

# Simple Segregations in Two Families of Mixed Origin

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## SUMMARY

Variations in skin color and palm patterns were investigated in two families in which the fathers are of mixed Negro-White origin and the mothers are Dutch. Segregation among the children indicates that two genes with cumulative effects are responsible for dark shades of skin in family A, whereas only one gene is responsible for dark skin in family B.

In family A the mother is heterozygous for accessory triradii and vestigial patterns in distal palmar areas, whereas in family B the father is heterozygous. Skin color and patterns in distal palmar areas do not occur independently among the children in family B, suggesting the possibility of linkage.

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Families in which one parent is of mixed Negro-White origin and the other is of European extraction are not uncommon in the island of Curaçao, Netherlands Antilles. There is no university in Curaçao and many of the best students from secondary schools are sent to Holland for higher education and technical training. Many of them marry Dutch spouses during their stay in Holland, after which they return to Curaçao.

This report is concerned with two such families. In each the father is of mixed origin and the mother is Dutch. In one of these, designated as family A, there are 6 children. There are 8 children in family B. Kodachrome photographs were obtained of the parents and 5 of the children in A, and both parents and 7 children in B (one of the children was not in Curaçao at the time). Hand prints were obtained from all members of family A, and from the parents and 7 children in B.

## PIGMENTATION

Family A is illustrated in Fig. 1. The oldest child has dark skin like the father. The second oldest and the youngest have as light or lighter skin than their mother. The other three (the youngest not included in the photo) have skin color lighter than the father and darker than the mother. The youngest boy has blond hair.

In family B the mother has dark auburn hair and freckles. Three of the children have skin color similar to the mother, red or auburn hair, and freckles. All of the other children have dark skin, hair and eyes.



Fig. 1. Photograph of family A. Upper right, father and mother; upper left, oldest child; middle row, left to right, children in age order; front, youngest in the photograph.

#### ACCESSORY TRIRADII AND VESTIGIAL PATTERNS IN PALMAR AREAS II, III AND IV

In family A the mother has vestigial patterns on interdigital areas III and IV of the right palm and II of the left, also an accessory triradius in area III (Tab. I). Five of the children have one or more accessory triradii and vestigial patterns in one or more areas.

In family B the father has a vestigial pattern on interdigital area IV of both palms, whereas the mother lacks accessory triradii and vestigial patterns in areas II, III and IV (Tab. II). Five of the children have vestigial patterns in one or more distal palmar areas and one has an accessory triradius in interdigital IV.

**Tab. I. Accessory triradii and vestigial patterns in Family A**

	Side	Palmar areas		
		II	III	IV
(1)	R	<i>O</i>	<i>O</i>	<i>O</i>
	L	<i>O</i>	<i>O</i>	<i>O</i>
(2)	R	<i>O</i>	<i>V</i>	<i>V</i>
	L	<i>V</i>	<i>D</i>	<i>O</i>
(3)	R	<i>O</i>	<i>O</i>	<i>D</i>
	L	<i>D</i>	<i>O</i>	<i>D</i>
(4)	R	<i>D</i>	<i>O</i>	<i>D</i>
	L	<i>V</i>	<i>O</i>	<i>D</i>
(5)	R	<i>V</i>	<i>O</i>	<i>D</i>
	L	<i>V</i>	<i>D</i>	<i>O</i>
(6)	R	<i>O</i>	<i>O</i>	<i>O</i>
	L	<i>O</i>	<i>O</i>	<i>O</i>
(7)	R	<i>D</i>	<i>O</i>	<i>D</i>
	L	<i>O</i>	<i>O</i>	<i>O</i>
(8)	R	<i>O</i>	<i>O</i>	<i>D</i>
	L	<i>O</i>	<i>V</i>	<i>O</i>

NOTE: Formulations are listed in the following order: father, mother and children according to age, beginning with the oldest (Fig. 1). *D* symbolizes an accessory triradius; *V*, vestigial pattern; *O*, no configuration.

**Tab. II. Accessory triradii and vestigial patterns in Family B**

	Side	Palmar areas		
		II	III	IV
(1)	R	<i>O</i>	<i>O</i>	<i>V</i>
	L	<i>O</i>	<i>O</i>	<i>V</i>
(2)	R	<i>O</i>	<i>O</i>	<i>O</i>
	L	<i>O</i>	<i>O</i>	<i>V</i>
(3)	R	<i>V</i>	<i>O</i>	<i>O</i>
	L	<i>O</i>	<i>O</i>	<i>V</i>
(4)	R	<i>O</i>	<i>O</i>	<i>O</i>
	L	<i>O</i>	<i>O</i>	<i>V</i>
(5)	R	<i>O</i>	<i>O</i>	<i>D</i>
	L	<i>O</i>	<i>O</i>	<i>O</i>
(6)	R	<i>O</i>	<i>O</i>	<i>O</i>
	L	<i>O</i>	<i>O</i>	<i>O</i>
(7)	R	<i>O</i>	<i>O</i>	<i>O</i>
	L	<i>O</i>	<i>O</i>	<i>O</i>
(8)	R	<i>O</i>	<i>O</i>	<i>O</i>
	L	<i>O</i>	<i>O</i>	<i>O</i>
(9)	R	<i>V</i>	<i>O</i>	<i>O</i>
	L	<i>O</i>	<i>O</i>	<i>O</i>

NOTE: 1, 2, 3, 4, and 5 are formulations for father and dark pigmented children; 6, 7, 8, and 9 are those for mother and lighter pigmented children.

