

## ***Effect of twin vs. single births on gestation length, reproductive performance, dystocia, calf survival rate and culling in Holstein COWS***

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Data of Holstein dairy cows in a private farm (TEC-DAP) in Al-Fayum Governorate comprising 5815 calving events (80 for twins and 5735 for singles) in the period from January 1997 to April 2008 were used to determine if there was any significant difference between twin and single calving cows in gestation length, reproductive performance, incidence of dystocia, perinatal calf survival and mortality rates and culling rate. Cows giving twins had shorter ( $p < 0.0001$ ) gestation and more ( $p < 0.005$ ) days to first heat, first service and days open than cows giving singles. Incidence of dystocia was higher in cows with twins (22.5%) than those with singletons (7.22%). Survival rate of singles was 12.9% greater than that of twins at birth, whereas perinatal mortality rate was 16.25 % (9.37% stillborn & 6.88% dead after birth) for twins and 3.33% (2.06% stillborn & 1.27% dead after birth) for singles. Culling rate was greater in cows producing twins (61.53%) than those with singles (30.73%). Twinning in cattle shortens the length of gestation, impairs subsequent reproductive performance by prolonging postpartum breeding intervals, increases the incidence of dystocia and perinatal calf mortality and increases number of cows to be culled during subsequent lactation. Thus, twinning in dairy cattle is undesirable due to its detrimental effect on cow fertility and health and calf survival. However, these adverse effects can be minimized by preparturient diagnosis of twin pregnancy and timely administration of obstetrical assistance which aids in management of dystocia to facilitate delivery of twin calves and to increase their neonatal survival.

Cattle are a monotonous species in which a successful pregnancy results in the birth of a single calf. Twinning occurs relatively rarely, with the frequency generally not exceeding 1% in most beef herds. In dairy herds, the incidence of double births is higher (4-5%) compared to beef herds (Komisarek and Dorynek, 2002). Hence, growing concern has focused on the incidence of twin births in dairy cattle. Twinning is an undesirable reproductive outcome in dairy cattle production systems and reduces profitability through negative effects on calves born as twins as well as on cows calving twins (Nielen *et al.*, 1989; Fricke, 2001). Economic analyses have estimated farm losses for every twin birth at about \$110 (Eddy *et al.*, 1991; Beerepoot *et al.*, 1992).

About one half of the females born as twins are sterile free martins; only 9 % of heifers born co-twin with a male are fertile (Rutledge, 1975). Gestation length was shorter for twin than for single pregnancies (Turman *et al.*, 1971; Vincent

and Mills, 1972; Bellows *et al.*, 1974; Cady and Van Vleck, 1978; Anderson *et al.*, 1979; Chapin and Van Vleck, 1980; Wheeler *et al.*, 1982; Gregory *et al.*, 1990; Guerra-Martinez *et al.*, 1990; Echternkamp and Gregory, 1999a,b; Echternkamp and Gregory, 2002; Bell and Roberts, 2007). Twinning may entail management problems such as longer breeding intervals, increased dystocia, retained placentas, decreased conception and low calf survival (Turman *et al.*, 1971; Bellows *et al.*, 1974; Johansson *et al.*, 1974; Cady and Van Vleck, 1978; Anderson *et al.*, 1979; Anderson *et al.*, 1982; Bendixen *et al.*, 1989; Nielen *et al.*, 1989; Gregory *et al.*, 1990; Gregory *et al.*, 1996; Echternkamp and Gregory, 1999a,b; Bell and Roberts, 2007). Culling rates are greater for cows calving twins as well as their longevity are reduced as compared to those producing singletons (Erb and Morrison, 1959; Nielen *et al.*, 1989; Eddy *et al.*, 1991; Bell and Roberts, 2007; Bicalho *et al.*, 2007).

Objective of this study was to evaluate effect of twin birth calvings on gestation length,

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reproductive performance, dystocia, calf survival and culling in Holstein dairy cows.

### Materials and Methods

**Management.** Cows were housed loosely in partially sheltered and fenced yards and milked three times daily in a milking parlour. Feeding was ad-lib on a total mixed ration (TMR). Estrus was detected by the use of electronic pedometer and cows that confirmed in estrus were artificially inseminated. Pregnancy diagnosis was done by rectal palpation at 35 days after insemination. Pregnant cows were isolated in collective calving area at 7-10 days before expected calving date. A veterinarian and well trained assistant are present all over the day for observation and monitoring of cows and calves during and after calving.

