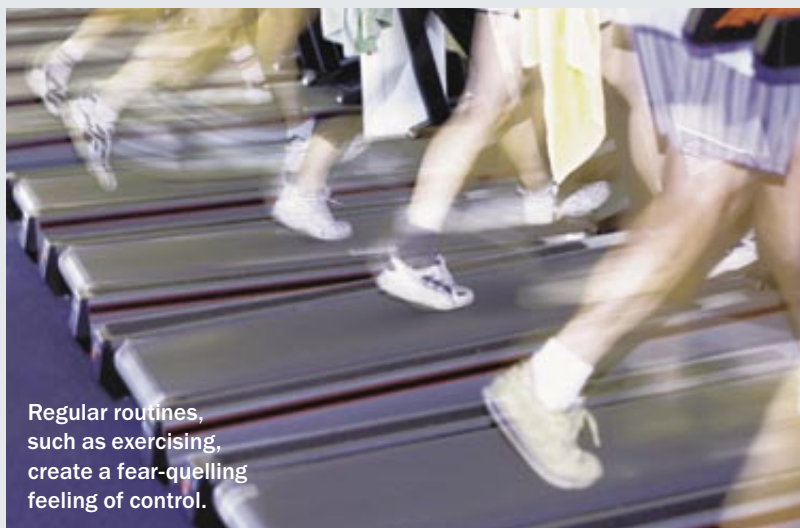
“Just by sticking to routines, rituals; they replaced the doubts little by little. When I saw I was getting my life back, I started to enjoy the routines.” Enrand hesitated. “Most important,” he said, “I’d always wanted to be a dad, and I loved my son more than anything, and I knew I was responsible for him. He needed me, and I grew stronger by refusing to let go of him.”

Many of the ways we can keep an

even keel mentally also make good common sense:

- Avoid overhyped TV news programs or Web sites, which leave you susceptible to personalizing the dangers depicted.
- Like Enrand, identify what matters to you—and use that knowledge to bolster your courage.
- Practice the “five R’s”: regular sleep, regular meals, regular entertainment, regular exercise and regular work schedule. Establishing order and control over many aspects of your daily life eases stressful fears.

—M.S.



Regular routines, such as exercising, create a fear-quelling feeling of control.

for Disease Control and Prevention, heart disease killed 700,142; cancer, 553,768; accidents, 101,537; and suicide, 30,622. Murders (not including 9/11) accounted for only 17,330 deaths.

Liquid Courage

So what can be done about irrational fear? There is no one standard treatment in part because symptoms vary from one individual to the next. A person may feel destined to a given bad outcome and have a greater sense of foreboding because of a certain family tendency. Some people’s bodies more easily release the fight-or-flight hormones than others. Time-consuming therapy and the resulting reeducation, to avoid triggering our fears, have been the chief solution to date. Now research also suggests therapy could be supplemented by a simple pill that blocks the reception or production of fear signals or even by a fear “vaccine.” The fear research does not seek a traditional vaccine—in which the immune sys-

tem develops protective capabilities in response to the presence of an injected (inert) disease agent. Rather the immune system might be chemically primed with a shot so that it is as healthy as possible—making the body less susceptible to hyperreacting to threats.

One of the first clues that an avenue to treating fear could be to stop certain signals from being received or transmitted by neurons came from work by neuroscientist Larry Cahill of the University of California, Irvine. In 1994 Cahill tested on humans the effects of the drug propranolol, a beta blocker that stops the reception of stress hormones called catecholamines. He found that the drug prevented people from recalling a gory story better than a bland one. Ordinarily, the mild stressfulness of hearing an exciting story makes it more memorable than an uneventful tale. Propranolol is routinely prescribed for anxiety relief and to treat high blood pressure and related ailments, but Cahill’s re-

CORBIS

search suggests it has a greater potential for treating fear.

