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RELATIONSHIP BETWEEN SOME BLOOD PARAMETERS, WOOL YIELD AND BODY MEASUREMENTS IN THE YOUNG ANGORA RABBITS.

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SUMMARY :
This paper deals with the relationship among wool production, growth and development, hemoglobin (Hb) content and the activities of serum alkaline phosphatase (ALP), acid phosphatase (ACP), glutamic-pyruvic transaminase (GPT) and 5'-nucleotidase (5'-NT) in angora rabbit. The experiment was conducted in the University Rabbit Farm from April 1991 to April 1992. 95 rabbits (29 German Angora, 36 Chinese Angora and 30 F_1 rabbits of the German (males) x Chinese (females) were raised under the same conditions. In each type, the blood of 3 to 6 rabbits, 20, 45, 90 and 180 days old, was taken for the measuring of biochemical traits.
The results show that body weight, body measurement and wool production increase as the rabbit's age increases. ALP activity first increases and decreases afterwards, as the rabbit grows older. ACP activity changes in the same pattern as ALP, in German Angora and Chinese Angora. But in the crossbreds of German x Chinese Angora, ACP activity increases continuously. The least square analysis indicates that wool yields of German Angora at 90 and 180 days are significantly higher than those of Chinese Angora ($P<0.05$). Hb contents of the German at 45 and 90 days are significantly higher than those of Chinese, and the latter is significantly higher than the F_1 rabbits ($P<0.05$). At 45 days, Chinese Angora has the highest ALP activity, F_1 the second and German the lowest, and the differences among them are significant ($P<0.05$). At 45 days, ACP activity of German Angora is significantly higher than that of Chinese Angora, and the latter higher than that of F_1 rabbits ($P<0.05$). But at 90 days and 180 days, ACP activity of F_1 is significantly higher than that of German and Chinese Angora, and the German is still higher than the Chinese ($P<0.05$).
Using body weight, body length, chest girth and wool yield as one variate group and Hb content, GPT, ALP, and ACP activity as another group, the canonical correlation coefficients of the first three pairs of variates have been calculated, which are 0.8295, 0.7395 and 0.5835 respectively ($P<0.05$ or 0.01). Its correlation information ratio is 87.34 %. The principal factors which affect the first pair of canonical correlation variates are body length ($a_2 = 1.3783$), wool yield ($a_4 = -1.0584$), GPT activity ($b_2 = 0.6145$) and ACP activity ($b_4 = 0.5441$).
Using body weight, body length and chest girth as one variate group an Hb content, GPT, ALP and ACP activity as another group, the canonical correlation coefficients of the first three variate pairs have been obtained, which are 0.9478, 0.5632 and 0.4170 respectively ($P<0.05$ or 0.01). Its correlation information ratio is 100 %. The principal factors affecting the correlation of the first variate pair are body weight ($a_1 = 0.7631$), chest girth ($a_3 = -0.6472$) and Hb content ($b_1 = 0.7807$).

