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# First Classification Score and Length of Herd Life

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**Abstract**

The relationship of first score and length of life in the herd was measured in Holstein females two or three years of age at first classification. The regression of herd life (number of times classified) on the first over-all type score (nearly all values were between 65 and 90 points) was 1.7 months. Correlation between first classification score and herd life was approximately 0.2, indicating that less than 5% of the variation in herd life could be attributed to the relationship between first score and herd life.

Differences among herds accounted for about 10% of the total variance in over-all type score and in the individual type traits. Differences among sires accounted for from 5 to 8% of the variation in over-all score and in each of the categories (general appearance, dairy character, body capacity, mammary system, fore udder, rear udder, legs and feet, and rump) of the Holstein classification system. Similarly, differences among classifiers accounted for 2 to 6% of the total variance. Classifier variation was greatest in the areas of general appearance, body capacity, and legs and feet.

An analysis of variance components on 7,927 artificially inseminated (AI) sired animals scored from 1958 through 1963 gave a heritability of 0.16 for over-all type score. Heritabilities of over-all score from each of the six years varied widely.

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It is a common belief in the dairy industry that the length of a dairy cow's productive life is strongly influenced by her physical characteristics. It is one of the major reasons dairy breed associations have conducted type classification programs for more than 30 years. Classification scores from animals in herds that frequently participated in the Holstein-Friesian classification program in New York were used to study the relationship between first type score and length of herd life.

An assessment of the amount of variation among scores for type in a large population of cattle was sought. There are limitations of the data, in that an upper limit is placed upon the score of a first calf heifer and that only a small proportion of all dairy herds classify. However, herds that do classify are the major source of sires for artificial breeding units and for individual breeding herds.

The problem of evaluating sires for their ability to transmit desirable type traits continues to be difficult. Therefore, it seems important to determine from field data what influence the herd, the sire, and the classifier might have upon the variation found in the type scores of dairy animals. The components of variation due to sires can be used to estimate what progress can be made in selecting for improved type.

## Data

Herds chosen for the project had been scored by classifiers from the Holstein-Friesian Association at least three times since 1950. Type scores were available on 31,719 females whose first classification occurred between the ages of 24 and 47 months. Sixty per cent of the animals were scored initially at more than 35 months of age.

General appearance, dairy character, body capacity, mammary system, fore udder, rear udder, legs and feet, and rump were rated Excellent, Very Good, Good Plus, Good, Fair, and Poor and were coded 9, 8, 7, 6, 5, and 4, respectively. Over-all type scores were the customary numeric values that range from less than 65 to more than 90 points.

## Results and Discussion

The means and standard deviations for over-all type and the eight individual traits are given in Table 1 for four nearly equal periods. The mean from 1950 through 1963 was 78.72 ± 3.37 for over-all first type score. Means and standard deviations for individual traits were: 6.27 ± 0.81 for general appearance, 7.33 ±

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TABLE 1

Means and standard deviations for first type score

| Year of classification<br>No. of animals | 1950–53<br>3,403 | 1954–57<br>6,142 | 1958–60<br>10,004 | 1961–63<br>12,170 |
|---|---|---|---|---|
| Over-all score | 78.19 ± 3.86 | 78.79 ± 3.31 | 78.87 ± 3.29 | 78.72 ± 3.31 |
| General appearance | 6.33 ± 0.82 | 6.40 ± 0.79 | 6.27 ± 0.80 | 6.18 ± 0.81 |
| Dairy character | 7.28 ± 0.63 | 7.36 ± 0.58 | 7.31 ± 0.58 | 7.35 ± 0.60 |
| Body capacity | 7.01 ± 0.77 | 7.21 ± 0.64 | 7.13 ± 0.61 | 7.10 ± 0.63 |
| Mammary system | 6.24 ± 0.86 | 6.33 ± 0.81 | 6.38 ± 0.77 | 6.38 ± 0.79 |
| Fore udder | 6.22 ± 0.88 | 6.35 ± 0.84 | 6.45 ± 0.82 | 6.40 ± 0.84 |
| Rear udder | 6.48 ± 0.95 | 6.60 ± 0.83 | 6.56 ± 0.79 | 6.53 ± 0.82 |
| Legs and feet | 6.61 ± 0.90 | 6.28 ± 0.80 | 6.24 ± 0.79 | 6.05 ± 0.79 |
| Rump | 6.35 ± 1.06 | 6.58 ± 0.95 | 6.46 ± 0.94 | 6.33 ± 0.93 |

