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GROWTH RATE AND HAIR DENSITY OF THE HUMAN AXILLA

A. COMPARATIVE STUDY OF NORMAL MALES AND FEMALES AND PREGNANT AND POST-PARTUM FEMALES*

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ABSTRACT

Using a technique previously described the rate of growth and hair density of the axillary region was studied.

The investigations were carried out on 126 individuals of both sexes whose age ranged between 10 and 74 years.

The subjects were grouped according to 3 age periods: pubescence, sexual maturity and senescence. Pregnancy and post-partum were investigated separately.

The axilla was divided into three subregions: central, thoracic and brachial.

Analysis of the results showed that the central axillary hairs show a greater rate of growth and hair density than the other subregions. Furthermore, the rate of growth and hair density decrease with age.

The speed of growth decreased between the 13th week of pregnancy and the 5th week of post-partum. Hair density decreased significantly in the central and thoracic subregions in the 5 weeks after delivery.

The brachial subregion does not participate in those changes.

In previous papers (1–3) we have dealt with such important characteristics of the trichogram of the scalp hair as state of cycle, growth rate, hair density and hair thickness.

The purpose of this paper is to analyze the variations in growth rate and hair density of axillary hairs of normal males and females. The results obtained with the latter group are compared with those from females during pregnancy, and post-partum.

MATERIALS AND METHODS

This investigation was carried out in two groups of apparently normal Caucasian individuals from the hospital staff. They were divided as follows: One hundred and four individuals of both sexes (53 men and 51 non-pregnant females) were distributed by sex and age.

The females were divided into three age groups.

1. Pubescence: 10 to 15 years of age, regardless of the onset of menstruation
2. Sexual maturity: 16 to 50 years, with complete development of sexual secondary characteristics
3. Menopause: 48 to 71 years of age, physiological or surgical menopause, regardless of age or the duration of the menopause

The men were grouped according to similar periods, although the age periods showed a wider range: Pubescence: 11 to 18 years; sexual maturity: 19 to 60 years and senescence: 61 to 74 years

Twenty-two pregnant and post-partum females were grouped as follows:

1. 11 cases from the beginning of pregnancy until the 13th week of pregnancy
2. 17 cases from the 14 week of pregnancy until delivery
3. 12 cases in early post-partum period until the 5th week after delivery
4. 6 cases in late post-partum, 5th through the 13th week

The reasons for selecting these periods were determined by the variations observed in the trichogram of scalp hair during pregnancy and post-partum (3).

Thickness of hairs and state of cycle were not determined because all the females usually shaved and deodorized their axilla.

According to its topography (4), the axillary region was divided into 3 subregions, namely, center of the axilla, thoracic and brachial subregions. Hairs were obtained by plucking from the center of each subregion.

Hair density and average daily growth were measured with a microscope specially adapted to the skin surface (5). Two oculars were used, one of them contained a micrometric scale permitting the measurement of at least $\frac{1}{40}$ mm; the other contained a reticulum that allowed the measurements to be done on an area of $\frac{1}{25}$ cm^2. The lower density of the axillary region, however, required that the study of this parameter be performed with a 10 × eyepiece which limited the area of

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TABLE

		REGIONS		
CONDITION	Sex.	Thoracic	Center	Brachial
PUBESCENCE	M	3.18 - S.E. ± 0.08	3.75 - S.E. ± 0.22	3.18 - S.E. ± 0.11
	F	3.09 - S.E. ± 0.20	3.48 - S.E. ± 0.17	3.01 - S.E. ± 0.06
SEXUAL MATURITY	M	3.68 - S.E. ± 0.06	4.14 - S.E. ± 0.08	3.50 - S.E. ± 0.05
	F	3.39 - S.E. ± 0.10	3.87 - S.E. ± 0.10	3.26 - S.E. ± 0.08
SENESCENCE	M	3.37 - S.E. ± 0.10	3.22 - S.E. ± 0.11	3.12 - S.E. ± 0.16
MENOPAUSE	F	3.17 - S.E. ± 0.17	2.98 - S.E. ± 0.14	2.80 - S.E. ± 0.14

Averages of Growth (MM/10 Days) for axillary hair in the course of life, in both sexes.

M: Males
F: Females

study to one square centimeter. Three determinations were carried out in each individual for each parameter and subregion and the results were averaged.

Student's "t" test was employed for statistical evaluation of the data.

RESULTS

The rate of growth and hair density vary according to sex, subregion, age group, pregnancy and post-partum period.

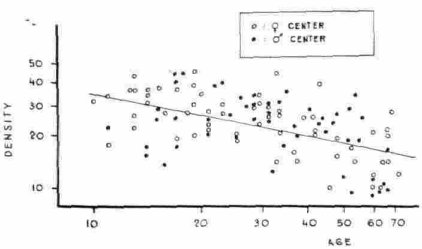

FIG. 1. Relationship between the age and hair density at the center of axilla (both parameters in logarithmic scales).

