

PHOTOPERIODISM EFFECT ON FUR MATURITY AND FUR QUALITY OF RABBITS, OWNING OR NOT REX GENE

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During the last 25 years, rabbit managing and house keeping methods have strongly moved in European countries. This evolution is a following upon breeding specialised lines selected to improve numerical and weight productivity, in a well controlled housing conditions saving working time, and more and more automatic. Those three parameters of the modern rabbit managing system have a large effect on pelt quality. The number of rabbits by hutch has increased. Using of iron hutches spread around, replacing concrete or wodden cages. The slaughtering age fell down from 16 weeks to 10 nowadays. Vrillon (1987) in an analysis of results collected in France pointed out an increase of the meat produced per dow per year in a range of 58,8 to 110 kg from 1974 till 1986.

During the same period of time, pelts quality fell down (Thomas, 1977, de Rochambeau and Vrillon, 1985) through the following features : rabbits to be slaughtered are smaller and younger, hair compacity or density of hair per cm<sup>2</sup> decreased too, and, as far as the customer's opinion is to be of importance, the steadiness of hair on rabbit pelts after tanning process is too low, European woman does not want to buy anymore rabbit fur, even less charged.

In the present study, we investigate to know if new managing, housing breeding methods, allow a joint production of meat and fur, both of them with a high quality standard. Through the litterature (Rougeot and Thébault, 1983, Rougeot et al, 1984) we know that furs of quality are produced by animals slaughtered at the beginning of winter. In fact, under natural conditions these winter rabbit pelts are of interest but the rabbit meat production is no more linked to a special season (Lebas, 1977). We checked the growth gradients of coat introduced by Rougeot and Thébault (unpublished) and the chronology of moults in the young rabbit.

We choosed to include in the experimental scheme a genetic factor in relation with the hair growth : the Rex mutation firstly described by Lienhart, 1927, 1962) and then made cleared by numerous authors (Letard, 1928 ; Fraser 1953 ; Vrillon, 1981). We will use the differents parameters formerly introduced by Rougeot and Thébault, 1983, about angora production such as the different type of coats before the adult one. Description of primary and secondary air follicles giving two types of guard hairs : bristles and awns covering the underfur hair : downs.

*MATERIAL AND METHODS*  
*Animal and treatments*

Two groups of animals : 28 Rex and 24 Common have been raised in two similar house keeping buildings from 4 to 23 weeks of age for the oldest rabbits. In the first building, we fixed the light period to 16 hours per 24 hours all along the raising period ; in the second, we moved at 9 weeks of age from 16 hours of light to 8 per 24 hours. We raised a controlled group to follow the follicle activity through histological methods. Rabbits are raised in wire individual cages of 0,13 m<sup>2</sup> each and fed ad libitum with commercial pellets. Growth of rabbits are recorded weekly. Hair quantity

is weighted after shearing of one half of each rabbit. Length and diameter of different type of hair are registered by shaving once a week a staple of hair on the back side. According to the fur quality, the precocity of the first adult coat has been observed. We put to the slaughtering a first group of 17 weeks of age and then, we had to wait till the 23rd week of age to obtain a dead stop activity of the hair follicles, specially for the group under 16 light period per 24 hours. Thanks to the melanine all the active hair follicles can be noticed by drawing or photography. Drawings and pictures taken are checked by a skin biopsy on which primary and secondary follicles are listed at two stages : rest and activity. Pelts have been processed and we recorded hair compacity dealing with fur quality.

