Body Condition Score As Early Indicator of Days Open Using Random Regression Analysis

A. A. Amin [1]*, S. A. Mokhtar * and T. Gere **

* Department of Animal Production, Faculty of Agriculture, Suez Canal University, 41522, Ismailia, Egypt.

** Karoly Robert College of Agriculture, Gyongyos, 3200-Hungary.

***Received:** 10/4/2007*

Abstract: The objective of the present study was to evaluate genetic variability in body condition score (Bcs) along with its relationship with reproductive performance (Do: days open) for Hungarian Holstein Friesian cows. Body condition score records were available from calving to end of lactation of the first three parities. Data consisted of 162,792 test-day observations on 4,215 cows daughters of 1,410 dams and 132 sires recorded between the years 1998 and 2001. Polynomial random regression of the third order was applied to explain variation in body condition score and days open. Heritabilities, additive and permanent environmental correlations were estimated using random regression animal model. Heritability of body condition score was estimated as 0.17± 0.08 on average, ranging from 0.01 for the first parity during early lactation to 0.26 for the second and the third parities during mid lactation. Heritability estimate of days open was 0.20 on average, ranging from 0.19 to 0.23 during late and early production life, respectively. Permanent environmental conditions contributed the lowest variation in Bcs within the first parity and during early stages of the second and third parities. Early body condition score was additively negatively correlated (-0.45) with next measures near to lactation end but that during midlactation showed strong positive additive correlation (0.96) with the next measures toward trajectory end. The results suggest that Bcs across different lactation segments could be treated as separate traits. Random regression on age showed that Bcs was not similar genetically across different calving age as evident from depression and weakness of their positive correlations. Days open during early lifespan was additively negatively associated with Bcs during maturing calving age (reached -0.27). The results indicated that cows with high Bcs had genetically shorter days open, hence an increased reproductive performance. In general, the current results suggested that Bcs data collected by type classifier can be well used for genetic evaluation and that pattern of genetic variation between animals for Bcs can be changed either across different stage of lactation or across different calving age.

Keywords: body condition scores, reproductive, days open, random regression.

INTRODUCTION

Total body energy reserves (or body condition) have been shown to influence reproduction, milking ability, and maintenance in multiparous cows (Morrison *et al.*, 1999). Even more important may be the influence of adequate body condition on reproduction in primiparous cows (Lalman *et al.*, 1997). Body condition scores are a subjective measure of body fat and tissue reserves that are commonly used to monitor and manage the nutritional and health status of dairy herds (Wildman *et al.*, 1982). They stated that body condition scores are phenotypically associated with yield, cow health, and reproductive performance. Economic efficiency of dairy production is dependent on all of these factors as well as efficiency of feed utilization. Selection for yield traits has been successful and has improved the efficiency of dairy production (Korver, 1988). However, simulation studies indicated that selection pressure for other economically important traits, such as reproductive performance using the best related traits such as body condition scores, has been less than optimal (Philipsson *et al.*, 1994). Cows that are fat or overconditioned at calving may be at risk for increased reproductive problems (Gearhart *et al.*, 1990). However, the fat or overconditioned cows may represent extremes in Bcs that are not typically seen in high yielding dairy herds. Cows with higher Bcs at calving generally lost more body condition during lactation, which could negatively influence milk yield (Domecq *et al.*, 1997). Higher Bcs loss during early lactation is also related to higher production and poorer reproductive performance. Bcs is favorably correlated genetically with days to first heat, days to first service, conception rates, and calving intervals (Dechow *et al.*, 2001; Pryce *et al.*, 2001; Veerkamp *et al.*, 2001). Several steps can be taken to address the reproductive performance conundrum, e.g. including Bcs in selection indexes. Bcs has been shown to be correlated (0.29 to 0.42) with improved fertility. Therefore, it seems to be a possible factor to be included in a selection index to maintain or improve reproduction. Bcs is easily measured, has herd management benefits and has a moderate correlation with fertility. The U.S. is starting to measure Bcs routinely and the UK has already included it in a selection index (Berry *et al.*, 2003).

The objectives of the current study were to: 1) investigate changes in genetic parameters for Bcs within and across lactations as well as with age at calving using random regression model, and 2) measure the relationship between Bcs and days open across different calving ages.

MATERIALS AND METHODS

There are five key areas on the body cows that need to be assessed, namely the area between the tail head and pin bones, inside of the pin bones, backbone, hips and depression the hip and pin bones as shown in Figure 1 (Moran, 2005). The system for body condition

[1] email: a.aminashraf@scuegypt.edu.eg

score (Bcs) ranges from emaciated/very little flesh over the skeleton (score 1) to very fat heavy fat cover (score 8). Only cows showing scores from 1.5 to 5 are described herein. Cows with scores of 1.5 or less are very thin and either severely underfed or suffering from disease or injury. Cows with scores over 5 are overfat and at risk of suffering from metabolic diseases around calving. Scoring increments are half point.

