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Reproduction in a Mongoloid

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Introduction

Reproduction in mongoloids is a rarity. Allen and Baroff (1955) cite only four reports prior to 1949 which described such instances and Øster (1953) considered the diagnoses uncertain in two of those reports. At least seven more recent instances have been recorded (Le Long, Borniche, Kreisler, and Baudy, 1949; Sawyer, 1949; Forsmann and Thysell, 1957; Rehn and Thomas, 1957; Schlaug, 1957; Mullins, Estrada, and Gready, 1960; and Hanhart, 1960). In four of those cases the offspring were non-mongoloid and in three, mongoloid.

The case described by Rehn and Thomas (op. cit.) is the subject of this report. Because those authors were aware of the present comprehensive study, their diagnoses of mongolism were based on only routine clinical examinations. The purpose in making this investigation was to determine whether or not both the mother and her female offspring were mongoloid. Toward that end the mother and child were examined carefully for the presence of the various stigmata of mongolism. The results of those examinations are presented below.

Social History

The mother in the present case was living at home when 19 years of age and would probably not have been committed to an institution had she not become pregnant. She was committed with the diagnosis of mongolism and pregnancy three months prior to delivery and remained a patient at the institution until released on home parole a few months following delivery. Her child was committed with a diagnosis of mongolism shortly after birth and has never been away from the institution. Paternity is unknown, though the mother's father has been suspected.

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Physical Examination

The number of physical characteristics associated with mongolism is legion, but, of course, no single attribute is indispensible to the diagnosis. The following is an an account primarily of those of the patients' physical aspects which have been associated with mongolism. Unless specified otherwise, examinations were performed when the mother was 23 years, 7 months, and the child 4 years, 5 months of age.

The mother is a dwarf with a height of 142 cm. Her eyes are somewhat slanted, though she lacks the typical epicanthal fold of mongoloids. She has a depressed nasal root and a broad, short nose. Her lower lip protrudes somewhat and she has a large, thick tongue with deep fissures (see Fig. 1). Her palatine arch is high and she has a speech defect. Her cranium is brachycephalic with a cephalic index of .84. Her hair is naturally straight, but has been artificially waved. Its dark color probably reflects her Italian ancestry. Her hands are short and broad with stubby digits. Both hands exhibit curving of the fifth finger medially and there is a marked cleft between the first and second toe on both feet (see Fig. 2). She has the typical lax ligaments of the mongoloid as evidenced by the fact that her thumb can be folded over the back of her hand without pain. Her skin is dry and she exhibits genu valgum.

The child's facial characteristics include epicanthal folds bilaterally, slanted eyes, a depressed nasal root, a short, broad nose, a protruding lower lip, and her face appears somewhat small relative to the size of her head. She has a fissured tongue and suffers from chronic nasopharyngitis. Her cranium is brachycephalic with an index of .85. Her hair is dark and straight and her skin dry. Her hands are broad with short digits. The 5th fingers are curved toward the radial side and the middle phalanx of the 5th digit appears to be relatively short (see Figs. 3 and 4). She has a distinct cleft between the first and second toe bilaterally, as shown in Fig. 5. Her ligaments are lax, as evidenced by the fact that her hand can be bent flat against her inner forearm.

Ophthalmologic Examination

Examination of the mother revealed that she has chronic blepharitis and conjunctivitis and is hyperopic. Slit lamp examination of the mother's brown irides could not demonstrate the poverty of stromal fibers or peripheral speckling notes by Lowe (1949) as a mongoloid characteristic. She has small postcapsular opacities in the left eye which could not be resolved by the ophthalmoscope. Her daughter has a slow horizontal strabismus but did not have blepharitis or conjuctivitis at the time of the examination. It was not possible to obtain a slit lamp examination of the daughter due to her lack of cooperation.

Psychosocial Status

The mother was given the Stanford Binet Form L test when she was 20 years old and the same test was repeated at 23 years yielding estimated I. Q.'s of 41 and 44 respectively. The mother exhibits the affectionate nature so frequently observed in mon-

