Recognizing Neurotoxicity[1]

The symptoms of brain injury from exposure to hazards like lead paint and toxic chemicals vary widely. But there are ways you and your experts can pinpoint the damage and its cause.

Raymond Singer and Dana Darby Johnson

Neurotoxicity—poisoning of the brain and nervous system—is a well-documented effect of exposure to many widely used chemicals, yet doctors (and lawyers) often fail to recognize it. Chemically injured clients often report a confusing array of symptoms, with no medical diagnosis. The symptoms may seem vague and unconnected, leading you to wonder, "Could these symptoms really be caused by a chemical exposure?" Once you recognize the signs and understand them in context—as a constellation of symptoms resulting from a toxic injury—you will have greater confidence in bringing your client's case to justice.

A person who has suffered a serious chemical injury is likely to have sustained considerable damage to his or her brain and nervous system. This is important for a lawyer to know, because doctors often recognize only the person's physical illness, not realizing that serious brain and nervous system damage may have also occurred.

Neurotoxicity can be documented, but perhaps not in the way you might think. A person's ability to think, perceive, control emotions, plan, and manage his or her life can diminish drastically without anything being visible to a radiologist or neurologist on an MRI or a CT scan.[1]

The most reliable and widely accepted way to assess actual brain function is through neuropsychological evaluation. (This is true for head-injury patients and those suffering from dementia, as well as those affected by exposure to toxic chemicals.)

Researchers have noted that imaging techniques are often of little value in evaluating neurotoxicity.[2] In our and others' experience, imaging techniques can occasionally pick up abnormalities caused by neurotoxicity and may be helpful for forensic purposes, but they are not cost-beneficial for routine screening.[3]

Neuropsychological testing tends to be more sensitive to brain injury than CT and routine MRI scans, which provide only a static and relatively gross view of neural structure. In one study of six head-injury cases, CT and/or MRI scans yielded little or no evidence of neuropathology as detected by neuropsychological testing. Positron emission tomography (PET) scans, however, corroborated the impaired function.[4] PET and SPECT (single photon emission computed tomography) scans offer a more dynamic look at brain structure, but both of these tests still need interpretation as to the cause of the abnormality (which could be benign).

Common symptoms

What do chronic pain, anxiety, neurological problems, confusion, psychiatric symptoms, and cognitive declines have in common? They can all result from neurotoxic chemical exposure.

Symptoms of neurotoxicity include memory and concentration problems; confusion; multiple sclerosis or MS-type symptoms; impaired control of the limbs, bladder, or bowels; headaches or migraines; sleep disorders, including sleep apnea; eye problems that are neurological in origin; balance and hearing problems; muscle weakness; anxiety or panic attacks; depression; and other psychiatric or neurological symptoms.[5]

Other symptoms that could be caused by chemical injury include multi-organ system malfunction; lower or upper respiratory problems, such as chronic sinus problems; multiple chemical sensitivity (MCS); liver or kidney problems; and fibromyalgia or other pain disorders.

Along with nervous system dysfunction, the temporal association of any of these conditions with toxic chemical exposure tends to support the theory that the overall cause of the client's injuries is a toxic insult to the body.

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[1]From: Raymond Singer & Dana Darby Johnson, Recognizing Neurotoxicity, TRIAL, Mar. 2006, at 62. Reprinted [or posted] with permission of TRIAL (March 2006). Revised: February 28, 2006.

The illness you probably need to know the most about is MCS, both because it is common among chemical injury patients, and because doctors often don't recognize it in their patients. The MCS diagnosis is still rejected by many doctors in part because it is difficult to quantify objectively—but then, so are headaches.

Many doctors are not aware of the significant research that shows MCS is common and quite real.[6] MCS is similar to other disabling illnesses. People who have it can become very ill from exposures to everyday chemicals, such as perfumes, paint, pesticides, and cleaning products.