Records were edited to include Hungarian Holstein cows classified between 100 and 350 week of age and between 15 and 395 days in milk (DIM) throughout the lactation representing 13 groups with one-month interval. Data consisted of 162,792 test-day observations on 4,215 cows daughters of 1,410 dams and 132 sires recorded between the years 1998 and 2001. Distribution percentages of Bcs and trend of its changes across different stages within the first three parities are shown in Figure 2.

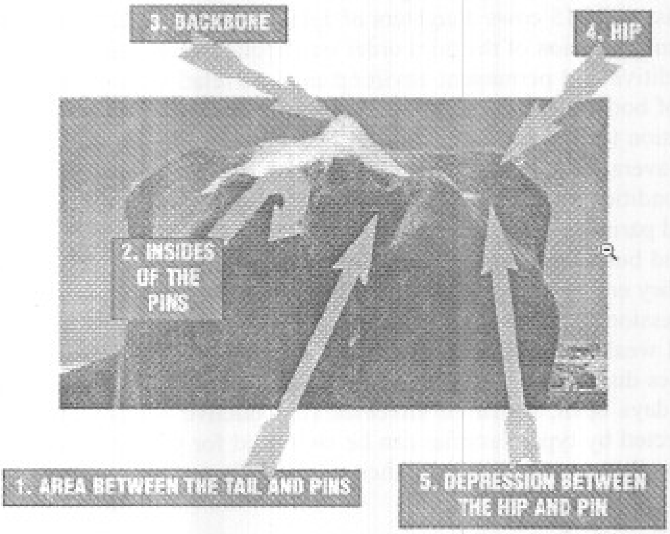

Figure (1): keys area for scoring body condition (Robins *et al.*, 2003)

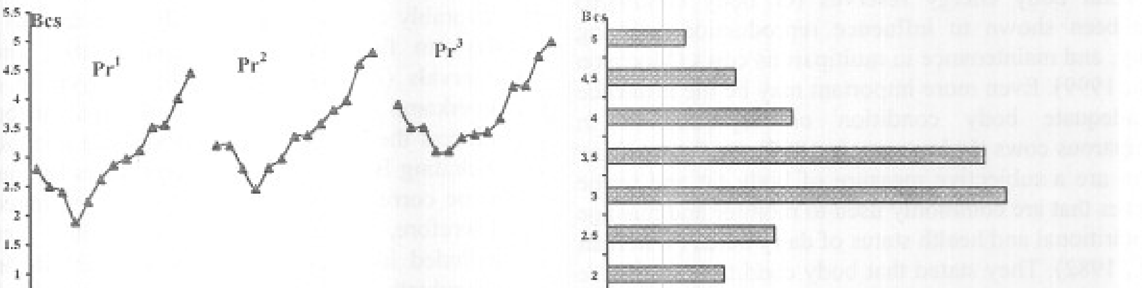

Figure (2): Changes of body condition score (Bcs) across different lactation stages and their percentage of distribution.

Mathematical Model:-

Two random regression models were applied to include either days in milk or calving age as fixed regression along with the covariate function.

Model 1:

$$Y_{ijk} = HTD_i + DIM_j + \sum_{n=0}^{r} \beta_{kn} Z_{jn} + \sum_{n=0}^{t} \alpha_{kn} Z_{jn} + \varepsilon_{ijk}$$

Model 2:

$$Y_{ijk} = HTD_i + CA_j + \sum_{n=0}^{r} \beta_{kn} Z_{jn} + \sum_{n=0}^{t} \alpha_{kn} Z_{jn} + \varepsilon_{ijk}$$

Where :- Y_{ijk} is the test-day observation for body condition score and days open, HTD_i is the fixed effect of herd-test-date; DIM_j is the fixed effect of days in milk (model 1) or CAj: calving age (model 2); Z_{jn} is the polynomial **n** for days in milk (DIM_j) Calving age (CAj), where **n**=(0,…..,r) for permanent environmental effects and **n**=(0,….,t) for additive genetic effects; β_{kn} is the random regression coefficient on Z_{jn} for the permanent environmental effect of cow k; α_{kn} is the random regression coefficient on Z_{jn}, for the additive genetic effect of animal k and ε_{ijk} is the random residual variance.

