Front. Biol. China 2008, 3(2): 143–146
DOI 10.1007/s11515-008-0021-2

RESEARCH ARTICLE

Gene frequency of five genetic characteristics in six nationalities in Southern Guizhou Province, China

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Abstract Five characteristics (hair forms, nasal profile, nostril forms, mongoloid fold and upper eyelid fold) were respectively investigated in six nationalities, including the Buyi, Miao, Shui, Maonan, Dong, and Han nationalities in Southern Guizhou, China. The gene frequencies of five characteristics in the six nationalities were estimated and compared. The results indicated that: (1) for hair forms and nasal profile, the frequency of the dominant gene was lower than that of their recessive gene, but the opposite was true for nostril forms. (2) Among different nationalities, the difference of gene frequency of the mongoloid fold, nasal profile, hair forms and upper eyelid fold was quite significant, which was followed by that of nostril forms.

Keywords genetic character, gene frequency, nationalities, Guizhou, China

1 Introduction

Some traits of human body (such as hair, earlobe, the mongoloid fold, etc.) and some behavioral traits of lateral functional dominance (such as advantage, favored foot, hand clasping etc.) are the classical index of genetics study. Some researchers investigated the lateral functional dominance in China. For example, Zheng et al. (1989; 1993; 1998), Zheng et al. (1999), Lu et al. (2000) and Han et al. (2001) researched some nationalities in Inner Mongolia of China. Lv et al. (2000) studied three nationalities in Hainan Province of China. Huo et al. (2002) studied two nationalities of Ningxia. Yu et al. (2004) studied eight nationalities of Guizhou Province, China. Abdula et al. (1998) studied the distribution of the gene frequency of twelve characteristics among four Xingjiang Minorities of China. Han et al. (2000) studied gene frequency of 10 genetic traits in three nationalities in Xing'an League, China. Lu et al. (2002) studied gene frequency of 12 characteristics in five nationalities in Inner Mongolia, China. They obtained some information about the distribution of gene frequency. But at present, there is no data about the gene frequency of characteristics among nationalities in Guizhou, China. Therefore, we investigated and analyzed the gene frequency of five characteristics among six nationalities in Southern Guizhou, China.

Translated from *Hereditas*, 2006, 28(4): 399–402 [译自: 遗传]

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2 Methods

We investigated five traits (hair forms, nasal profile, nostril forms, the mongoloid fold and upper eyelid fold) of six nationalities in Southern Guizhou of China by random sampling. These six nationalities includes: the Buyi, with 539 people in the population (male 289, female 250); the Miao, with 548 people in the population (male 290, female 258); the Shui, with 386 people in the population (male 227, female 159); the Maonan, with 377 people in the population (male 206, female 171); the Dong, with 406 people in the population (male 206, female 200); and the Han, with 528 people in the population (male 290, female 238). Individuals (aging from 18 to 55) were investigated. They were in good health and were not handicapped with three generations belonging to same nationality. We judged these five traits based on the generally recognized method (Wu et al., 1984; Shao, 1985) and deduced the gene frequency of the different traits by the law of Hardy-Weinberg (Xu, 1996), then adopted u to test the difference of gene frequencies among nationalities.

3 Results and discussion

3.1 Hair forms

For hair forms, the frequency of the dominant gene was lower than that of recessive gene in six nationalities. The

distribution of dominant gene was: Maonan (0.0687) > Miao (0.0551) > Dong (0.0531) > Han (0.0357) > Buyi (0.0321) > Shui (0.0199). The difference of the dominant gene frequency among nationalities shows that the Maonan's was obviously higher than the Miao's ($u = 3.22$, $p < 0.01$), the Dong's ($u = 3.61$, $p < 0.01$), the Han's ($u = 9.88$, $p < 0.01$),the Buyi's ($u = 11.60$, $p < 0.01$) and the Shui's ($u = 18.16$, $p < 0.01$). The Miao's was slightly higher than the Dong's ($u = 0.55$, $p > 0.05$)and significantly higher than the Han's ($u = 6.96$, $p < 0.01$), the Buyi's ($u = 8.73$, $p < 0.1$) or the Shui's ($u = 15.81$, $p < 0.01$). The Dong's was significantly higher than the Han's ($u = 6.05$, $p < 0.01$), the Buyi's ($u = 7.74$, $p < 0.01$) or the Shui's ($u = 14.56$, $p < 0.01$). The Han's was slightly higher than the Buyi's ($u = 1.74$, $p > 0.05$) and is significantly higher than the Shui's ($u = 8.99$, $p < 0.01$). The Buyi's was significantly higher than the Shui's ($u = 6.66$, $p < 0.01$) (Table 1).