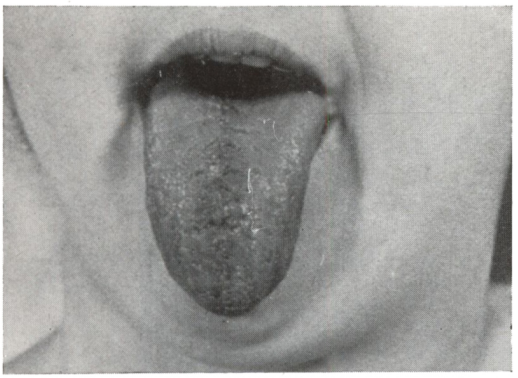

Fig. 1

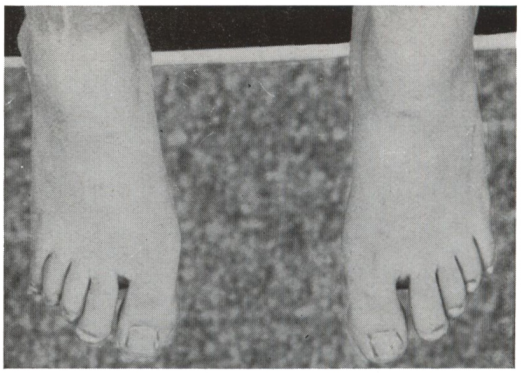

Fig. 2

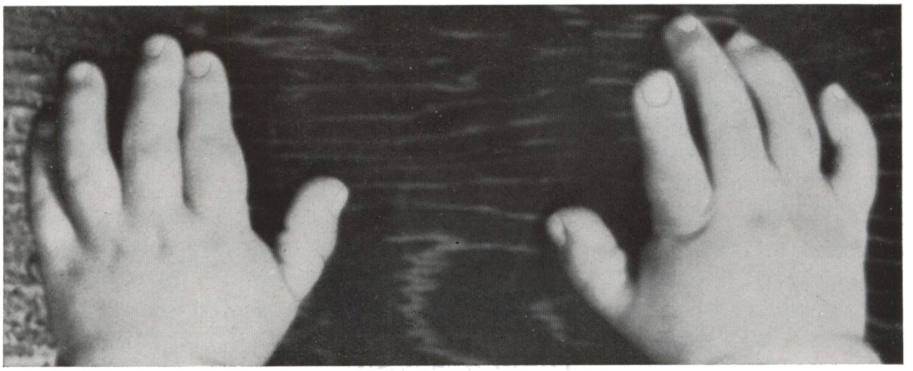

Fig. 3

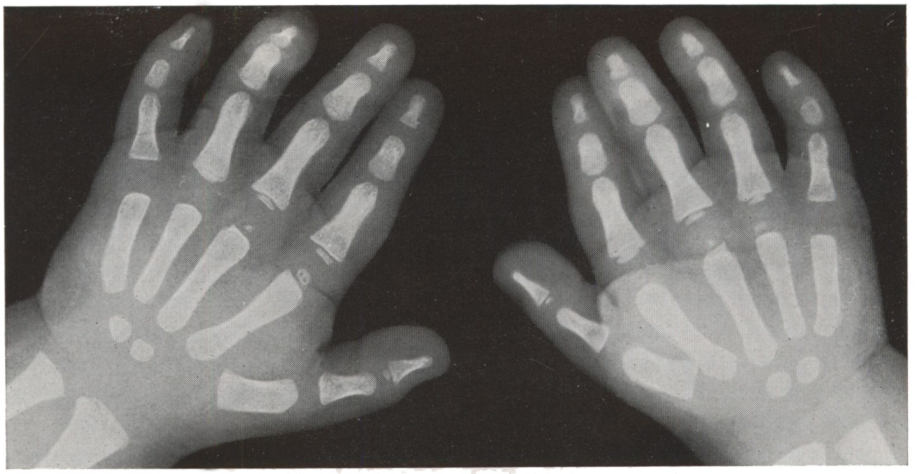

Fig. 4

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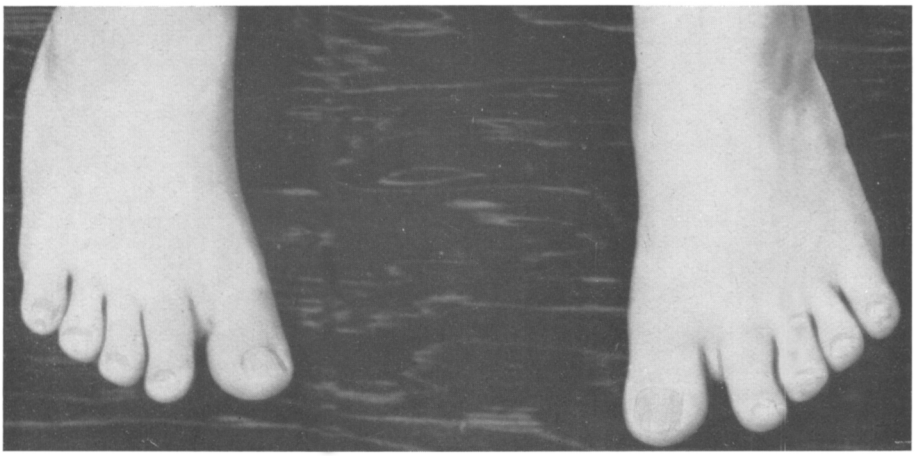


