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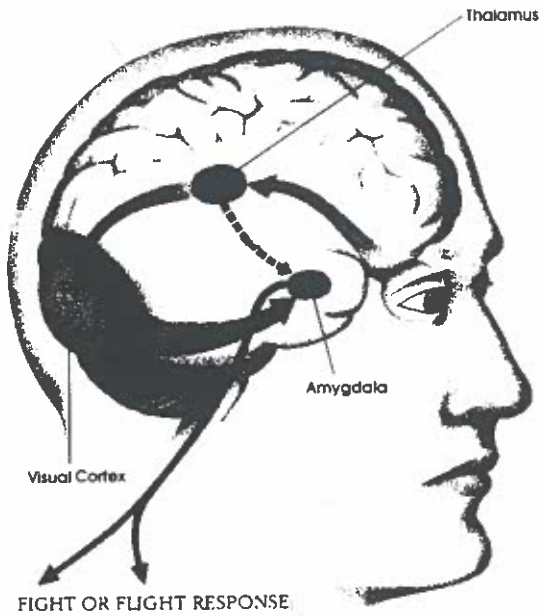
Mind-Body Aspects of Mulitple Chemical Sensitivity

Part I: The Amygdala



FIGHT OR FLIGHT RESPONSE
Heart rate and blood pressure increase. Large muscles prepare for quick action

Although psychological factors are not the cause of MCS, they have important implications in gaining a further understanding of the mechanisms of the disease and in healing. In my practice as a chemically sensitive psychotherapist, I have been able to use information and techniques gained through the treatment of individuals who suffer from post- traumatic stress disorder, as additional tools to help myself and my patients who have been injured by chemicals.

Anyone can be injured by toxic chemicals. Yet two people with seemingly identical exposures can differ in their susceptibility to injury. This variability can be due to their genetic endowments, previous exposure histories, momentary states of health, or any combination of these factors.

When injury occurs, the body can record the event as a trauma, which, by definition, can be psychological as well as tissue injury. To further complicate matters, trauma can occur whether or not the individual is consciously aware of the event that caused the injury.

The body responds to injury by setting up a defensive structure against future such injuries. The center controlling this defensive strategy is the amygdala, from the Greek word for almond. It is an almond-shaped cluster of interconnected structures located above the brain stem. Humans have two such clusters, one on each side of the brain, nestled toward the sides of the head.

The amygdala is perhaps our most important and most primitive survival mechanism. It has the ability to observe a situation, scan its memory bank, and then, depending on its instantaneous conclusion, send neurochemical messages to various parts of the organism. These chemicals initiate action and a strategy that allows the organism to avoid the same or similar situation. It is an emotional early-warning system with a very sensitive, hair-trigger tripwire. The amygdala is one of the reasons that we as a species have survived and prospered.

The amygdala works as follows. It is the storehouse of emotional memory. It is the also the source of our feelings and emotional life. This has been scientifically demonstrated by observing people who have had their connections severed between the brain and the amygdala. These individuals become devoid of feelings or any memory of feelings. They do not feel emotions, such as anger, fear, or rage. Nor do they recognize friends or even family members. Cutting the amygdala (a prefrontal lobotomy), was once a barbaric way of surgically "curing" mental illness.

The amygdala developed from our most primitive sense — that of smell. More precisely, it developed from the olfactory lobes, which contain cells that take in and analyze odors. As evolution proceeded and the brain grew more complex, additional layers evolved around these olfactory cells to enable it to differentiate between scents. This enabled the proper reflex message to be sent, telling the body what to do in a given situation: bite, spit, approach, flee, chase, etc.

With the evolution of mammals, a new layer formed on top of these layers that now surrounded the olfactory cells. With this additional layer came the capability for experiencing emotions such as love, hate, anger, fear, panic, anxiety, and even altruism. This combined structure became the source of our now more complex emotional life.

Next, two new powerful evolutionary tools — learning and memory — were added. Thus memories could be stored and proper life-saving decisions made by recognizing smells from the past that

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were good or bad. A hormonal system consisting of adrenaline, epinephrine, norepinephrine, and others deeply imprinted these memories and strengthened similar ones in its storage bank. It was a process somewhat like cross-indexing library files.

What this means is that psychological or physical events that cause extreme moments of emotional arousal are imprinted in the amygdala on a level directly proportional to or even greater than the intensity of the experience. The more intense the arousal caused by the event, the stronger the imprint. We can relate to this by noting that the events that we are most conscious of are the ones that were most highly charged emotionally. We remember when we broke a leg, when we almost drowned, when we fell in love — intense physical and/or emotional experiences. Sometimes we remember them in vivid color.

The cortex and neocortex, or thinking brain, evolved next and physically covers this primitive stem-brain structure. This thinking brain is the part of the brain that can plan ahead, comprehend what is sensed, coordinate action, discriminate between events, even think about thinking. It can also either increase or calm down the emotions, as the situation or past experience dictates. It, too, has a memory system, but it is for facts and cognitive experiences. The cortex can remember about emotions, but the emotional memory of the experience is located elsewhere.

