Genetic polymorphism of factor B (Bf) in Okayama Prefecture, Japan.

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Abstract

The genetic polymorphism of factor B (Bf) was investigated in Okayama Prefecture, Japan. Cellogel immunofixation electrophoresis was employed according to Martin and Ziegler (1981) with minor modifications. In 316 non-blood related Japanese, the Bf was: Bf S, 70.6%; Bf FS, 27.8%; and Bf F, 1.6%. No rare variants were observed. The gene frequencies of Bfs and Bff were 0.845 and 0.155, respectively. The gene frequencies in Okayama Prefecture were quite similar to those in other districts of Japan. Considering the phenotype distribution in Japan, the Bf system might be a useful marker for personal identification and in disputed paternity cases.

KEYWORDS: factor B, polymorphism, cellogel immunofixation electrophoresis

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Ameno and Nanikawa: Genetic polymorphism of factor B (Bf) in Okayama Prefecture


GENETIC POLYMORPHISM OF FACTOR B (Bf) IN OKAYAMA PREFECTURE, JAPAN

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Abstract. The genetic polymorphism of factor B (Bf) was investigated in Okayama Prefecture, Japan. Cellogel immunofixation electrophoresis was employed according to Martin and Ziegler (1981) with minor modifications. In 316 non-blood related Japanese, the Bf was : Bf S, 70.6 %; Bf FS, 27.8 %; and Bf F, 1.6 %. No rare variants were observed. The gene frequencies of Bf^8 and Bf^9 were 0.845 and 0.155, respectively. The gene frequencies in Okayama Prefecture were quite similar to those in other districts of Japan. Considering the phenotype distribution in Japan, the Bf system might be a useful marker for personal identification and in disputed paternity cases.

Key words: factor B, polymorphism, cellogel immunofixation electrophoresis.

Factor B (Bf), previously termed C3 proactivator and glycine rich/β-glycoprotein (1), is an important component of the alternative pathway of complement activation (2). It is also widely accepted that Bf is closely linked to C2, C4 and HLA (3-11). Alper et al. (12) first investigated the inherited polymorphism of Bf by agarose gel immunofixation electrophoresis and showed that Bf consisted of common alleles F and S and rare alleles Fl and Sl. Furthermore, Martin and Ziegler (13) reported that cellogel immunofixation electrophoresis was a useful method for investigating of the polymorphism of Bf. In the present study, we examined the distribution of Bf phenotypes in Okayama Prefecture, Japan, using this cellogel immunofixation electrophoresis method (13-15).

MATERIALS AND METHODS

Serum samples were collected from 316 non-blood related Japanese living in Okayama Prefecture, and were stored at -20 °C. All blood donors were volunteers connected with the Okayama Red Cross Center. Bf typing was carried out by cellogel electrophoresis and subsequent immunofixation according to Martin and Ziegler (13) with minor modifications.

Two microliters of serum was spread with a micropipette on cellogel (Chemetron, 9×5 cm). The electrophoresis was performed with a barbital-calcium lactate buffer system for 2 h at 17 V/cm at room temperature. After electrophoresis, the appropriate region of the cellogel surface was layered with 50 µl anti-human properdin factor B serum (goat, ICL Scientific, Calif.) and left in a moist chamber for 15 min at room temperature. The cellogel was washed in isotonic saline for 2 h, changing the saline occasionally. The cellogel was stained with 1%
nigrosin (in 2% acetic acid) for 2 min and decolorized with 5% acetic acid.

RESULTS AND DISCUSSION

The electrophoresis method utilized enabled the examination of small amounts of monospecific anti-Bf serum in a shorter time than the starch or agarose gel electrophoresis methods. The entire process took only about 5 h and needed only 50 µl of anti-Bf serum to analyze four serum samples.

Fig. 1 shows the Bf electrophoretic patterns. BfF and BfS consisted of more than three bands, but the electrophoretic separation did not differentiate all the bands. However, Bf typing was possible by the use of control serum Bf FS provided by Dr. H. Nishimukai (Oita Medical College).

Table 1 shows the result of Bf typing of 316 non-blood related donors living in Okayama Prefecture. No rare variants were observed. The Bf phenotype results fit the Hardy-Weinberg equilibrium ($\chi^2 = 0.0004$, $0.99 > p > 0.975$).

Table 2 shows the Bf gene frequencies in other Japanese populations (9, 10, 16, 18). Tokuhaga et al. (10) and Nishimukai (18) reported a variant Bf$^{PT}$ (Bf$^{8.75}$). Tokunaga et al. reported that Bf$^{PT}$ existed with high frequency among Japanese

![Fig. 1. Bf phenotypes after cellogel electrophoresis and immunofixation.](image)

<table>
<thead>
<tr>
<th>Phenotype</th>
<th>No. observed (%)</th>
<th>No. expected (%)</th>
<th>Gene frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>223 (70.6)</td>
<td>225.6 (71.4)</td>
<td>Bf$^S = 0.845$</td>
</tr>
<tr>
<td>FS</td>
<td>88 (27.8)</td>
<td>82.8 (26.2)</td>
<td>Bf$^F = 0.155$</td>
</tr>
<tr>
<td>F</td>
<td>5 (1.6)</td>
<td>7.6 (2.4)</td>
<td>$\chi^2 = 0.0004$</td>
</tr>
<tr>
<td></td>
<td>316 (100.0)</td>
<td>316.0 (100.0)</td>
<td>$0.99 &gt; p &gt; 0.975$</td>
</tr>
</tbody>
</table>
patients with insulin-dependent diabetes mellitus (17), and the BfF frequency in central Japan was slightly higher than in western Japan (10). The frequency of BfF in Okayama Prefecture was slightly higher than that in western Japan (Table 2).

Table 3 shows the gene frequencies of Bf in various populations. In Caucasian populations, the gene frequencies of Bfs are between 0.709 and 0.826 (4, 5, 7, 8, 12, 13, 19-21). Thus, the Bf gene frequencies of Japanese and Caucasians are similar. From the Japanese phenotype distributions shown here, the Bf system might be a useful marker for personal identification and paternity testing in legal disputes.

**REFERENCES**


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