

TASTE SENSITIVITY TO PHENYLTHIOUREA AMONG LEPROSY AND FILARIAL PATIENTS IN COASTAL ANDHRA PRADESH

B.R. BUSI

SUMMARY

Taste blindness for PTC has been studied in (a) 416 leprosy patients and 424 healthy subjects, and (b) 261 filarial patients and 136 normal individuals of both sexes. A significant difference was found between leprosy patients and the healthy control group in the proportion of nontasters ($\chi^2 = 4.096$, for 1 *DF*, $P < 0.05$). No significant difference could be observed between the filariasis and the control group ($\chi^2 = 0.605$, for 1 *DF*, $P > 0.30$).

In modern clinical genetics the analysis of multifactorial genetic systems is of increasing importance. Monogenic factors are probably important in multifactorial genetic systems too, as for example, the ability to taste phenylthiourea (PTC).

An extensive field investigation was undertaken by the author in some of the villages under Amalapuram, Ramachandrapuram taluks of East Godavari district, Narsapur in West Godavari district of coastal Andhra Pradesh during April-July 1970.

The purpose of the survey was to determine whether the taste blindness gradient may also be due to disease selection, as leprosy and filariasis are common in this area. Leprosy patients were selected because an association of the taste blindness gene was earlier reported by Beiguelman (1962, 1964*b*) in his leprosy patients, and among patients with both tuberculosis and leprosy (1964*a*). As for the filariasis, nothing was reported so far, with regard to the proportion of nontasters, among affected and nonaffected subjects. Therefore, it seemed interesting to enquire whether a similar association between these diseases and taste blindness for PTC would be discernible.

MATERIAL AND METHOD

A total number of 677 patients (416 leprosy and 261 filarial cases) were tested against a suitable control of 560 subjects.

For PTC taste sensitivity the sorting technique of Harris and Kalmus (1949) could not be followed because of obvious difficulties in field work. A simplified technique was used instead. A PTC solution at the highest concentration level (Harris and Kalmus 1949), 1300 mg per 1 litre of boiled redistilled water, was prepared; the subjects were given 1 ml of the solution to taste and their reactions were noted.

Leprosy

A total number of 416 patients affected with leprosy (323 males and 93 females) and aged from 7 to 80 years were examined. The patients were further classified into lepromatous and tuberculoid types on the basis of their histobacteriological disease characters and degrees of infection with the help of an expert leprologist.

As the Indian population is highly stratified according to castes, religion, etc., selection of suitable controls had to be considered very carefully. It was, therefore, decided to match, if possible, every patient with a sibling or, in rare cases, another near relative who lived together with him, or at least a person belonging to the same caste, sex and age, but who was not affected. As a result, a total of 424 controls (333 males and 91 females) were tested against 416 patients.

Filariasis

As to filariasis, the patient series could supply 261 individuals (110 males and 151 females) against a control of 136 individuals (49 males and 87 females) aged 10 to 75 years.

The diagnosis of filariasis was based on the type of fever, the degree of severeness and the growth of adipose tissue (swelling) with the help of an expert in filariasis. The disease was further classified into three stages: (1) no swelling, (2) ordinary swelling, and (3) acute or elephantoid swelling, on the basis of either swelling or other clinical manifestation.

RESULTS

The table shows the frequency of PTC nontasters among both the leprosy and the filarial series, as well as among their corresponding controls. From that table it is apparent that no sex difference could be ascribed, neither within the patient series nor within the controls. It is also evident that the frequency of nontasters in the pooled series of leprosy cases (17.07%) is significantly different from the proportion of nontasters in the healthy control group (22.64%). (In fact, $\chi^2 = 4.096$, 1 *DF*, $P < 0.05$.) However, no significant difference could be observed when both types of leprosy are compared separately to the control sample ($\chi^2 = 3.244$, 1 *DF*, $P > 0.05$ for the lepromatous type and $\chi^2 = 1.860$, 1 *DF*, $P > 0.20$ for the tuberculoid type.)

Concerning the patients with filariasis as compared to their control group, no significant difference could be observed with regard to the frequency of nontasters ($\chi^2 = 0.605$, 1 *DF*, $P > 0.30$).

