studies are submitted to us with more than a dozen names on the title page, we insist that all persons listed there sign a statement that they fulfill *all* of these criteria. We believe that in every paper, each listed author must be able to take public responsibility for its content.

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References

1. S. Klahr *et al.*, *N. Engl. J. Med.* **330**, 877 (1994).
2. J. P. Kassirer and M. Angell, *ibid.* **325**, 1510 (1991).

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EPA and Biotechnology Regulation

The Policy Forum "A need to reinvent biotechnology regulation at the EPA" by Henry I. Miller (16 Dec., p. 1815) gravely misportrays an approach to reviewing biotechnology products of which I am proud.

The contention on which the Policy Forum is based, that the Environmental Protection Agency (EPA) regulates or singles out for special treatment products because they are created using recombinant DNA, is wrong. EPA has had a functioning program addressing biotechnology products under the Federal Insecticide, Fungicide and Rodenticide Act and the Toxic Substances Control Act since 1986 (*1*). That regulatory program focuses on identifying and minimizing risks to public health and the environment. Early indications are that many biotechnology products provide lower-risk agricultural and industrial approaches. For example, biological pesticides may present lower risks than do older chemical pesticides. In general, EPA wishes to promote development of environmentally safer products and technology. EPA's accomplishments in the biotechnology area show that it is achieving this goal.

EPA has an established record of bringing a range of biotechnology products through field testing to commercialization while safeguarding public health and the environment. At the same time, EPA's activities reassure the public concerning biotechnology products.

Readers who would like additional information are referred to documents in the public domain (*2*) that describe the EPA program.

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References and Notes

1. *Fed. Regist.* **51**, 23302 (26 June 1986).
2. *ibid.* **59**, 45600 (1 September 1994); *ibid.*, p. 45524 (23 November 1994); *ibid.*, p. 60495; *ibid.*, p. 60519; *ibid.*, p. 60535; *ibid.*, p. 60542; *ibid.*, p. 60545; most of these documents may be accessed through the Internet at gopher.epa.gov. under the rules and regulations (Toxics Program) entries for 1 September 1994 and (Pesticide Program) 23 November 1994. Readers may also contact my office at 202-260-6900 for further information.

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Reading Disability, Attention-Deficit Hyperactivity Disorder, and the Immune System

The article "Quantitative trait locus for reading disability on chromosome 6" by Lon R. Cardon *et al.* (14 Oct., p. 276) describes a possible gene for a reading disability, dyslexia, localized to 6p21.3, a region within the human major histocompatibility complex (MHC). This finding accords closely with our observation (*1*) that

the quantity of the product of the C4B gene, located in the same general area on chromosome 6, was decreased in the plasma of subjects with attention-deficit hyperactivity disorder (ADHD) or their mothers, or both. This gene codes for one of the complement components that are important in protection against pathogens such as viruses and bacteria.

The relation between reading disability and ADHD is controversial, and great effort has been made to distinguish between the two disorders and their cognitive consequences (*2*). However, it is possible that the disorders are slightly different manifestations of the same underlying pathophysiological process. The C4B protein also appears to be deficient in some subjects with autism (*3*), and this deficiency results from the inheritance of a null (no protein produced) allele of the C4B gene (*4*).

Most of the genes located within the MHC are associated with the immune system and play important roles in regulating normal and autoimmune processes. We and others have found that autism is associated with a number of immune anomalies (*5*) or autoimmune processes (*6*), or both. Circumstantial evidence that there is an association of autoimmune diseases with reading disability has also been found (*7*), but to date few, if any, studies have explored autoimmune processes in ADHD. Some cases of reading disability, ADHD, and autism may share a common susceptibility gene on chromosome 6 that may be related to the immune system. Obviously, other specific genes or environmental processes, or both, are also involved in the development of these disorders.