Under some conditions, MCS is recognized as a potentially disabling condition by the Social Security Administration, the U.S. Department of Housing and Urban Development, and the Americans with Disabilities Act.[7]

Documenting a chemical injury

There are various ways you can document the presence and course of a neurotoxic injury. All of them will help you build your case.

Conduct a neuropsychological evaluation. This procedure reveals both the most detailed view and the most subtle problems of the working brain.

A forensic neuropsychological evaluation usually includes a full battery of tests that can take up to 12 hours to complete. It can assess brain function, including memory; concentration; the ability to learn new information; executive function (the ability to plan, manage, and carry out a plan); perceptual functions, such as spatial awareness; motor functions, such as dexterity; and personality, emotion, and motivation. This evaluation can often detect whether changes have occurred that may be a result of toxic injury.

Be aware that some neuropsychologists consider someone impaired only if his or her cognitive functioning is well below average. Such an approach is inadequate when the person was once high-functioning.

For example, a client with a superior IQ—such as a doctor or scientist—who now is unable to do his or her job will not benefit from an evaluation that interprets an "average" level of intelligence as "normal." Or your client may be someone who previously functioned at an average level but now is considered below average or has more marked problems in particular areas of brain function, such as emotion, personality, or executive function. These individuals benefit from more complex and subtle evaluations.

Several red flags can signal that the brain is not working as well as it should. For example, if a client's vocabulary skills are high but his or her ability to process new information is at the 50th percentile, this discrepancy suggests a decline in information-processing skills. If the client was previously a successful engineer, a neuropsychological evaluation will give you findings that point to a decline in brain function.

Assess personality and emotional function. Chemically injured people can suffer personality changes induced by brain damage. The neuropsychologist needs to take a thorough history and conduct a record review to determine whether any personality disorders were preexisting or caused (or exacerbated) by the chemical injury.

The Minnesota Multiphasic Personality Inventory-2 (MMPI-2) is often used to assess personality.[8] But this instrument was not standardized on brain-injured people or those with neurological disorders, so the results must be interpreted carefully.

For example, if a “normal” person showed many neurological symptoms, he or she might correctly be characterized as mentally ill. But it would be normal for a chemically injured person to report an array of neurological symptoms.

The patient with “too many” symptoms can get a diagnosis of “somatic disorder”—that is, having physical symptoms caused by psychological conditions. This misdiagnosis says that psychological problems are the underlying cause of the illness.

Neurotoxicity patients may well have psychological problems, but these are often the result, not the cause, of their condition. The true cause—organic (physical) brain dysfunction, or neurotoxicity—is too easily overlooked. When interpreting the MMPI-2, the expert must consider the person’s medical and neurological conditions before reaching conclusions.

Also, some common interpretations of the MMPI-2 might over-diagnose malingering.[9] An improper diagnosis of malingering can make it difficult to prove an injury.

It is not unusual for patients suffering from neurotoxicity to be misdiagnosed as having psychological problems because of their depression and anxiety levels, the sheer number of their symptoms, and their belief that chemicals made them ill. To minimize this error, choose among the most qualified experts you can find: Psychologists, neuropsychologists, or psychiatrists who are familiar with chemical injury, neurotoxicity, and MCS.

“Image” the brain. It would be ideal to have an X-ray that would show what’s gone wrong in the chemically injured brain. Unfortunately, brain scans are usually not helpful, because we don’t have the technology to “take a picture” of most brain injuries. (Even damage caused by traumatic brain injuries, such as from an automobile accident, may not show up in brain imaging.) A weak correlation exists between neuroimaging findings and neurocognitive outcome.[10] Neurotoxic damage does not necessarily affect brain structure at the level we can see on a brain scan.

PET and SPECT scans are often more sensitive to brain injury than either MRIs or CT scans, [11] but even if they show an abnormality, they don’t show what caused it. Such scans have limited utility in court as proof of damage.[12] The meaning of the abnormality still needs to be explained via neuropsychological assessment. A brain MRI often can be useful to rule out the possibility of another brain disorder.

