

Abnormal multiple pregnancy with septuplets in a cow

A case report

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Key words

Multiple births, recumbency, cattle

Summary

A 5-year-old Brown Swiss cow being 8 months pregnant became recumbent and died. Postmortem examination revealed a multiple pregnancy with six normally developed fetuses and an amorphous globosus. The cow's internal organs were displaced and compressed the lungs. Fatty liver caused by metabolic disturbances was diagnosed. A multiple pregnancy with more than two fetuses is very rare in cattle. It could be induced by treatment with exogenous hormones, but it could also be the result of genetic selection.

Schlüsselwörter

Mehrlingsträchtigkeit, Festliegen, Rind

Zusammenfassung

Eine 5 Jahre alte Braunviehkuh kam im achten Trächtigkeitsmonat zum Festliegen und verendete. Bei der pathologisch-anatomischen Untersuchung wurde eine Mehrlingsgravidität mit sechs normal entwickelten Feten und einem Amorphus globosus diagnostiziert. Beim Muttertier führte die Mehrlingsgravidität wegen der Verdrängung der Bauchhöhlenorgane zu einer Kompression der Lunge. Durch Störungen im Stoffwechsel wurde eine hochgradige Leberverfettung hervorgerufen. Mehrlingsgraviditäten mit mehr als zwei Feten sind beim Rind äußerst selten. Sie können durch eine exogene Hormonsubstitution ausgelöst werden, aber auch eine genetische Selektion kommt ursächlich infrage.

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Abnormale Mehrlingsgravidität mit Siebenlingen bei einer Kuh. Ein Fallbericht

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Introduction

A multiple pregnancy with more than two fetuses is very rare in cattle (1). The high mechanical and metabolic burden often causes recumbency and death of the dam.

Recumbency in pregnant cows can be due to various reasons, which include metabolic disturbances and impairment of the musculoskeletal system (4). Metabolic disturbances comprise hypocalcemia, hypophosphatemia and hypokalemia. Impairment of the musculoskeletal system can occur as a consequence of metabolic disturbances. It could also be caused by straddling which leads to disruption of adductor muscles, ischemic necrosis, articular luxations, fractures and nerve paralysis.

This case report describes a cow with a septuplet pregnancy and the resulting changes in the dam's organ system.

Case details

History and clinical examination

A 5-year-old Brown Swiss cow was treated with a PRID[®]alpha pessary (progesterone releasing intravaginal device) (CEVA, Düsseldorf) for induction of estrus. The following artificial insemination was not successful and the cow came into estrus 3 weeks later. In this estrus, the cow was not artificially inseminated. In the next estrus, the cow finally became pregnant by artificial insemination without any exogenous hormonal treatment.

One month before term (253rd day of pregnancy), the cow showed breathing problems, became recumbent and died. Milk production had already ceased 3 months before and the cow was dry since then, but this was not investigated further. The day before the cow died, pregnancy control by rectal palpation resulted in the diagnosis of a living calf. Caesarean section was considered,

Table 1 Sex, crown-rump-length and weight of the normally developed fetuses.

Tab. 1 Geschlecht, Scheitel-Steiß-Länge und Gewicht der normal entwickelten Feten

Fetus	Sex	Crown-rump-length (cm)	Weight (kg)
1	male	72	18
2	male	72	18
3	male	72	18
4	male	72	18
5	female	72	18
6	female	70	17

but eventually refused because of the poor general condition of the cow.

It was the third pregnancy of this cow. The two previous pregnancies resulted in each case in birth of a single calf. The cow itself was born as a twin. Its mother gave birth to twins four times and to a single calf five times in a period of 10 years.

Postmortem findings

The cow's abdomen was markedly distended. Opening of the abdominal cavity revealed a severely dilated uterus. This caused displacement and compression of internal organs, cranial dislocation of the diaphragm as well as compression of the lungs. Opening of the uterus revealed six normally developed fetuses (▶ Table 1) and an amorphous globosus (▶ Fig. 1, ▶ Fig. 2). The placentas did not easily separate from the uterine wall.



Fig. 1 Septuplets with the uterus. Six fetuses are normally developed, one is malformed (amorphous globosus).

Abb. 1 Siebenlinge mit Uterus. Sechs Feten sind normal entwickelt, einer ist missgebildet (Amorphus globosus).

The cow was in good body condition. The liver was enlarged, pale and fragile. By histopathologic examination a severe hepatocellular lipidosis was identified. A severe acute diffuse alveolar edema and congestion as well as compression atelectasis was diagnosed in the lungs. Petechiae were found subepicardially and in the mesenchyme surrounding the trachea. There was a moderate pericardial effusion accompanied by a mild chronic focal fibroplastic nonadhesive pericarditis. Changes in other organs or organ systems were not observed.

Discussion

Abnormal multiple pregnancies with more than two calves are reported rarely. Cases of quintuplets to septuplets are listed by Bostedt (1). Between 1855 and 1967 20 cases of quintuplets, seven cases of sextuplets and six cases of septuplets were reported. Determination of the exact prevalence of abnormal multiple pregnancies is not possible because of the rare reports (5, 8). In the majority of cases, pluriparous dairy cows were affected (15).

