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Soluble IL-2 receptor of birch pollinosis in Japan

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Introduction

Birch pollinosis is a common allergic disease in Scandinavia, Europe, North America and Canada. On Hokkaido island, we have many birch pollinosis patients instead of Japanese cedar's, as the climate and flora are similar to Scandinavia and Northern Europe. We have studied the clinical features of birch pollinosis and allergen analysis of birch pollen in order to clarify the mechanisms of the antigen recognition system[1,2]. We have focused the immunological responses of birch pollinosis patients during the pre-season, season and post-season. In this study, we report on the useful examination that reflects the general immunological condition of birch pollinosis patients from peripheral blood samples.

Patients and methods

We selected birch pollinosis patients using the following criteria: sex, age, duration of suffering, clinical symptom score (Okuda's score), total IgE and RAST score. To obtain immunological information from the peripheral blood, we chose the following criteria: (1) IL-2 production of peripheral blood lymphocytes (PBL), (2) surface expression of IL-2 receptors on PBL, and (3) soluble IL-2 receptors (sIL-2R) in the serum during the three periods.

Methods

IL-2 production (normal range: 4-25 U/ml) of PBL. After PBL (1×10^6) had been incubated with ConA for 24 hours in 5% CO_2, 37°C incubator, supernatant was collected and examined following the assay. Radioimmunoassay of IL-2 was performed using standard IL-2, anti-IL-2 antibody (Amarciam) and ^{125}I labeled IL-2 (NEN)[3].

Surface expression of IL-2 receptor on PBL (normal range: 32-62%). After PBL (5×10^5) had been incubated with ConA for 48 hours in 5% CO_2, 37°C incubator, resuspended PBL (5×10^5) was treated with AB type human serum to block the Fc receptor. After treatment with anti-IL-2 receptor antibody (IL-2I, Coulter) for 30 minutes, PBL was analyzed by flow cytometry[4].

Soluble IL-2 receptor (sIL-2R) in serum (normal range: 120-384 U/ml). After first being mixed with antibody-coated polystyrene beads for 90 minutes, the serum was tested for a reaction with horseradish labeled mouse anti-human IL-2R monoclonal antibody. After washing, it was mixed with OPD (oltophenylene diamine) for two minutes and then measured for light absorption using the 492 nm wavelength.

1000 U/ml was determined to be the concentration of IL-2R in supernatant from the human IL-2 dependent cell line co-cultured with 10% recombinant IL-2 for four days[5-7].

Results

IL-2 production of PBL and the surface expression of IL-2 receptors on PBL are still within the normal range (Figs. 1 and 2). However, soluble IL-2 receptors in the serum of birch pollinosis patients during the season are higher than normal healthy controls according to statistical

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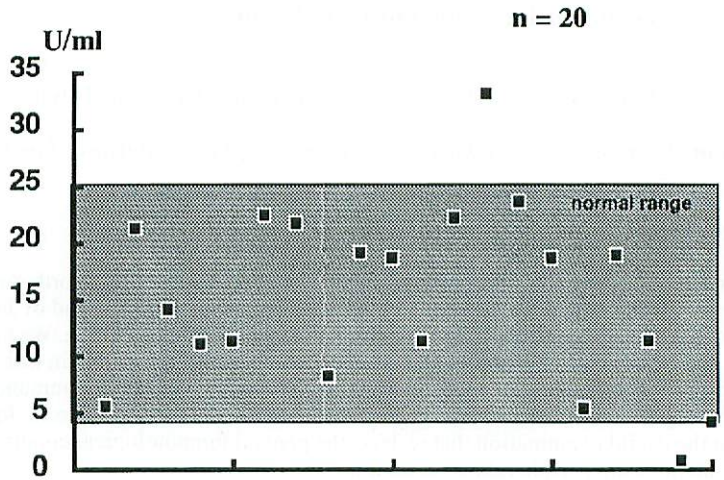

Fig. 1. IL-2 production of peripheral blood lymphocytes (PBL). PBL of birch pollinosis patients (n=20) was examined by RIA. The normal range is between 4 and 25 U/ml. Almost all patients (18/20) are within the normal range.

analysis (Student's t test, $p<0.05$) (Fig. 3). Old serum from the same patients during the pre-treatment period (at most, 15 years previously) was compared with recent serum taken during the pre- and post-pollen scattering seasons (data not shown). Although some of the old results were higher than recent ones, there was no consistent tendency as the number of patients examined was too small.

Discussion and conclusions

The T lymphocytes are the main conductors of allergic inflammation. The process is largely guided by the production of various kinds of cytokines by these cells[8,9]. T lymphocytes also upregulate T-cell receptors when activated. This leads to the shedding of soluble IL-2 receptors (sIL-2R). Although not entirely unique to T cells, the level of sIL-2R may provide a good approximation for the activity of T lymphocytes. It has been reported that sIL-2R is the extracellular portion of the IL-2R α chain (45 kDa) instead of the full length α chain (55 kDa)