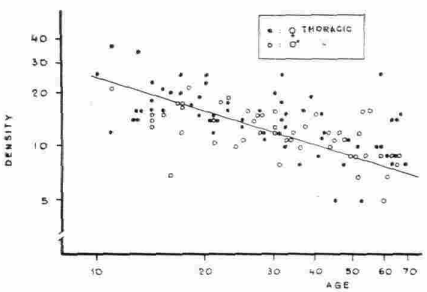

FIG. 2. Relationship between the age hair density at the thoracic subregion of axilla (both parameters in logarithmic scales).

The results are shown in the Table and Figures 1–4. Only significant differences are stated.

Rate of Growth (Table)

1. The growth rate of axillary hairs is faster in males than in females during sexual maturity in all the subregions ($P < 0.05$). No significant

differences related to sex were observed between pubescent and senescent subjects.

2. In both sexes and in all the age periods considered, the growth rate in the center of axilla is faster than in the thoracic and brachial subregions ($P < 0.05$). In males, the growth rate of the hairs in the thoracic and brachial subregions is faster during sexual maturity than during pubescence ($P < 0.05$) and senescence ($P < 0.001$). The last two mentioned periods did not differ significantly between themselves. In the female group the thoracic and brachial axillary hairs did not differ significantly during the periods analyzed, but the hairs in the brachial subregion grew faster during sexual maturity than during senescence ($P < 0.01$).

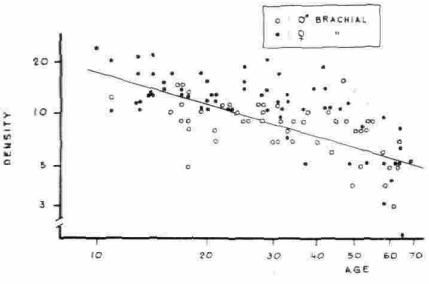

FIG. 3. Relationship between the age and hair density at the brachial subregion (both parameters in logarithmic scales).

3. The rate of growth was significantly faster in both sexes during sexual maturity than during pubescence ($P < 0.05$) and senescence ($P < 0.001$) in all the studied subregions. This phenomenon is specially evident in the center of the axilla. Moreover, in females the growth rate was faster during pubescence than during senescence ($P < 0.05$); no significant difference was observed in males.

4. The growth rate of the central axillary hairs decreases significantly from the 13th week of pregnancy to the 5th week after delivery ($P < 0.01$ and < 0.05 respectively) (Fig. 4).

5. The growth rate of the thoracic hairs decreases significantly only from the 13th week of pregnancy until delivery ($P < 0.05$). The hairs of the brachial subregion show the same tendency, but the changes are not statistically significant ($t = 2.06$; significance at the 5% level is achieved for a $t = 2.08$) (Fig. 4).

Hair Density (Figs. 1–4)

1. No significant differences in density associated with sex were observed in any of the periods considered. The hair density ranged from 2 to 47 hairs for square centimeter.

2. Hair density decreased with age in the three subregions, with the same slope.

3. In both sexes hair density is significantly greater in the center of axilla than in the thoracic ($P < 0.001$) and brachial ($P < 0.001$)

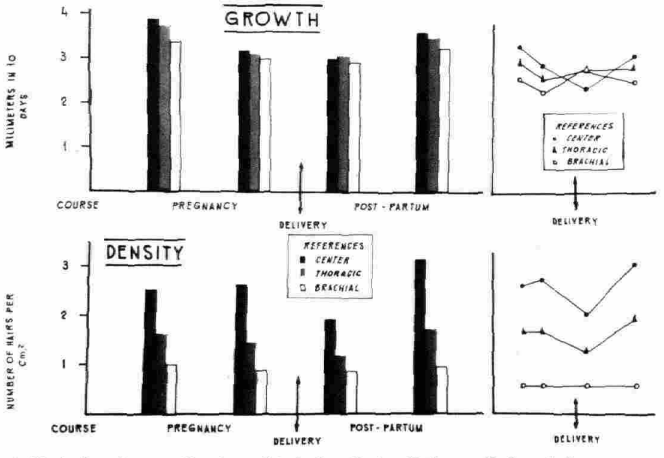

FIG. 4. Variations in growth rate and hair density in all the studied periods.

subregions. No significant differences were seen between the latter subregions.

4. Hair density decreases significantly in the central and thoracic subregions of the axilla in the 5 weeks after delivery ($P < 0.05$); normal density values are restored after the 13th post-partum week (Fig. 4).

5. The brachial subregion does not show any changes (Fig. 4).

DISCUSSION

Clinical observations of the axillary region of different individuals suggested the simultaneous study of the biological behavior of the hairs of the central, thoracic and brachial subregions. This is the first report in the literature in which the hairs of the axillary region have been so studied.

The results obtained suggest that each of these subregions presents certain peculiarities relative to the rate of growth and hair density that further support this division.

The rate of growth and the hair density of the center of axilla show greater values than in the other areas, an indication that the response of the hair system not only depends on factors such as age, sex, race, pregnancy, genetic information, hormones, etc., but also is subordinated to regional influences.

It is noteworthy that the axillary hair during pregnancy and post-partum follows a similar pattern as already observed in the scalp (3).

Only a brief reference on the effect of pregnancy and parturition on the axillary hairs has been reported (6).

Our contention is that the hairs of the central subregion of axilla, showing more activity than the peripheral ones, express with greater sensitivity the state of the region.

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