While in both patients and control series the males show consistently a higher frequency of nontasters, a significant difference could only be observed in the control group ($\chi^2 = 5$, 1 *DF*, $P < 0.02$). The same was not true for the patient series ($\chi^2 = 1.216$, 1 *DF*, $P > 0.20$). This significance observed in the control group might be due either to chance or to the small sample size.

DISCUSSION

Harris et al. (1949) have studied the reaction to PTC of patients suffering from different forms of thyroid diseases. They found a higher incidence of nontasters among

TABLE
FREQUENCY OF PTC NONTASTERS AMONG THE AFFECTED (LEPROSY AND FILARIAL) AND HEALTHY SERIES

Series	Sex	No.	Nontasters		Sex difference	
			No.	%	χ^2	P (1 DF)
Lepromatous	M	217	40	18.43	1.021	$P > 0.30$
	F	75	10	13.33		
	M+F	292	50	17.12		
Tuberculoid	M	106	18	16.98	0.001	$P > 0.99$
	F	18	3	16.67		
	M+F	124	21	16.94		
Both leprosy types	M	323	58	17.96	0.807	$P > 0.30$
	F	93	13	13.98		
	M+F	416	71	17.07		
Control of leprosy sample	M	333	73	21.92	0.459	$P > 0.50$
	F	91	23	25.27		
	M+F	424	96	22.64		
Filarial patients	M	110	25	22.73	1.949	$P > 0.20$
	F	151	24	15.89		
	M+F	261	49	18.77		
Control of filarial sample	M	49	16	32.65	5.0	$P < 0.02$
	F	87	14	16.09		
	M+F	136	30	22.06		

patients with nodular goitre. Kitchin et al. (1959) confirmed these findings and showed a gross excess of nontasters among males with nontoxic goitre. Brand (1963, 1964) has also found the same significant difference of incidence of nontasters among patients with endemic goitre and also in poliomyelitis. Fraser (1961) found an even greater excess of nontasters in a series of children with a presumptive diagnosis of athyreotic cretinism. Sheppard and Gartler (1960) have also reported the same phenomenon. Saldanha (1956) has observed a highly significant difference among Brazilians, in the proportion of nontasters, between the tuberculous and healthy people. As for diabetics, Terry and Segall (1947) and Terry (1950) have reported a highly significant difference between diabetics and nondiabetics in the frequency of nontasters. But Akesson (1958) found no significant differences in the incidence of nontasters both in diabetic patients and in tuberculosis. In his attempt to find out a probable association, Beiguelman (1962, 1964a-b) observed a significant value in the proportion of nontasters in tuberculosis as well as in leprosy. However, in their follow-up study, Beiguelman and Marques (1964) did not find any statistically significant correlation, in their leprosy patients with four-years disease duration, between PTC and clinical manifestation. Relatively less incidence of nontasters among the leprosy and tuberculous patients is worth mentioning.

Most investigators have found that females are more sensitive to PTC than males (Kalmus 1957, Terry 1950, Brand 1964, etc.). On the other hand, there are workers who did not get differences between the two sexes with respect to the incidence of nontasters (Harris et al. 1949 and Akesson 1958, *inter alia*). In our present investigation no sex differences were found with regard to the nontasters incidence both in leprosy and filariasis and in the control group, except in the matched controls against filariasis. The reason for divergent findings in this respect is not clear, but may be due to the result of chance as well as to the small size of the data.