3.2 Upper eyelid fold

The frequency of the dominant gene for the upper eyelid fold was lower than that of recessive gene in theBuyi, the Miao and the Han. The opposite was true in the Shui, the Maonan and the Dong. The frequency of the dominant gene was noted as follows: the Shui (0.639) > the Dong (0.5589) > the Maonan (0.5540) > the Buyi (0.4264) > the Han (0.3769) > the Miao (0.3499). The significance test results indicated that the Shui had a slightly higher result than the Dong ($u = 1.91$, $p > 0.05$). Other results are as follows: the Maonan ($u = 2.00$, $p < 0.01$), the Buyi ($u = 6.20$, $p < 0.01$), the Han ($u = 8.09$, $p < 0.01$) and the Miao ($u = 9.09$, $p < 0.01$).The Dong's result was similar to the Maonan's ($u = 0.12$, $p > 0.05$) but obviously higher than the Buyi's ($u = 4.13$, $p < 0.01$), the Han's ($u = 6.01$, $p < 0.01$) and the Miao's ($u = 7.03$, $p < 0.01$). There were significant differences among the Maonan and the Buyi ($u = 3.91$, $p < 0.01$), the Han ($u = 5.75$, $p < 0.01$), the Miao ($u = 6.75$, $p < 0.01$). The Buyi's was higher than the Han's ($u = 2.02$, $p < 0.05$) and the Miao's ($u = 3.16$, $p < 0.01$). No significant difference was detected between Han and Miao populations ($u = 1.18$, $p > 0.05$) (Table 1).

3.3 Mongoloid fold

The frequency of the dominant gene of the mongoloid fold was lower than that of the recessive gene, except in the Shui's and the Dong's. For the frequency of the dominant gene, the results are as follows: the Shui (0.6426) > the Dong (0.5189) > the Maonan (0.4453) > the Han (0.4309) > the Miao (0.3159) > the Buyi (0.2633). The frequency of the dominant gene in the Shui was obviously higher than that of the Dong ($u = 30.5$, $p < 0.01$), Maonan ($u = 5.16$, $p < 0.01$), Han ($u = 6.10$, $p < 0.01$), Miao ($u = 10.79$, $p < 0.01$) and the Buyi ($u = 14.03$, $p < 0.01$). The Dong's was higher than the Maonan's ($u = 2.14$, $p < 0.05$), but markedly higher than the Han ($u = 2.82$, $p < 0.01$), Miao ($u = 7.45$, $p < 0.01$) and the Buyi's ($u = 10.52$, $p < 0.01$). The difference between the Maonan and the Han were not significant ($u = 0.49$, $p > 0.05$), but obviously higher than the Miao ($u = 5.02$, $p < 0.01$) and the Buiyi ($u = 7.91$, $p < 0.01$). The Han's was obviously higher than the Miao's ($u = 4.96$, $p < 0.01$) and the Buyi's ($u = 8.12$, $p < 0.01$) and the difference between the Miao and the Buyi was significant ($u = 2.91$, $p < 0.01$) (Table 1).