**Assembly of the Data.** Calving records of Holstein dairy cows in a private farm (TEC-DAP) in Al-Fayum Governorate were collected from a computerized data base in the period from January 1997 to April 2008 comprising 5815 calving events. Information for individual calving events, including cow identification, insemination date, calving date, calving score (normal or dystocia), number of calves born alive or dead (single or twin), days to first estrus, days to first insemination, days open, calf survival after parturition and culling of cows. Calvings were scored on a 5-point system of difficulty according to the degree of assistance (**Chapin and Van Vleck, 1980**) where (1- unobserved or no problem; 2- normal or slight problem; 3- needed assistance; 4- considerable force; 5- extreme difficulty). Scores 1 and 2 (no assistance) were defined as normal parturition, while scores 3, 4, and 5 (assistance) were defined as dystocia.

**Statistical analysis.** For comparing the effect of twin vs. single births on gestation length and studied reproductive parameters (days to first heat, days to first insemination and days open) data were analyzed by t-test using SPSS 13.0 according to (**Norusis, 2004**), whereas their effect on dystocia, calf survival and culling were expressed as percentage.

### Results and Discussion

**Table (1): Mean of gestation length in days for twin and single bearing Holstein cows.**

| Twin |        |      | Single |         |      |
|------|--------|------|--------|---------|------|
| No.  | Mean   | SE   | No.    | Mean    | SE   |
| 80   | 266.36 | 1.08 | 1920   | 274.86* | 0.46 |

\*Superscript within rows indicate significant difference at  $p < 0.0001$

Means of gestation length for twin and single bearing cows are shown in Table 1. Gestation lengths of twin calves (266.36) were 8.5 days shorter ( $p < 0.001$ ) than those of singles (274.86). This may be related to the larger size and weight of twin calves which constitute more pressure stimuli on the wall of the uterus leading to early parturition as compared to singles. Other authors, have reported gestation lengths ranging from 1.5 to 11 days shorter for twins than for singles (**Pfau et al., 1948; Turman et al., 1971; Vincent and Mills, 1972; Bellows et al., 1974; Kay et al., 1976; Anderson et al., 1979; Cady and VanVleck, 1978; Chapin and Van Vleck, 1980; Anderson et al., 1982; Wheeler et al., 1982; Gregory et al., 1990; Guerra-Martinez et al., 1990; Echternkamp and Gregory, 1999a,b; Echternkamp and Gregory, 2002; Bell and Roberts, 2007**).

Table 2. highlights the differences in reproductive performance of twin and single calving cows in the postpartum period. More days to first estrus ( $p < 0.005$ ) were recorded for dams birthing twins (49.34) as compared to dams of singles (38.12). Thus the postpartum anestrus period was 11.22 longer for cows of twins than those of singles. Twin calving cows had a significantly ( $p < 0.005$ ) longer days to first service (69.66) as compared to single calvers (59.19). On the other hand, days open was longer ( $p < 0.005$ ) for cows birthing twins (124.00) than in cows birthing singles (105.44) with a difference of 18.56 days longer in twin calvers. Such delays in the studied reproductive parameters may result from low body condition score and body reserves at calving time of twin calvers as a result of short gestation length and consequently short dry off days which had a negative effect on reinitiation of estrus cycle (**Koong et al., 1982; Echternkamp and Gregory, 1999b; Bell and Roberts, 2007**) as well as due to increased incidence of dystocia, retained placenta, metritis and endometritis in cows with twins than those with singletons leading to increased intervals from calving to first service and conception (**Echternkamp and Gregory, 1999a; Bell and Roberts, 2007**). The results obtained are in agreement with (**Gregory et al., 1990; Echternkamp and Gregory, 1999a,b; Bell and Roberts, 2007**) for days to first heat; with (**Bell and Roberts, 2007**) for days to first service and with (**Chapin and Van Vleck, 1980; Nielen et al., 1989; Eddy et al., 1991; Echternkamp and Gregory, 1999b**) for days open, whereas **Bell and Roberts (2007)** found no

**Table (2): Mean of some reproductive parameters in twin and single calving Holstein cows.**

| Reproductive parameters (days) | Twin |         |      | Single |        |      |
|--------------------------------|------|---------|------|--------|--------|------|
|                                | No.  | Mean    | SE   | No.    | Mean   | SE   |
| Days to first heat             | 52   | 49.34*  | 1.56 | 540    | 38.12  | 1.02 |
| Days to first service          | 48   | 69.66*  | 3.78 | 1230   | 59.19  | 1.16 |
| Days open                      | 37   | 124.00* | 9.00 | 1230   | 105.44 | 7.11 |