Fig. 5

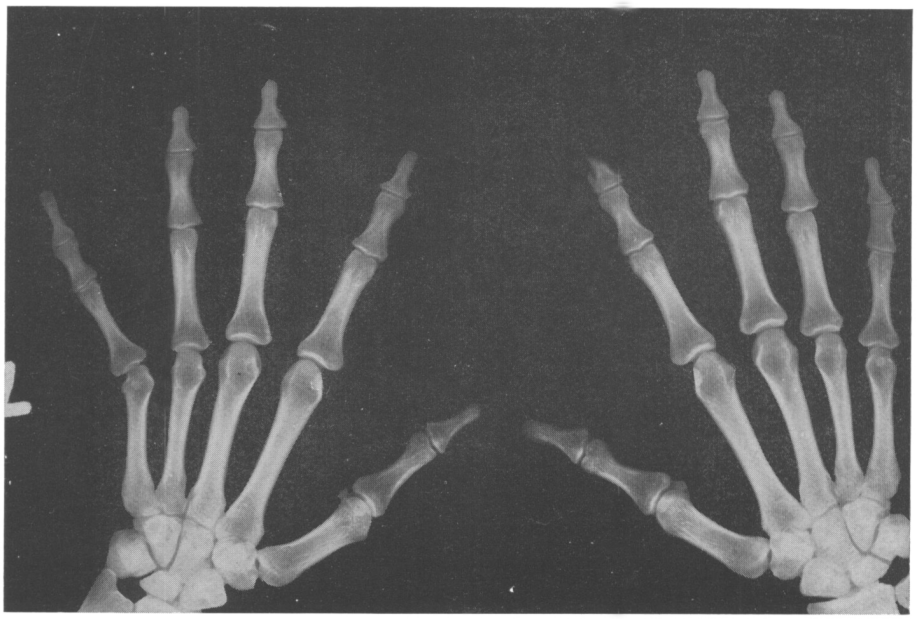
goloids. She is able to help with housework under supervision, and enjoys listening to radio and watching television. She has had some special schooling which has enabled her to learn to read elementary words. Her early development was probably somewhat retarded. Her parents related that she walked at 16 months and began to speak a few words at 3 years of age.

The child was given the Kuhlman Performance Test when 4 years and 5 months of age and was estimated to have an I. Q. of 22. She was still unable to feed herself and remained untidy. She had not yet developed speech. The child is, like the mother, very affectionate. The child's intellectual development is clearly in the usual range of mongoloids (Penrose, 1949).

X-ray Studies

X-ray studies of the skull and extremities of both child and mother were obtained. Typically a mongoloid exhibits some retardation of epiphysial ossification, hypoplasia of the middle phalanx of the 5th fingers, brachycephaly, and hypoplasia of the basilar cartilaginous bones, nasal bones and maxilla (Caffey, 1950). Fig. 6 illustrates the shortened middle phalanx of the 5th digit in the mother, and Fig. 4 the same condition in the child. Spitzer and Quillam (1958) and Spitzer and Robinson (1955) have drawn attention to the persistence of the metopic suture and the absence of frontal sinuses in mongolism. Normally, the metopic suture is obliterated during the third year, but persists throughout life in about 10% of cases (Caffey, op. cit. 1950). The frontal sinuses usually become evident about the third year and attain full development by the twentieth year. About 4% of normal persons do not develop one or both sinuses (de Lorimier, Mochring, and Hannan, 1954). Among 48 mogoloids in the two series examined by Spitzer and his co-workers, 45 were found to lack frontal sinuses, one gave equivocal evidence of frontal sinuses and two has sinuses which were

Fig. 6



reduced in size. In contrast, 21 out of 27 individuals with undifferentiated mental defect and with ages comparable to those of their older mongoloid patients had normal frontal sinuses. An x-ray of the mother's skull (see Fig. 7) demonstrates the absence of frontal sinuses, though there is no evidence of persistence of the metopic suture.

The child's x-rays revealed marked retardation of ossification. From the child's carpal (see Fig. 4) and tarsal bones her bone age was estimated at between 1 and 1½ years, as compared to her chronological age of 4½ years. Since persistence of the metopic suture and the absence of frontal sinuses in the child would not be diagnostic at her age, only the lateral film of the child's skull is presented in Fig. 8. That figure demonstrates the persistence of the anterior fontanelle and hypoplasia of the nasal and maxillary bones in this child.

According to statements of the mother's parents, her teeth erupted at the normal time. Similarly, the eruption of the child's teeth was normal for her age. The teeth of both are somewhat irregular in shape though the extensive restorations in the mother, including a partial denture, preclude a valid assessment of the aplasia and microdontism referred to by Spitzer and Robinson (op. cit.) as characteristic of the mongoloid.