Additive genetic $\sigma^2 a_k$ and permanent environmental $\sigma^2 c_k$ variances and heritabilities at DIM k were calculated as:

$$\sigma^2 a_k = z'_k G z_k, \quad \sigma^2 c_k = z'_k P z_k,$$

$$h^2_k = \frac{\sigma^2 a_k}{\sigma^2 a_k + \sigma^2 c_k + \sigma^2_e}$$

where : Z_k is the vector of polynomials in the model for DIM_k, G: is the (co)variance matrix for additive genetic random regression coefficients, P is the (co)variance matrix for permanent environmental random regression coefficients and $\sigma^2 e$ is the random residual variance.

Correlations between traits:

$$r_{g_{Do_i,Bcs_j}} = \frac{\sum_i \sum_j \sigma_{g_{Do_i,Bcs_j}}}{\sqrt{\sum_i \sum_j \sigma_{g_{DO_i\,DO_j}}} \sqrt{\sum_i \sum_j \sigma_{g_{Bcs_i\,Bcs_j}}}}$$

Where

$r_{g_{Do_i,Bcs_j}}$ is genetic correlation between Do at i[th] DIM and Bcs at j[th] DIM, $\sigma_{g_{Do_i,Bcs_j}}$ is genetic covariance between Do at i[th] DIM and Bcs at j[th] DIM, $\sigma_{g_{DO_i\,DO_j}}$ is genetic covariance between Do at i[th] and at j[th] DIM, respectively and $\sigma_{g_{Bcs_i\,Bcs_j}}$ is genetic covariance between Bcs at i[th] and at j[th] DIM, respectively.

Software package of DFREML (Meyer, 1998 Version 3ß last update 2001) was used for fitting random regression model.

RESULTS AND DISCUSSION

Heritabilities of body condition scores:

Heritability estimates for body condition score (Bcs) showed clearly different trends across different lactation stages within the first three parities (Figure 3). Averages and ranges of estimates were 0.02; 0.01 to 0.04, 0.14; 0.0 to 0.27 and 0.14; 0.03 to 0.23 within the first three parities, respectively. Peak of heritability estimates were obtained near mid-lactation for all parities. The lowest estimates were observed within the first parity. It seems that, genetic variability among young cows in Bcs during early life was lower than at later stages of their lifespan. The highest heritabilities ranging from 0.23 to 0.27 during mid of the last two parities. It seems that, inheritable effects on Bcs are in progressing mode with advancing order of lactation. The lowest heritability estimates were mostly during both trajectories of the first three parities. It is possible that genetic variation in Bcs might be greatly affected by stage of lactation effects. Veerkamp *et al.* (2001) reported that genetic variance of Bcs was found to be highest in midlactation and lower at the beginning and end of lactation. Therefore, the best results for enhancing genetic improvement of Bcs genetic could be achieved when selection is applied within mid 2[nd] and 3[rd] parity. Heritability estimates of Bcs during early stage of lactation were low (0.09) and reached its highest level near to lactation end (0.20) across different parties (Dechow *et al.*, 2001). Biffani *et al.* (2002) found that heritability for Bcs was 0.198 which is similar to corresponding values obtained in the present study. In addition, low heritability estimates (0.05) for Bcs reported by Pryce *et al.* (2000) agrees with the current estimates across the first parity.

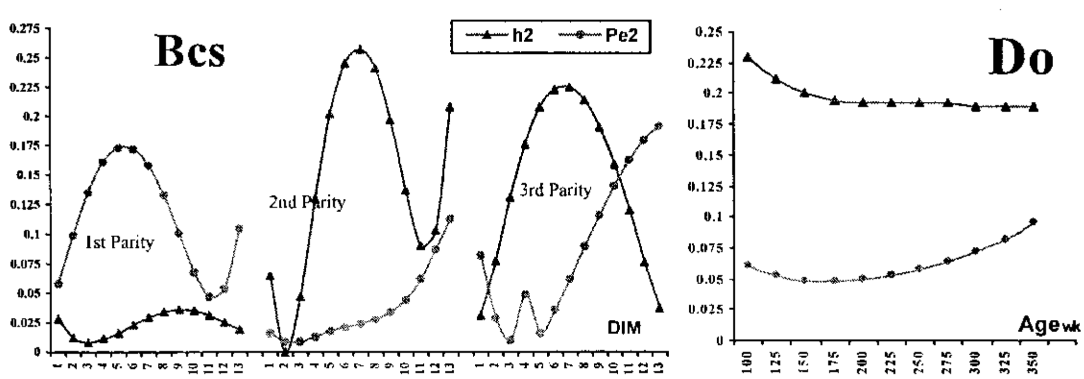

Figure (3): Heritability (h^2) and permanent environmental effects (Pe^2) for body condition score (Bcs) across days in milk and for days open (Do) across calving ages (in weeks).