Development of a multiple pregnancy is based on the ovulation of several follicles. Normally double ovulations occur in less than 10% in cattle, because a dominating follicle suppresses the development of subordinated follicles (18). Multiple ovulation is requested in embryo transfer. Therefore several treatment strategies to induce multiple ovulation have been developed (14).

Progestins have been integrated in multiple ovulation strategies for many years. P₄-releasing vaginal pessaries like the PRID® alpha pessary are often used. The treatment leads to maintenance of a corpus luteum similar period and as a consequence release of gonadotropin releasing hormone by the hypothalamus is inhibited. After removal of the pessary, the P₄ drop-off leads to a preovula-



Fig. 2 Amorphous globosus. The umbilical cord and a pair of rudimentarily developed extremities are visible.

Abb. 2 Amorphus globosus. Der Fetus weist einen Nabelstrang und rudimentäre Gliedmaßenanlagen auf.

tory gonadotropin increase with induction of estrus and ovulation (18). In the superovulation protocols P₄ is combined with PGF₂α for induction of luteolysis and gonadotropins for induction of superovulation (12) and has little effect on the ovulation rate itself (21). In this case, the cow was treated once with a PRID® alpha pessary and it became pregnant three ovulations later. Hence an influence of the exogenous hormone treatment with regard to the multiple pregnancy is unlikely. Therefore a naturally occurring multiple pregnancy is assumed.

The cow itself was born as a twin and the dam had three more twin births. A genetic involvement in the development of multiple pregnancy is suspected. Statistically significant familial accumulation with respect to twinning was demonstrated (20). A long term genetic selection is possible (6). Breed differences have been determined. Brown Swiss showed the highest incidence among dairy cattle with 8,9% (20).

Multiple pregnancies give rise to several problems. Pregnancies with three or more fetuses often lead to abortion before the fifth month of pregnancy, premature births and dystocia as well as death of the dam (6). In the case reported here, the severe alveolar edema and the acute congestion of the lungs indicate an acute cardiovascular failure, presumably as a consequence of the multiple pregnancy. Compression of the lungs and the higher blood supply to the uterus may play a role. At the end of pregnancy, a uterus carrying a single fetus requires about 20% of the cardiac output for nutrition and oxygen supply. Changes in the cardiovascular system in sheep in normal pregnancies include a decrease of arterial blood pressure, systemic and uterine vascular resistance and an increase in heart rate, cardiac output and blood volume (9). In multiple pregnancies these changes are more severe because of the bigger uterine volume. The six normally developed fetuses had a crown-rump-length of 70–72 cm and a weight of 17–18 kg (► Table 1). This is in the normal range of a single fetus aborted in the 8th month of pregnancy (19), indicating a high cardiovascular and metabolic burden of the cow by the multiple fetuses.

A major pregnancy complication in human medicine is gestational or pregnancy-induced hypertension (23). In this syndrome maternal arterial blood pressure is increased and uterine blood flow is decreased leading to fetal hypoxia (16). It manifests usually late in pregnancy and causes amongst others maternal morbidity and mortality. The incidence and severity are higher in multiple than in singleton pregnancies (3, 13). The cause is unclear. Low serum ionized calcium concentrations seem to play a role (16). Fetal calcium requirements increase during the last trimester when significant fetal bone calcification occurs. Hypocalcemia leads to an increase in systemic arterial blood pressure, systemic and uterine vascular resistance and a significant reduction in cardiac output and uterine blood flow. Hypocalcemia can be responsible for recumbency and death of the dam (16). As the cow reported here showed recumbency shortly before death, hypocalcemia and subsequent gestational hypertension should be considered. As neither blood calcium levels nor blood pressure were recorded this remains speculative.

Clinical relevance

In recumbent cows abnormal multiple pregnancies have to be considered as a differential diagnosis, even if they occur very rarely. However, diagnosis could be very difficult. With rectal palpation often only one fetus will be reached because of uterine and fetal size as well as fetal position. Therapeutic strategies (Caesarean section) can be considered to save the dam's life.

80% of fetal growth takes place in the last trimester. Maternal need for protein and energy supply is extremely high during this period (7). Multiple pregnancies increase the maternal need for glucose even more (9). Simultaneously food intake decreases in the last 3 weeks of pregnancy about 30%, especially in multiple pregnancies. The following negative energy balance can cause ketosis (22). The analysis of blood serum samples in cows pregnant with twins revealed significantly elevated activities of GLDH (glutamate dehydrogenase), SDH (sorbitol dehydrogenase) and AST (aspartate aminotransferase) in comparison to cows with single fetuses (2). This indicates a severe burden on liver metabolism. In sheep maternal serum levels of β-hydroxybutyrate, ammonia and lactate increased progressively with increasing litter size, indicating that increasing fetal nutrient demands are maintained by mobilizing maternal protein and fat stores (11). In the cow reported here, blood analysis was not performed, but the severe hepatic lipidosis strongly suggests a disturbance of liver metabolism. Occurrence in the last trimester in conjunction with multiple pregnancy points to the same pathogenesis of ketosis as in sheep in late pregnancy.