It is the cortex, these higher functions, that make us human and civilize us. It gives us the choice to act on our feelings or to control them, to give up some of our individuality and independence for the support and protection of the group, even to perform selfless acts.

The amygdala has an interesting wiring system. Neural projections extend from it to every major part of the brain. One loop goes to the hypothalamus, a gland that secretes corticotrophin-releasing hormone (CRH), which is the body's emergency-response substance. CRH causes the secretion of other hormones, which mobilize the body's fight-or-flight mechanisms.

A second pathway from the amygdala leads to the locus ceruleus in the brain stem, which manufactures norepinephrine and disperses it throughout the brain. Among the effects of norepinephrine is a heightening of the overall reactivity of the brain areas that receive it, which increases the sensitivity of the sensory circuits. This process allows for deeper imprinting, louder warnings, and faster action.

A third loop goes to the cortex, the thinking center. The purpose of this loop is to give the cortex-possessing human the ability to cognitively evaluate a situation and decide what to do.

The important fact is that the first loop, leading to the limbic system (the primitive brain), is shorter and has faster signals than the third loop, which leads to the higher centers. This causes a response before the information gets to the thinking center for evaluation and decision-making.

One can easily see how crucial this mechanism has been for the survival and growth of our species, as well as the problems that it has created for a "civilized" society. The fact is, the higher centers of our brain do not govern all of emotional life. In crucial matters, especially in emotional emergencies, they defer to the limbic system because of the shorter and faster loop which bypasses the thinking center of the brain. This mechanism gives the emotional centers immense power to influence functioning of the entire brain and, most importantly, the brain's center for rational thought.

We can understand this process and its ramifications if we think back to some period in our lives when we were in the grip of one passion or another, when we loved with abandon or were in a "white" rage and acted in a way that was extreme and out of place. At a later time we were amazed at what we had said or done. *The amygdala "hijacked" the brain*, as Daniel Goleman writes in his book, *Emotional Intelligence*.

Such "neural hijacking" involves two dynamics: triggering of the amygdala and a failure to activate the neocortical process that usually keeps the emotional response in balance. A sensory signal, a smell, a sound, a sight is encountered. It travels to the thalamus. From the thalamus it races across a synapse to the amygdala. The amygdala quickly processes the signal by flipping through its memory bank. The amygdala then proclaims whether the signal is an emergency, or not, depending on past experiences. If the amygdala declares an emergency, it triggers secretion of CRH and a cascade of other hormones to

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recruit the rest of the brain for action. Simultaneously, the thalamus has routed a second signal to the neocortex, but at a slower rate. This second signal loses the race. Action has been taken before it reaches the neocortex. The emotional has swamped the rational.

This scenario becomes both more urgent and more complex when an individual has previously encountered an extreme situation of grave danger. If the experience was intense and the danger severe, the imprinting is deep and a situation called post-traumatic stress disorder (PTSD) results.

PTSD is a state in which traumatic events become memories emblazoned in the emotional circuitry. This is achieved by a system of hyperactive chemical secretion in response to an extreme situation. The pituitary gland increases its secretion of CRF, which is the main stress hormone, to alert the body to an emergency. CRF makes one protectively overreact by causing a decrease in its receptors, thus it making the brain more sensitive. The purpose of this, of course, is to protect the system. But in PTSD, the system has become so sensitized that the trigger may only be a metaphor, a similarity, a reminder. The individual then experiences memories as happening now, rather than then. Patients I have treated who were abused as children react to a stimulus in the present just as they reacted in childhood. They have an emotional and/or physical "flashback." The past is the present. If something triggers them, they will start shaking, crying, running, trembling, panicking, or even freezing and submitting or reverting to a childlike state. The amygdala has hijacked the brain.

We can relate to people with PTSD if we can remember a time when we woke up from a dream believing that the dream was reality. Or perhaps we have had the experience of calming a terrified child waking up from a night terror. We try to sooth the child. We say, "It is only a dream." At first, the child is not sure.

The symptoms of PTSD can include terrifying dreams, anxiety, fear, hypervigilance, being easily upset, and hyperaroused readiness for fight or flight. The memories and intense emotion that go with them serve as hair triggers to sound an alarm that the dreaded event of the past is about to happen once again. We have all heard unfortunate stories of combat veterans. The imprint of a horror can last a lifetime, as Holocaust survivors have found. The more brutal, shocking, and horrendous the events that trigger the amygdala, the more indelible the memory. The more sensitive the trigger, the greater the reaction. Reality not only becomes immaterial, it becomes impossible to grasp. Fear has defeated logic.