Permanent environmental effect:

Body condition scores seemed to be mainly controlled by environmental condition across the first parity. Environmental influence was however minimum across early 2nd and 3rd lactations (Figure 3). It appears that, Bcs measured early in life may be influenced to a greater extent by management and environmental conditions. These results are in agreement with those reported by Dechow *et al.* (2001). Therefore, improving systems for rearing heifers could be favorable for improving body condition during first lactation.

Heritability estimates of days open:

Heritability of days open (Do) was 0.198 on average and ranging from 0.189 during late life to 0.230 during early lifespan (Figure 3). Changes of heritability estimates across different calving ages seem to be negligible. This result agrees with that reported by VeerKamp *et al.* (2001). Contribution of permanent environmental effects to variations in Do was limited where only minor changes were observed across different calving ages.

Correlation among repeated Bcs across lactation:

Additive genetic correlations between Bcs at DIM^{30} with nearest measures were moderately low and were in depression mode from 0.83 to 0.05. (Figure 4). It appears that genetic association of Bcs at early lactation with those at mid lactation segments tends to decline as lactation proceeds. Therefore, Bcs could be considered as non repeated trait across the first half of lactation due to existence of several physiological changes (estrus, conception, lactation progress and pregnancy). This is in agreement with results reported by Berry *et al.* (2002) and Dechow *et al.* (2004). Additive genetic correlations between early Bcs with the corresponding late measures were negative and reached -0.45. This may indicate that, thin cows during early lactation could be progressing lactation and pregnancy in a good body condition status. Although showing slight reduction towards lactation end, body condition score during midlactation ($Bcs^{150, 180}$) was in strong additive correlation with next measures till lactation end (close to unity). The small changes in additive genetic correlations across the 2nd half of lactation and the high genetic correlations imply that Bcs are genetically similar. In other words, Bcs could be considered as repeated trait during the second half of lactation. These results are in agreement with reports of Koenen and Veerkamp (1998). They found that, genetic correlations were very high (0.84 to 1.00) between Bcs observations across the 2nd half of lactation. Additive correlation between repeated measures of Bcs around the first 90 days in milk was about 0.8 being lower than the around midlactation. Therefore if true, avoiding Bcs depression across the current lactation may be more successful by manipulating Bcs after the middle of the previous lactation.

Relationship between early Bcs with repeated Do across calving ages:

Additive associations between early body condition scores (Bcs) and days open (Do) during middle lifespan increased with progressing calving age and arrived to more than 0.60 (Figure 5). This means early over weight is the most possible reasons for inefficient reproductive performance during lifespan end. On the other hand negative additive correlation was established between Bcs at 175 wk of age with the nearest subsequent measures of Do. It appears that, mature cows genetically inclined to produce higher levels of body condition scores tend to have short days open, loose more body condition score and suffer more severe negative energy balance in early production life. Therefore, fattening heifers during early production life must be avoided in order to extend reproductive life. On the other hand, a moderate body condition score seems to have a normal effect on subsequent reproductive performance in mature cows. Domecq *et al.* (1997) reported that early losses of body condition scores lead to impaired reproductive performance in multiparous cows more than other reproductive disorders. Body condition score of cows at calving is the most important factor affecting postpartum interval to estrus and pregnancy rate in multiparous cows (Selk *et al.*, 1988). Biffani *et al.* (2000) found that genetic correlations between Bcs and reproductive traits were moderately high and seem to be not negligible. These relationships have positive implications for the evaluation of Bcs as candidate predictor of reproductive performance.

