

**Ph. D. THESIS**

**BREEDING POSSIBILITIES TO INCREASE THE PRODUCTIVE LIFE IN  
LIVESTOCKS OF DAIRY CATTLE**

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## **I. BACKGROUND OF THE RESEARCH**

The inland cattle production in the last few decades has essentially changed considering not only the composition of the race but the level of production.

The proportion of the dual-purpose stocks was continually decreased and the rate of the dairy herds increased dynamically, the symmetry of beef cattle races moderate. Our dairy livestock's deciding proportion, cca. 90% is Holstein-Friesian type. Than in all countries like that where the production of the big amount of milk was an expectation with the increase of the consumer claims, that race appeared, the one that mostly suits the challenges, the Holstein-Friesian. The appearance of the race and the modernized keeping and forage technology made it possible that the milk production that come into one cow to come close to the specific production of the countries where there is advanced cattle breeding.

Beside the Holstein-Friesian the concentrate-milked races role starts coming into the foreground lately. Beside the increase of the production we had to count with the fact that in the secondary - today's wording functionally- characteristics a decline takes place. In the dairy herds the time between the two deliveries is over 440 days today already. the productive life (the time between the first delivery and the getting out) does not attain the three years. This for latter can be considered an enormous wasting if we only watch that the cattle's biologically possible lifetime is 30-35 years. As the consequence of staying in the short production the role of the functional characteristics, like the endurance (fitness) and the lifetime, grew in the milking cattle's breeding. These are especially important between the conditions of the industrial production when because of the non-natural keeping it must be reckon with the adverse exterior effects.

Onto the resistance capacity, the quality of the constitution can be drawn a conclusion beforehand from the organizational solidity. The long useful lifetime proves the distinguished constitution, respectively the big life performance.

The long useful lifetime significantly reduces the expense of the herd replacement in every lactation period in a cow's case and it makes possible in order that a cow to provide the maximum when it reached its full-grown age in the production. Furthermore in good health and suitable fertility staying in a breeding for long time reduces the service charge and the forced sorting out.

Moreover, according to CSUKÁS (1954), if the lifetime is short the breeding may keep fewer cows because the feeding is consumed in significant part by the calves and the young. Disregarding these facts in numerous cattle herds the lifetime decreased because the selection was aimed at the production characteristics more or less in the latter period .

Since the Hungarian Holstein Friesian stock's importance is extremely big because of the above-mentioned facts, I thought that I can give in many ways useful information for the cattle breeders if I select a topic for my dissertation which is in context with the Holstein Friesian's production, appearance, and productive life.

## II. OBJECTIVES OF THE RESEARCH

From the above-mentioned facts emerges that there exist cows in the domestic population which ó living in the same environment like their companions culled out early - have a distinguished life performance, a long productive life at their disposal. The question arises what factorsøinfluence evolves the differences.

Accordingly a considerable part of the individuals living in the same environment are culled prematurely, a smaller fraction spend far much time in the production and hereby produce the livestock products for the farmer in a more economic way.

With the examination of these individuals we set as an aim to:

- explore, if there is changing the correlations concerning the milk production defined earlier with the increase of the milk quantity as the result of the genetic progress in the last decades,
- explore what connections are between milk components and the productive life,
- determine if there is a connection between the first lactation production and the lifetime, and the productive life
- analyze if there is a coherence between the age of the first calving and the productive lifetime, furthermore
- determine what kind of the production parameters of the groups based on the appearance characteristics,
- what is the failure risk of individuals based on appearance compared, if we take into consideration of effects of the birth date, the settlement, the classifier, and the first calving age
- determine the connection between the genetic background and the outstanding lifetime production,

I wished to have my assay done from the achievements of Hungarian Holstein Friesian livestock obtained in studiously domestic relations.

### III. METHODS OF THE RESEARCH

The assay was made from the data from Cattle Information System operated by the Nationwide Animal Husbandry Data Bank.

In the course of my searches I analyzed in diverse grouping the production of cows with short and long termed life-span, their attributes of appearance ,pedigree, or rather in what average cow- head counted breeding did they achieve their results.

In the course of the analyses on the one part I took as a base the domestic cows which in October 2006 considering their life performance occupied the first 200 places. The milk production of the individuals chosen this way varied between 80000 and 153000 kg. I wished to get answer for what kind of genetic background do the Hungarian cows with the best lifetime production have as well as if there is nexus between the individual's appearance and their lifetime production.