Test the body. Searching for physical evidence of a chemical injury has been compared to searching for a bullet shot through someone’s body: The bullet may be gone, but the havoc it wreaked is still there. Blood and urine can be tested for residue of the chemical in question and its breakdown products, or for a range of chemicals, but usually this testing is effective only while the client is still being exposed or after recent exposure.

The body may store toxicants in the fat and tissues, longer-lasting storage sites than the blood or urine. Tissue samples can be taken and occasionally are helpful, but these procedures can be difficult, painful, and expensive. Hair analysis may be helpful, but it is often controversial.[13] Immunological testing can determine whether the client has elevated antibodies to some molds, suggesting high levels of exposure to toxic mold.[14]

Test and analyze the exposure location. When analyzing an exposure location for toxic substances (such as might be found in the air or on surfaces), it is better to hire your own consultants to perform the work. They can control many important variables that could be ignored by other service providers.

Earlier tests conducted by the defendant may be available, but the results might not be valid for various reasons, even if the tests were conducted by a government agency. A potential defendant, after discovering that its site would be tested, may have aired out the building and washed down all the surfaces before testing. Unfortunately, the tests that government agencies perform are often woefully inadequate.

Analyze the site carefully. Is there adequate ventilation? Is there a clean-air exchange? Is the ventilation system blowing contaminated air into the client’s breathing space?

Some toxic chemicals may be heavier than air, so ventilation in those circumstances should exhaust air out of the room from the level of the floor, not the ceiling. One of our clients suffered severe brain damage after using solvents outdoors on his boat. Most people think that applying solvents outside is safe. However, our client applied them while lying on his back, under the boat. Because the solvent was heavier than air, this

amounted to lying in a dense cloud of neurotoxic gas, and friends had to pull him out from under his boat. The toxic exposure caused injuries that rendered him completely disabled[15].

Under *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, [16] the expert should present published research showing that the chemical implicated in the case has caused the same damage that your client suffered. But there is room for some flexibility.

For example, in a 2001 federal toxic-tort case, the court admitted testimony that experts do not always need extensive, specific research on a particular product to arrive at an opinion.[17] Instead, the chemical's toxicity can be deduced from general toxicology and basic logic: The substance was an organic solvent; organic solvents are neurotoxic; therefore, this solvent is neurotoxic.

In our experience, neuropsychological testimony is routinely admitted under *Daubert* rules.[18] Its application to neurotoxicology is well established but may be challenged. We are not aware of cases where this testimony has been excluded on *Daubert* grounds, but individual states' requirements will vary.

In one case, the Ohio Supreme Court unanimously ruled that a witness who is not a physician, but who qualifies as an expert under state evidence rules, may give evidence that would be relevant to diagnosis of a medical condition if the testimony is within the expertise of the witness.[19]

Usually, the statute of limitations does not start running until the client has received a diagnosis stating that his or her condition was caused by a chemical exposure. In many cases, it takes years for this diagnosis to be made.

In other situations, the client is so seriously injured that he or she cannot seek out appropriate medical or legal help. The very symptoms of neurotoxicity—memory problems, inability to concentrate or think clearly, and difficulty processing information—impede the injured person's ability to understand what happened to him or her and can decrease his or her intellectual and emotional capacity to pursue litigation. In such cases, you may need to file a statement of mental incompetence to extend the statute of limitations.