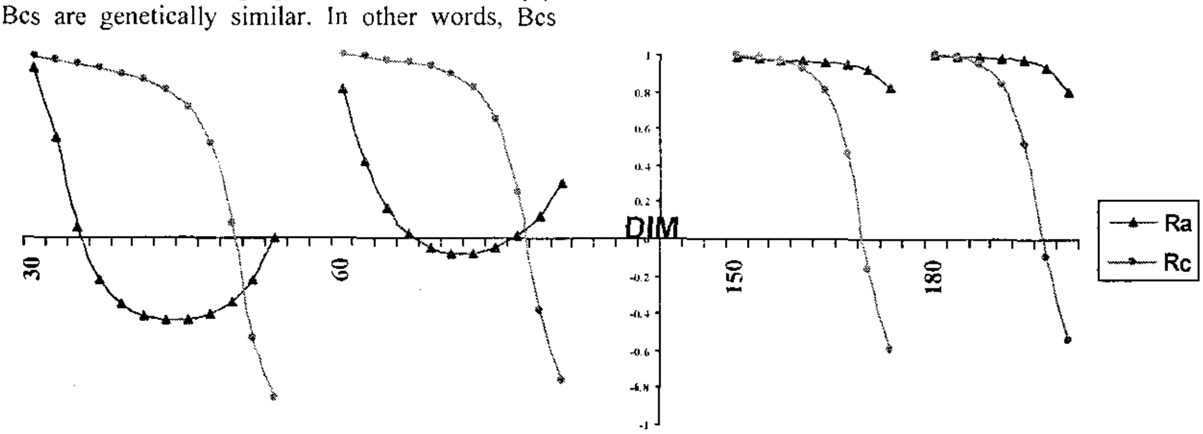

Figure (4): Additive (Ra) and permanent environmental (Rc) correlations between early ($Bcs^{30, 60}$) and midlactation ($Bcs^{150, 180}$) body condition score with their next measures across lactation.

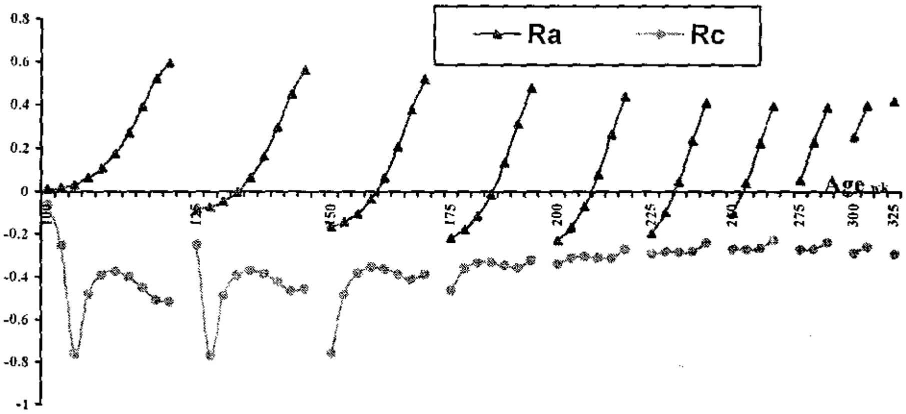

Figure (5): Additive (Ra) and permanent environmental (Rc) correlations between early body condition score and days open across calving ages (weeks)

Permanent environmental correlations between early Bcs and Do were -0.42 on average and remaining stable at low levels (between -0.2 to -0.3) across most calving ages (Figure 5). Enhancing environmental conditions for rearing pregnant heifers have no serious effect of future reproductive performance due to their negative relationship with Do. Thus measuring body condition scores during early ages are very important for addressing reproductive performance in future.

Relationship between early Do with repeated Bcs across calving ages:

Additive relationship between early (at 100, 125wk) measures of days open with body condition scores across different calving ages follows a negative curvelinear fashion (Figure 6). Highest magnitudes were -0.25 to -0.30 for Do at 125wk with Bcs across the interval of calving age from 225 to 275 weeks. This indicates that early good reproductive performance will lead to a good body condition score during mature age. Permanent environmental correlation between early Do and nearest three measures of Bcs increased in negative direction (around -0.8) and then decreased toward production life end (between -0.4 to -0.6). Such relationships are favorable for genetic enhancement of body status during stage of progressing pregnancy and embryo development. Thus, routinely measurements of Bcs are recommended to be included in reproductive selection index.

Relationship between Bcs and Do across calving ages:

Genetic and permanent environmental relationships between Bcs and Do are not consistent at the same calving age (Figure 7). Body condition score was found to be additively negatively correlated with Do during middle productive life reaching to -0.29. These results suggest that Bcs could be considered important factor to be included in a selection index to maintain or improve reproductive performance. Cows with low Bcs will exhibit poorer fertility, suggesting that genes associated with body tissue mobilization may have pleiotropic effects or be closely linked to genes controlling fertility in animals (Berry *et al.*, 2003). Relationships during early calving age were low and ranged from 0.0 to -0.20 across the 150 wk of age. Despite the antagonistic relationship between Bcs and production traits (Dechow *et al.*, 2002), selection must be practiced for enhancing body status because of a favorable relationship with reproductive performance. Positive association between Bcs and Do was observed at the 300th week of age and progressed throughout the rest of animals' life where it reached 0.42. This means that, lowering reproductive performance (extending Do) during the late productive life was associated with enhancing body score. So, decreasing reproductive efficiency of dairy cows at life end will be associated with enhancing body condition as a result of more fat deposition. Curve shape in Figure 7 indicates that all efforts to enhance Bcs though managerial aspects will lead to shortness days open as evident from their negative permanent environmental correlations.