Dermatoglyphic Data

Prints of the fingers, palms and plantar surfaces of both subjects were obtained using Faurot materials (Walker, 1957a) and are reproduced in Figs. 9-16). It is clear that the child's prints possess many of the mongoloid attributes first documented by

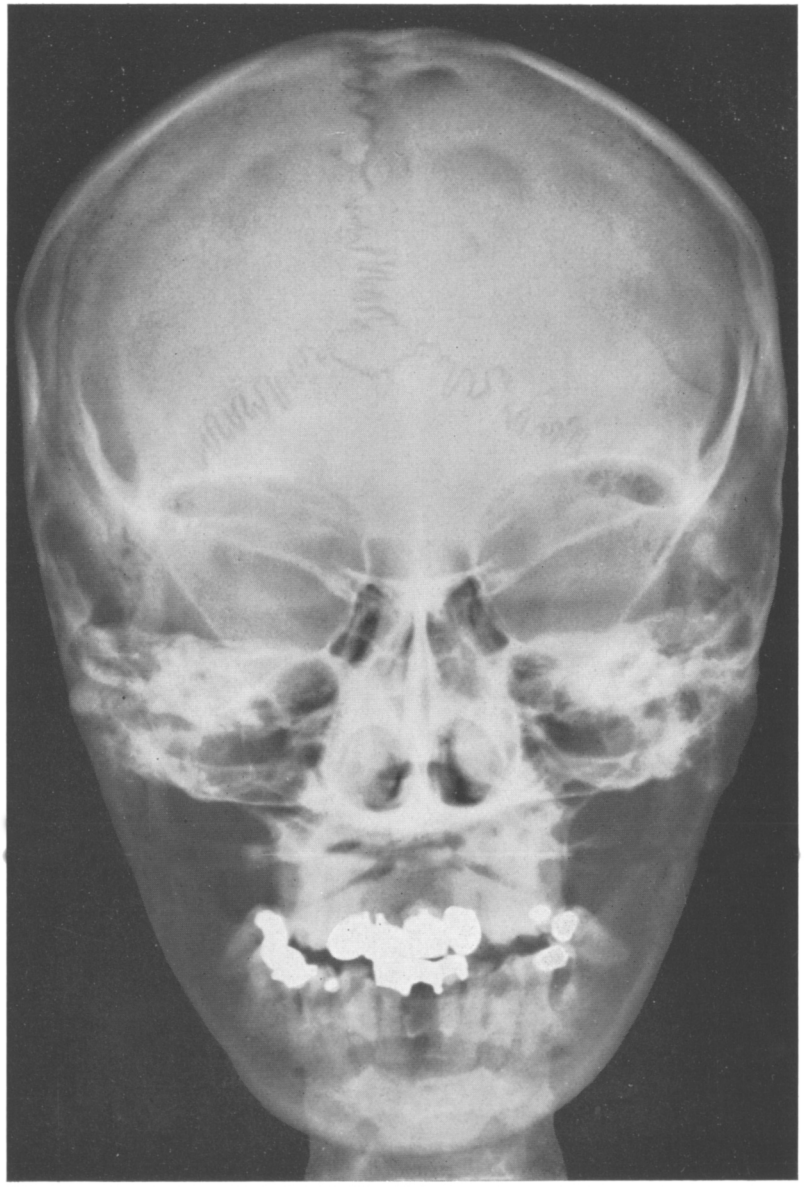


Fig. 7

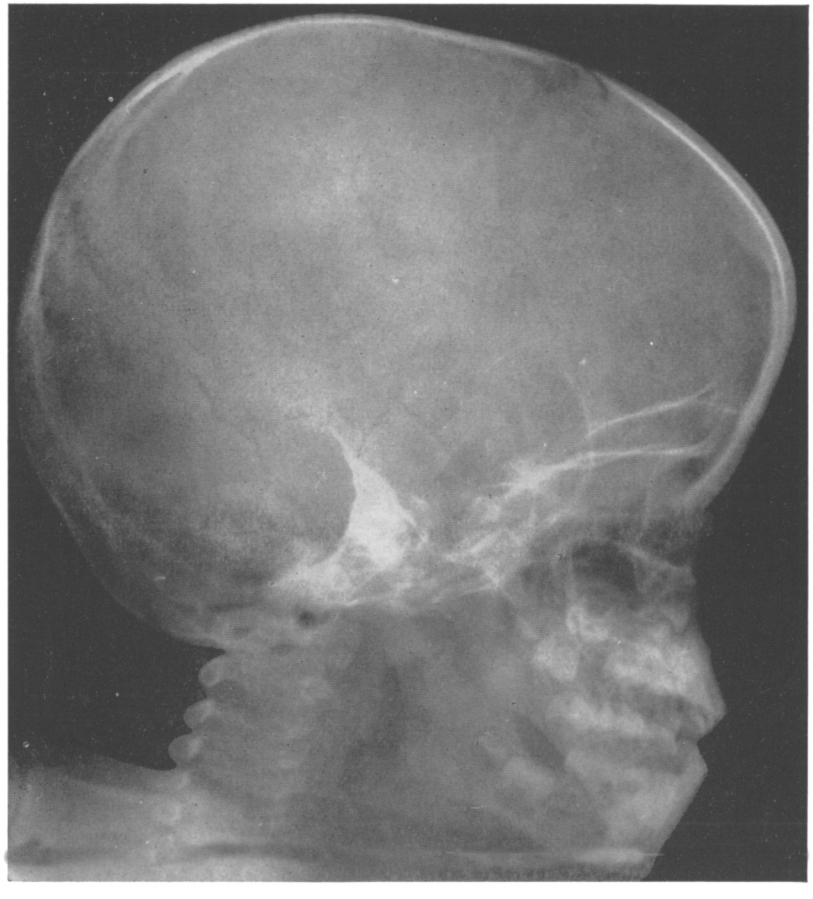


Fig. 8

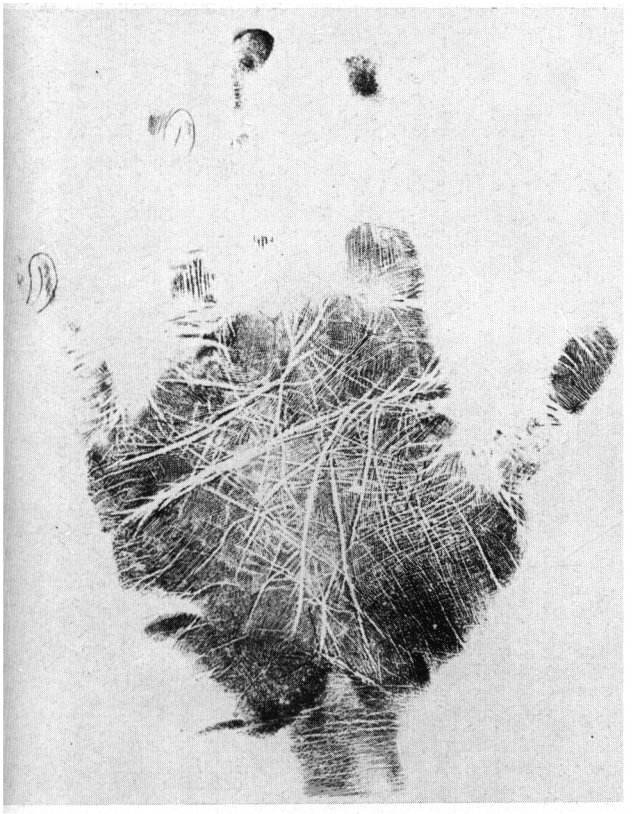


Fig. 9