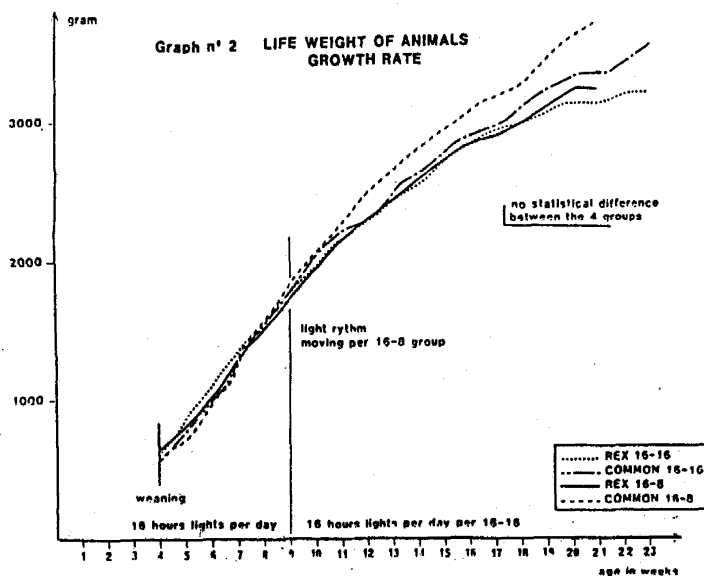
**RESULTS**

Number of animals are summarised on graph 1. The control animals have been slaughtered at the end of the observations at 23 weeks of age.

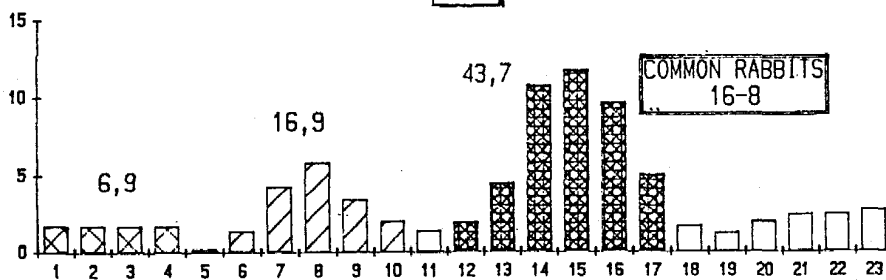
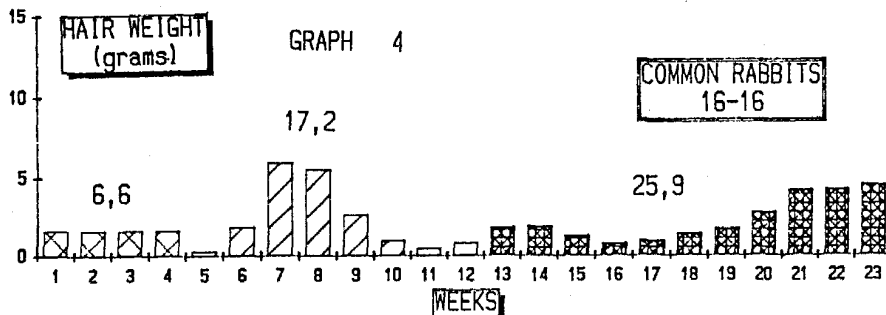
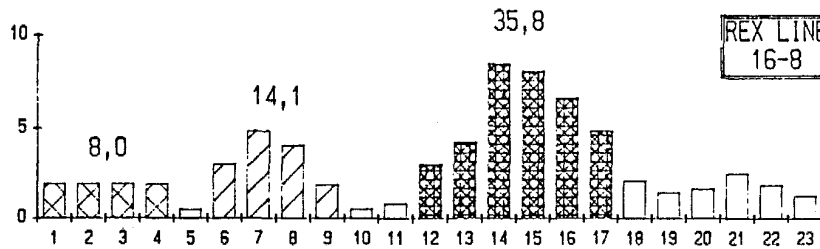
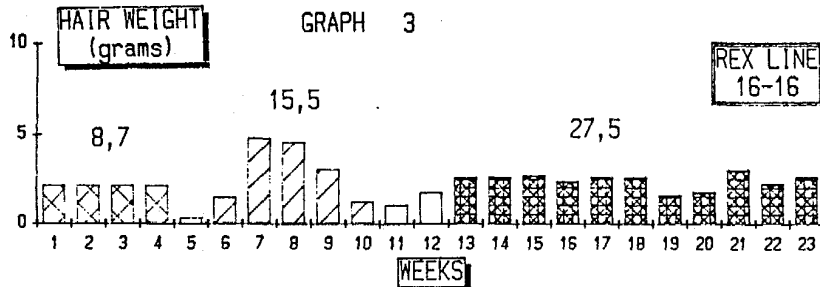
Graph 1 NUMBER OF RABBIT IN THE EXPERIMENTAL SCHEMA