From the 200 individuals 135 had classification. So in our assay we considered these individuals' classification from the first lactation. We could compare the mean of the certain classification's with the mean of the scores' reviewed between 12000 first-calved cows published by the National Association of Holstein Friesian Breeders. I made correspondence monitoring between the linear and main attributes of the review and the parameters of milk-production ability in reference to find out a connection between attributes in appearance and milk-lifetime production's parameters.

The additional assays were made on the base of subsequent cow colonies. We composed five cow groups .In the first group were the individuals whom genotype was Holstein Friesian and which were born between 01 January 1985 and 31 December 1992 and sorted out after their first calving. At this group's individuals the maximum amount of milk was 16998 kg, the fat amount 696.0 kg, the protein amount 447.0 kg.

The ones sorted out after their first calving between 01 January 2006 and 31 December 2006 got into the second group.

I counted in the third group also the individuals whom genotype was Holstein Friesian and the cows were born between 01 January 1985 and 31 December 1992 and accomplished eight lactations. These individuals are contemporary with the first group's individuals, so they were born in the same period, but they lived much longer.

Beside this I examined all of the individuals who were born between 1985 and 1992 as the fourth group and their appearance was classified in 1<sup>st</sup> lactation. (n=101479)

In some of the examinations I considered only the individuals which in their lifetime had classification. In the first group 173985 individuals were selected from these 16716 had classification. In the second group there were 20413 and from these 6027 had classification. In the third group I selected 13762 from which 3648 had classification.

I determined in each group the production attributes namely the age at the time of the first calving, the milking days, the amount of milk, fat and protein, the fat and protein content, the average value and deviation of daily milk amount. I analyzed in the groups the correlation of the certain production attributes as well as the mean of 140 linear and 4+1 appearance classification, its deviation, and the frequency occurrence of the scores of linear and attributes of classification. The linear descriptive classification attributes were these:

I used the SPSS for Windows 15.0 program to calculate the means, the deviations and correlations. I used the method of distribution-analyze (comparison of two empiric frequency distributions with more than two classes) to compare the certain results of the attributes of classification. For the fitting-analyses I used the  $\chi^2$  test by the methods of SVÁB (1981). While making the assay I took in consideration the methods of KOVÁCS-BÉRI (2007) too. When inspecting the certain appearance attributes I categorized the scores of the classifications, I coded them and made the comparisons this way. The coding was as follows:

Classification score: 1, 2, 3. Code: 1

Classification score: 4, 5, 6. Code: 2

Classification score: 7, 8, 9. Code: 3

For the comparison of certain groups' production and appearance parameters based on linear classification scores I applied the t-test. Because the groups formed many, numerous samples, independent from each other, I made the samples collective comparison with Kruskal-Wallis (non-parametrical variance analyses).

Where the zero hypotheses relative to homogeneity must have been rejected in the course of the Kruskal-Wallis-test I made comparison in couples with Mann Whitney-test.

With the Kaplan-Meier-test I draw survival diagram in the case of each group. I wanted to find out with its help that in case of each group which date is the one after which the survival chances significantly decrease.

Besides this statistical assay shows where the survival median is, respectively the survival rate is determinable. (KOVÁCS-BÉRI, 2007) The method itself was developed by

KAPLAN and MEIER (1958). I analyzed which classification score as a factor shows higher or smaller risk in point of the survival.

Beside this Survival Kit v6.0 software package was used. This package applies Cox proportional hazard model (COX,1972), (MÉSZÁROS et al, 2009) where we may change the form of this function (e.g. constant, exponential, Weibull, etc.), depend on this we get different models.