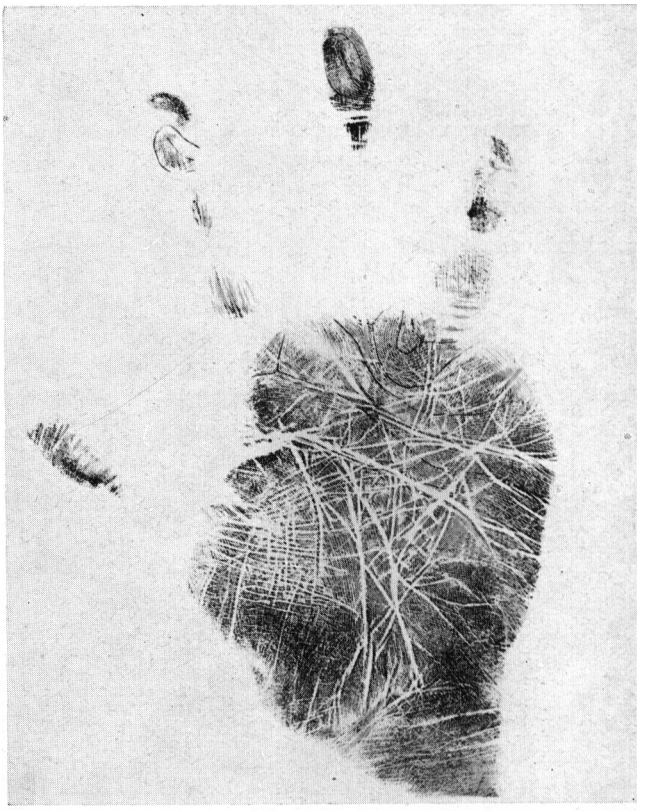


Fig. 10

Fig. 11

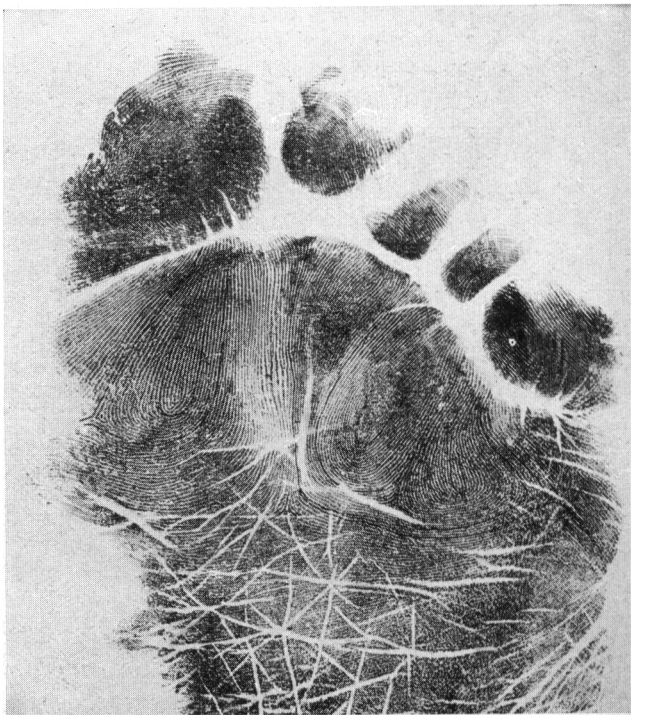


Fig. 12

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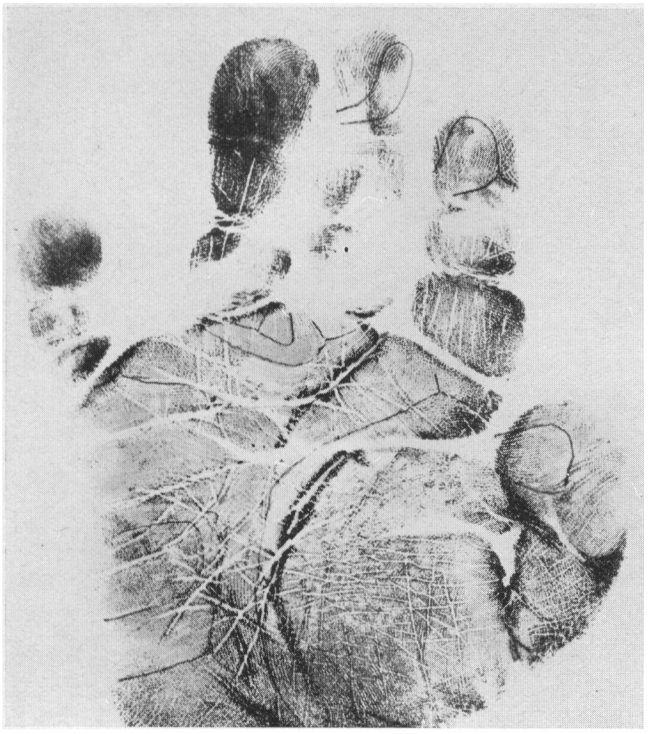

