

INHERITANCE OF DERMAL RIDGES: RELATION BETWEEN FINGER AND PALMAR a-b RIDGE COUNTS

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Summary The correlation of the ridge counts between the right and left fingers is highly significant. The correlation of the a-b ridge counts between the right and left palms is also highly significant. However, no correlation is present between the finger ridge count and palmar a-b ridge count. The findings suggest that the set of genes responsible for the finger ridge count are different from those responsible for the palmar a-b ridge count.

INTRODUCTION

The problem of inheritance of dermal ridges, ever since Galton's pioneering observation, has evinced the interest of workers in the field of dermatoglyphics. While the studies on families and twins conclusively proved that they are inherited (Bonnie, 1924; Mitra *et al.*, 1966; Lamy *et al.*, 1957; Newman, 1930; Mavalwala, 1966; Loesch, 1971, 1974; Penrose, 1972), the exact mode of their inheritance is still not well understood. Most of the workers working either on finger or palmar ridge counts concluded that they are due to polygenes with additive effect (Holt, 1952, 1954, 1955, 1956, 1957, 1958, 1961a, b, 1968; Pons, 1964; Tiwari, 1966; Glanville, 1965a, b).

In the present paper an attempt has been made to find out if there is any relationship between the finger and the palmar a-b ridge counts.

MATERIALS AND METHODS

The finger ridge counts have been made according to Cummins and Midlo (1961), while the palmar a-b ridge counts have been made according to Chattopadhyay (1966) and Mitra *et al.* (1966). In the case of whorls, and in case where an accessory triradius was found to be present, the higher ridge count has been considered in the final analysis.

The data analysed consists of inked bilateral finger and palmar prints of 105 Malays and 58 Chinese (all males) collected from the city of Alor Star, Kedah, Malaysia by one of us (D.G.).

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Table 1. Correlation coefficients (r) for finger and palmar ridge counts (Malays).

	r	t-test value	Comment
Right fingers-Left fingers	0.87	19.64	Very highly significant
Right a-b-Left a-b	0.72	10.59	-do-
Right fingers-Right a-b	0.07	0.71	Insignificant
Left fingers-Left a-b	0.02	0.20	-do-
Right fingers-Left a-b	0.02	0.20	-do-
Left fingers-Left a-b	0.10	1.23	-do-
Total fingers-Total a-b (R+L) (R+L)	0.05	0.51	-do-

Table 2. Correlation coefficients (r) for finger and palmar ridge counts (Chinese).

	r	t-test value	Comment
Right fingers-Left fingers	0.69	7.08	Significant
Right a-b-Left a-b	0.57	5.61	-do-
Right fingers-Right a-b	0.08	0.59	Insignificant
Left fingers-Left a-b	0.08	0.59	-do-
Right fingers-Left a-b	0.13	1.06	-do-
Left fingers-Left a-b	0.08	0.06	-do-
Total fingers-Total a-b (R+L) (R+L)	0.02	0.15	-do-

RESULTS AND DISCUSSION

The correlation coefficients calculated are given in Table 1. It is evident that the correlations between the right and left finger ridge counts and between the right palmar and left palmar ridge counts are very highly significant, while the correlations between the finger and palmar a-b ridge counts are very insignificant. From these it seems probable that separate set of genes are responsible for the finger and palmar ridge counts; the influence of one set over the other is extremely low.

Chattopadhyay (1968) working on the interdigital triradial palmar ridge counts found a very high degree of correlation between them. He concluded that "from this, it appears probable that the interdigital triradial ridge counts are determined by the same set of genes."

Further work is needed to elucidate this problem.

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REFERENCES

- Bonnevie, K. 1924. Studies on papillary twins patterns of human fingers. *J. Genet.* **15**: 1.
- Chattopadhyay, P.K. 1966. Quantitative estimation of the distance between the two digital triradii a and d in palmar dermatoglyphics of the Maharashtrians. *Am. J. Phys. Anthropol.* **24**: 261.
- Chattopadhyay, P.K. 1968. Genetics of the dermal ridges: correlation between inter-digital triradial distances in palmar dermatoglyphics. *Acta Crim. Jpn.* **34**: 163-167.
- Cummins, H., and Midlo, C. 1961. *Finger Prints, Palms and Soles*. Dover Publ., New York.
- Glanville, E.V. 1965a. Heredity and dermal patterns in the interdigital areas of the palm. *Acta Genet. Med. Gemmel* (Rome), **14**: 295.
- Glanville, E.V. 1965b. Heredity and line A of palmar dermatoglyphics. *Am. J. Hum. Genet.* **17**: 420.
- Holt, S.B. 1952. Genetics of dermal ridges: inheritance of total finger ridge count. *Ann. Eugen. (Lond.)* **17**: 140.
- Holt, S.B. 1954. Genetics of dermal ridges: bilateral asymmetry in finger ridge counts. *Ann Eugen. (Lond.)* **18**: 211.
- Holt, S.B. 1955. Genetics of dermal ridges: frequency distribution of total finger ridge count. *Ann. Hum. Genet. (Lond.)* **20**: 159.
- Holt, S.B. 1956. Genetics of dermal ridges: parent child correlation for total ridge count. *Ann. Hum. Genet. (Lond.)* **20**: 278.
- Holt, S.B. 1957. Quantitative genetics of dermal ridge patterns on fingers. *Acta Genet. (Basel)* **6**: 473.
- Holt, S.B. 1958. Genetics of dermal ridges: the relation between total finger ridge-count and the variability of counts from finger to finger. *Ann. Hum. Genet. (Lond.)* **22**: 323.
- Holt, S.B. 1961a. Quantitative genetics of finger print patterns. *Brit. Med. Bull.* **17**: 247.
- Holt, S.B. 1961b. Inheritance of dermal ridge patterns. In *Recent Advances in Human Genetics*, Chap. 6, Penrose, L.S. ed., J & A Churchil Ltd., London, p. 101.
- Holt, S.B. 1968. *The Genetics of Dermal Ridges*, Charles C. Thomas, Springfield, Illinois.
- Lamy, M., Frezal, J., de Grouchy, J., and Kelley, J. 1957. Le nombre de dermatoglyphes dans un enchantillon de jumeaux. *Ann. Hum. Genet. (Lond.)* **21**: 374.
- Loesch, D. 1971. Genetics of dermatoglyphic patterns on palms. *Ann. Hum. Genet.* **34**: 277.
- Loesch, D. 1974. Genetical studies on sole and palmar dermatoglyphics. *Ann. Hum. Genet.* **37**: 405-420.
- Mavalwala, J.D. 1966. Inheritance studies in dermatoglyphics. *Ann. N.Y. Acad. Sci.* **134**: 812-814.
- Mitra, A.K., Chattopadhyay, P.K., Sharma, P.D., and Bardhan, A. 1966. Inheritance of the a-b ridge count in human palms. *Humangenetik* **2**: 25.
- Newman, H.H. 1930. The finger prints of twins. *J. Genet.* **23**: 415.
- Penrose, L.S. 1972. Genetical studies in dermatoglyphics (Abstract). *Int. Dermatoglyphics Assoc.*, New Bulletin, June, p. 16.
- Pons, J. 1964. Genetics of the a-b ridge count on the human palm. *Ann. Hum. Genet. (Lond.)* **27**: 273.
- Tiwari, S.C. 1966. Genetical analysis of the a-b ridge counts. *The Anthropologist* (Univ. Delhi) **12**: 25.