Age of slaughtering (weeks)	REX				COMMON			
	17	21	23	Control	17	21	23	Control
16 h light/24 h continuously 16-16	5		5	3	5		5	2
16 h light till 9 weeks then 8-hours/24 h 16-8	5	5		3	5	5		2

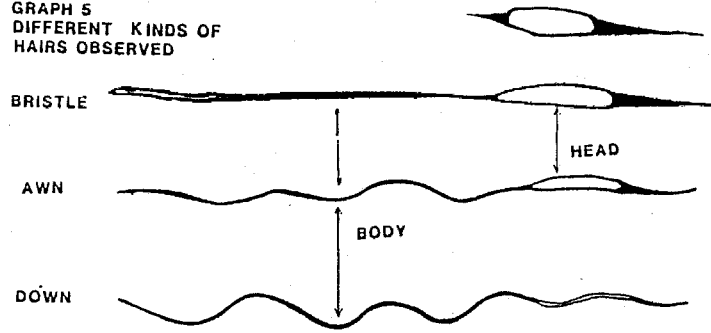
No statistical differences are observed about the growth rate during the fattening period (graph. 2). A light tendency in favor of the common animals is likely to be underrate at the end of the period.



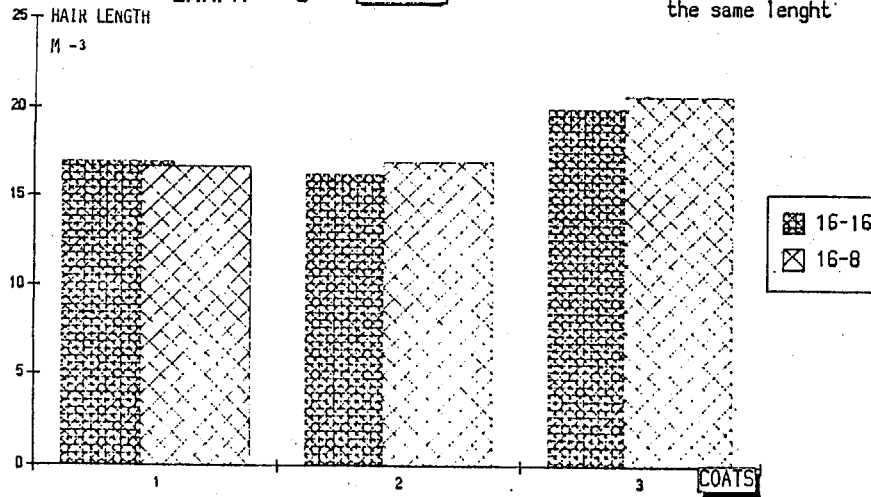
We did not point out differences among the two groups in relation with light rythm. Records of the hair weight sheared each week after the 4th are reported on graphs 3 (Rex) and 4 (Common). We picked out 3 different coats : called 1st or New born's coat, 2nd or Young's coat and 3rd or Sub-adult's coat. The last one is the first coat available to give a fur from a wild animal. Then the moults are under seasonal effects (Rougeot et al, 1984). Graphs 6 and 7 give the data about hair lenght and diameter of the two kinds of hair : guard hair (bristles and awns) and down hair. A drawing of them is given on graph 5. Rex rabbit hair of both kind have the same length.