What to expect from the defense

Invariably, the defense will seek to minimize the link between your client's symptoms and the toxic substance he or she was exposed to and will try to play down the product's harmfulness. Expect arguments like these:

"This product cannot damage your health." The Material Safety Data Sheet (MSDS), required by law of every manufacturer, is a good place to start when seeking documentation of a chemical's adverse health effects, because often the MSDS lists them.[20] But sometimes the MSDS doesn't even hint at a product's real dangers, and you will need to conduct further research. The neurotoxicity of common products is discussed in various texts.[21]

"If this product caused ill health effects, it would not be marketable." In fact, hundreds of neurotoxic products are promoted and sold. More than 850 industrial and commercial chemicals are known to cause neurobehavioral disorders.[22]

"Ninety-five percent of the ingredients are inert, so what's the problem?" There are two issues here. One is whether 5 percent of an active ingredient is toxic enough to cause health effects—and often it is, because toxic substances can be harmful in small amounts.

The other issue is the meaning of "inert." So-called inert ingredients can be more toxic than the "active" ones. By labeling an ingredient "inert," a company may be trying to avoid admitting that there is a noxious ingredient in its product. The manufacturer may call its formulation a "trade secret."

Try to obtain a list of the inert ingredients by subpoena and have a laboratory analyze the product. Once you establish what the inert ingredients are, your consultants should assess their toxicity.

"But we didn't exceed government standards for exposure." "Safe" levels of exposure are a compromise between an industry's commercial needs and consumer protection and do not guarantee that an injury cannot occur. These standards generally become stricter with every passing decade, and incidents of reported chemical injury are what cause them to change.

Furthermore, safe levels are routinely set to protect a healthy male worker. But some people are more susceptible than others. Women, for instance, tend to be more sensitive than men, and different bodies react differently to toxins.[23] Variations in sensitivity are even observable in rats. Also, there may be no safe level at which a person can inhale a particular substance.

The MSDS typically will state that if a person shows signs of illness, you must remove him or her from the area immediately. This suggests that it is generally recognized that some people will become ill even when they are working under the recommended safe-exposure guidelines.

"This amount was far too small to damage anyone's health." Chronic exposure to low levels of some toxic chemicals can be even worse than a single acute exposure, because brain damage is cumulative over time.

"The plaintiff had preexisting conditions." Plaintiffs in these cases often do. It makes sense that people whose health is already compromised are the most vulnerable to poisons, because their bodies' detoxification systems—especially the liver and kidneys—are already stressed. People with a preexisting condition suffer further deterioration of their health. Your expert should document the preexisting condition thoroughly—this may require extensive review and analysis of the medical record—and document what new symptoms emerged and what preexisting symptoms became worse.

"Just smelling the chemical could not have caused this." Actually, inhalation and skin contact are often more effective routes of entry for a poison than swallowing. When something is swallowed, it is partly neutralized by stomach acids. The body then attempts to detoxify it through the liver, kidneys, and other organs. But inhalation and skin contact allow a substance to enter the bloodstream directly, without any filtering. For example, doctors now use skin patches to administer morphine and birth control.[24] And sniffing glue (solvents) can produce an instantaneous high and cause immediate and permanent brain damage.

"A neurologist found nothing wrong." Few neurologists have training in toxicology, and they rarely recognize the symptoms of neurotoxicity. A patient who suggests his or her symptoms were caused by a chemical exposure may encounter a brick wall of denial, bordering on hostility.

Some neurologists won't pay attention unless a patient's symptoms are extreme: For example, the patient cannot tell what day it is or walk in a straight line. Even then the neurologist may misdiagnose the patient as normal, even if neuropsychological testing shows serious functional deficits. Still, a neurologist's exam may help rule out non-toxicological causes of a neurological illness or document certain physical signs, such as seizures or gait disturbances.

"Chronic pain is not a symptom of brain or nerve damage." The term "chronic pain" may seem vague, outside the realm of most doctors, and potentially confusing to a jury. But chronic pain can certainly be a symptom of brain damage and toxic exposure.

Damage to the brain and nerves can disrupt the nerve signals themselves or the way the brain interprets those signals.[25] Resulting sensations can be tingling, burning, or debilitating pain, which one of my chronic pain patients described as "like a thousand razor blades." Chronic pain can be a terrible ordeal and may require strong painkillers whose side effects could cause more damage.