Relationship between repeated Bcs across calving ages:

Relationship between early Bcs and nearest repeated measurements are strong and decreased rapidly toward lifespan end (Figure 8). This means that, fatty heifers during earlier calving ages are not reliable indicator for their body condition score during older calving ages. Similarly, frailer cows, i.e. those with early low body condition form has good possibility for achieving good Bcs with advancing calving age. In addition, Bcs could not be considered as repeated measurements as evident from reducing its correlations with progressing calving age. It appears that, management practices for enhancing Bcs are not the same across different calving ages, since permanent environmental correlations between repeated Bcs are negative

Relationship between repeated Do across calving ages:

Additive genetic correlations between early Do with subsequent measures are in depression mode toward productive life end (but still high ~ 0.75) as shown in Figure 8. This means that Do could be considered as repeated trait across different stages of productive life. Also from economic point of view, early selection for efficient reproductive performance will be very effective for reducing general reproductive losses in dairy herds.

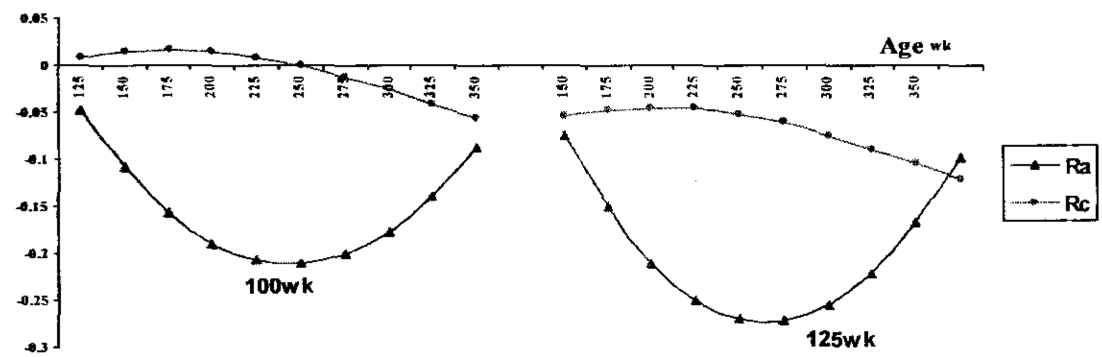

Figure (6): Additive (Ra) and permanent environmental (Rc) correlations between early days open (at 100 and 125 wk) with body condition score across calving ages (wk).

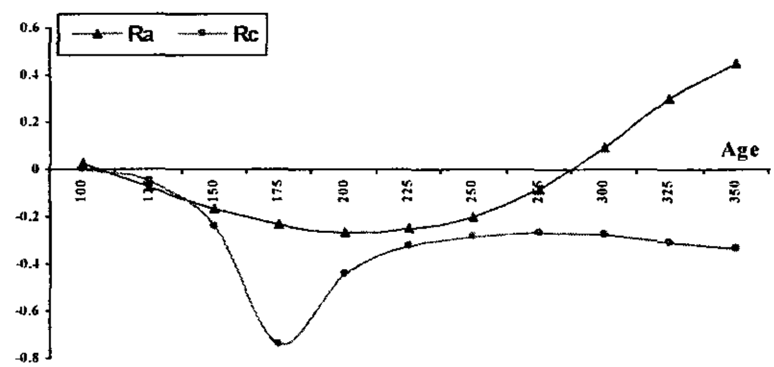

Figure (7): Additive (Ra) and permanent environmental (Rc) correlations between body condition score and days open at the same point across different calving ages (wk).

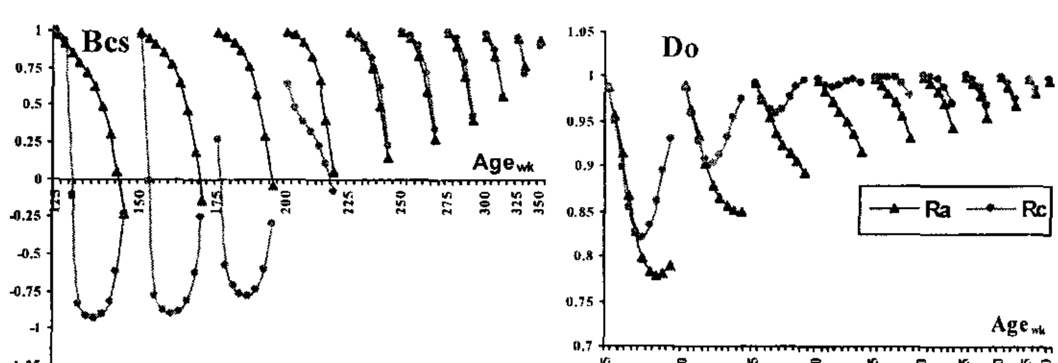

Figure (8): Additive (Ra) and permanent environmental (Rc) correlations between either early body condition score (Bcs) or days open (Do) with their repeated measures across calving ages).