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REFERENCES

- Akesson H.O. 1958. Taste sensitivity to phenylthiourea in tuberculous and diabetes mellitus. *Ann. Hum. Genet., Lond.*, 23: 262-265.
- Beiguelman B. 1962. Reação gustativa a feniltiocarbamida (PTC) e lepra. *Rev. Bras. Leprol.*, 30: 111-124.
- Beiguelman B. 1964a. Taste sensitivity to phenylthiourea among patients affected with both tuberculosis and leprosy. *Acta Genet. Med. Gemellol.*, 13: 190-192.
- Beiguelman B. 1964b. Taste sensitivity to phenylthiourea and leprosy. *Acta Genet. Med. Gemellol.*, 13: 193-196.
- Beiguelman B., Marques M.B. 1964. Taste sensitivity to phenylthiourea and drugs with antileprotic effect. *Acta Genet. Med. Gemellol.*, 13: 200-202.
- Brand N. 1963. Taste sensitivity and endemic goitre in Israel. *Ann. Hum. Genet., Lond.*, 26: 321-324.
- Brand N. 1964. Taste response and poliomyelitis. *Ann. Hum. Genet., Lond.*, 27: 233-239.
- Chung C.S., Witkop C.J., Henry J.L. 1964. A genetic study of dental caries with special reference to PTC taste sensitivity. *Am. J. Hum. Genet.*, 16: 231.
- Fraser G.R. 1961. Cretinism and taste sensitivity to phenylthiocarbamide. *Lancet*, I: 964-965.
- Harris H., Kalmus H. 1949. The measurement of taste sensitivity to phenylthiourea (PTC). *Ann. Eugen., Lond.*, 15: 24-31.
- Harris H., Kalmus H., Trotter W.R. 1949. Taste sensitivity to phenylthiourea in goitre and diabetes. *Lancet*, II: 1038.
- Kalmus H. 1957. Defective colour vision, PTC tasting and drepanocytosis in samples from fifteen Brazilian populations. *Ann. hum. Genet.*, 21: 313.
- Kitchin F.D., Howel-Evans W., Clarke C.A., Mc Connel R.B., Sheppard P.M. 1959. PTC taste response and thyroid disease. *Br. Med. J.*, 1: 1069-1074.
- Saldanha P.H. 1956. Apparent pleiotropic effect of genes determining taste thresholds for phenylthiourea. *Lancet* 11: 74.
- Sheppard II T.H., Gartler S.M. 1960. Increased incidence of non-tasters of phenylthiocarbamide among congenital athyreotic cretins. *Science*, 131: 929.
- Terry M.C., Segall G. 1947. The association of diabetes and taste blindness. *J. Hered.*, 38: 135-137.
- Terry M.C. 1950. Taste blindness and diabetes in the colored population of Jamaica. *J. Hered.*, 41: 306-307.

RIASSUNTO

La sensibilità gustativa alla PTC è stata studiata in (a) 416 pazienti di lebbra e 424 controlli e (b) in 261 pazienti di filariasi e 136 controlli di ambedue i sessi. Mentre una differenza significativa per la proporzione di non-gustatori è stata riscontrata fra lebbrosi e controlli ($\chi^2 = 4.096$, $P < 0.05$ per 1 *gl*), nessuna differenza significativa è stata riscontrata fra pazienti di filariasi e controlli ($\chi^2 = 0.605$, $P > 0.30$ per 1 *gl*).

RÉSUMÉ

Le goût pour la PTC a été étudié chez (a) 416 patients de lèpre et 424 contrôles et (b) chez 261 patients de filariose et 136 contrôles des deux sexes. Tandis qu'une différence significative dans la proportion de non-gôûteurs a été trouvée entre patients de lèpre et contrôles ($\chi^2 = 4.096$, $P < 0.05$ pour 1 *dl*), aucune différence significative n'a été trouvée entre patients de filariose et contrôles ($\chi^2 = 0.605$, $P > 0.30$ pour 1 *dl*).

ZUSAMMENFASSUNG

Untersuchung des Geschmacks für PTC bei (a) 416 Leprakranken und 424 Kontrollen und (b) 261 Filariasefällen und 136 Kontrollen beiderlei Geschlechts. Der Anteil der Nichtschmecker war bei Leprakranken und Kontrollen sehr unterschiedlich ($\chi^2 = 4.096$, $P < 0.05$ für 1 *Fg*); zwischen den Filariasekranken und ihren Kontrollen hingegen bestand kein wesentlicher Unterschied ($\chi^2 = 0.605$, $P > 0.30$ für 1 *Fg*).

Dr. B.R. Busi, Department of Anthropology, Andhra University, Waltair, AP, India.