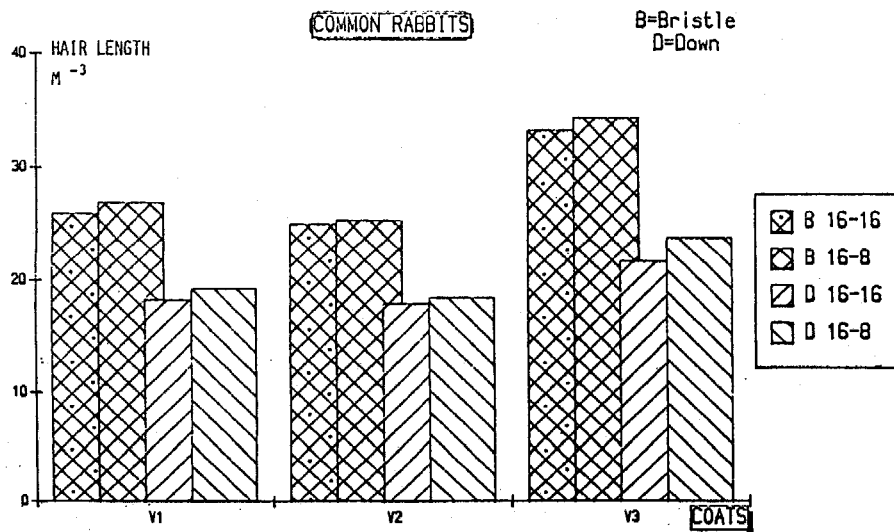
GRAPH 5  
DIFFERENT KINDS OF  
HAIRS OBSERVED

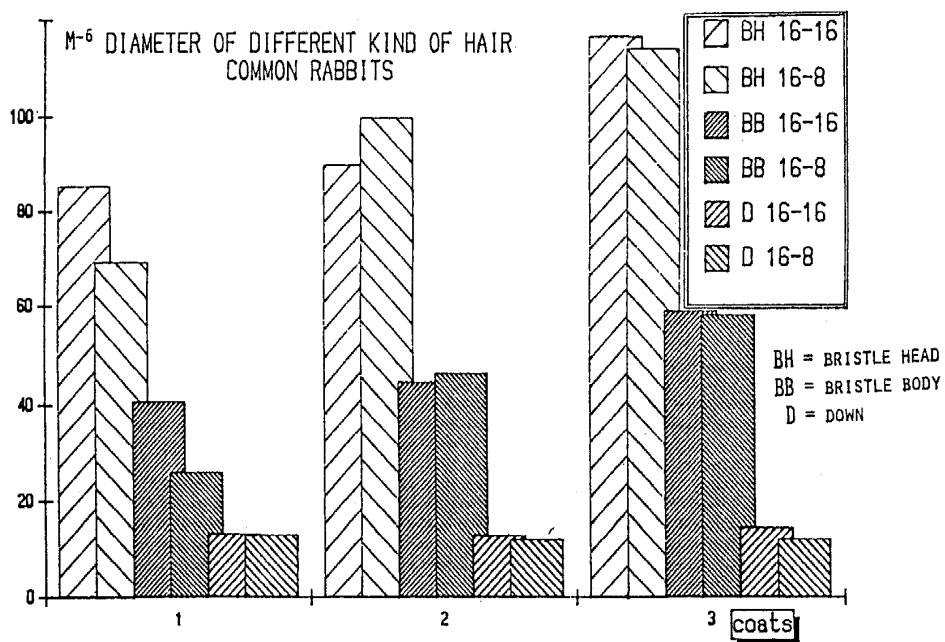
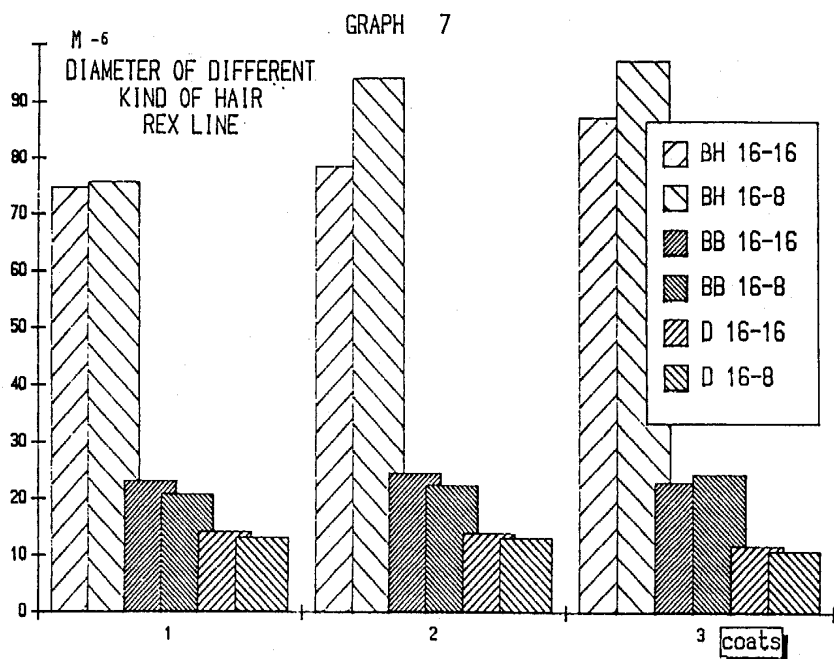


