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TASTING ABILITY OF PHENYLTHIOCARBAMIDE (PTC) IN PAKISTAN HUMAN POPULATION

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In order to determine the incidence of the lack of ability to taste phenylthiocarbamide (PTC) in some Pakistani human populations, 499 probands were tested for two different concentrations of PTC solution (0.5% and 1%). The incidence of tasting ability of PTC in the sample was found to be 54-62% for two solutions which has been compared with the incidence found in other ethntic groups. The x^2 – analysis of the data shows that the two sexes do not differ significantly from each other in their relative proportions of tasters and non-tasters, thus indicating an autosomal inheritance of the trait.

INTRODUCTION

In human populations individuals differ in their ability to taste an organic compound, phenylthiocarbamid (PTC, also called phenylthiourea). If tasting is dune with a series of solutions containing decreasing concentrations of PTC, it is found that nearly all persons are able to taste strong solutions and that persons differ from one another in the weakest PTC solution whose taste they are able to distinguish from that of plain water. The components of the variability in the taster reaction are manifold: there are racial differences; the same person will give different responses in different tests; response differs in different age groups; and women are more sensitive tasters than man. In other words, the penetration of one or all three T and t genotypes is variable but details have still to be worked out. [3].

Graziosi [4] and Bernhard [7] worked out the incidence of PTC tasting in Chitral and Dir, and Malakand, Swat, Kohat and Peshawar, respectively. The present study also attempts to determine the incidence of the lack of ability to taste PTC in some Pakistani human populations.

MATERIALS AND METHODS

In all, 499 probands were examined, out of whom 421 were women, taken randomly from the local population of Rawalpindi and 78 were men, students from Quaid-i-Azam University, Islamabad. Filter papers dipped in 0.5% nd 1% solutions were used to determine the incidence of tasters for low as well as high concentration.

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RESULTS

Tables 1 and 2 show the relative frequencies of tasters and non-tasters among males and females in the sample for solutions 1 and 2 respectively. Table 3 shows the relative frequencies of tasters and non-tasters among males and females in the sample both for solution 1 and 2.

X^2-analysis of Tables 1, 2 and 3 shows that the two sexes do not differ signficantly from each other in their relative proportions of tasters and non-tasters, thus indicating an autosmoal inheritance of the trait.

DISCUSSION

Results of various surveys on human populations regarding their ability to taste PTC are shown in Table 4.

According to the studies referred to in Table 4, Chinese, American Indians, American Blacks and African Negroes show relatively lower frequency of t allele ranging from 14-32% as compared to other racial groups. Egyptians and American whites show intermediate frequencies i.e., 49-59%. Australoids show frequencies rather on the higher side i.e., 70%. Previously studied Pakistani human populations showed frequencies of t alleles ranging from the intermediate frequencies i.e., 0.48, 0.50 and 0.58% in the Chitrali, Kalash and Kati populations, respectively to higher frequencies i.e., 76% in Sindhis. The frequencies of t allele obtained from the present study are also somewhat intermediate i.e., 54-62%, for two solutions differing in their concentration.

According to Stern, [3], a curious relation exists between the ability to taste phenylthiocarbamide and certain types of thyroid disease called the nodular goitre. Among

affected persons a significantly higher frequency of non-tasters has been found than among non-affected. PTC is chemically related to substances which produce goitre, and it is possible to speculate on selective forces involving disease in determining polymorphism at the PTC locus. An understanding of this problem is still to be attained [3].

Phenylethiocarbamide appeared to suppress somatic growth and development of the Sarotherodon aureas, when eggs and larvae were treated with it. It was presumably due to an inibitory effect on the thyroid gland [8].

The ability to taste PTC behaves like a Mendelian trait with minor complications. The majority of people are tasters (homozyaous or heterozygous for dominant allele), a large minorit non-tasters (homozygous recessives) [3].

The results of the present study showing lack of differences in relatives frequencies of tasters and non-tasters in the two sexes and between populations are in contrast with the findings of Lee [2], who found a higher proportion of non-tasters among males than females, and those Negoescu *et al.*, [5] who found statistically signficant genetic hetero-

Table 1. Relative frequencies of tasters and non-tasters among males and females for solution No. 1

Sex	Tasters	Non-tasters	Total
Females	259	162	421
Males	49	29	78
TOTAL	308	191	499

x^2 (1) = 0.008138

$0.90 < P < 0.95$

Table 2. Relative frequencies of tasters and non-tasters among males and females for solution No. 2

Sex	Tasters	Non-tasters	Total
Females	280	141	421
Males	55	23	78
TOTAL	335	164	499

x^2 (1) = 0.314

$0.5 < P < 0.7$

Table 3. Relative frequencies of tasters and non-tasters among males and females for both solution 1 and 2

Solution	Sex	Tasters	Non-tasters	Total
No. 1	Females	259 (271)	162 (150)	421
	males	49 (50)	29 (28)	78
No. 2	Females	280 (271)	141 (150)	421
	males	55 (50)	23 (28)	78
TOTAL		643	355	998

x^2 (3) = 3.7788

$0.3 < P < 0.5$

Table 4. Results of survey on various human population regarding ability to paste PTC

Populations	Sample size	Tasters	Frequency of t allele	Reference
Australoids	152	51	0.70	Valls, 1958
American Whites	> 6000	65-75	0.5-0.59	"
Egyptians	208	76	0.49	"
American Blacks	> 3000	91	0.30	"
African Negroes	> 1000	91-97	0.17-0.30	"
Chinese	> 200	89-94	0.24-0.32	"
American Indians	> 1000	90.98	0.14-0.32	"
Chitrali	43	77	0.48	Graziosi, 1964

Continued

Table 4 (Continued)

Kalash	60	75	0.50	"
Kati	33	67	0.58	"
Sindhi	49	42	0.76	Bernhard, 1967
Pathan	111	60	0.63	"
Pathan	148	52	0.69	"
For solution No. 1 (Punjabi (females from local population of Rawalpindi)	421	62	0.62	Present study
Mixed (male students of Quaid-i-Azam University, Islamabad)	78	63	0.61	"
For solution No. 2 Punjab (females from local population of Rawalpindi)	421	67	0.57	"
Mixed (male students of Quaid-i-Azam University, Islamabad	78	71	0.54	"

geneity with regard to PTC taste sensitivity in relation to sex and places of origin. Negoescu *et al.*, [5] also found lack of an increased potential in non-tasters (tt) to develop goitre which is in contradiction with the previous findings referred to by Stern [3] showing a correlation between lack of ability to taste PTC and tendency to develop goitre. Statistically significantly higher number of non-tasters among the polio patients than in non-polio patients were found in an Israeli population for an association between PTC tasting and polio [6].

The polymorphism for PTC tasting ability has also been observed in primates other than man. Out of 28 chimpanzees in British zoos, 20 showed by their unambiguous reactions that they were tasters, while 7 were obviously non-tasters. Among the three orangutans available, two were tasters and one was a non-tasters. Other species were represented by one or two specimens only, some being tasters and some not [3].

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