The general formula of the Cox-model (which is otherwise an exponential function :  $e$ ) the one I used in my assay is the following:

$$e^{x\beta} = \frac{h(t|x, \beta)}{h_0(t)}$$

where  $h_0$  is the fundamental risk function  $x = (x_0, x_{1,i}, \dots, x_n)$  the categorized variables used in the model ( the categorized values of the linear attributes classification),

$\beta = (\beta_0, \beta_1, \dots, \beta_n)$  is the coefficient that shows effects of the variables, and  $t$  is the time coefficient. We only have to show interest to the  $e$  the so-called the relative risk value, on the base of this we can compare the rate of the risk. If the value of  $\beta$  is equal to 0 than the rate of the risk is equal to the basic risk. The negative  $\beta$  values shows that the value of  $e$  will be between 0 and 1 what indicates that the risk belonging to the variable value will be minor than the fundamental risk. If the value of  $\beta$  is positive than the value of  $e$  will be more than 1 what indicates that the risk belonging to the variable value will be superior than the fundamental risk. (KOVÁCS, 2009)

I analyzed with the fitting of the Weibull model if the groups depending on the attributes of the individuals classification scores namely according to their points correlating to a point or category have higher chance to survive or to get sorted out in the specific month-life.

Based on the aims of the examinations the databases were the following.:

- a) *examination of the changing of the correlations concerning the milk production with the increase of the milk quantity defined earlier by calculation of Pearson's correlation.*

Group of Holstein cows who were born between 1985 and 1992 and they dropped once. (n=173985)

Group of Holstein cows who were culling after the first calving in 2006 (n=20413)

Group of Holstein cows who were born between 1985 and 1992 and they dropped at least 8 time. (n=13762)

- *b) analysis of the coherence between milk components and the productive life by calculation of Pearson's correlation.*
- Group of Holstein cows who were born between 1985 and 1992 and they dropped once. (n=173985)
- Group of Holstein cows who were culling after the first calving in 2006 (n=20413)
- Group of Holstein cows who were born between 1985 and 1992 and they dropped at least 8 time. (n=13762)
- *c) examination of the connection between the first lactation production and the lifetime, and the productive life by calculation Pearson's correlation*
- Group of Holstein cows who were born between 1985 and 1992 and they dropped at least 8 time. (n=13762)
- *d) analysis of the connection between first calving age and the productive life by calculation Pearson's correlation*
- Group of Holstein cows who were born between 1985 and 1992 and they dropped at least 8 time. (n=13762)
- *e) connection between type traits and the productive life*
- in given time the best 200 Holstein cows based on milk production performance who had results of reputation (n=135)
- Group of Holstein cows who were born between 1985 and 1992 and they dropped once. (n=173985)
- Group of Holstein cows who were culling after the first calving in 2006 (n=20413)
- Group of Holstein cows who were born between 1985 and 1992 and they dropped at least 8 time. (n=13762)
- *f) the survival probability of individuals based on appearance compared, if we take into consideration of effects of the birth date, the settlement, the classifier, and the first calving age*
- I used Survival Kit v6.0, calculation of Weibull proportional hazard model.
- Group of Holstein cows who born between 1985 and 1992 and had results of reputation in the first lactation. (n=101479)

- *g) the connection between the genetic background and the outstanding lifetime production*
- Group of Holstein cows who were born between 1985 and 1992 and they dropped once. (n=173985)
- Group of Holstein cows who were culling after the first calving in 2006 (n=20413)
- Group of Holstein cows who were born between 1985 and 1992 and they dropped at least 8 time. (n=13762)

#### IV. MAIN STATEMENTS OF THE THESIS

As it was outlined before, during our researches we were interested in the production results of different cow groups, or rather in the work out of the index coherent with milk production of early sorted out individuals and the ones with long productive life.

When analyzing the index coherent with milk production it can be stated that there is a significant difference between the two early sorted out individuals together with the group of individuals at their first lactation production getting out late, except the milk protein content. After the first calving 22-25% of the individuals are sorted out immediately, this is not an economical for the raiser considering the raising costs.

Analyzing the average lactation production of individuals that lived many lactation periods it marked out that the proportion of milk components is not in connection with the average lactation production however there is a moderate connection in the case of quantitative attributes. When comparing the quality of the production of early sorted out individuals and the ones with long lifetime I found out connection according to the literature. I couldn't determine connection between the parameters of the first lactation index of individuals with long life and the life-span. At the same group I found very weak connection between the first calving age and the lifetime. The amount of produced milk quantity per days of life is much bigger in the group of the animals with long productive life, which is a very important factor in terms of economic production.