GRAPH 6 REX LINE



COMMON RABBITS





Graph 8 gives results of compacity. On photography n° 9, we can see biopsy of rex and common skins of 17 weeks old rabbits. In a follicle group, the main follicle (PC) grows the bristle, four bundles of one awn (PL1 or PL2) and several downs (S). In the common skin biopsy, every follicle grows a specific keratinized hair, in the rex skin biopsy, bristles (PC) and awns issued from PL1 are degenerated and donot grow any hair. On graph 10 are recorded the processed pelt's weight in grams.

Graph 8 HAIR COMPACITY

Measure done by a special machine, dealing with number of hair and diameter of them prened with similar force through to 5 mm window.

		REX			COMMON		
Rythm \ Age in weeks	Age in weeks	17	21	23	17	21	23
		16-16	16		29	15	
	16-8	29*	28*		31*	31*	

Graph 10 WEIGHT OF THE PROCESSED PELTS (in grams)

		REX			COMMON		
Rythm \ Age in weeks	Age in weeks	17	21	23	17	21	23
		16-16	102 ± 7		140 ± 10	101 ± 7	
	16-8	140 ± 8	152 ± 9		133 ± 4	166 ± 12	

#### DISCUSSION

##### *Body weight gain*

The four growth curves are very similar with a light difference observed in favor of common rabbits due to the selecting progress. Forward period's end the group 16-8 is a little heavier than the group 16-16. Statistical tests are of no interest. The number of rabbit per group is too small.

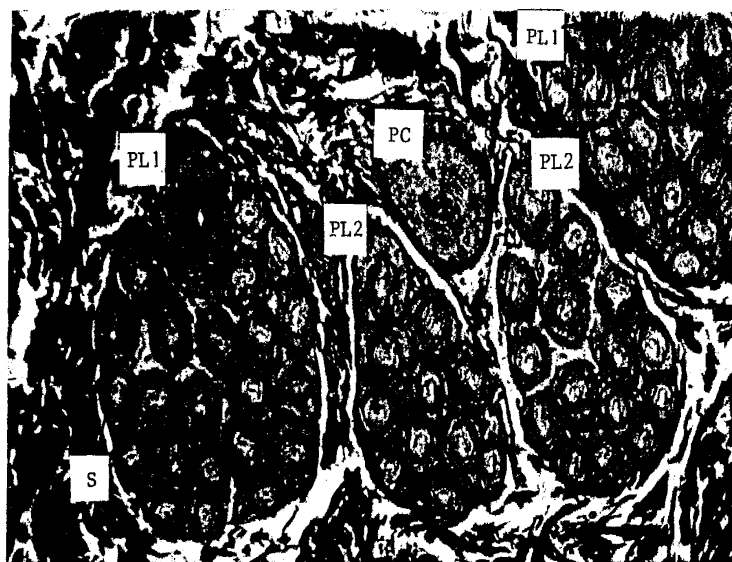
##### *Growing gradient of the coat*

Changing down light rythm (group 16-8) gain one week on the moul't leading the 3rd coat. Further one, it speeds the growing gradient within 18 weeks of age for the rabbits. We did not observe the end of growth after 23 weeks of age for rabbits in the group 16-16 thus we stopped the observations. Hair weight dealing with fur compacity and fur quality is twice as high in the group 16-8 than in the other. Rex hair production is lower