\*Superscript within rows indicate significant difference at  $p < 0.005$

**Table (3): Calving difficulty score and incidence of dystocia in twin and single calving Holstein cows.**

| Calving difficulty score   | Twin |       | Single |       |
|----------------------------|------|-------|--------|-------|
|                            | No.  | %     | No.    | %     |
| 1-Unobserved or no problem | 59   | 73.75 | 1426   | 79.22 |
| 2-Normal or slight problem | 3    | 3.75  | 244    | 13.56 |
| 3-Needed assistance        | 6    | 7.50  | 38     | 2.11  |
| 4-Considerable force       | 6    | 7.50  | 87     | 4.83  |
| 5-Extreme difficulty       | 6    | 7.50  | 5      | 0.28  |
| Total                      | 80   | 100   | 1800   | 100   |

**Table (4): Perinatal calf survival and mortality rate in twin and single calving Holstein cows.**

| Calf survival rate | Twin |       | Single |       |
|--------------------|------|-------|--------|-------|
|                    | No.  | %     | No.    | %     |
| Live               | 134  | 83.75 | 1740   | 96.67 |
| Stillborn          | 15   | 9.37  | 37     | 2.06  |
| Dead after birth   | 11   | 6.88  | 23     | 1.27  |
| Total              | 160  | 100   | 1800   | 100   |

**Table (5): Culling rate and percentage of its different causes in twin and single calving Holstein cows.**

| Birth type | Total cow No. | Total culled cow No. | Culling rate % | Different causes of culling (%) |            |          |          |          |          |         | Total |
|------------|---------------|----------------------|----------------|---------------------------------|------------|----------|----------|----------|----------|---------|-------|
|            |               |                      |                | Reproduction                    | Production | Diseases | Mastitis | Lameness | Injuries | Low BCS |       |
| Twin       | 78            | 48                   | 61.53          | 60.42                           | 14.58      | 12.50    | 4.17     | 6.25     | 0.00     | 2.08    | 100   |
| Single     | 2180          | 685                  | 30.73          | 41.31                           | 11.97      | 18.69    | 12.26    | 6.42     | 1.17     | 8.18    | 100   |

significant difference for days open between cows giving twins or singles.

Table 3 illustrated the difference in calving difficulty score and incidence of dystocia in twin and single calving cows. Incidence of normal calving without assistance was (77.50) and (92.78) % for twin and single calving cows. On the other hand, Cows birthing twins had a higher incidence of dystocia (22.5) % than those with

singletons (7.22) % i.e. the incidence of dystocia in twin calvers was 3.1 times as likely to be occurred as in single calvers. Although not recorded in this study, dystocia with twins resulted primarily from abnormal presentation of head and (or) legs for one or both twin foetuses at parturition (Echternkamp, 1992; Gregory *et al.*, 1996; Echternkamp and Gregory, 1999a). Whereas this occurs to a very less degree in

single births. The increased incidence of foetal malpresentation with twins may result from the higher circulating concentrations of progesterone and estradiol found in cows gestating multiple fetuses (Echternkamp, 1992). Dystocia in cows giving single births is generally attributed to foeto-maternal disproportion (Bellows *et al.*, 1971; Gregory *et al.*, 1990; 1996). Our result is inconsistent with those of (Gregory *et al.*, 1990; Echternkamp and Gregory, 1999a,b; Gregory *et al.*, 1996). Different incidences of dystocia have been reported by other authors ranging from 35 to 46.9% for cows with twins and from 23-20.6% for those with singles (Gregory *et al.*, 1990; Echternkamp and Gregory, 1999a,b; Gregory *et al.*, 1996; Bell and Roberts, 2007).

It can be recognized from Table 4 that survival rate of single born calves was greater than those born as twins by 12.9% at birth. Mortality rate of calves at the time of calving was 16.25 % (9.37% stillborn & 6.88% dead after birth) for twins and 3.33% (2.06% stillborn & 1.27% dead after birth) for singles, so the mortality rate of twin calves at the time of birth was 4.8 times as in singletons. The increased rate of stillbirths and calf mortality at birth in twin calves may be attributed to the shorter gestation period (premature birth) and to the increased incidence of dystocia in dams bearing twins (Cady and Van Vleck, 1978; Gregory *et al.*, 1996). Furthermore, increased dystocia with twins decreases calf vigor and survival (Gregory *et al.*, 1990, 1996), emphasizing the importance of diagnosing twin pregnancies and of monitoring the dams at parturition. For twins, abnormal presentation of the foetus at delivery decreased perinatal calf survival from 88.2 to 80.6% and a malpresentation requiring traction further reduced calf survival to 73.6% (Gregory *et al.*, 1996), whereas normal presentation of twin with traction had no effect on calf survival at birth (91.5%). Same results for calf survival and mortality rate are obtained by (Cady and Van Vleck, 1978; Nielen *et al.*, 1989; Gregory *et al.*, 1990; Mee, 1991; Gregory *et al.*, 1996; Bell and Roberts, 2007; Silva del Rio *et al.*, 2007).