I established there is moderate coherence between lifetime and quantity productivity indicators (milk kg, fat kg, protein kg) however there is no demonstrable relation between milk content (fat %, protein %) and productive life. It proved true that the selection based on the performance and the appearance in the past decades did not modify the context between the lifetime and the milk production indicators. (*Table 1*)

Analysing of milk production parameters I established there is difference between the correlation of fat- and protein content at cows with early culling and long productive life. There is closer relation between fat- and protein content at cows with longer productive life. (*Table 2 and Table 3*)

*Table 1*

**Correlations between average production parameters of lactation and lifetime and productive life in case of cows with more lactations (n=13762)**

<b>Yield parameters</b>	<b>Lifetime</b>	<b>Productive life</b>
<i>Milk quality</i>	0,30*	0,31*
<i>Fat quality</i>	0,30*	0,31*
<i>Protein quality</i>	0,28*	0,29*
<i>Fat content</i>	0,07	0,07
<i>Protein content</i>	0,04	0,03

Asterisks (\*) mark significant difference at P<0.05

*Table 2*

**Correlations between production parameters of individuals with short life (n=173985)**

<b>Parameters</b>	<i>Milking days</i>	<i>Milk quality</i>	<i>Fat quality</i>	<i>Fat content</i>	<i>Protein quality</i>	<i>Protein content</i>
<i>Milking day</i>	1					
<i>Milk quality</i>	0,878**	1				
<i>Fat quality</i>	0,892**	0,969**	1			
<i>Fat content</i>	0,125**	NS	0,208**	1		
<i>Protein quality</i>	0,891**	0,992**	0,975**	0,033*	1	
<i>Protein content</i>	0,331**	-0,022*	0,306**	0,328**	0,317**	1

\*P>0,05; \*\*P>0,01

Table 3

**Correlations between production parameters of individuals with long life (n=13762)**

<b>Parameters</b>	<i>Milking days</i>	<i>Milk quality</i>	<i>Fat quality</i>	<i>Fat content</i>	<i>Protein quality</i>	<i>Protein content</i>
<i>Milking day</i>	1					
<i>Milk quality</i>	0,657*	1				
<i>Fat quality</i>	0,672*	0,889*	1			
<i>Fat content</i>	0,203*	-0,072*	0,324**	1		
<i>Protein quality</i>	0,630*	0,941*	0,910**	0,072*	1	
<i>Protein content</i>	0,255*	-0,017*	0,337**	0,575*	0,439*	1

\*P&gt;0,05, \*\*P&gt;0,01

By improving the functional traits, one can expect that the useful lifetime will increase. The reason behind is that the technological tolerance improves, which in turn can yield a longer productive life. Differences among the averages of the linear appearance traits were analyzed. Based on the results, I concluded that except from the rump width, the hind leg rear views and teat placement traits, there is a difference in all other characteristics between the group of animals with short life and the group of animals with long life. Based on the results of the group of animals with long life it is clear that there is a statistically significant relationship between the body depth, the body capacity characteristics and the length of productive lifetime.

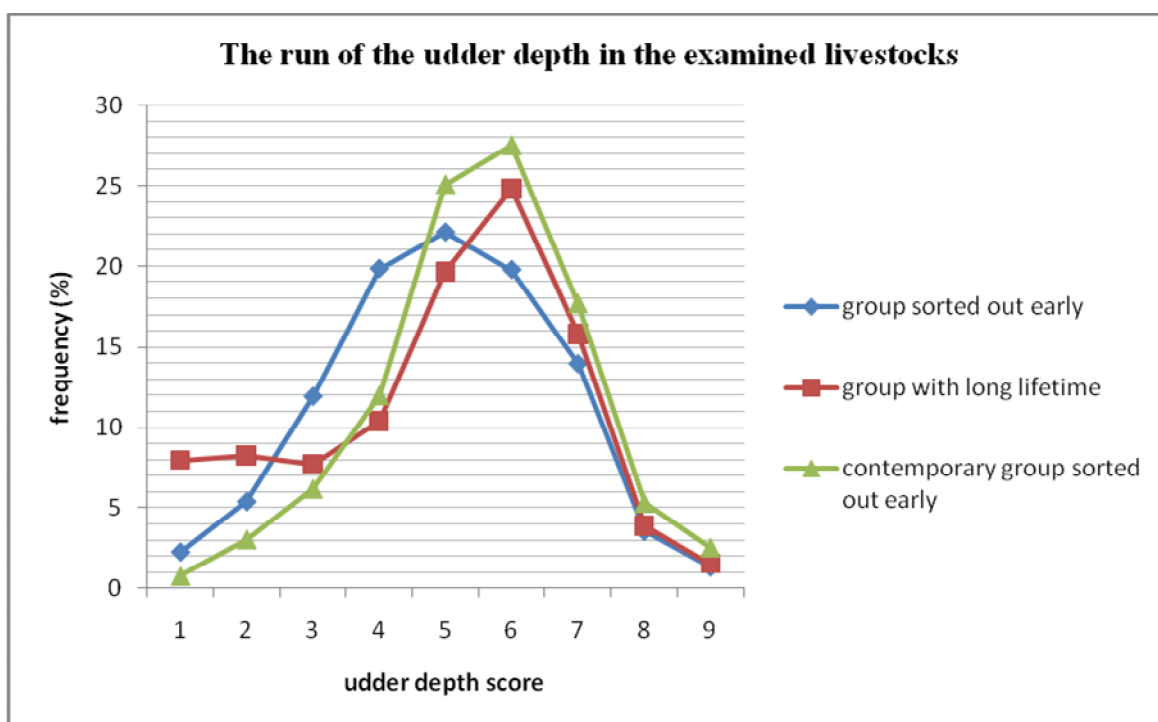
At the time of the classification of the characteristics the classifier determines the score of the linear type trait of the individual in proportion to mean of the country. (Value 5). From this visible, that in how much the cow differs from the average.