Fig. 13

Fig. 14

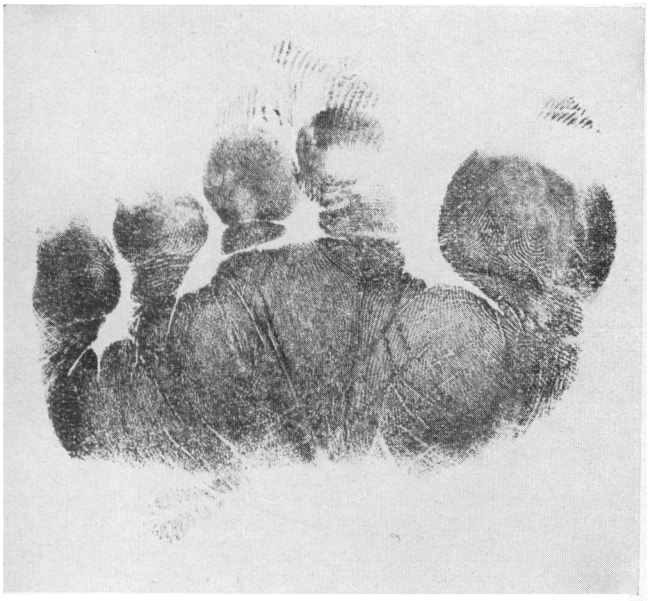

Fig. 15

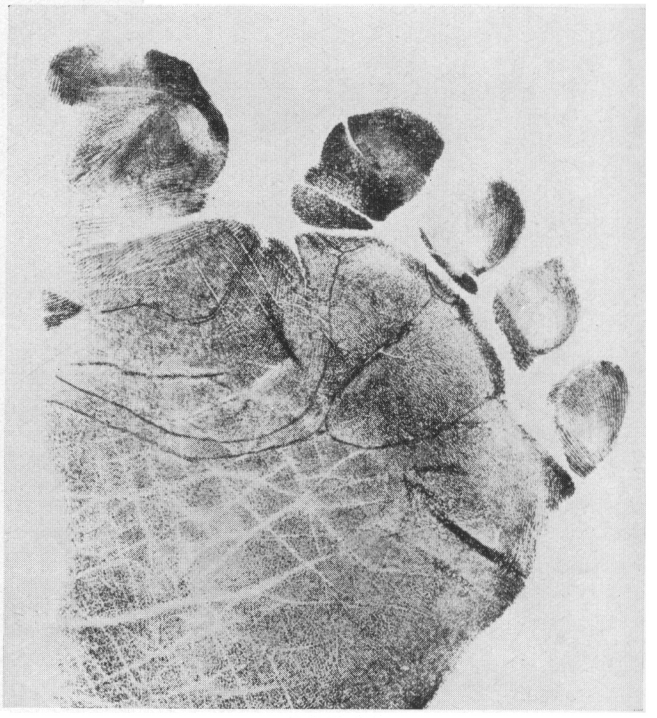

Fig. 16

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Cummins (1939) including axial triradii more distal than in non-mongoloids, transverse alignment of palmar lines, and a high proportion of ulnar loops. Digital patterns were all ulnar loops in both subjects, except for whorls on the 4th digits of both left hands. However, the mother has axial triradii in the *t* area, whereas those of about 85% of mongoloids (combined right and left hands) are in the *t''* area (Walker, 1957b). Reflecting in part the location of the axial triradii, the « adt » angles (Penrose, 1954) the child were 96° on the left, 83° on the right, while the mother's were 44° on the left, 41° on the right. Comparing these subjects with Penrose's extensive series, the sum of angles of the right and left hand of the child are 4.1 and 5.2 standard deviations above the mean for control females in the 0 — 4 and 5 — 14 year age classes respectively, and is above the mean for either age class among mongoloids. The sum of the angles of the mother's prints, on the other hand, is about at the mean for control females 15 years and older.

Dr. Norma Ford Walker very kindly performed analyses on the prints obtained, using her new method (1957 b), one which combines several differences between mongoloids and non-mongoloids in a quantitative index. This index depends on the ratio of the frequencies of certain stigmata in mongols compared to their frequency in controls. She has incorporated fingertip pattern, the position of the axial triradii and third interdigital configurations of the palm, and hallucal patterns into her index thus far. The indices expressed in logarithms range from 9.0 to -2.0 in mongoloids and from 3.5 to -8.5 in non-mongols. There is an area of overlap between 3.5 and -2.0. The child's index was 4.5, placing her clearly in the mongoloid population. The mother's index was -0.09, placing her in the area of overlap. Both the mother's and the child's left hands bear the simian crease noted by Cummins (op. cit.) and others to occur more frequently among mongoloids.

Serology

It has been demonstrated that the distribution of blood types among mongoloids does not differ significantly from that in the general population (Lang-Brown, Lawler, and Penrose, 1953). However, blood typings provided by Dr. Philip Levine are presented for their possible future interest. The similarity of blood types of mothers and their mongoloid children notes by Penrose (1957) appears evident in the blood types below:

	ABO	D	C	E	c	K	k	Fy^a	Le^a	S	MN
Mother	O	+	+	o	+	o	+	o	o	o	MN
Child	O	+	+	o	+	o	+	o	o	o	N

Biochemical Studies

Many investigators have considered the primary defect in mongolism to reside in endocrine malfunction and, in particular, in thyroid imbalance (Benda, 1939). However, there has been no agreement as to whether the thyroid tends to be hyperac-

tive or hypoactive. Certainly, both types of malfunction have been observed in mongoloids. As one estimate of thyroid function, protein-bound iodine determinations (PBI), were performed on sera from the mother and her child. The first tests performed, though precise, were not valid because one reagent was later found to have deteriorated. By calculating a correction factor for the deteriorated reagent, the value for the mother's serum was estimated to be not more than 2.4 nor less than 1.8 micrograms percent and for the child, not more than 2.1 nor less than 1.5 micrograms percent. A second serum specimen was obtained form the child, and on retest with fresh reagents yielded a value of 2.1 micrograms percent. Normal values range from 4.0 to 8.0 micrograms percent. Hence, both subjects appear to fall in the hypothyroid or myxedematous category. Simon, Ludwig and Gofman (1954) were unable to demonstrate a significant difference in the PBI levels of 74 institutionalized mongoloids and 17 institutionalized controls, nor was the mean PBI in mongoloids different from published levels of apparently normal controls of similar ages. Their findings suggest that the low protein-bound iodine levels of our subjects may be unrelated to or coincidental with their mongoloid status.