RESUME : Relation entre différents paramètres sanguins, la production de poil et les mensurations corporelles chez le jeune lapin Angora.
Ce papier traite des relations entre la production de poil, la croissance et le développement, le taux d'hémoglobine (Hb) et les activités sériques de la phosphatase alcaline (ALP) , de la phosphatase acide (ACP), de la glutamique-pyruvique transaminase (GPT) et de la 5'-nucléotidase (5'-NT) chez le lapin angora. Cette expérimentation a été conduite dans l'élevage de lapins de l'Université d'avril 1991 à avril 1992. 95 lapins (29 Angoras Allemands, 36 Angoras Chinois et 30 F_1 issus du croisement Allemand (mâles) x Chinois (femelles) ont été élevés dans les mêmes conditions. Dans chaque groupe le sang de 3 à 6 lapins âgés de 20, 45, 90 et 180 jours a été prélevé pour l'analyse des paramètres biochimiques.
Les résultats montrent que le poids vif, les mensurations et la quantité de poil augmentent avec l'âge du lapin. L'activité de l'ALP augmente d'abord puis décroît avec l'âge du lapin. L'activité de l'ACP varie dans le même sens que celle de l'ALP chez les lapins Angoras Allemands et Angoras Chinois. Mais chez les lapins issus du croisement de ces deux races, l'activité de l'ACP augmente continuellement. L'analyse par la méthode des moindres carrés indique que le rendement en poil des Angoras Allemands à 90 et 180 jours est significativement plus élevé que celui des Angoras Chinois ($P<0.05$). Le taux d'hémoglobine du génotype allemand à 45 et 90 jours est significativement plus élevé que celui du génotype chinois ; il est plus élevé chez ces derniers que chez les lapins F_1 ($P<0.05$). L'activité de l'ALP la plus élevée se trouve à 45 jours chez les Angoras Chinois, les F_1 venant en second et Allemands enregistrant la plus basse, les différences entre chacun des trois génotypes étant significatives ($P<0.05$). A 45 jours, l'activité de l'ACP chez les Angoras Allemands est significativement plus élevée que chez les Angoras Chinois, et plus élevée chez ces derniers que chez les F_1 ($P<0.05$). Mais à 90 jours et 180 jours l'activité de l'ACP chez les F_1 est significativement plus élevée que chez les Angoras Allemands et Chinois, les Allemands devançant les Chinois ($P<0.05$).
En utilisant le poids vif, la production de poil, la longueur du corps et le tour de poitrine en un groupe de variables et le taux d'hémoglobine, les activités de l'ALP, l'ACP et de la GPT en un second groupe, les coefficients de corrélation canonique des trois premières paires de variates explicatives ont été calculés et ont pour valeur 0,8295 , 0,7395 et 0,5835 respectivement ($P<0.05$ ou 0.01). Ces trois premières paires expliquent 87.34 % de la variabilité totale. Les principaux facteurs affectant la corrélation canonique de la première paire de variates sont la longueur du corps ($a_2 = 1,3783$), la production de poil ($a_4 = -1,0584$), l'activité de la GPT ($b_2 = 0,6145$) et celle de l'ACP ($b_4 = 0,5441$.
En utilisant le poids vif , la longueur du corps et le tour de poitrine comme premier groupe de variables, et le même ensemble de quatre paramètres que précédemment, comme second groupe de variables, les coefficients de corrélation canonique des 3 première paires de variates explicatives ont pour valeur 0,9478 , 0,5632 et 0,4170 respectivement

(P<0,05 ou 0,01). Ces 3 paires expliquent 100 % de la variabilité totale. Les principaux facteurs affectant la corrélation de la première paire de variates sont le poids vif (a_1 = 0,7631), le tour de poitrine (a_3 = - 0,6472) et le taux d'hémoglobine (b_1 = 0,7807).

INTRODUCTION

Many studies on the heridity and breeding of Angora rabbit have been conducted in China and in other countries (LIN, 1991 ; CHENG *et al.*, 1988). The studies of HUANG (1988) and ZHANG (1989) on the relationship between protein polymorphism and performance in German Angora indicate that rabbits whose serum ceruloplasmin is homozygous Cp^B will have higher wool yield and there are no significant correlations between Es-1 polymorphism and body weight, wool yield and reproduction (ZHANG *et al., 1989;* LIN, 1991). DING (1986) studied the serum biochemical and immunological traits of German Angora. At present, no studies on the relationship between serum enzyme activites and production performances have been reported in Angora rabbit.

Enzyme is a kind of important material which accelerates animal's metabolism. So it plays an important role in the growth, production and reproduction of animals. It's an essential biological catalyser. It is necessary to study the correlation between enzyme activities and performances. In this paper, the authors report on the relationship of hemoglobin (Hb) contents, the activities of serum alkaline phosphatase (ALP), acid phosphatase (ACP), glutamic-pyruvic transaminase (GPT) and 5'-nucleotidase (5'-NT) with the growth, and wool yields of Angora rabbit (German Angora, Chinese Angora and their crossbreds). They hope to provide scientific basis for the selection and breeding of the animals.

MATERIALS AND METHODS

Experimental rabbits

The experiment was done from April 1991 to April 1992 on the Rabbit Farm of Sichuan Agricultual University. The German Angora were selected from the nucleus herd of Yaan Wool Rabbit Institute, and the Chinese Angora were from Anyue Shiqiao Rabbit Farm. The F_1 rabbits were the offsprings of German Angora (males) x Chinese Angora (females). 95 rabbits, including 29 German rabbits, 36 Chinese rabbits and 30 crossbreds (F_1) were studied. All the experimental rabbits were raised under the same nutritional and environmental conditions. In each type, the blood samples of three to six rabbits were taken for the measuring of biochemical traits when the animals were 20, 45, 90 and 180 days old.