Along these lines, Roger K. Pitman, a professor of psychiatry at Harvard University, theorized that administering propranolol can both prevent the laying down of fear memories and blunt the fight-or-flight response. In 2002 Pitman and his group looked at the effects of giving propranolol to 41 people in the emergency room, starting within six hours of a traumatic event (mostly car accidents). The study participants received the drug for 10 days. Three months after the trauma, Pitman found a significantly lower

Blunting fearful memories with pills or vaccines is, however, not the same as retraining the brain so that it is better equipped to handle future situations. Regardless of the development of such medicines, therapy will continue to play an important role in treatment for fear. As the President's Council on Bioethics put it in the 2003 book *Beyond Therapy*, "Use of memory-blunters at the time of traumatic events could interfere with the normal psychic work.... There is a danger that our new pharmacological remedies will keep us 'bright' or impassive in the face of things that ought to trouble, sadden, outrage, or inspire

Could medical remedies keep us impassive in the face of things that ought to sadden, outrage or inspire us?

incidence of post-traumatic stress disorder in those who received the drug than in the control group, which had not received the drug.

Another way to hinder the fear response is by disrupting signal production. LeDoux and Karim Nader of McGill University reported in the August 17, 2000, issue of *Nature* that when rats received a shot of anisomycin, an antibiotic that inhibits protein synthesis, their fear memory was blocked. They could not recall a previous fright and could not trigger a new fight-or-flight response, because the amygdala could not make the signaling molecules.

→ Reducing neural overreaction is another approach. In a study by neurobiologist Jonathan Kipnis, now at the University of Nebraska Medical Center, and his colleagues published in the May 25, 2004, issue of *Proceedings of the National Academy of Sciences USA*, the authors found evidence that immunological "vaccines" could prevent excess fear. They injected normal mice with amphetaminelike drugs that caused psychotic symptoms. Some of the mice received the protective vaccine, a chemical cocktail known as glatiramer acetate, or copolymer-1 (Cop-1); a control group got no vaccine. Cop-1 stimulates production of immune system T cells, which protect nerve cells from "irritability," or hair-trigger firing. The mice that received Cop-1 were able to learn to swim through a maze in recognizable patterns, whereas the control mice could not do so. The Cop-1 mice exhibited normal calm behavior, showing that they avoided a state of panic. This kind of immune modulation has yet to be studied in humans, but such experiments are anticipated.

us—that our medicated souls will stay flat no matter what happens to us or around us."

For years, I have tried to help my patients handle their disease fears without knowing if I am succeeding or not. In studying the fear circuitry of the brain, I have come to appreciate that teaching might not automatically lead to learning. Fear is a deep-rooted emotion, difficult for the brain to control. Sometimes it cannot be avoided. My daughter's experience with the bubbles taught me that if fear is unlearned, it is because a new emotion replaces it. (She developed courage about returning to the bath.) This healing occurs at its own speed, and a parent, or a doctor, often has little control over it.

To conquer fear we must return it to its primitive place as an instinct reserved for protecting us from true physical dangers. We must stop over-personalizing it. We must resist those in the media and elsewhere who highlight the wrong dangers and hype the need to respond—making the threat seem even more real. We must regain our footing by exerting order over controllable aspects of our lives [see box on opposite page]. We must replace our unreal fears with real courage. **M**

(Further Reading)

- ◆ **The Emotional Brain: The Mysterious Underpinnings of Emotional Life.** Reprint edition. Joseph LeDoux. Simon & Schuster, 1998.
- ◆ **The Culture of Fear: Why Americans Are Afraid of the Wrong Things.** Barry Glassner. Basic Books, 2000.
- ◆ **Emotions Revealed: Recognizing Faces and Feelings to Improve Communication and Emotional Life.** Paul Ekman. Owl Books, 2004.
- ◆ **Does Stress Damage the Brain? Understanding Trauma-Related Disorders from a Mind-Body Perspective.** New edition. J. Douglas Bremner. W. W. Norton and Company, 2005.