Based on our additional results, it seems that the long-lived individuals have a taller rump, a stronger and deeper body, taller rear udder height, better udder cleft with a less deep udder, than their short-lived companions.

On the *Figure 1* among the linear type traits I emphasized the curves of the frequency distribution of the udder depth trait.

It is showing up on the *Figure 1*, that the mostly appearing value is the number 6 on the individuals with long lifetime. This score is like the less deep udder. It characterizes the contemporary group of the individuals who sorted out early.

*Figure 1*



Comparing the characteristic results by the Kruskal-Wallis non-parametric method I defined, cows with longer productive life have higher rumps, stronger bodies, deeper bodies, crooked legs, higher rear udders, better udder clefts; on the other hand they have less deep udders than those born in the same time and culled early. It is shown on *Table 4*.

In the case of the groups categorized by the linear type traits significant differences were found among the production of all analyzed groups. In the case of the two short-lived groups differences were also found among the analyzed traits, except foot angle. Based on the results of all three groups it can be stated that animals with taller rump, deeper body and less deep udder had higher levels of milk production. (*Table 5*)

Table 4

**Averages and statistical differences of the linear type traits on the cows with short  
and long lifetime**

Type traits	Group with failure after 1 <sup>st</sup> lactation (n=6027)		Group with long life (n=3648)		Contemporary group with failure after 1 <sup>st</sup> lactation (n=16716)	
	average	st. dev.	average	st. dev.	average	st. dev.
<i>Stature</i>	5,37*	1,45	4,55*	1,66	4,40*	1,51
<i>Strength</i>	4,74*	1,31	4,38*	1,54	4,13*	1,39
<i>Body depth</i>	5,25*	1,23	5,41*	1,61	5,10*	1,45
<i>Dairy form</i>	5,56*	1,01	5,69*	1,04	5,64*	0,99
<i>Rump angle</i>	5,12	1,52	5,13	1,51	5,10	1,52
<i>Rump width</i>	4,99*	1,24	4,38*	1,55	4,28*	1,40
<i>Rear leg side view</i>	5,96*	1,22	6,09*	1,04	5,93*	1,02
<i>Rear leg rear view</i>	4,91*	1,31	4,96	1,46	4,97	1,44
<i>Foot angle</i>	4,76*	1,19	4,44*	1,20	4,49*	1,18
<i>Fore udder attachment</i>	4,61*	1,54	4,46*	1,40	4,41*	1,21
<i>Rear udder height</i>	4,68*	1,20	4,92*	1,29	4,72*	1,21
<i>Udder cleft</i>	5,21*	1,47	5,56*	1,49	5,39*	1,42
<i>Udder depth</i>	4,95*	1,67	4,92*	1,97	5,52*	1,53
<i>Fore teat placement</i>	4,55*	1,45	4,43 <sup>a)</sup>	1,16	4,42 <sup>a)</sup>	1,10