Methods

Measuring times

Each animal was measured for four times, *i.e.* at 20, 45, 90, 180 days.

Measured traits

Performance traits, such as body weight, body length, chest girth and wool yield at 90 days (first shearing) and 180 days (second shearing), and biochemical indexes, such as Hb content and the activities of ALP, ACP, GPT and 5'-NT, were surveyed.

Measuring methods

Five millilitres of blood were taken from the rabbit heart. Hb content and 5'-NT activity were surveyed by colorimetry. ALP and ACP activity were determined by KING'S method, and GPT activity by REITMAN-FRANKELL method (WANG, 1987 ; LU, 1983)

Data processing and analysis

All the data were processed by a computer 286. The analysis of variances in performances and biochemical indexes of different rabbits and at different time were conducted by least square method. The correlation between biochemical traits and wool yield, body weight and body measurement were determined by canonical correlation analyzing method (YOSHIYUKI, 1989 ; KENDALL, 1983).

RESULTS

The standard curve fonctions of ALP, ACP and GPT activity :

The standard curve functions which present the

Table 1 : Function of standard curves.

Enzyme	Standard curve fonction	R^2
ALP	Y= -1.8239 + 27.03X	0.9986**
ACP	Y= -0.6880 + 215.74X	0.9978**
GPT	Y= 15.3782 + 2078.12X	0.9971**

X : value of light density

Y : estimated value of enzyme activity

** : highly significant (P<0.01)

Table 2 : Least square means of the different parameters according to the rabbit's age.

Age in days	20 days			45 days			90 days			180 days		
Type	German	Chinese	F_1	German	Chinese	F_1	German	Chinese	F_1	German	Chinese	F_1
Body weight (g)	378.3^a	274.2^b	270.4^b	538.3^b	717.0^a	501.0^b	1611.7^a	1396.7^b	994.3^c	2661.4^a	2035.7^b	1958.3^b
	(6)	(13)	(12)	(6)	(10)	(5)	(6)	(6)	(7)	(11)	(7)	(6)
Body length (cm)	24.33^a	19.54^b	20.08^b	29.50^a	26.90^b	27.00^b	42.75^a	38.17^b	36.43^b	47.82^a	43.21^b	48.20^a
	(8)	(13)	(12)	(6)	(10)	(5)	(6)	(6)	(7)	(11)	(7)	(6)
Chest girth (cm)	17.17^a	14.77^b	15.25^{ab}	16.67^b	20.05^a	18.60^b	25.58^a	25.33^a	26.71^a	31.55^b	29.57^b	32.75^a
	(6)	(13)	(12)	(6)	(10)	(5)	(6)	(6)	(7)	(11)	(7)	(6)
Wool yield (g)	–	–	–	–	–	–	55.00^a	24.67^b	30.00^b	77.82^a	65.71^b	69.58^{ab}
							(6)	(6)	(7)	(11)	(7)	(6)
Hb (g/l)	121.51	–	101.50	111.70^a	93.20^b	82.20^b	97.00^a	88.67^{ab}	80.00^b	97.67^a	101.2^a	94.17^a
	(6)		(4)	(5)	(5)	(4)	(6)	(5)	(4)	(6)	(5)	(6)
GPT (R & F units)	–	–	–	74.50^c	152.05^a	86.03^b	49.67^c	135.5^a	92.68^b	73.70^c	108.12^b	165.31^a
				(6)	(3)	(5)	(6)	(3)	(5)	(6)	(4)	(6)
ALP (King's units)	7.82	–	19.73	5.96^c	15.74^a	10.43^b	11.30^{ab}	14.83^a	9.76^b	6.06^a	6.84^a	8.56^a
	(6)		(4)	(6)	(5)	(5)	(6)	(3)	(5)	(6)	(5)	(6)
ACP (King's units)	74.89	–	0.21	142.70^a	96.56^b	0.61^c	81.71^b	1.69^c	96.05^a	64.00^b	1.36^c	111.18^a
	(6)		(2)	(6)	(5)	(4)	(6)	(2)	(5)	(6)	(5)	(6)
5'-NT (units)	46.11	–	35.99	28.12^a	11.05^a	1.49^a	4.34^a	6.18^a	2.40^a	–	2.21	2.59
	(4)		(4)	(6)	(4)	(3)	(2)	(2)	(3)		(2)	(3)

a, b, c : on the same row, within age, means with different superscripts are significantly different (P<0.05)
Numbers between ( ) are the sample size

relationship between enzyme activity and light density (D) have been established and listed in table 1.

