CC/NUMBER 50
DECEMBER 16, 1985

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Kirkpatrick C H, Rich R R & Bennett J E. Chronic mucocutaneous candidiasis: model-building in cellular immunity. *Ann. Intern. Med.* 74:955-78, 1971.
[Sections of Clinical Allergy and Hypersensitivity and Infectious Disease, Lab. Clinical Investigation, NIAID, NIH, Bethesda, MD]

Chronic and recurrent infections of the skin, nails, and mucous surfaces were identified as clinical expressions of defective cellular immunity. In the majority of patients, the most significant defect is impaired lymphokine production by *Candida*-stimulated T lymphocytes. Correction of this defect with dialyzable transfer factor may be accompanied by long-term clinical remissions. [The *SCI*® indicates that this paper has been cited in over 275 publications since 1971.]

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November 14, 1985

In the late 1960s, little was known about the consequences of defective cell-mediated immune mechanisms in human beings. Bob Rich and I had recently arrived at the Laboratory of Clinical Investigation of the National Institute of Allergy and Infectious Diseases and had decided to attempt to define the clinical consequences and underlying immunological mechanisms in patients with impaired cellular immunity.

The problem of identification of the proper patient population was largely solved as a result of a fortuitous consultation on a patient with chronic mucocutaneous candidiasis and hypoparathyroidism. This patient had no delayed cutaneous hypersensitivity responses, and, when his lymphocytes were stimulated *in vitro* with common antigens, they failed to produce lymphokines. His antibody-mediated immune responses were intact. As additional patients were studied, it became clear that, while there was some heterogeneity in the array of immunological defects in patients with chronic mucocutaneous candidiasis, impaired lymphokine production in response to antigens from *Candida albicans* seemed to be a feature that was common to most patients.

The work reported in this paper described our analysis of the immunological defects and reviewed currently available treatments for this disorder. John Bennett's experience with antifungal antibiotics was especially important because it demonstrated that antifungal agents, while effective in the short term, often failed to produce long-term remissions. This observation prompted an entirely different line of research in which we undertook an evaluation of the efficacy of immunologic reconstitution as a method for inducing long-term remissions in patients with chronic candidiasis.[1] The immunologic agent that we used was dialyzable transfer factor. We had found that administration of this material would restore the ability to express delayed hypersensitivity as well as antigen-specific lymphokine production in anergic subjects.[2] Transfer factor from *Candida*-sensitive donors is now widely used as an agent for immunological reconstitution and maintenance of clinical remissions in patients with chronic mucocutaneous candidiasis.[3]

This work has been frequently cited because it was one of the first that demonstrated the significance of *Candida albicans* as an opportunistic organism in patients with defective cellular immunity. This point has been confirmed in other disorders including neoplastic diseases, in recipients of immunosuppressive drugs, and recently in patients with acquired immunodeficiency syndrome (AIDS).

1. **Kirkpatrick C H & Smith T K.** Chronic mucocutaneous candidiasis: immunologic and antibiotic therapy. *Ann. Intern. Med.* 80:310-20, 1974. (Cited 85 times.)
2. **Kirkpatrick C H, Rich R R & Smith T K.** Effects of transfer factor on lymphocyte function in anergic patients. *J. Clin. Invest.* 51:2948-58, 1972. (Cited 130 times.)
3. **Kirkpatrick C H & Greenberg L E.** Treatment of chronic mucocutaneous candidiasis with transfer factor. (Khan A, Kirkpatrick C H & Hill N O, eds.) *Immune regulators in transfer factor.* New York: Academic Press, 1979. p. 547-62.