REFERENCES

Berry, D. P., F. Buckley, P. Dillon, R. D. Evans, M. Rath, and R. F. Veerkamp. (2002). Genetic parameters for level and change of body condition score and body weight in dairy cows. J. Dairy Sci. 85:2030–2039.

Berry, D. P., F. Buckley, P. Dillon, R. D. Evans, M. Rath, and R. F. Veerkamp (2003). Genetic relationships among body condition score, body weight, milk yield, and fertility in dairy cows. J. Dairy Sci. 86:2193–2204

Biffani, S, A.B. Samoré, F. Canavesi, E. Olzi, M. Cassandro (2002). Genetic aspects of body weight, body condition score, scrotal circumference and reproductive performance in Italian Holstein young bulls. Online available at http://www.bsas.org.uk/downloads/annlproc/Pdf2003/intro~programme03.pdf

Dechow, C. D., G. W. Rogers and J.S. Clay (2001). Heritabilities and correlations among body condition scores, production traits and reproductive performance. J. Dairy Sci. 84:266-275.

Dechow, C. D., G. W. Rogers, L. Klei, and T. J. Lawlor (2004). Heritability and Correlations for Body Condition Score and Dairy Form Within and Across Lactation and Age. J. Dairy Sci. 87:717–728.

Domecq, J. J., A. L. Skidmore, J. W. Lloyd, and J. B. Kaneene (1997). Relationship between body condition scores and milk yield in a large dairy herd of high yielding Holstein cows. J Dairy Sci 80:101–112

Gearhart, M. A., C. R. Curtis, H. N. Erb, R. D. Smith, C. J. Sniffen, L. E. Chase, and M. D. Cooper (1990). Relationship of changes in condition score to cow health in Holsteins. J. Dairy Sci. 73:3132–3140.

Koenen, E. P. C., and R. F. Veerkamp (1998). Genetic covariance functions for live weight, condition score, and dry-matter intake measured at different lactation stages of Holstein Friesian heifers. Livest. Prod. Sci. 57:67–77.

Korver, S. (1988). Genetic aspects of food intake and feed efficiency in dairy cattle: a review. Livest. Prod. Sci. 20:1–13.

Lalman, D. L., D. H. Keisler, J. E. Williams, E. J. Scholljegerdes, and D. M. Mallett. (1997). Influence of postpartum weight and body condition change on duration of anestrus by undernourished suckled beef heifers. J. Anim. Sci. 75:2003–2008.

Meyer, K. (1998). "D_XM_{RR}" a program to estimate covariance functions for longitudinal data by restricted maximum likelihood in proceeding 6th WCGA 12-16 Jan. University New England, Armidale, 27: 465-466. Last modified: Jan. 24, 2000

Moran, J. (2005). New system of scoring the body condition of dairy stock. On line available at http//:www.landlinks.com.aue

Morrison, D. G., J. C. Spitzer, and J. L. Perkins (1999). Influence of prepartum body condition score change on reproduction in multiparous beef cows calving in moderate body condition. J. Anim Sci. 77:1048–1054.

Philipsson, J., G. Banos, and T. Arnason. (1994). Present and future uses of selection index methodology in dairy cattle. J. Dairy Sci. 77:3252–3261.

Pryce, J. E., Coffey, M.P. and Brotherstone, S. (2000). The genetic relationship between calving interval body condition score, linear type trait and management traits in registered Holsteins J. Dairy Sci. 83: 2664-2671.

Pryce, J. E., M. P. Coffey, and G. Simm. (2001). The relationship between body condition score and reproductive performance. J. Dairy Sci. 84:1508–1515.

Robins, C., R. Stockdale, J. Crosby, and J. Morton (2003). The condition magician: Body condition scoring in dairy herds (2nd ed.) Department of Natural Resources and Environmental Victoria. Online available at http//:www.landlinks.com/nid/18/pid/5126.htm.

Selk, G. E., R. P. Wettemann, K. S. Lusby, J. W. Oltjen, S. L. Mobley, R. J. Rasby, and J. C. Garmendia (1988). Relationships among weight change, body condition and reproductive performance of range beef cows. J. Anim. Sci. 66:3150-3159.

Veerkamp, R. F., E. P. C. Koenen, and G. De Jong (2001). Genetic correlations among body condition score, yield, and fertility in first-parity cows estimated by random regression models. J. Dairy Sci. 84:2327–2335.