Least square means and their comparison.

The least square means of wool yield, body weight, body lenght, chest girth and biochemical traits of different rabbit types with the same age, are listed in table 2.

The results show that the body measurements and wool yields of all the three types increase as the animals grow. ALP activity firs increase an then decrease as the rabbit's age in days increases. 5'-NT activity decreases as the animals grow. Hb content vary in a narrow span. ACP activity of German and Chinese Angora first increases and then decreases, but that of F1 rabbits increases continuously.

The least square means indicate that the wool yield of German Angora at 90 days (first shearing) is significantly higher than that of Chinese Angora and the F1 rabbits (P<0.05), the difference between Chinese and F1 is not significant (P>0.05). The yield of German at 180 days (second shearing) is significantly higher than that of Chinese Angora (P<0.05), but the difference between F1 and German or Chinese is not significant (P>0.05). Except at 45 days old the body weight of German Angora is significantly higher than that of Chinese Angora and the F1. At 45 and 90 days the Hb content of German Angora is significantly higher than that of Chinese Angora and F1 (P<0.05). At 180 days, the differences of Hb content among them are not significant (P<0.05). At 45 days, ALP activity of Chinese Angora is significantly higher than that of German and the F1 rabbits and the activity of F1 is significantly higher than that of German rabbits (P<0.05). But at 180 days, the differences of ALP acitvity are not significant (P>0.05). At 45 days, German Angora's ACP activity is significantly higher than the Chinese and the F1 rabbits, and Chinese Angora activity is significantly higher than F1's activity (P<0.05). But at 90 days, the ACP activity of F1 rabbits is significantly higher than that of German and Chinese Angora, and the activity of German rabbits is significantly higher than that of Chinese rabbits (P<0.05).

Canonical correlation analyses

The results of the first canonical correlation analysis are in table 3. They were obtained by using body weight (X1), body lenght (X2), chest girth (X3) and wool yield at 90 or 180 days (X4) as one variate group and using Hb content (Y1), GPT activity (Y2), ALP activity (Y3) and ACP activity (Y4) as another variate group. The results of the second canonical correlation analysis by using body weight (X1), body lenght(X2) and chest girth (X3) as one variate group and using Hb content (Y1), GPT activity (Y2), ALP activity (Y3) and ACP activity (Y4) as another variate group are listed in table 4.

Within the first analysis, the canonical correlation coefficients of the first 3 pairs of canonical correlation variates are 0.8295, 0.7395 and 0.5835 respectively, and their correlation information ratio is

Table 3 : Canonical correlation analysis of wool yields, body measurments and biochemical traits.

Canonical correl. coefficient	Sample size	Variate of canonical correlation	Significance Test X^2
0.8295 (33.6783 %)	27	$U(1) = -0.5996X_1 + 1.3783X_2 + 0.579X_3 - 1.0584X_4$ $V(1) = -0.012Y_1 + 0.6145Y_2 + 0.0246Y_3 + 0.5441Y_4$	53.1894**
0.7395 (30.0245 %)	27	$U(2) = 0.6442X_1 - 0.5109X_2 + 0.5282X_3 + 0.4658X_4$ $V(2) = 0.3652Y_1 + 0.4189Y_2 - 0.8014Y_3 - 0.2582Y_4$	26.8367**
0.5835 (23.6921 %)	27	$U(3) = 0.0292X_1 - 1.2607X_2 + 1.0827X_3 + 0.0238X_4$ $V(3) = -0.787Y_1 + 0.568Y_2 - 0.096Y_3 - 0.698Y_4$	10.0935*

** : highly significant (P<0.01) ; * : significant (P<0.05)

Table 4 : Canonical correlation between body measurements and biochemical traits.