0.59 for dairy character, 7.12 ± 0.65 for body capacity, 6.35 ± 0.80 for mammary system, 6.39 ± 0.84 for fore udder, 6.55 ± 0.83 for rear udder, 6.17 ± 0.81 for legs and feet, and 6.42 ± 0.96 for rump.

The lowest scores and the largest standard deviations occurred in the first period. Exceptions were general appearance, legs and feet, and rump, where the lowest averages appeared in 1961–63. The highest scores and the smallest standard deviations were in dairy character and body capacity. There was little difference among the four periods, except for the decline in the score for legs and feet.

*First type score and herd life.* First type score and length of herd life represented by the number of times classified (or checked without the animal's score being changed) were compared by using females two and three years of age classified from 1950 through 1958. Average age at classification, the means and standard deviations for first score, and other data are given in Table 2.

The regression of times classified, used as a measure of herd life, on first type score was small. The correlation between first type score and herd life was about 0.2. This suggests that less than 5% of the variation in herd life can be accounted for by the relationship between type score and length of herd life. The average interval between first and second classifications was 17 months for cows classified at least twice. With a regression of 0.1, a cow scoring 79 points at first classification would be expected to remain in the herd 1.7 months longer than a herdmate that scored 78. A cow scoring 85 points versus one scoring 75 would likely have an additional period of herd life equal to the interval between classifications, or about one and one-half years. Whether this advantage in added herd life is because those herd owners who classify regularly prefer cows with higher type scores, or because the higher scoring cows were better milkers, or because of some combination of both, was not determined.

The correlations between individual type trait scores and herd life were essentially the same as that for over-all score and herd life. An exception was the lack of correlation between the first score for body capacity and herd life. The associations between the categories of (1) legs and feet, and (2) rumps with herd life were slightly lower than for the other subdivisions. A major question not resolved by this study is the interrelationship between first type score, first lactation production, and their joint effect on herd life.

*Difference in first score due to age.* The proportion of cows rated Fair differed among animals of different ages. Fourteen per cent of the animals 24 to 35 months of age were classified Fair on first score. Nine per cent were rated

TABLE 2

First score and herd life

| Age at classification | 24–35<br>Months | 36–47<br>Months |
|---|---|---|
| No. of animals | 5,054 | 6,653 |
| Mean age *(months)* | 30.8 | 40.6 |
| Mean over-all type score | 78.21 ± 3.41 | 79.27 ± 3.43 |
| Mean times classified | 2.6 | 2.5 |
| Correlation of first score and times classified | 0.11** | 0.20** |
| Regression of times classified on first score | 0.10** | 0.09** |

** Significantly different from zero at .01 level.

TABLE 3
First type scores for natural service and AI progeny

| | Daughters of natural service sires | Natural service daughters of AI sires | AI daughters |
|---|---|---|---|
| No. of daughters | 8,220 | 648 | 2,839 |
| Mean first score | 78.84 ± 3.43 | 80.58 ± 3.12 | 78.33 ± 3.37 |
| Correlation of times classified and first score | .20** | .16** | .21** |
| Regression of times classified on first score | .09** | .08** | .09** |

** Significantly different from zero at .01 level.

Fair among those scored for the first time at 36 to 47 months of age. A third group classified initially between 24 and 35 months of age had only 5% rated Fair when scored again as three-year-olds. The higher percentage of animals scored Fair in the first group probably indicates a larger proportion of undersized animals and an insufficient time lapse for the owners to have made all of their culling decisions. It is also possible that classifiers are more strict when scoring animals at the younger ages.