GRAPH 9. : HAIR FOLLICULAR GROUPS



COMMON RABBIT



REX RABBIT

than common. Statistical tests of Wilcoxon, Mann, Whitney confirm the results given on graph 4. A big statistical difference is pointed out for genotype effect and photoperiodical effect. The 3 coats growing are deeply separated in every group of rabbits. However the moult leading the 3rd coat

is slow and last continuously in group 16-16. In group 16-8, this moult is ended within 6 weeks. The steadiness of hair, dealing with another quality parameter, will be far better after pelt processing in that situation. Dealing with the body growing, no competition has been observed with hair growing.

*Length and diameter of hair : bristles, awns, downs*

We do not pick any difference out on every kind of hair in the 1st and 2nd coat intra genetic type. This expected result deals with the light period changing date. The whole second coat has grown before 9 weeks of age. Looking the 3rd coat growing, some low differences in favor of the short light period can be noticed, without any statistical difference likely due to the weak number of animals. On graph 6, the 3rd coat's hair is longer than the 1st and 2nd coats (25 %). On graph 7, bristle's head and bristle's body are wider in the 3rd coat than in the 2nd one respectively of 23 and 31 p. cent. We confirm here former results given by Rougeot and Thébault (1983). The seasonal effect is the most important about compacity, then on length of hair at last on diameter of hair, as far as only parameters of hair are concerned.

*Number and stages of hair follicles*

Rougeot and Thébault, 1984, gave a sharp description of hair genesis in angora rabbits. We borrow here 3 stages introduced : *Anagen stage* dealing with a high mitotic activity of the hair bulb, this stage lasts a fixed period according to the breed. *Catagen stage* dealing with the end of the mitotic activity, in connection with a regression of the hair follicle. *Telogen stage* is a rest stage lasting more or less time in connection with intrinsic factors (age breed, sex) or extrinsic factors such as photoperiod. During our experiment, though the biopsies of skin samples on 13 and 17 weeks old rabbits we issue the statement that rex rabbits have similar follicles to common rabbits.

In the Rex line, after a first normal growing, hair issued from the primary central and lateral follicles (PL1) degenerate quickly eventually till a total dying out. From our observations on different biopsies, the degenerating process can be complete (graph 9) coming off no bristle at all, or partial coming off shortened an thinner bristle with a temporary narrow diameter underneath head of hair.

Photoperiodism is of large influence on follicle activity. In group 16-8, the rest phase is shorten and budding of secondary follicles is accelerated so, full compacity and maturity of the 3rd coat is obtained within 17 weeks.

*Hair compacity*

This handy method to appreciate a combined character dealing with fur quality provides data in relation with the number of hair ; we did not yet issue the statistical statement of this relation. However the difference of 100 p. cent in favor of the group 16-8 on 17 weeks old rabbits does not need any further comment.

*Processed pelt's weight*

30 to 40 p. cent of difference between the groups 16-16 and 16-8 is huge. Of course we are looking for more hair on pelts, purpose reached, but fur industry rather likes to process light pelts. New experiments have to be carried out to examin if it is possible to increase the hair weight on a low weight pelt.