Asterisks (\*) mark significant difference at  $P < 0.05$  between the three groups

There is no significant difference ( $P < 0,05$ ) between groups marked <sup>a</sup>

Table 5

Milk production parameters of the linear type traits according to categories in case of cows with long life (n=3648)

Linear type traits	Category	Average milk quality (kg)
<i>Stature</i>	1	59374 <sup>a)</sup>
	2	60480 <sup>b)</sup>
	3	62506 <sup>c)</sup>
<i>Strength</i>	1	NS
	2	
	3	
<i>Body depth</i>	1	59213 <sup>a)</sup>
	2	59508 <sup>a)</sup>
	3	63669 <sup>b)</sup>
<i>Dairy form</i>	1	54450 <sup>a)</sup>
	2	59204 <sup>b)</sup>
	3	66226 <sup>c)</sup>
<i>Rump angle</i>	1	NS
	2	
	3	
<i>Rump width</i>	1	NS
	2	
	3	
<i>Rear leg side view</i>	1	59114 <sup>a)</sup>
	2	59683 <sup>a)</sup>
	3	61914 <sup>b)</sup>
<i>Rear leg rear view</i>	1	60910 <sup>a)</sup>
	2	59870 <sup>b)</sup>
	3	62224 <sup>c)</sup>
<i>Foot angle</i>	1	62017 <sup>a)</sup>
	2	60129 <sup>b)</sup>
	3	58664 <sup>c)</sup>
<i>Fore udder attachment</i>	1	62412 <sup>a)</sup>
	2	59740 <sup>b)</sup>
	3	60817 <sup>c)</sup>
<i>Rear udder height</i>	1	NS
	2	
	3	
<i>Udder cleft</i>	1	58786 <sup>a)</sup>
	2	59393 <sup>a)</sup>
	3	63855 <sup>b)</sup>
<i>Udder depth</i>	1	63148 <sup>a)</sup>
	2	60782 <sup>b)</sup>
	3	58902 <sup>c)</sup>
<i>Fore teat placement</i>	1	NS
	2	
	3	

a) b) c) P<0,05, There is no significant difference between marked same letters

The risk of failure of the individuals were born between 1985 and 1992 was analyzed. Based on my results, risk of failure was higher in case of cows with towery rump, collateral and curved legs and the ones with loose fore udder attachment, loose udder cleft, very deep udder and outside fore teat placement

Table 6

**Comparison of some linear type traits in aspect of failure risk on cows were born between 1985 and 1992 (n=101479)**

	Score	P-score	Relative risk score	Examined cows (n)
Fore udder attachment	1	<i>0.0080</i>	<i>1.166</i>	337
	2	0.1124	1.041	1822
	3	0.0701	1.018	16751
	4	*	1.000	35415
	5	<i>0.0001</i>	<i>0.967</i>	27875
	6	<i>0.0000</i>	<i>0.938</i>	12013
	7	<i>0.0000</i>	<i>0.926</i>	4873
	8	<i>0.0000</i>	<i>0.885</i>	2261
	9	0.1356	0.877	132
Udder cleft	1	0.7943	1.053	26
	2	<i>0.0000</i>	<i>1.308</i>	771
	3	<i>0.0000</i>	<i>1.156</i>	7171
	4	<i>0.0000</i>	<i>1.099</i>	15495
	5	<i>0.0000</i>	<i>1.038</i>	23615
	6	*	1.000	31465
	7	<i>0.0005</i>	<i>0.964</i>	14065
	8	<i>0.0064</i>	<i>0.964</i>	7790
	9	0.4802	0.978	1081
Fore teat placement	1	<i>0.0009</i>	<i>1.141</i>	690
	2	<i>0.0000</i>	<i>1.097</i>	3086
	3	<i>0.0001</i>	<i>1.046</i>	9851
	4	*	1.000	37999
	5	0.9782	1.000	35832
	6	0.3157	1.012	10975
	7	0.2266	0.973	2188
	8	0.9128	1.004	745
	9	0.7348	1.033	113

\*Score of reference,  
*Italic values are significant on P<0,05 level*

Seen in the *Table 6* the comparison of some linear type traits in aspect of failure risk on cows were born between 1985 and 1992. Based on this I can declare that failure risk is higher in case of cows with outside fore teat placement, and with loose udder cleft.