Canonical correl. coefficient	Sample size	Variate of canonical correlation	Significance Test X^2
0.9478 (49.1599 %)	42	$U(1) = 0.7631X_1 + 0.4011X_2 - 0.6472X_3$ $V(1) = 0.7807Y_1 - 0.1302Y_2 - 0.1168Y_3 + 0.1049Y_4$	105.7406**
0.5632 (29.2123 %)	42	$U(2) = 0.9618X_1 + 0.4794X_2 + 0.8176X_3$ $V(2) = 2.0243Y_1 + 0.9289Y_2 + 0.321Y_3 - 1.4364Y_4$	20.6108**
0.4170 (21.6278 %)	42	$U(3) = 0.6804X_1 - 2.8916X_2 + 3.1548X_3$ $V(3) = -0.3224Y_1 - 0.5765Y_2 + 1.0002Y_3 + 0.4596Y_4$	6.6847

** : highly significant (P<0.01) ; * : significant (P<0.05)

87.3949 %. All these have reached the significant or highly significant level by Chi-square test (P<0.05 or P<0.01). (Table 3). Analysing the load of the first pair of correlation variates (i.e. the coefficients of each variate), we can found that the principal factors which affect the first pair of canonical correlation variates are body length ($a_2 = 1.3783$), wool yield ($a_4 = -1.0584$), GPT activity ($b_2 = 0.6145$) and ACP activity ($b_4 = 0.5441$).

Using body weight, body length and chest girth as one variate group, and Hb content, GPT, ALP et ACP activities as another group, the canonical correlation coefficients of the first 3 pairs of correlation variates are 0.9478, 0.5632 and 0.4170, respectively and their correlation information ratio is 100 %. All these have reached the significant or highly significant level by Chi-square test (P<0.05 or P<0.01). (Table 4). Analysing the load of the first canonical correlation variate, we can found that the principal factors which affect the first pair of canonical correlation variates are body weight ($a_1 = 0.7631$) chest girth ($a_3 = -0.6472$) and Hb content ($b_1 = 0.7807$).

DISCUSSION

1 - Serum ALP is a kind of none-specific enzymes which catalyzes the hydrolisis of phosphomonolipids. Its main physiological functions are :

- ALP catalyses the hydrolysis of phospholipids in bone to produce phosphoric acid, which is beneficial to the transportation of calcium and phosphorus, and furthermore, beneficial to the growth of bone.

- ALP can promote the absorption of some nutrients at the epithelial cells and the calcification of bones by increasing the storage of calcium phosphate (SHANGHAI FIRST MEDICAL COLLEGE, 1979).

ALP in animal's serum mainly comes from their bones, and is produced by osteoblasts (POND and HOUPT, 1978 ; ROCHAMBEAU, 1989). So ALP is an indicator of the action of the osteablasts and the formation of bones. Generally speaking, the younger the animal is, the higher its serum ALP activity will be. For example, serum ALP activity of puppy and kitten is two to three times this one of their adults, and for a one month old horse it is four time this one of a one year old horse (LU, 1983). Animal's body is composed of bone, muscle and fat. Its growth order is bone-muscle-fat. The growth of bone plays an important role in determining animal's body size, and muscle growth determines the body weight (INO, 1987). It was reported that the German Angora reaches

its body maturity at the age of 8-10 months (WANG K.N., 1989) and its growth peak is between the age of 2 and 3 months (WANG and JIANG, 1992). In this study, the body length of German Angora, Chinese Angora and their crossbreds at 90 days has reached 89.4, 88.34 and 75.58 % of those at 180 days respectively, and the corresponding figures for chest girth are 81.09, 88.34 and 81.56 %, respectively. Serum ALP activity of all the 3 rabbit types reaches the highest at about 90 days, and it decreases after this time, which indicates that the change of ALP activity is identical with the growth speed of animal's, especially the bone. So we think Angora's bone growth fast before the age of 3 months, and after this age it grows slowly.