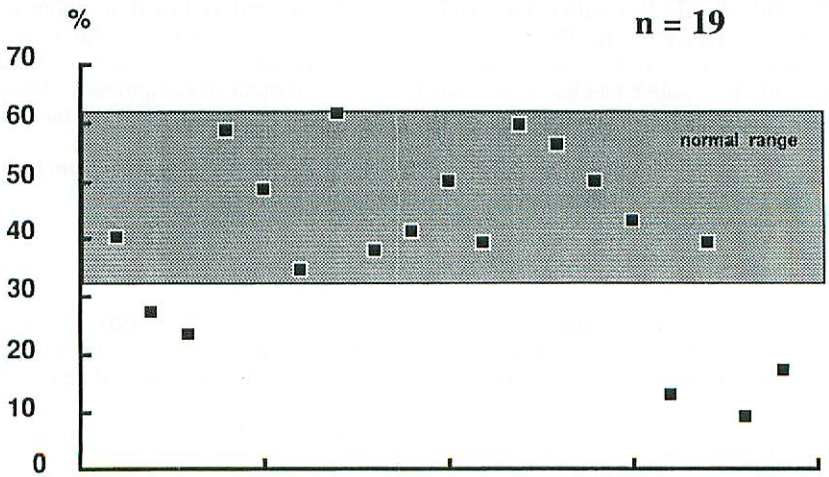

Fig. 2. Surface expression of IL-2 receptor on PBL. PBL of birch pollinosis patients (n=19) was examined by flow cytometry. The normal range is between 32 and 62%. Almost all patients (14/19) are within the normal range.

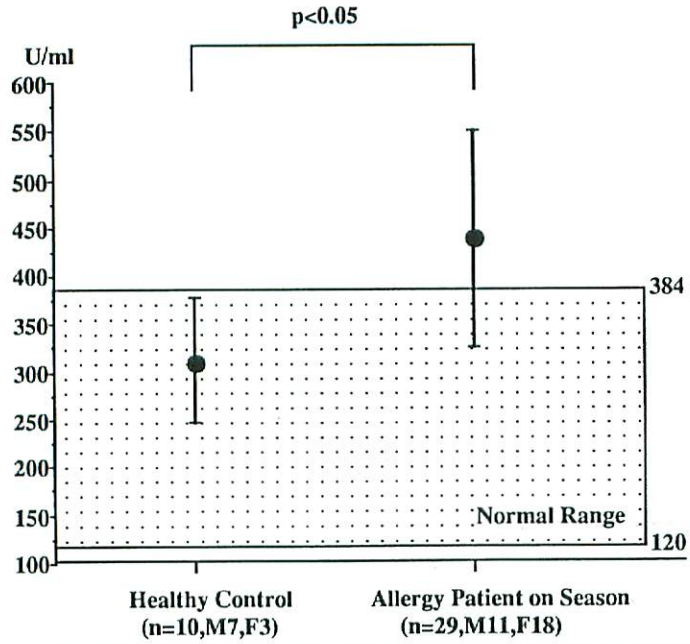

Fig. 3. Soluble IL-2 receptor (sIL-2R) in the serum. Serum of birch pollinosis patients (n=29) and healthy controls (n=10) was examined by EIA. Statistical analysis was performed by Student's t test.

and is elevated higher in many diseases: adult T-cell leukemia (ATL), lymhocytic leukemia, lymphoblastic lymphoma, multiple myeloma, AIDS and asthma, etc. It is still unclear which peripheral blood examination in allergic patients is most useful for investigating their general immunological condition during the pre-season, season, and post-season of pollen scattering. In this report, we have studied several peripheral blood examinations to estimate the clinical condition of birch pollinosis patients. From our data, it is suggested that sIL-2R would provide information on or be a marker for detecting the general immunological condition from PBL and for reflecting the T-cell activation stage in the patient.

References

1. Kumai M, Miyokawa N, Adachi T, Katagiri M, Unno T: Association between HLA antigens and birch pollen allergy in Japanese subjects. Am J Rhinol 4:19-23, 1990
2. Kumai M, Krishnaswamy G, Marsh DG, Huang SK: The effect of IFNγ, IL-4 and Ig receptor cross-linking of monocytes on allergen specific T cell responses. Immunology 79:174-177, 1993
3. Gillis S et al: T cell growth factor. J Immunol 120:2027-2032, 1978
4. Cantrell DA, Smith KA: Transient expression of interleukin 2 receptors: consequence for T cell growth. J Exp Med 158:1895-1911, 1983
5. Marcon L, Rubin LA, Kurman CC, Fritz ME, Longo DL, Uchiyama T, Edwards BK, Nelson DL: Elevated serum levels of soluble Tac peptide in adult T-cell leukemia: correlation with clinical status during chemotherapy. Annal Int Med 109:274-279, 1988
6. Yasuda N, Lai PK, Ip SN, Kung PC, Himura Y, Matsuoka M, Hattori T, Purtilo DT: Soluble interleukin 2 receptors in sera of Japanese patients with adult T cell leukemia mark activity of disease. Blood 71:1021-1026, 1988
7. Symons JA, Wood NC, DiGlivine FS, Duff GW: Soluble IL-2 receptor in rheumatoid arthritis: correlation with disease activity, IL-1 and IL-2 inhibition. J Immunol 141:2612-2618, 1988
8. Corrigan CJ, Kay AB: T cell and eosinophils in the pathogenesis of asthma. Immunol Today 13:501-507, 1992
9. Wierenga EA, Snoek M, De Groot C, Chretien I, Bos JD, Jansen HM, Kapsenberg ML: Evidence of compartmentalization of functional subjects of CD4+T lymphocytes in atopic patients. J Immunol 144:4651, 1990