Table 2 shows that over-all type score averaged 79.3 for a group of 6,653 animals scored initially between the ages 36 and 47 months. Average score for 5,054 cows between the ages of 24 and 35 months was 78.2. The three-year-olds had higher scores in all subclassifications. The biggest differences were in general appearance, body capacity, and rump.

Waiting until the daughters of a sire are three years of age before classifying could add one or more points to the daughter type average. It would also allow additional time to cull animals of inferior type before they were classified.

*Type scores for natural service and artificial insemination progeny.* The two- and three-year-old cows scored from 1950 through 1958 were divided into three groups: 1) offspring of bulls used only in natural service, 2) daughters resulting from natural service of sires later placed in AI units serving New York, and 3) AI progeny of the sires mentioned in 2) above. Table 3 gives data on the three groups of daughters.

Over-all type scores (first classification) for daughters from the natural service of sires later used by AI studs averaged 2.25 points higher than those of their AI half-sisters. The smaller standard deviation for the natural service daughters could indicate that this group was more selected than either their AI half-sisters or the progeny of the sires used only in natural service. The relationship between herd life and first type score was almost identical for the three progeny groups.

*Classifier variation.* There were 16 classifiers participating in the New York program over a 14-year period. Six men scored over 1,000 cows each on first classification and three men scored more than 750 animals. The others scored less than 500 animals at first classification.

The mean over-all type scores for two-year-olds by classifier ranged from 76.5 to 79.1 points. The average two-year-old score for the six most active classifiers ranged from 77.4 to 79.1 points. Differences among classifiers tended to persist in their scores on older animals. Averages of best scores by age, including checking of previously classified animals, were 78.21 for two-year-olds, 79.17 for three-year-olds, and 79.92, 80.52, 81.72, for four-, five-, and six-year-old and older animals, respectively.

*Classifier by herd analysis.* The proportions

TABLE 4
Herd and classifier variance

| | Percentage of total variance | | | |
|---|---|---|---|---|
| | Herd | Classifier | Herd × classifier | Residual |
| Over-all type score | 12.9 | 2.5 | 5.6 | 79.0 |
| General appearance | 10.9 | 5.2 | 4.3 | 79.6 |
| Dairy character | 6.8 | 2.3 | 5.4 | 85.7 |
| Body capacity | 5.1 | 6.0 | 6.3 | 82.7 |
| Mammary system | 8.5 | 3.6 | 4.3 | 83.6 |
| Fore udder | 7.5 | 4.0 | 4.5 | 83.9 |
| Rear udder | 7.3 | 2.8 | 4.8 | 85.2 |
| Legs and feet | 5.2 | 5.2 | 7.6 | 82.0 |
| Rump | 8.3 | 2.8 | 5.0 | 83.8 |

TABLE 5
Herd and sire variance

| Components | d.f. | Percentage of total variance | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | OTS | GA | DC | BC | MS | FU | RU | FL | R |
| Herd | 470 | 14.2 | 12.3 | 10.2 | 9.9 | 10.0 | 8.5 | 8.2 | 7.6 | 7.7 |
| Sire | 286 | 8.5 | 7.6 | 4.7 | 5.5 | 7.1 | 6.6 | 5.1 | 5.0 | 8.5 |
| Sire × herd | 4,836 | 3.9 | 3.1 | 2.5 | 1.2 | 2.4 | 1.9 | 3.5 | 5.3 | 6.6 |
| Residual | 2,334 | 73.5 | 77.0 | 82.7 | 83.4 | 80.5 | 83.1 | 83.2 | 82.1 | 77.2 |
| $\bar{x}$ | | 78.33 | 6.11 | 7.31 | 7.06 | 6.29 | 6.33 | 6.47 | 6.05 | 6.28 |
| SD | | 3.30 | 0.79 | 0.60 | 0.61 | 0.77 | 0.81 | 0.80 | 0.79 | 0.91 |

of variance attributable to herds, classifiers, and interactions between classifiers and herds, from analysis of a two-way random model by the method of Henderson and Searle [Van Vleck and Henderson (3)] are in Table 4.

