Studies on the Human Immunoglobulin Allotypes among Han and Minority Nationalities in China

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INTRODUCTION

Inherited structural differences in human immunoglobulins are referred to as allotypes or genetic markers. So far, genetic markers have been found for the IgG heavy (H) chain (Gm), the IgA H chain (Am), the IgE H chain (Em) and kappa type light (L) chain (Km) common to all classes of immunoglobulins.

Since the discovery of Gm system by Grubb and Laurell(1956), more than twenty allotypes have been described that occur on the H chains of three of the four IgG subclasses, IgGl, IgG2, and IgG3. The Gm system provides genetic markers which are unique in studies of human genetics, particularly in the characterization of different populations and in studies of genetic drift and gene flow determined by the presence of either a unique haplotype in a particular race or by differences in the frequencies of the same haplotypes in a given ethnic group. This paper is one of a series based on studies of genetic markers of immunoglobulins of Mongoloid scattered in the world and neighboring populations.

MATERIALS AND METHODS

Serum samples from a total of 5,048 unrelated individuals from 31 distinct populations in China were tested for Glm(a,z,x, and f), and G3m(bo, bl, b3, b4, b5, s, t, g, u and c3) allotypes. The tests were carried out using previously described methods (Matsumoto and Takatsuki 1968).

RESULTS AND DISCUSSION

China is a vast country with a broad coast bordering the USSR and Mongolian People's Republic on the north and west; it is flanked by Korea on the northeast; the Yellow Sea, East China Sea and South China Sea on the east; Vietnam, Laos and Burma on the south and

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the Karakoram and Himalaya ranges on the southwest. China is a multinational country made up of 56 ethnic groups mainly of Han nationality. The characteristic of distribution of multinational ethnic groups, mainly Han over a broad area; for example dispersed over a vast range of land or concentrated in a smaller section of space; has been caused by racial movements, stationing engagged in cultivation, immigration or alterations of dynasties repeatedly over a long history period.

Table 1. Gm haplotype frequencies among various ethnic groups in China

Population	ag	axg	ab3st	afblb3	fblb3
Olunchun (NE China)	0.374	0.121	0.440	0.065	-
Tibetans (Lasa)	0.570	0.148	0.213	0.069	-
Tibetans (W Tibet)	0.650	0.159	0.130	0.061	-
Mongols (Wulanhoubu)	0.325	0.209	0.194	0.272	-
Mongols (Inner Mongolia)	0.379	0.190	0.140	0.291	-
Mongols (Huhehote)	0.471	0.203	0.097	0.229	-
Huis (Changji)	0.377	0.108	0.141	0.277	0.097
Uighurs (Wulumuqi)	0.331	0.120	0.113	0.095	0.341
Tibetans (Hezhue)	0.470	0.185	0.128	0.217	-
Han (Haerbin)	0.441	0.210	0.113	0.236	-
Han (Changchun)	0.471	0.219	0.089	0.221	-
Han (Liaoyuan)	0.466	0.237	0.083	0.214	-
Han (Dairen)	0.384	0.266	0.094	0.256	-
Han (Beijing)	0.428	0.214	0.117	0.241	-
Han (Shandong)	0.431	0.190	0.116	0.263	-
Han (Kunsan)	0.376	0.141	0.098	0.385	-
Han (Hefei)	0.416	0.172	0.084	0.328	-
Han (Xian)	0.405	0.183	0.113	0.299	
Han (Hangzhou)	0.350	0.184	0.079	0.387	-
Han (Chengdu)	0.168	0.078	0.048	0.706	-
Han (Changsha)	0.204	0.066	0.054	0.676	-
Han (Gueiyang)	0.226	0.085	0.043	0.646	-
Han (Guangzhou)	0.183	0.054	0.033	0.730	-
Han (Fuzhou)	0.188	0.077	0.043	0.692	-
Han (Taiwan)	0.222	0.087	0.047	0.643	-
Takasagos (Taiwan)	0.194	0.042	0.002	0.762	-
Miaos (Taijing)	0.095	0.015	0.015	0.875	-
Puyis (Duyun)	0.062	0.010	0.014	0.914	-

Chuangs (Guangxi)	0.031	0.005	0.022	0.942	-
Shuis (Sandu)	0.024	0.005	0.019	0.952	-
Koreans (Yanji)	0.491	0.166	0.186	0.157	-

ag=a,z;g,u axg=a,z,x;g,u ab3st=a,z;b0,b3,b5,s,t afblb3= a,f;b0,bl,b3,b4,b5,u

In sharp contrast to Japanese and Korean populations which show homogeneities, respectively, 16 Han nationalities in China indicate clear genocline extending from Haerbin to Guangzhou in which the Gm haplotype frequency of Gm ag changes from 0.471 to 0.168, that of Gm ab3st from 0.117 to 0.033, and that of Gm afblb3 from 0.214 to 0.739, respectively. Even comparing northernmost Beijing with Japanese and Korean populations, highly significant heterogeneities were observed (χ^2=114.58, d.f.=3, p<0.001; χ^2=32.85, d.f.=3, p< 0.001, respectively). In general, Han nationality is clearly divided into two groups of northern and southern; the former has relatively high frequencies of Gm ag and Gm ab3st haplotypes, the latter has low incidences of Gm ag and Gm ab3st and extremely high frequency of Gm afblb3 haplotype.

Of the Minority nationalities Tibetans from Hezhue shows homogeneity with Han from Xian. This may be results of miscellaneous and mingled living of Tibetans and Hans in neighboring surroundings. Tibetans from Lasa and western region in Tibet and Olunchuns from northeasternmost China as well are very characteristic of having high frequencies of Gm ag and Gm ab3st and very low frequency of Gm afblb3 haplotype which characterize northern Mongoloid populations. On the other hand, Miaos, Puyis, Shuis and Chuangs from south China are the most striking ethnic groups to have the highest incidence of Gm afblb3 haplotype which characterizes southern Mongoloid populations. Especially, the incidence of the Gm afblb3 haplotype observed in Chuang and Shuis is the highest value among Mongoloid populations together with Kadazans who are thought to have moved in Borneo 4,000 years B.C. from the southern part of China. Both of Huis from Changji and Uighurs from Wulumuqi in Xinjiang have five Gm haplotypes, Gm fblb3 characteristic of Caucasoids, in addition to the four Gm haplotypes characteristic of Mongoloid populations, which are unique and quite different from other ethnic groups in China. However, Uighurs are in striking contrast to Huis in the frequencies of Gm fblb3 and afblb3 haplotypes. The former have very high frequency of Caucasian haplotype of Gm fblb3 for the latter, on the contrary, Huis have a rather high incidence of Mongoloid haplotype of Gm afblb3 in comparison with Uighurs. They are also different from each other in the frequency of Gm ab3st haplotype. In spite of having lived in a close geographical environment, these ethnic groups are in contrast with each other. It is resonable to say that Huis are basically Mongoloid with some Caucasoid admixture, on the other hand, Uighurs are basically Caucasoid with some Mongoloid admixture.

In conclusion, populations in China show remarkable heterogeneities from north to south, in sharp contrast to Korean and Japanese populations showed homogeneities, respectively. The center of dispersion of the Gm afblb3 haplotype characterized southern Mongoloid populations must exist in Gangxi and Yunnan area in the southwest China.

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