Based on the pedigree analyses we can conclude that no effects of a specific bull can be found in forming longer or shorter productive life. We cannot establish that progeny of the Hungarian or the foreign bulls lived more.

I demonstrated that the primarily causes of culling are material diseases and low production in case of the short-lived cows. On the contrary, the long-lived animals are primarily culled because of reproduction and udder problems. Cows with deep udder are culled with higher probability than individuals with regular udder.

By all means, obligate failure has to be avoided to be significant at farms. (e.g. because of frequent material streaming diseases) First of all, this can be reached by improving environmental conditions such as appropriate feeding and providing such conditions that promote suitable and calm way of living for productive animals. Additionally, perfect keeping technology and perfect management and appropriate feeding manner are required. The rate of sorting out - because of selection - should be put to be significant in the stock. In case it succeeds, secondly sorting out on functional traits should be promoted

When analyzing the milk production of the first 200 excellent cows with a significant life performance, I also studied the size of farms where these performances were achieved. I found that the majority of these cows are performing in specialized farms with good environmental conditions and large herd size. It is interesting, that farms not having the opportunity to meet the individual keeping and feeding claims of the animals are still able to ensure conditions for the highest life performances.

## V. NEW SCIENTIFIC RESULTS

1. I established there is moderate coherence between lifetime and quantity productivity indicators (milk kg, fat kg, protein kg) however there is no demonstrable relation between milk content (fat %, protein %) and productive life. It proved true that the selection based on the performance and the appearance in the past decades did not modify the context between the lifetime and the milk production indicators.

2. Analysing of milk production parameters I established there is difference between the correlation of fat- and protein content at cows with early culling and long productive life. There is closer relation between fat- and protein content at cows with longer productive life.

3. Comparing the characteristic results by the Kruskal-Wallis non-parametric method I defined, cows with longer productive life have higher rumps, stronger bodies, deeper bodies, crooked legs, higher rear udders, better udder clefts; on the other hand they have less deep udders than those born in the same time and culled early.

4. According to the characteristics made by the rated linear classification review I can state the lifetime production of cows with higher rumps, deeper bodies, more notable dairy form namely cows with more open ribs, flatter bones, crooked legs, stronger udder clefts and deeper udders is more significant than the ones' with the contrary values regarding the same characteristics.

5. Based on Hungarian Holstein Friesian population I demonstrated that risk of failure was higher in case of cows with towery rump, collateral and curved legs and the ones with loose fore udder attachment, loose udder cleft, very deep udder and outside fore teat placement by Weibull proportional hazard model

## **VI: RESULTS IN PRACTICAL USE**

Breeders of dairy cows should seriously consider by all means selection by functional type traits since the appropriate type infers long productivity life which results in economic milk production. Among the appearance traits, the characteristics of udders and body size must be presented in one of the first rows during selection.

It can be unambiguously recommended that cows with higher rumps, stronger and deeper bodies and with less shallow udders should constitute the main part of the stock because the probability for obligate culling is less in this case.

As the inheritableness value of long productive life is small, appropriate environmental conditions have to be ensured for the livestock. This is the only way how longer productive life, outstanding productivity and finally economic milk production can be achieved.

Cattles taking part in the Hungarian progeny examination, namely application of the Hungarian sires is practical to put forward in breeding as the characteristics of these cattles developed under Hungarian conditions. That is why descendants can be expected to reach suitable values in higher degree.

By the estimate of breeding value, indicator relating to long lifetime has to be involved soon in the index of estimate of breeding value. Moreover the index of longevity has to be considered in which rate it should be demonstrated in the index.

By all means, obligate culling has to be avoided to be significant at farms. (eg. because of frequent material streaming diseases) First of all, this can be reached by improving environmental conditions such as appropriate feeding and providing such conditions that promote suitable and calm way of living for productive animals. Additionally, perfect keeping technology and perfect management and appropriate feeding manner are required. The rate of sorting out - because of selection - should be put to be significant in the stock. In case it succeeds, secondly sorting out on functional traits should be promoted

Anyway, it is necessary to emphasize the executed examinations take the results of the individuals lived in Hungary into consideration. Namely, the results based on home feeding, livestock's measure, keeping technology and environment. Therefore establishments may practicable among on home conditions principally.

## VII. PUBLICATIONS IN THE THEME OF THE DISSERTATION

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