REFERENCES

- FRASER R.D.B., 1953. - A note on the growth of the Rex and Angora coats. *J. Genet.* 51, 237-242.
- LEBAS F., 1977. - Valeur du 5ème quartier en élevage cunicole. *Cuniculture* N° 17, pp. 253-256.
- LETARD G., 1928. - Le lapin Castor Rex, l'histoire d'une mutation. *Rev. Med. Vet. de TOULOUSE*, 80, pp. 136-143.
- LIENHART R., 1927. - A propos d'une récente mutation chez le lapin domestique : le lapin Castor rex. *C.R. Société de Biologie*, 97, 386-388.
- LIENHART R., 1962. - Mise au point de nos connaissances biologiques actuelles sur le lapin Castor rex. *Bulletin de la Société Lorraine des Sciences*, pp. 84-102.
- ROCHAMBEAU H. de., VRILLON J.L., 1985. Facteurs de variation de la qualité de la fourrure et de la productivité pondérale chez le lapin domestique. *Ann. Zootech.*, 34 (1), 49-76.
- ROUGEOT J. et THEBAULT R.G., 1983. - Variations saisonnières de la composition et de la structure du pelage : exemple de la toison du lapin angora. *Ann. Zoot.* 32 (3) 287-316.
- ROUGEOT J., ALLAIN D. et MARTINET L., 1984. Photoperiodic and hormonal control of seasonal coat changes in mammals with special reference to sheep and mink. *Acta Zool. Fennica* 171, 13-18.
- ROUGEOT J., THEBAULT R.G., 1984. *Le lapin angora, sa toison, son élevage.* Ed. Le Point Vétérinaire, Maisons Alfort, France, 182 pp.
- THOMAS C., 1977. - Que deviennent les peaux de lapins ? *Cuniculture* N° 14 86-88.
- VRILLON J.L., 1981. - Problèmes posés par la production de fourrure de lapin, *B.T.I.*, 358-359.
- VRILLON J.L., 1987. - CEC Seminar on Rabbit Production Systems including welfare. Torino 6-7 Nov. 86, Report EUR 10983 EN, 57-68.

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OF RABBITS OWNING OR NOT REX GENE**

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The modern management to produce meat of rabbits notably through the decrease of slaughtering age does not set for good fur quality. Three following coats are observed on young rabbits : the "new born's coat" ends its growth at about 4 weeks of age, the "young's coat" at about 2 months, and the "sub adult's coat" spreads slowly out from 11 weeks till over 23 weeks following a gradient from the back to the belly and from the front to the tail. Items recorded on length and diameter of hairs, for compactness are analysed. It's impossible to obtain a good fur quality before the 3rd coat maturity. We noticed that a fall down of light period from 16. to 8. hours/day on 9 weeks rabbits : 1) brings one week forward the beginning of the moult inducing the 3rd coat. 2) speeds the growing gradient up it within 17 weeks. 3) gives a "winter pelt" compact enough. From a pelt physiology point of view, his experiment confirm the previous observations made by J. ROUGEOT and R.G. THEBAULT (unpublished) putting on that Rex gene is in connection with a "degeneration" of primary hair follicles and the first generation of secondary lateral hair follicles, inducing a quite complete lack of cover hairs (bristle and awn).

**EFFET DU PHOTOPERIODISME SUR LA MATURETE ET LA QUALITE DES  
FOURRURES DE LAPINS PORTEURS OU NON DE LA MUTATION REX**

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Les techniques actuelles d'élevage du lapin de chair, notamment en diminuant l'âge d'abattage, ne permettent plus l'obtention de fourrures de qualité. Trois pelages se succèdent sur le jeune lapin. Le "pelage du nouveau-né" termine sa croissance vers l'âge de 4 semaines, le "pelage du jeune" vers 2 mois et le pelage "sub adulte" se développe lentement, à partir de 11 semaines, selon un gradient dorso ventral, en antero postérieur. Il atteint sa maturité après 23 semaines. Les mesures effectuées concernant les longueurs en diamètres de poils, ainsi que la compacité du pelage, montrent qu'une fourrure de qualité ne peut être obtenue avant la maturité du troisième pelage. Nous avons montré qu'une réduction brutale de la durée d'éclaircissement (de 16 h à 8 h de lumière/jour) sur des lapins âgés de 9 semaines, permet d'avancer d'une semaine le début de la mue instaurant le 3ème pelage, d'accélérer très nettement le gradient dorso ventral et, conjointement, d'obtenir un pelage compact "type hivernal", dont la croissance est achevée dès l'âge de 17 semaines. Au plan de la physiologie des pelages, cette expérience a permis de confirmer les observations de J. ROUGEOT et R.G. THEBAULT (non publiées), précisant que le gène rex est en relation avec une "dégénérescence", à chaque mue, des follicules pileux primaires centraux et des follicules pileux primaires latéraux de 1ère génération provoquant l'absence quasi-totale d'un pelage de couverture (jarres et barbes).