2 - Canonical correlation analysis is a statistical method which is used to study the correlation between 2 variates groups (or 2 random vectors). It can obtain not only the whole correlation coefficients (i.e. canonical correlation coefficients) of the 2 variate groups, but also explain the main factors which cause the correlation of the groups of traits by the load of each trait obtained, and calculate the other group of variates by one variate group already known. So canonical correlation analysis has a practical significance in animal breeding. In this study, the main factors affecting the combined variate U are body length and wool yield, and the main factors affecting the variate V are GPT activity and ACP activity. It can be concluded that the longer the body length is, the greater the U value will be. It was reported that the genetic correlation between body length and wool yield of German Angora at the age of 6 months is 0.679 (CHENG *et al.*, 1988) which indicates that to a certain extent, the longer the body is, the higher the wool yield will be. Wool yield is also a principal factor which affects the combined variate U, but its load is negative. This is probably caused by the fact that the experimental rabbits did not reached their full maturity, so their nutrients must be used for maintenance, growth and production. German Angora reaches its body maturity at the age of 8-10 months. Age is one of the principal factors which affects the animal's wool yield. It was reported that before 3 years old, German Angora's wool production increased as it grew up (OCCTKICUICZ *et al.*, 1981) and its wool yield of the third shearing was the highest (RICH MUNOZ, 1984). So before six months old, Angora rabbit spends its nutrients probably mainly to meet the requirement of growth, development and maintenance. As for the combined variate V, the load (b_2) of serum GPT activity and the load (b_4) of serum ACP activity are positive. The greater these variates are, the higher the V value will be. GPT can catalyze the transamination between glutamic acid and acetonemic acid. The transaminase plays an important role in the metabolism of amino acids and the mutual trasforming of protein, fat and carbohydrate. ACP can present the activity of cell lysosomes. So it plays an important role in the metabolism cells. The results of this study show that the ACP activity of Chinese Angora is significantly lower than this one of German Angora and the crossbreds F1 ($P<0.05$). But Chinese Angora's wool yield and growth rate are significantly lower than those of German Angora ($P<0.05$), which probably indicates that the growth and wool producing abilities of Angora rabbits are related with ACP activity to a certain extent. So the value of V may be used as a indirect index in the selection and breeding of Angora rabbits.

3 - In the first canonical correlation variate group of table 4, a_1 is positive and a_3 is negative, so the contributions of body weight and chest girth to the combined variate U are essentially different. It was reported that at 6 months, the genetic correlation between body weight and wool yield was 0.478, and this one between chest girth and wool yield was −0.461. So in the selection and breeding of Angora rabbits, it is not necessary to pursue a high increase of chest girth, since big chest girth may be disavantageous to the increasing of wool yield (CHENG *et al.*, 1988). The load of Hb content (b_1) is positive and fairly big. The higher the Hb content is, the bigger the V value will be. The results of this study indicate that the Hb content and the growth rate of German Angora are significantly higher than those of Chinese Angora ($P<0.05$). So Hb content is related with the growth and development of rabbits. Since Hb content is affected by multiple factors, it needs further studies to determine how Hb content is correlated with the growth and development of Angora rabbits.

4 - The heterosis of the first filial generation is generally dependent on the genetical differentiation and the complementary effect of traits of the parents. If the two parents are with distant blood relationship, big physical and physiological differentiation and complementary traits, the heterosis of the crossbred progeny will be great. It was pointed out that the initial heterosis of plant was related with the growth substances, such as enzyme and growth hormone (WHALY, 1952). HAGEMAN and FLERSHAR (1957) discovered that the diosephosphate dehydragenase of F1 was higher than this one of the two parents trough the study of corn seedlings (PEI, 1983). All these have proved that the heterosis of plant is closely related with the biochemical and physiological traits. In domestic animals, it is thought that significant heterosis exists in traits, such as growth and development, reproductive performance and feed utilization, which are correlated with animal's production performance and adaptability (MITSUMA *et al.*, 1982). In this study, there is negative heterosis in F1's wool yield. At 90 and 180 days, ACP activity of the first filial generation was significantly higher than this one of German and Chinese Angora ($P<0.05$). It seems that the wool producing ability of the crossbred progeny is related intra-genetic type with ACP activity. Rabbit wool comes from the differentiation of epidermal cells. It is a kind of protein

fiber, and its protein content is about 93 %. The protein content of 1kg of rabbit wool is equal to this one of 4.5kg of rabbit carcass or 6-7kg of body weight (CHENG, 1989). So the wool yield of Angora rabbit is closely correlated with the metabolism of proteins. When ACP activity increases, the brittleness and penetrability of lysosomes increase (ZHOU *et al.*, 1993). Some enzymes, which can catalyze the hydrolysis of certain proteins, polysaccharoses and nucleic acids, will be released from lysosomes. This will accelerate the metabolism and the multiplication of cells in the hair bulb. The wool will grow continuously.

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