The fatty liver with suspected ketosis and the suspected hypocalcemia have to be considered in the context of ceased milk production in this cow 3 months before death. Ketosis and hypocalcemia ("milk fever") are known reasons for declining milk yields (17). It can be assumed that the fetal demand for calcium and glucose caused a severe glucose and calcium deficit in the cow so that milk production could not be maintained.

One fetus was identified as an amorphous globosus (acardiac monster). This malformation arises in monochorial diamniotic twins (10). It is a very rare malformation. In humans it occurs in one of 35 000 births. The pathomechanism assumed is the so called TRAP (transversed arterial perfusion) syndrome.

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Conflict of interest

The authors confirm that they do not have any conflict of interest.

References

1. Bostedt H. Beitrag zur abnormen Mehrlingsträchtigkeit beim Rind. Berl Münch Tierärztl Wochenschr 1967; 10: 184–187.
2. Bostedt H. Die Zwillingsgeburt beim Rind – Auswirkungen auf Puerperalverlauf und Fertilität. Berl Münch Tierärztl Wochenschr 1982; 95: 101–106.
3. Coonrod DV, Hickok DE, Zhu K, Easterling TR, Daling JR. Risk factors in twin pregnancies: A population-based cohort study. Obstet Gynecol 1995; 85: 645–650.
4. Dirksen G. Krankheiten der Bewegungsorgane. In: Innere Medizin und Chirurgie des Rindes. Dirksen G, Gründer HD, Stöber M, Hrsg. Hamburg: Parey 2006; 863–871.
5. Dockeray J. Bovine multiple birth. Vet Rec 1993; 133 (22): 555.
6. Echternkamp SE, Cushman RA, Allan MF, Thallman RM, Gregory KE. Effects of ovulation rate and fetal number on fertility in twin-producing cattle. J Anim Sci 2007; 85: 3228–3238.
7. Ferrell CL, Garrett WN, Hinman N. Growth, development and composition of the udder and gravid uterus of beef heifers during pregnancy. J Anim Sci 1976; 42 (6): 1477–1489.
8. Ferries WJ. Bovine multiple birth. Vet Rec 1993; 133 (24): 603.
9. Gootwine E, Spencer TE, Bazer FW. Litter-size-dependent intrauterine growth restriction in sheep. Animal 2007; 1: 547–564.
10. Grubinger E, Scheier M. Multiple pregnancy – epidemiology, development and morbidity. J Gynaecol Endocrinol 2011; 21 (2): 14–19.
11. Lassala A, Bazer FW, Cudd TA, Datta S, Keisler DH, Satterfield MC, Spencer TE, Wu G. Parenteral administration of L-arginine enhances fetal survival and growth in sheep carrying multiple fetuses. J Nutr 2011; 141: 849–855.
12. Mapletoft RJ, Steward KB, Adams GP. Recent advances in the superovulation in cattle. Reprod Nutr Dev 2002; 42: 601–611.
13. Mastrobattista JM, Skupski DW, Monga M, Blanco JD, August P. The rate of preeclampsia is increased in triplet as compared to twin gestations. Am J Perinatol 1997; 14 (5): 263–265.
14. McCaughney WJ, Dow C. Hormonal induction of twinning in cattle. Vet Rec 1977; 100: 29–30.
15. Mee JF. Bovine multiple births. Vet Rec 1994; 134 (7): 176.
16. Prada JA, Tsang RC, Clark KE. Hypocalcemia and pregnancy-induced hypertension produced by low-calcium diet. Hypertension 1994; 23: 695–702.
17. Rajala-Schultz PJ, Gröhn YT, McCulloch CE. Effects of milk fever, ketosis, and lameness on milk yields in dairy cows. J Dairy Sci 1999; 82 (2): 288–294.
18. Rathbone MJ, Macmillan KL, Inskip K, Burggraaf S, Bunt CR. Fertility regulation in cattle. J Control Release 1998; 54:117–148.
19. Rüsse I, Grunert E. Die normale Gravidität. In: Tiergeburtschilfe. Grunert E, Arbeiter K, Götze R, Richter J, Hrsg. Hamburg: Parey 1994; 52–55.
20. Rutledge JJ. Twinning in cattle. J Anim Sci 1975; 40 (5): 803–815.
21. Sreenan JM, Gosling JP. The effect of cycle stage and plasma progesterone level on the induction of multiple ovulations in heifers. J Reprod Fert 1977; 50: 367–369.
22. Wu G, Bazer FW, Wallace, JM, Spencer TE. Intrauterine growth retardation: Implications for the animal sciences. J Anim Sci 2006; 84: 2316–2337.
23. Zhang J, Zeisler J, Hatch MC, Berkowitz G. Epidemiology of pregnancy-induced hypertension. Epidemiol Rev 1997; 19 (2): 218–232.



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