## Discussion

In family A the ratio of different shades of skin color among the children is 1 dark; 3 intermediate; 2 light. The latter are no darker than the mother. This is close to the expected backcross ratio if the father is heterozygous for two pairs of alleles affecting skin color and having cumulative effects. In family B the ratio is 4 dark; 3 light, as close as possible to the 1:1 backcross ratio when only a single set of alleles is involved.

The occurrence of accessory triradii and vestigial patterns in distal areas of the palm is of particular interest in both of these families. The concentration of these configurations is high within individuals in A, a total of 19 occurring on the palms of the mother and 5 children. Seven occur on interdigital II, 4 on III and 8 on IV.

Among 6 individuals in B the total number of these configurations is only 8, 2 of which are on II and 6 on IV. Among these only 1 is a true pattern, the rest being vestiges. Investigations have indicated that patterns in distal palmar areas resulting from accessory triradii and vestiges (*D* and *V*) are caused by one or more dominant genes with incomplete penetrance and variable expressivity (Weinand, 1937; Bansal and Rife, 1962). Thus one parent in both A and B is apparently heterozygous and the other parents are homozygous recessive. The great difference in pattern concentration in these families suggests the possibility that different dominant alleles may be involved, one of which results in high and the other in low pattern concentration.

In A the father is heterozygous for skin color and homozygous recessive for *D* and *V* configurations; the mother is homozygous for skin color and heterozygous for *D* and *V* in distal palmar areas. In B the father is heterozygous for skin color and *D* and *V* configurations, whereas the mother is homozygous recessive for both variations. If no linkage is involved, skin color and palm patterns should segregate independently in this family. This is not the case as four of the children resemble the father in both traits and two resemble the mother. Only one child is an exception, having light skin and a vestigial pattern in area IV. This observation suggests linkage, and is of interest because studies of populations of mixed origin have revealed associations between these same traits also suggestive of linkage (Rife, 1954 a, b; 1971).

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### RIASSUNTO

L'autore ha studiato le variazioni del colore della pelle e dei disegni palmari in due famiglie con padri di origine mista bianco-negra e madri olandesi.

Per quanto riguarda il colore scuro della pelle, la segregazione nei figli indica che due geni con effetto additivo sono responsabili di tale carattere nella famiglia A, e un solo gene nella famiglia B.

Per quanto riguarda invece i triradi accessori e i disegni vestigiali nelle aree distali palmari, sono risultati eterozigoti la madre nella famiglia A, il padre nella famiglia B.

I caratteri descritti non si manifestano in modo indipendente nei figli della famiglia B, il che suggerisce la possibilità di linkage.

### RÉSUMÉ

L'auteur a étudié les variations de la couleur de la peau et des dessins palmaires chez deux familles dans lesquelles les pères étaient d'origine mixte blanche-noire et les mères hollandaises.

En ce qui concerne la couleur foncée de la peau, la ségrégation chez les fils indique que deux gènes avec effet additif sont responsables de ce caractère dans la famille A, et un seul gène dans la famille B.

Au contraire, en ce qui concerne les triradii accessoires et les dessins vestigiaux des régions distales palmaires, dans la famille A la mère est résultée hétérozygotique, dans la famille B le père.

Les caractères décrits ne se manifestent pas indépendamment chez les fils de la famille B, ce qui suggère l'hypothèse de linkage.

### ZUSAMMENFASSUNG

Verf. untersuchte die Variationen von Hautfarbe und Handflächenzeichnung bei zwei Familien, wo die Väter gemischt weiss-Negerursprungs, die Müttern hingegen Holländerinnen sind.

Die Verteilung der Hautfarbe bei den Kindern lässt bei Familie A auf zwei Gene mit additiver Wirkung, bei Familie B auf ein einziges verantwortliches Gen schliessen.

Bezüglich der Neben-Triradien und der nur angedeuteten Zeichnungen an den distalen Zonen der Handflächen war bei Familie A die Mutter und bei Familie B der Vater heterozygot.

Bei den Kindern der Familie B treten die beschriebenen Merkmale nicht unabhängig voneinander auf, was an ein Linkage denken lässt.

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