"It is ludicrous to believe that neurotoxic chemicals can cause such disparate symptoms as insomnia, chronic fatigue, and gastrointestinal problems." On the contrary, the brain and nervous system control all bodily functions. The autonomic nervous system controls the involuntary part of bodily processes, including digestion, blood circulation, and the "fight or flight" response.

"Multiple chemical sensitivity does not exist." Studies indicate that almost 16 percent of the U.S. population report having unusual reactions to common chemicals.[26] About 6.3 percent have been diagnosed with MCS or declared disabled from it.[27] There is considerable research on, and international recognition of, this condition.

"The plaintiff is malingering." Every competent forensic neuropsychological assessment includes tests for malingering. When assessing a potential client, consider that a chemical injury would be one of the most difficult injuries to fake. Doctors who recognize the symptoms are few and far between.

You will probably find that your client has tried to find a cure, sincerely wants to return to work, and is seeking litigation as a last resort. The "invalid" label is profoundly depressing to most people. Nevertheless, you must always rule out the possibility of malingering and psychosomatic disorders.

"The plaintiff has a personality disorder (or is mentally ill)." Ironically, a plaintiff's personality disorder may be evidence of injury, not a reason to dismiss the case. Brain damage can result in such disorders, psychiatric symptoms, and even schizophrenia. Establish the patient's mental health before the exposure to help determine whether the exposure caused or exacerbated the psychiatric symptoms. In any case, it is not surprising when a person with a chronic illness, adjusting to a devastating life change, develops what may be diagnosed as a personality disorder.

On the other hand, some patients with a diagnosis of a psychiatric disorder don't actually have one. A patient may have received that diagnosis precisely because he or she claimed to be hurt by chemicals and was labeled "delusional."

Compensation and cure

There is no standard medical cure for chemical injury, but conventional medical treatments may help some symptoms and promote modest improvement. Alternative medicine treatment for neurotoxicity is controversial, but in our experience, nutritional therapy (including natural foods diet) and natural medicines (including acupuncture and holistic exercises, such as Tai Chi and Chi Gong) may be the only methods that help neurotoxic and extremely sensitive patients. Your clients should receive enough compensation to pay for continuing treatment, including less conventional approaches, such as medically supervised detoxification, infrared saunas, visits to rehabilitation centers, and possibly hyperbaric oxygen treatments.

Compensation should include lost salary, lost savings, and medical bills that will probably continue for a lifetime. It should cover counseling or psychotherapy to help patients adjust to being chronically ill; losing their jobs, their friendships, and possibly their homes; straining their marriages; and being unable to continue with hobbies. But they generally should avoid psychiatric drugs. Chemically sensitive patients may react to pharmaceuticals (usually petroleum derivatives) as they do to chemicals.

Your familiarity with neurotoxicity and chemical injury will help you guide your client to the clearest assessment of his or her disability. Choosing the right experts and testing will contain litigation costs and further your goals of obtaining justice and compensation.