Culling rate and percentage of different reasons for culling are illustrated in Table 5. 61.53% of twin calving cows were culled during lactation, compared with 30.73% of the single calving cows. Thus twin calvers were 2 times more likely to be culled than single calvers. The obtained culling rate for twin calving cows was greater than that reported by (Nielen *et al.*, 1989; Eddy *et al.*, 1991; Bell and Roberts, 2007;

Bicalho *et al.*, 2007). The major reason for culling in cows with twins is due to reproductive failure (60.42%) of culled cows as compared to those with singles (41.31%). Percentage of other reasons for culling are (14.58), (12.50), (4.17), (6.25), (0.00), (2.08) % in twin calving cows and (11.97), (18.69), (12.26), (6.42), (1.17), (8.18)% in single calving cows for low production, diseases, mastitis, lameness, injuries and low body condition score (BCS) respectively. This result is in the same concert with (Erb and Morrison, 1959) but disagree with (Bell and Roberts, 2007) who found no significant difference for reason of culling in between cows bearing singles and twins.

### Conclusion

Twinning in cattle shortens the length of gestation, impairs subsequent reproductive performance by prolonging postpartum breeding intervals and increases the incidence of dystocia and perinatal calf mortality. High culling rate was found in cows giving twins which is mainly due to reproductive failure. Thus, twinning in dairy cattle is undesirable due to its detrimental effect on cow fertility and health and calf survival. However, these adverse effects can be minimized by preparturient diagnosis of twin pregnancy and timely administration of obstetrical assistance which aids in management of dystocia to facilitate delivery of twin calves and to increase their neonatal survival. A high level of intensive management is required for twin producing dams and their calves to achieve maximum production and to reduce losses.

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### تأثير ولادة التوائم على طول فترة الحمل و الأداء التناسلي وعسر الولادة و معدل بقاء العجول و معدل الاستبعاد في الأبقار الهولشتين

تمت الدراسة على سجلات الأبقار الهولشتين الحلابية في مزرعة (تيك-داب) باستخدام 5815 حدث ولادة (80 لولادات التوائم و 5735 لولادات الفردى) لاستبيان ما اذا كان هناك فروق معنوية بين ولادات التوائم وولادات الفردى على طول فترة الحمل و الأداء التناسلي و معدل حدوث عسر الولادات و معدل بقاء العجول و معدل الاستبعاد في هذه الأبقار. ولقد كانت فترة الحمل اقصر معنويا في الأبقار التي أعطت توائم عنها في الأبقار التي أعطت ولادات فردية. كانت هناك زيادة معنوية في الفترات من الولادة وحتى أول شويوع وأول تلقيح وحتى الحمل في الأبقار ذات التوائم عن الأبقار ذات المواليد الفردية. كان معدل عسر الولادات أعلى في الأبقار ذات التوائم (22.5%) عنها في الأبقار ذات الولادات الفردية (7.22%). أيضا كان معدل بقاء العجول الفرادى أعلى بنسبة 12.9% عن العجول التوائم. بينما كان معدل النفوق بعد الولادة أعلى في العجول التوائم (16.25%) عنها في العجول الفرادى (3.33%). أيضا كان معدل الاستبعاد في الأبقار التي أعطت توائم أعلى (61.53%) من الأبقار التي أعطت ولادات فردية (30.73%). ولقد استنتج من هذه الدراسة أن حدوث التوائم في الأبقار الحلابية كان مصحوبا بقصر في فترة الحمل ونقص في الأداء التناسلي وزيادة في معدلات حدوث عسر الولادة ونقص في معدلات بقاء العجول وزيادة النفوق بعد الولادة للعجول التوائم وزيادة معدلات الاستبعاد في الأبقار ذات التوائم. لذلك فإن زيادة معدلات حدوث التوائم في الأبقار الحلابية غير مرغوب فيه نظرا لهذه التأثيرات السلبية على معدلات الأداء واقتصاديات المزارع.