

dodecyl sulfate–polyacrylamide gel electrophoresis (12.5%), showing protein bands ranging from 14 to 70 kDa (Fig 1A). For immunodetection of IgE-binding proteins, bands were electroblotted onto a nitrocellulose membrane. Immunoblotting with the patient's serum revealed IgE reactivity with a 33-kDa band (Fig 1B). To achieve samples for mass spectrometry (MS), 200 μ g from the cotton extract were precipitated and processed by sodium dodecyl sulfate–polyacrylamide gel electrophoresis (12.5%). After staining with Coomassie blue colloidal, the protein band of interest was manually excised from the gel. Enzymatic digestion was accomplished by addition of trypsin using a slightly modified procedure.⁴ The sample was analyzed by matrix-assisted laser adsorption/ionization–time-of-flight MS following the method of Konecny and Redinbaugh.⁵ Spectra were acquired in the 700 to 3,000 m/z range, and the resulting peak lists identified 3 peptides homologous with the cotton protein vicilin c72 precursor, when compared in the NCBItr and Swiss-Prot databases.

Vicilins are mature 7S globulins with a trimeric structure of approximately 150 to 190 kDa. The molecular weights (MWs) of the subunits range from 40 to 80 kDa.⁶ The most important allergenic vicilins reported are Ara h 1, the major allergen of peanut, and Jug r 2, from walnut.⁶ Vicilin c72 precursor (α -globulin B) has been described in the cottonseed of *Gossypium hirsutum* (upland cotton) with a MW of 70.5 kDa.⁷

We present a case of cutaneous allergy to cotton. The clinical history and the positive SPT result suggested an IgE-mediated

reaction. Immunoblotting indicated IgE reactivity with a 33-kDa protein. The MS and peptide mass fingerprinting assays identified this protein as vicilin c72 precursor. Although the MW of the vicilin c72 precursor present in the cottonseed has been reported to be 70.5 kDa,⁷ the authors suggest that a 33-kDa fragment derived from the former, or a related protein variant present in the cotton fiber, should be considered as the allergen involved in the reaction, as reported in Len c 1, where processing fragments from the vicilin are also relevant cotton IgE-binding proteins.⁸

This is the first description of IgE reactivity against cotton-related vicilin. Furthermore, no cases of true skin allergy to cotton have been reported. Physicians should take into account this possibility before considering skin lesions with cotton as merely irritant or nonspecific.

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RESOLUTION OF HYPOGAMMAGLOBULINEMIA AFTER RESECTION OF RENAL CELL CARCINOMA

To the best of our knowledge, hypogammaglobulinemia has not been previously associated with renal cell carcinoma. However, we describe a patient with hypogammaglobulinemia associated with renal cell carcinoma (nephrotic syndrome was not present) that resolved after resection of the tumor.

A 65-year-old man with a history of hypertension, hyperlipidemia, allergic rhinitis, and hiatal hernia presented for examination because of an 18-month history of recurrent bronchitis and otitis media, with a long history of chronic sinusitis. At presentation, the patient was taking lisinopril, cetirizine, and a multivitamin. Quantitative immunoglobulin analysis revealed hypogammaglobulinemia: IgG, 511 mg/dL (reference

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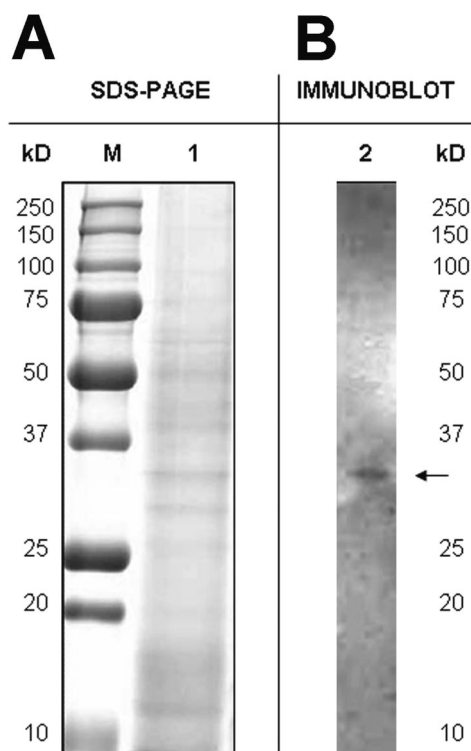


Figure 1. Cotton's protein identification. A, Coomassie staining with sodium dodecyl sulfate–polyacrylamide gel electrophoresis (SDS-PAGE) with cotton extract (lane 1). B, Immunoblotting with the patient's serum (lane 2). The arrow denotes IgE reactivity with a 33-kDa band. M indicates molecular mass marker.