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back to top

Notes

1. *See*, *e.g.*, Bernhard Voller et al., *Neuropsychological, MRI, and EEG Findings After Very Mild Traumatic Brain Injury*, 13 BRAIN INJURY 821 (1999) (finding only 3 of 12 patients with brain dysfunction demonstrated an abnormal MRI).
2. *See*, *e.g.*, Joseph C. Arezzo & Herbert H. Schaumburg, *Screening for Neurotoxic Disease in Humans*, 8 J. AM. C. TOXICOLOGY 147(1989); *see also* Pamela Reed Gibson, *Disability-Induced Identity Changes in Persons with Multiple Chemical Sensitivity*, 15 QUALITATIVE HEALTH RES. 502, 503-04 (2005).
3. *See generally* RAYMOND M. SINGER, NEUROTOXICITY GUIDEBOOK (2d ed. 2006, expected; 1st ed., 1990).
4. Ronald M. Ruff et al., *Computerized Tomography, Neuropsychology, and Positron Emission Tomography in the Evaluation of Head Injury*, 2 NEUROPSYCHIATRY, NEUROPSYCHOL. & BEHAV. NEUROLOGY 103 (1989).
5. *See generally* SINGER, *supra* note 3. The Neurotoxicity Screening Survey provides a complete checklist of possible signs and symptoms, *available at* http://www.neurotox.com/files/Q1_9.pdf (last visited Feb. 27, 2006).
6. *See*, *e.g.*, Stanley M. Caress & Anne C. Steinemann, *Prevalence of Multiple Chemical Sensitivities: A Population-Based Study in the Southeastern United States*, 94 AM. J. PUB. HEALTH 746 (2004); Nancy Fiedler et al., *Responses to Controlled Diesel Vapor Exposure Among Chemically Sensitive Gulf War Veterans*, 66 PSYCHOSOMATIC MED. 588 (2004); Howard M. Kipen et al., *Prevalence of Chronic Fatigue and Chemical Sensitivities in Gulf Registry Veterans*, 54 ARCHIVES ENVTL. HEALTH 313 (1999); Richard Kreutzer et al., *Prevalence of People Reporting Sensitivities to Chemicals in a Population-Based Survey*, 150 AM. J. EPIDEMIOLOGY 1 (1999); William J. Meggs et al., *Prevalence and Nature of Allergy and Chemical Sensitivity in a General Population*, 51 ARCHIVES ENVTL. HEALTH 275 (1996).