There were 31,411 first scores of two- and three-year-olds in 529 herds, with 16 classifiers, and 2,238 classifier by herd subclasses. The percentage of the variation accounted for by herds was less than commonly reported for the herd effect on production, but agreed well with the work of Carter et al. (1) and Van Vleck (2). Classifiers agreed best on over-all type score, dairy character, rear udder, and rump. Wider differences of opinion existed among classifiers as to general appearance, body capacity, and legs and feet. Fore-udder and over-all mammary-system scores were intermediate in classifier agreement. The classifier by herd contribution equalled or exceeded the classifier component in all cases except general appearance. The interaction of classifier with herd could have been inflated by interactions of year by herd or year by classifier.

*Regression of daughter score on herdmate average score.* Regressions of 1,723 groups of paternal half-sisters (6,029 cows from natural service) on herdmates were 0.26 to 0.45 for the eight type traits. The regression for the average over-all score of the paternal sisters on their herdmates' average score was 0.35. Correlations ranged from a low of 0.08 (rear udder) to 0.17 (legs and feet), with 0.12 for over-all score.

*Sire by herd analysis.* A variance component analysis with 7,927 AI sired cows, utilizing the procedure mentioned previously, gave values for herd effect that ranged from 8 to 14%, while the residual variation was about 80%. Sire effect ranged from 5 to 8% and the sire by herd component from 1 to 6%, for individual type traits. Table 5 indicates the range found for the different traits, along with their means and standard deviations.

Separating the data into individual years from 1958 through 1963 gave heritability estimates on over-all score from 0.0 to 0.39, with an average for the six years of 0.16. These values plus the means, standard deviations, and variance components for over-all score are given in Table 6.

## Conclusions

Classification scores on New York Holstein cattle have changed little over a 14-year period, although scores for legs and feet decreased.

The linear relationship between first classification score (both for over-all score and the individual traits) and herd life appears small. No relationship was found between body capacity ratings at first classification and length of herd life. The importance of type score to herd life appears to be relatively minor.

Culling practices and age differences can influence the classification average on the daugh-

TABLE 6
Year-to-year variation in first type score

| Year | N | Heritability estimate | $\bar{x}$ | SD | Percentage of total variance | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Herd | Sire | Sire by herd | Residual |
| 1958 | 765 | .39 | 79.19 | 3.12 | 10.7 | 8.2 | 0.0 | 83.6 |
| 1959 | 1,124 | .10 | 78.30 | 3.07 | 14.1 | 2.2 | 20.9 | 62.9 |
| 1960 | 1,326 | .02 | 78.07 | 3.43 | 9.7 | 0.5 | 10.7 | 79.4 |
| 1961 | 1,320 | .00 | 77.52 | 3.54 | 3.0 | 0.0 | 7.7 | 90.4 |
| 1962 | 1,874 | .23 | 78.40 | 3.25 | 5.6 | 5.5 | 13.4 | 75.9 |
| 1963 | 1,518 | .24 | 78,79 | 3.12 | 4.6 | 5.8 | 17.6 | 72.6 |
| Wtd. average | | .16 | 78.34 | 3.27 | 7.4 | 3.6 | 12.6 | 77.2 |

ters of a bull, and lead to errors in the evaluation of a sire's ability to transmit improved type.

Classifiers accounted for a larger percentage of the total variation in general appearance, body capacity, and legs and feet than in the other traits. Herds accounted for an average of 10% of the variation, both in overall score and in individual traits. Variation due to sires was about one-half that for herds. Sire-by-herd interaction, although smaller than the sire effect on all traits in the analysis of six years of data, fluctuated widely for individual years and substantially exceeded the sire effect in five of the six years.

Use of the herdmate approach for type scores, although possibly not justified on the basis of the total variance due to herds, might be worthwhile if it would eliminate some of the variation due to years and to the difference in culling rates that seems to exist between daughters of bulls in single-herd use and the progeny of sires used extensively in AI.

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