Serum Proteins

Serum proteins were measured on paper strips in barbital buffer at pH 8.6 and an ionic strength of 0.075. Constant current of 8 microamperes was applied for 16 hours at room temperature. The strips were then dyed with bromphenol blue according to the method of Block, Durrum, and Zweig (1955). The quantitative estimates of the proteins present were performed with the Spinco Analytrol. Duplicate analyses were performed simultaneously upon sera from the mother, the child and from an apparently normal non-institutionalized adult male. The data expressed as percent of the total protein provided by the separable components are presented in Table I, along with mean values and their standard deviations published by Carver, Wiltse,

Tab. 1. Serum proteins of mother, child and normal control. Components expressed as percent of total protein

	Mother	Mongols* 10-39 yrs. (N=39)		Child	Mongols* 3-9 yrs. (N=24)		Control	Normals* (N=11)	
		$\bar{X}$	Std. Dev.		$\bar{X}$	Std. Dev.		$\bar{X}$	Std. Dev.
Albumin	35	48.2	5.9	34	55.6	1.6	49	51.5	5.7
$Alpha_1$	6	4.6	1.1	8	4.4	0.8	6	4.4	0.7
$Alpha_2$	6	11.3	2.5	8	11.9	2.7	14	10.6	3.2
Beta	30	12.8	2.1	28	12.7	1.7	14	18.2	4.1
Gamma	23	23.1	5.1	22	15.4	2.7	17	15.3	2.5

* Data of Carver, et al. (1959)

and Wittson (1959). The latter values were obtained under the same conditions as in the present study except that the constant current was 9 rather than 8 microamperes.

The values of our single control subject can be seen to lie within two standard deviations of the control means for all fractions except the α_1 globulin. Sampling error and the small size of the published control sample may account for this deviation. In contrast, the values for the mother and child deviate from normals in the same direction that Carver, et al. noted to be the case in mongoloids, i. e., a decreased proportion of albumin and a significantly increased proportion of γ globuin. Moreover, the proportion of albumin in our subjects' sera appears to be significantly lower then the mean values of the mongoloids studied by Carver and his coworkers (op. cit.). A second unexpected difference is the relative elevation of the β globulins in our mongoloid subjects. The values for the mother and child are not only significantly higher than corresponding mean values from the data of Carver et al. but are also more than two standard deviations above the mean of their small « normal » group.

Whether these differences reflect variations in technique, familiar or ethnic differences or the influences of other unknown variables cannot be established from these data. However, these data suggest that the serum protein distributions of both mother and child fit better with the distributions in mongoloids than with those of normal subjects.

Chromosome Study

Subsequent to the foregoing examinations, Alan W. Johnston obtained somatic cells from the child and has graciously permitted us to relate that he found she had 47 chromosomes with trisomy of chromosome number 21 or 22. This finding is consistent with that of Le Jeune, Gauthier, and Turpin (1959) and the observations of several other workers who have studied the karyotype in mongolism. Furthermore, a chromosome count of the somatic cells from the mother by Malcolm A. Ferguson-Smith resulted in counts of 47 and the extra chromosome as in the child can be accounted for by trisomy of either chromosome 21 or 22. As Ferguson-Smith points out, at this time, chromosome 21 cannot be distinguished from 22 with certainty.

Discussion

The validation of the occurrence of mongolism in a mother and her child depends in this instance on the diagnosis of the mother since evidence that the child is mongoloid seems unequivocal. The mother's facial characteristics are not as pronounced as one often observes in mongoloids. The subjective impression of mongolism is further diminished by the excellent care she has received at home (her hair has, as was mentioned a permanent wave and she normally wears glasses). However, if we consider those four characteristics tabulated by Penrose (1934) which were at least ten times more frequent in mongoloids than in non-mongoloid defectives (epi-

canthal fold on either eye, fissured tongue, conjunctivitis, and transverse palmar lines on either hand), it has been shown that the mother exhibits all except the epicanthal fold. In addition, her cephalic index of .84, an I. Q. at the imbecile level, her broad hands with stubby fingers, her slanted eyes and dry skin, the spaces between first and second toes, her lax ligaments, her lack of frontal sinuses, her dwarf stature, the distribution of her serum proteins, and her affectionate personality all support the diagnosis of mongolism. On these bases, we conclude that both mother and child are mongoloid.

The birth of both normal and mongoloid offspring to mongoloid mothers is consistent with the expected meiotic behavior of trisomic cells. However, Böök, Fraccaro, and Lindsten (1959) cautioned against considering the trisomy observed in mongoloids as the sole explanation for the syndrome. The later work of Polani, Briggs, Ford, Clarke and Berg (1960) and that of Fraccaro, Kaijser and Lindsten (1960) in which mongoloids did not exhibit the trisomy anticipated provide evidence of the need for cautious interpretations and for continued work in this most promising area.

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