Even more disturbing is that studies have shown that animals exposed to mild stress when young were far more vulnerable to trauma-induced brain changes later in life than were animals that had not been exposed to stress. This seems to suggest that when different people are exposed to the same catastrophe, one may develop PTSD and the other may not. The amygdala of the former is primed to find danger whenever life seems to present it. Instantly, if the situation is the same as or similar to an earlier trauma, the amygdala's alarm shrieks and action ensues. More frightening are the studies that suggest that the brain may undergo lasting changes when put under extreme and/or chronic stress.

I have observed PTSD in some of my patients who have MCS. I have also noticed a similarity between PTSD and some cases of MCS. Obviously, not all cases of chemical sensitivity involve an easily discernable trauma. But in cases of multiple chemical sensitivity where the initial exposure to the toxic substance was apparent and the resulting physical pain and tissue trauma severe, PTSD can result. In addition, if we can assume that the experience of dealing with MCS may itself be psychologically traumatic until the condition is stabilized, then PTSD becomes an even stronger possibility.

In a case of MCS that includes PTSD, when the individual encounters a situation similar to the one that originally poisoned him or her (for example, a similar smell), the odor may or may not come from a chemical that is toxic. However, it may be just similar enough to the odor involved in that original, harmful incident that the amygdala reacts. If so, hormonal chemicals are quickly released to start the protective mechanisms. The emergency scenario that has been mapped out goes into action. The internal chemicals also

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change the brain's neurochemistry to create an emotional climate that will underscore the danger. The result can be panic, anxiety, anger, depression, or flight. (For me, my scenario was panic attacks, which caused me to run to my car and to frantically drive to find some place where I could breathe, some physical place where the burning, swelling, incessant pain inside my head would stop, where there would be clean air.)

Getting out of real danger is important, even crucial, but the stress caused by this scenario and by the individual's own internal chemicals is obviously detrimental to the body. It has been well documented that stress can wreak havoc on many of the body's systems, including the immune system, making us more vulnerable to a myriad of other diseases.

When the thinking brain kicks in, we believe that our symptoms are due to the offending smell. But there could be another possibility. The symptoms might be due to the trauma response. It might be a PTSD reaction. It might be similar to my patient who ran screaming down the street because she feared that the man on the street, who looked like her assailant, was going to rape her again, or to another patient who wakes up in a cold sweat and terror from a nightmare triggered by something as simple as a TV show. In PTSD, the dream becomes the reality.

What makes this more complicated is that not all cases of chemical sensitivity involve an obvious, initial, observable trauma. However, it is postulated that what might not be observable to our conscious mind might be observable to the amygdala. Some of my patients suffering from PTSD do not have a severe trauma. They have had ongoing, low-level chronic traumas over a long period of time. In them, PTSD symptoms resulted. It is postulated that the amygdala could have become sensitized over the years, and is reacting to similar situations. This is an interesting and complex area, which needs further study and examination.

Getting treatment presents another problem. Medical practitioners who observe the anxiety, panic, depression, and other psychological symptoms often make a judgment based on training and experience that do not include MCS. If they are not familiar with chemical poisoning, they might refer the patient to a psychiatrist or put the patient on psychotropic drugs.

Being told that something we *know* to be physical is psychological challenges our sense of reality. In effect, we are "diagnosed" and treated as if we are "crazy." This gets us angry. (We might be even more angry and irrational due to inhalants encountered during the trip and in the medical office.) Stress is produced. More internal chemicals are secreted, leading to more symptoms, brain damage, more anger, more "irrational" behavior — all of which conclusively demonstrate to the uneducated or prejudiced that the problem is psychological. They are further convinced that multiple chemical sensitivity is psychologically induced. They are sure that chemicals that the whole world uses and benefits from have nothing to do with it: "The sufferers are mentally crazy." "The patient is infantile and has a character disorder." "The patient is manipulating for attention."

The unwitting medical practitioner prescribes with certainty a psychotropic drug either for the symptoms or for what is taken to be the underlying cause, such as depression, stress, or psychosis. However, taking a psychotropic drug is ingesting a chemical which can make many of us physically sicker. The chemical can even increase the psychological byproduct symptoms. (One can only speculate, at this point, about the reported suicides of some people who were taking an antidepressant, prescribed by their physician.)

Love, tender feelings, attention, caring, feeling safe and protected, and having hopeful thoughts all entail parasympathetic arousal — the physiological opposite of the "fight-or-flight" state. Chemicals are sent out which calm the brain and start to heal it.

Part II of this article, coming in a future issue of *The Human Ecologist*, will develop a self-help treatment plan. This plan recognizes the primacy and urgency of avoiding toxic exposures so that additional damage will not be done. Its object is to slow down the amygdala to eliminate the secondary effects of panic and stress while one is moving quickly to avoid danger. The premise is that, with a self-trained attitude of meditative calmness, an individual can decrease or eliminate false or secondary responses and can discriminate between toxic and nontoxic situations. This would stop the panic that goes along with an exposure, that makes the exposure worse, and that gives credence to those who would dismiss this illness as "psychological." ■

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