Wildman, E. E., G. M. Jones, P. E. Wagner, R. L. Bowman, H. F. Troutt, and T. N. Lesch (1982). A dairy cow body condition scoring system and its relationship to selected production characteristics. J. Dairy Sci. 65: 495 - 506.

تقدير حالة الجسم كمؤشر مبكر لفترة التلقيح المخصب بإستخدام تحليل الإعتماد العشوائي

أشرف أمين*، سمير مختار*، جرى تيبر**
* قسم الإنتاج الحيواني- كلية الزراعة- جامعة قناة السويس- ٤١٥٢٢- الإسماعيلية- مصر
** كلية كرولى روبرت الزراعية- مدينة جونجش- ٣٢٠٠ المجر

الهدف من هذه الدراسة هو تقييم التغير الوراثى فى حالة الجسم من خلال علاقته مع الأداء التناسلي (فترة التلقيح المخصب) لأبقار الهولستين فريزيان المجرية. سجلات تقديرات حالة جسم الحيوان كانت متاحة من الولادة وحتى نهاية موسم الحليب للثلاثة مواسم الإنتاجية الأولى. تكونت البيانات من ١٦٢٧٩٢ مشاهدة على أساس يوم الإختبار لعدد ٤٢١٥ بقرة كبنات لعدد ١٤١٠ أم و ١٣٢ أب وذلك خلال الفترة من عام ١٩٩٨ وحتى ٢٠٠١. تم إستخدام معادلة الإعتماد العشوائي للرتبة الثالثة وذلك لتفسير التباين فى حالة جسم الحيوان وفترة التلقيح المخصب. تم تقدير قيم المكافئ الوراثى والارتباطات التجمعية والبيئية الدائمة بإستخدام معادلة الإعتماد العشوائي للنموذج الحيواني. متوسط قيم المكافئ الوراثى لتقديرات حالة الجسم خلال مراحل الحليب المختلفة كانت ٠,١٧ ± ٠,٠٨. وتراوحت بين ٠,٠١ خلال بداية موسم الحليب الأول وقد وصلت إلى ٠,٢٦ خلال منتصف موسم الحليب الثاني والثالث. متوسط تقديرات قيمة المكافئ الوراثى لفترة التلقيح المخصب كانت ٠,٢٠ حيث تراوحت من ٠,١٩ إلى ٠,٢٣ خلال نهاية وبداية الحياة الإنتاجية، على التوالى. التأثيرات البيئية الدائمة حققت أقل قدر من التباينات فى حالة جسم الحيوان خلال موسم الحليب الأول وخلال بداية موسم الحليب الثاني والثالث. القياسات المبكرة لحالة جسم الحيوان كانت على درجة إرتباط وراثي تجمعي سالب (-٠,٤٥) مع القياسات التالية حتى نهاية موسم الحليب ولكن قياسات حالة الجسم خلال منتصف موسم الحليب كانت على إرتباط وراثي تجمعي عالي (٠,٩٦) مع تلك القياسات التالية حتى نهاية الموسم. وهذه النتيجة تشير إلى أن حالة جسم الحيوان يمكن أن تعامل على أنها صفات مستقلة خلال المراحل المختلفة لمنحنى الحليب. هذا وقد أوضحت نتائج تحليل الإعتماد العشوائي لحالة الجسم على العمر أن هذه الصفة ليست على درجة واحدة من الأداء الوراثى خلال المراحل المختلفة من العمر وذلك نتيجة ضعف وانحدار قيم معاملات الإرتباط بين القياسات المتكررة عند الأعمار المتخلفة من الحياة الإنتاجية للحيوان. فترة التلقيح المخصب كانت على درجة من الإرتباط الوراثى السالب مع حالة الجسم خلال العمر عند الولادة لمرحلة النضج الجنسي (وصلت إلى -٠,٢٧). هذه النتائج تشير إلى أن الأبقار ذات الحالة الجسمانية العالية يتوافر لديها العوامل الوراثية التى تمكنها من الإخصاب فى وقت قصير وبالتالى إنخفاض فترة التلقيح المخصب وزيادة كفاءة الأداء التناسلي. بصفة عامة ، نتائج الدراسة الحالية تقترح ضرورة عملية تسجيل قياسات حالة الجسم لكى تستخدم فى مجال التقييم الوراثى للحيوانات بالإضافة إلى إمكانية قياس وتحديد التغير فى التعبير الوراثى لهذه الصفة بين الحيوانات خلال المراحل المختلفة لمنحنى الحليب وكذلك عند أعمار الولادة المختلفة خلال حياة الحيوان الإنتاجية.