7. *See*, *e.g.*, letters and memoranda to and from Department of Housing and Urban Development, *available at* www.usdoj.gov/crt/foia/tal105.txt (last visited Jan. 23, 2006).
8. The MMPI-2 is *available at* www.pearsonassessments.com/tests/mmpi_2.htm#norms (last visited Jan. 23, 2006).
9. *See*, *e.g.*, James N. Butcher et al., *The Construct Validity of the Lees-Haley Fake Bad Scale: Does This Scale Measure Somatic Malingering and Feigned Emotional Distress?* 18 ARCHIVES CLINICAL NEUROPSYCHOL. 473 (2003).
10. *See*, *e.g.*, Voller et al., *supra* note 1; Paul A.M. Hofman et al., *MR Imaging, Single-Photon Emission CT, and Neurocognitive Performance After Mild Traumatic Brain Injury*, 22 AM. J. NEURORADIOLOGY 441 (2001); Shelli R. Kesler et al., *SPECT, MR, and Quantitative MR Imaging: Correlates with Neuropsychological and Psychological Outcome in Traumatic Brain Injury*, 14 BRAIN INJURY 851 (2000) (finding a modest but significant correlation between memory and intellectual impairments and number of brain abnormalities evidenced by quantitative magnetic resonance, magnetic resonance (MR), and all imaging studies combined (but not SPECT alone) and noting a positive correlation between psychological distress and MR abnormalities, most frequently in the frontal lobes).
11. *See* Donald J. Nolan & Tressa A. Pankovits, *High-Tech Proof in Brain Injury Cases*, TRIAL, June 2005, at 26.
12. Brickford Y. Brown et al., *Are We Out of the Gray Area Yet? Recent Developments in the Use of PET and SPECT Scans to Prove Causation and Injury in Toxic Tort Litigation*, *available at* www.morankikerbrown.com/CM/Articles/Articles67.asp (last visited Jan. 23, 2006). For an alternate perspective, see Garo Mardirossian & Joseph Martin Barrett, *The Use of Functional Brain Imaging of Organic Brain Injury: A Primer*, *available at* www.caala.org/DOCS/3-98mardirossian.pdf (last visited Jan. 23, 2006); *see also* Charles G. Monnett III & Kristin M. Jordan, *Scientific Evidence Following* Daubert vs. Merrell Dow*: Are PET Scans Admissible to Establish Traumatic Brain Injury?, available at* www.carolinalaw.com/CM/Articles/article-scientific-evidence.asp (last visited Jan. 23, 2006).
13. *See generally* SIDNEY A. KATZ & AMARES CHATT, HAIR ANALYSIS: APPLICATIONS IN THE BIOMEDICAL AND ENVIRONMENTAL SCIENCES (1988).
14. Raymond Singer, *Clinical Evaluation of Suspected Mold Neurotoxicity*, in BIOAEROSOLS, FUNGI, BACTERIA, MYCOTOXINS & HUMAN HEALTH: PROC. OF THE FIFTH INT'L BIOAEROSOL CONF. 78 (2005); *see also* Raymond Singer, *Forensic Evaluation of a Mold (Repeated Water Intrusions) Toxicity Case*, 20 ARCHIVES CLINICAL NEUROPSYCHOL. 808 (2005).
15. 1Singer, R. (1996, March). Neurotoxicity from outdoor, consumer exposure to a methylene chloride product. Fundamental and Applied Toxicology, Supplement: The Toxicologist, 30, 1, Part 2.
16. 509 U.S. 579 (1993).
17. Bonner v. ISP Techs., 259 F.3d 924 (8th Cir. 2001); *see also* www.daubertontheweb.com (last visited Jan. 23, 2006).
18. *See generally* Bruce H. Stern, *Admissibility of Neuropsychological Testimony After* Daubert *and* Kumho, 16 NEUROREHABILITATION 93 (2001).
19. Shilling v. Mobile Analytical Servs., Inc., 602 N.E.2d 1154, 1156-57 (Ohio 1992).
20. *See* www.msds.com (last visited Jan. 23, 2006).
21. *See*, *e.g.*, Raymond Singer, *Neurotoxicity Guidebook*, *in* NEUROTOXICITY OF INDUSTRIAL & COMMERCIAL CHEMICALS (John L. O'Donoghue ed., 1985).
22. Kent Anger & Barry Johnson, *Chemicals Affecting Behavior*, *in* NEUROTOXICITY OF INDUSTRIAL & COMMERCIAL CHEMICALS (John L. O'Donoghue ed., 1985).
23. *See*, *e.g.*, Mark R. Cullen & Carrie A. Redlich, *Significance of Individual Sensitivity to Chemicals: Elucidation of Host Susceptibility by Use of Biomarkers in Environmental Health Research*, 41 CLINICAL CHEMISTRY 1809 (1995); Timothy T. Iyaniwura, *Individual and Subpopulation Variations in Response to Toxic Chemicals: Factors of Susceptibility*, *available at* www.riskworld.com/Nreports/2004/Iyaniwura.htm (last visited Jan. 23, 2006); Michael K. Robinson, *Intra-Individual Variations in Acute and Cumulative Skin Irritation Responses*, 45 CONTACT DERMATITIS 75 (2001); Michael K. Robinson, *Population Differences in Acute Skin Irritation Responses: Race, Sex, Age, Sensitive Skin, and Repeat Subject Comparisons*, 46 CONTACT DERMATITIS 86 (2002).
24. *See*, *e.g.*, Mayo Clinic Med. Servs., *Birth Control Patch, at* www.mayoclinic.com/index.cfm?id=PR00075 (last visited Jan. 23, 2006).
25. *See* Nat'l Inst. Neurological Disorders and Stroke, *Pain: Hope Through Research, at* www.ninds.nih.gov/disorders/chronic_pain/detail_chronic_pain.htm (last visited Jan. 23, 2006).
26. *See*, *e.g.*, Caress & Steinemann, *supra* note 6; Kreutzer et al., *supra* note 6; *see also* Meggs et al., *supra* note 6 (finding 33 percent).
27. *See*, *e.g.*, Kreutzer et al., *supra* note 6.