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References

1. R. P. Warren *et al.*, *J. Am. Acad. Child Adolesc. Psychiatr.*, in press.
2. F. Wood, R. Felton, L. Flowers, C. Naylor, in *The Reading Brain: The Biological Basis of Dyslexia*, D. D. Duane and D. B. Gray, Eds. (York, Parkton, MD, 1991), pp. 1–25.
3. R. P. Warren, R. A. Berger, J. D. Odell, A. R. Torres, W. L. Warren, *Arch. Pediatr. Adolesc. Med.* **148**, 180 (1994).
4. R. P. Warren *et al.*, *Clin. Exp. Immunol.* **83**, 438 (1991).
5. E. G. Stubbs, M. L. Crawford, D. R. Burger, A. A. Vanderbark, *J. Aut. Childh. Schizophr.* **7**, 49 (1977); R. P. Warren, N. C. Margaretten, N. C. Pace, A. Foster, *J. Aut. Develop. Dis.* **16**, 189 (1986); R. P. Warren *et al.*, *Immunol. Invest.* **19**, 245 (1990).
6. A. Weizman, R. Weizman, G. A. Szekely, H. Wijsenbeek, E. Livini, *Am. J. Psychiatr.* **139**, 1462 (1982); V. K. Singh, R. P. Warren, J. D. Odell, W. L. Warren, P. Cole, *Brain Behav. Immunol.* **7**, 97 (1993); A. V. Pliopys, A. Greaves, K. Kazemi, K. E. Silverman, *Dev. Brain Dysfunct.* **7**, 12 (1994).
7. J. C. DeFries, R. K. Olson, B. F. Pennington, S. D. Smith, in *The Reading Brain: The Biological Basis of Dyslexia*, D. D. Duane and D. B. Gray, Eds. (York, Parkton, MD, 1991), pp. 53–88.

Response: The possibility of the same gene contributing to reading disability and ADHD is plausible and is consistent with recent results suggesting a common genetic etiology for these two traits. We agree with Warren *et al.* that some cases of reading disability and ADHD may "share a common susceptibility gene ... that may be related to the immune system."

Although we have not evaluated the specific role of the C4B protein in subjects with reading disorder, several twin studies, including our own, have yielded evidence for a genetic overlap between reading disorder and ADHD (*1*). At present, it is unknown whether or not the MHC region on chromosome 6 is involved in this overlap.

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References

1. J. C. DeFries, J. Stevenson, J. J. Gillis, S. J. Wadsworth, *Reading Writing: An Interdisc. J.* **3**, 271 (1991); J. W. Gilger, B. F. Pennington, J. C. DeFries, *J. Am. Acad. Child Adolesc. Psychiatr.* **31**, 343 (1992); J. Stevenson, B. F. Pennington, J. W. Gilger, J. C. DeFries, J. J. Gillis, *J. Child Psychol. Psychiatr.* **34**, 1137 (1993).

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Amorphous Stability and Trehalose

The feature Frontiers in Materials Science (31 Mar., pp. 1918–1953) focusing on glasses and amorphous materials was informative. The News article by Karen Celia Fox, "Putting proteins under glass" (p. 1922), however, does not specify that the glassy state in Sea Monkeys or brine shrimps and many other such organisms is formed by a particular sugar, the simple disaccharide trehalose (α-D-glucopyranosyl α-D-glucopyranose) (*1*). Consistent with this observation, trehalose shows properties superior to those of other sugars in the stabilization of proteins and, in particular, during the long-term or high-temperature storage of dried formulations (*2*, *3*). For example, restriction enzymes dried in trehalose can be stored for months at 70°C with no detectable loss of activity (*3*). Finally, the efficacy of trehalose probably results from a combination of three properties, namely, the nature of glass formed (the glass transition temperature, T_g, for trehalose is 110°C), water replacement (greater flexibility because of the lack of direct hydrogen bonds between the two rings), and its chemical stability and inertness (*4*). The latter is a particularly important consideration in the use of glasses for stabilizing protein, as the poorly appreciated reactivity of reducing sugars with proteins, also known as the Maillard reaction, is accelerated both by the removal of water and at low water activities (*4*, *5*).

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References

1. M. J. Burke, in *Membranes, Metabolism and Dry Organisms*, A. C. Leopold, Ed. (Cornell Univ. Press, Ithaca, NY, 1985), pp. 358–363.
2. J. Crow *et al.*, *Biochem. J.* **242**, 1 (1987).
3. C. Colaco *et al.*, *Biotechnology* **10**, 1007 (1992).
4. C. Colaco *et al.*, in *Formulations and Delivery of Proteins and Peptides*, J. L. Cleland and R. Langer, Eds. (Symposia Series No. 567, American Chemical Society, Washington, DC, 1994), pp. 222–240.
5. P. A. Finot *et al.*, Eds., *The Maillard Reaction in Food Processing, Human Nutrition and Physiology* (Birkhauser, Basel, 1990).