range, 694–1,618 mg/dL); IgA, 49 mg/dL (reference range, 81–463 mg/dL); IgM, 19 mg/dL (reference range, 48–271 mg/dL). On repeat measurement of quantitative immunoglobulins 6 weeks later, the IgG level was borderline, at 616 mg/dL (reference range, 600–1500 mg/dL); the IgA and IgM levels were reduced to 24 mg/dL (reference range, 50–400 mg/dL) and 22 mg/dL (reference range, 50–300 mg/dL), respectively. IgG subclasses were also reduced: IgG1, 413 mg/dL (reference range, 490–1140 mg/dL); IgG2, 128 mg/dL (reference range, 150–646 mg/dL); IgG3, 15.6 mg/dL (reference range, 20–110 mg/dL); and IgG4, 20 mg/dL (reference range, 8–140 mg/dL). Quantitative lymphocyte analysis revealed a normal total lymphocyte count (1930/ μ L [reference range, 660/ μ L–4600/ μ L]), a normal CD3 (T cell) count (1,757/ μ L [reference range, 582/ μ L–1,992/ μ L]), a decreased CD19 (B cell) count (50/ μ L [reference range, 71/ μ L–567/ μ L]), and a normal natural killer cell count (95/ μ L [reference range, 80/ μ L–597/ μ L]). Lymphocyte proliferation maximum stimulation indexes to *Candida* and tetanus toxoid were 65.4 and 4.4, respectively (reference range maximum stimulation index, >3). Lymphocyte proliferation maximum stimulation indexes compared with normal control for phytohemagglutinin, pokeweed, and concanavalin were 80%, 62%, and 100%, respectively (>70% indicates normal; 50.1%–70%, slightly diminished; 30%–50%, diminished; and <30%, markedly diminished). The diphtheria titer was 0.18 IU/mL (reference range, >0.10 IU/mL), and the tetanus titer was 0.43 IU/mL (reference range, >0.16 IU/mL). The result of human immunodeficiency virus serological testing was negative. Urinalysis on 2 separate occasions revealed no signs of proteinuria.

Because of a history of night sweats and urinary frequency, an abdominal computed tomographic scan was obtained and revealed a 2.2-cm solid mass in the lower pole of the left kidney; this mass was suggestive of renal cell carcinoma. The patient underwent a partial nephrectomy, which confirmed a grade 2 clear cell type renal cell carcinoma confined to the renal parenchyma.

Quantitative immunoglobulin levels improved within 3 weeks of renal cell carcinoma resection (IgG, 700 mg/dL [reference range, 600–1,500 mg/dL]; IgA, 39 mg/dL [reference range, 50–400 mg/dL]; and IgM, 63 mg/dL [reference range, 50–300 mg/dL]) and normalized within 7 months (IgG, 1020 mg/dL [reference range, 600–1,500 mg/dL]; IgG1, 724 mg/dL [reference range, 490–1,140 mg/dL]; IgG2, 252 mg/dL [reference range, 150–646 mg/dL]; IgG3, 33.1 mg/dL [reference range, 20–110 mg/dL]; IgG4, 24.5 mg/dL [reference range, 8–140 mg/dL]; IgA, 89 mg/dL [reference range, 50–400 mg/dL]; and IgM, 73 mg/dL [reference range, 50–300 mg/dL]). The immunoglobulin levels remained within normal limits 1 year after surgery. The CD19 (B cell) count improved but continued to remain less than the lower limit of normal (67/ μ L [reference range, 71/ μ L–567/ μ L]). In addition, before-and-after pneumococcal vaccine antibody titers showed a robust response to vaccination (Table 1). Vaccination and initial titers were performed immediately before resection of the carcinoma, whereas the postvaccination titers were obtained after surgical resection. Before vaccination, 10 of 23 pneumococcal serotype titers were less than 1.3

Table 1. Pneumococcal Vaccine Titers

Serotype	Prevaccination titer, μ g/mL	Postvaccination titer, μ g/mL
1	1.0	>350.0
10A	5.3	14.0
11A	0.8	11.0
12F	0.5	105.9
14	1.4	145.8
15B	0.6	57.0
17F	10.9	845.4
18C	0.7	131.4
19A	1.6	4.4
19F	0.7	34.1
2	0.7	81.8
20	1.8	9.6
22F	5.9	11.6
23F	9.9	24.7
3	1.1	14.7
33F	1.1	52.2
4	0.8	3.8
5	3.9	335.2
6B	2.4	3.2
7F	5.0	7.3
8	1.9	16.3
9N	2.2	6.7
9V	2.0	62.0

μ g/mL. After vaccination, all serotypes had titers greater than 1.3 μ g/mL. Of 23 serotypes, 16 had greater than a 4-fold increase in titer. After removal of the renal cell carcinoma, the patient had no known significant reoccurrence of bronchitis or otitis media. He continued to periodically receive treatment for sinus infections. Serial abdominal computed tomographic scans showed no sign of renal cell carcinoma reoccurrence after 2 years of observation.

To the best of our knowledge, this is the first report of hypogammaglobulinemia associated with renal cell cancer. We were unable to identify evidence of other primary or secondary immunodeficiencies. Interestingly, the hypogammaglobulinemia resolved after surgical resection of the tumor. We speculate a paraneoplastic process may have resulted in hypogammaglobulinemia, which resolved on tumor resection.

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