3.4 Nasal profile

The frequency of the dominant gene of nasal profile was obviously higher than of their recessive gene in six nationalities. Among nationalities, the frequencies are as follows: the Maonan (0.1184) > the Han (0.1028) > the Miao (0.0839) > the Shui (0.0674) > the Buyi (0.0614) > the Dong (0.0518). The u test results are as follows: the Maonan was higher than the Han ($u = 2.09$, $p < 0.05$) and obviously higher than the Miao's ($u = 5.04$, $p < 0.01$). The Han was obviously higher than the Miao ($u = 3.23$, $p < 0.01$), the Shui ($u = 6.45$, $p < 0.01$), the Buyi ($u = 8.51$, $p < 0.01$) and the Dong ($u = 10.59$, $p < 0.01$). The Miao was obviously higher than the Shui ($u = 3.26$, $p < 0.01$), the Buyi ($u = 5.01$, $p < 0.01$) and the Dong ($u = 7.24$, $p < 0.01$). The Shui was slightly higher than the Buyi ($u = 1.42$, $p > 0.05$) but obviously higher than the Dong ($u = 3.76$, $p < 0.01$). The Buyi was obviously higher than the Dong ($u = 5.59$, $p < 0.01$) (Table 1).

3.5 Nostril forms

For nostril forms, the frequency of the dominant gene was obviously higher than that of their recessive gene in six nationalities. Among nationalities, results shows the Shui (0.7675) > the Han (0.7643) > the Dong (0.6901) > the Buyi (0.6579) > the Maonan (0.6562) > the Miao (0.6041). The u test results were as follows: the Shui was not significantly different from the Han ($u = 0.06$, $p > 0.05$) and the Dong ($u = 1.52$, $p > 0.05$), but was higher than the Maonan ($u = 2.19$, $p < 0.05$). It was significant different with the Buyi ($u = 2.35$, $p < 0.01$) and the Miao ($u = 3.57$, $p < 0.01$). The results from the Han was similar to the Dong's ($u = 1.55$, $p > 0.05$), but the differences had certain statistical significances among the Maonan ($u = 2.26$, $p < 0.05$), the Buyi ($u = 2.45$, $p < 0.01$) and the Miao ($u = 3.75$, $p < 0.01$). The Dong was slightly higher than the Buyi ($u = 0.75$, $p > 0.05$) and the Maonan ($u = 0.70$, $p > 0.05$), but obviously higher than the Miao ($u = 1.98$, $p < 0.01$). The Buyi was not significantly different from the Maonan ($u = 0.04$, $p > 0.05$) and the Miao ($u = 1.36$, $p > 0.05$). The difference between the Maonan and the Miao was insignificant ($u = 1.21$, $p > 0.05$) (Table 1).

Table 1 Gene frequency of five characteristics in six nationalities

characteristics		Buyi nationality		Miao nationality		Shui nationality		Maonan nationality		Dong nationality		Han nationality	
		numbers	frequency	numbers	frequency	numbers	frequency	numbers	frequency	numbers	frequency	numbers	frequency
hair form	curly	34	0.0321	52	0.0551	16	0.0199	50	0.0687	42	0.0531	37	0.0357
	straight	504	0.9679	433	0.9449	391	0.9801	327	0.9313	364	0.9469	491	0.9643
upper eyelid fold	have	361	0.4264	280	0.3499	354	0.6391	302	0.5540	327	0.5589	323	0.3769
	not have	177	0.5736	205	0.6251	543	0.3609	75	0.4460	79	0.4411	205	0.6231
Mongoloid fold	have	246	0.2633	258	0.3159	355	0.6426	261	0.4453	312	0.5189	357	0.4309
	not have	292	0.8367	227	0.6841	52	0.3574	116	0.5547	94	0.4811	171	0.5691
nasal profile	protruding	64	0.0614	78	0.0839	53	0.0674	84	0.1184	41	0.0518	103	0.1028
	straight	474	0.3986	407	0.9161	354	0.9326	293	0.8816	365	0.9482	425	0.8972
naris form	wide	475	0.6579	409	0.6041	385	0.7675	329	0.6562	367	0.6901	461	0.7643
	narrow	63	0.3421	76	0.3959	22	0.2325	48	0.3438	39	0.3099	67	0.2357

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