



Question raised by requestor

1. At what gestational length does hormone-induced weakening of the pelvic ligaments begin to increase the risk of transporting a cow?
2. From what gestational length does transport pose a risk for the cow's welfare in general?
3. At what gestational age could abortion or premature parturition result in physical changes, such as pelvic ligament relaxation or injuries to the birth canal, that could render the cow unfit for transport?



Answer

EURCAW *Ruminants & Equines* is responding to a query on the risk of transport for a cow, caused by relaxation of ligaments due to hormonal changes around the time of delivery.

Short answer

Pelvic ligament relaxation has been reported to begin as early as around day 100 of gestation [1], but the extent to which this increases transport risk at this stage is unclear. The relaxation becomes more pronounced as parturition approaches which may increase the risk of loss of balance, slipping and splitting injuries during loading, transport and unloading. Welfare risks, such as physical strain, stress-induced abortion or premature parturition, heat stress, metabolic disturbances, risk of injuries etc. may occur throughout gestation and increase progressively as pregnancy advances, particularly during late gestation. Therefore, the risk for unsafe transport is developing gradually making it hard to specify an exact threshold for the gestational age. Abortion in late gestation, when the foetus is larger, may be complicated by dystocia and subsequent injuries to the birth canal, retained placenta and infections. Thus, the risk is likely larger in last trimester and before ripening of cervix occur, even though specific research in this regard seems to be lacking. Any complications need to be considered when assessing fitness for transport.

Legal framework

Council Regulation (EC) No 1/2005 of 22 December 2004 on the protection of animals during transport and related operations [2], Annex I, Chapter I, Fitness for transport states that

'1. No animal shall be transported unless it is fit for the intended journey, and all animals shall be transported in conditions guaranteed not to cause them injury or unnecessary suffering.

2. Animals that are injured or that present physiological weaknesses or pathological processes shall not be considered fit for transport and in particular if: [...]

(c) they are pregnant females for whom 90 % or more of the expected gestation period has already passed, or females who have given birth in the previous week;'

Council Regulation (EC) No 1/2005 lays down the provisions for the protection of animals during transport. To transport any animal in a way that causes, or is likely to cause, injury or unnecessary suffering is not compliant with the EU legislation. For more details what to evaluate before transport, please see the EURCAW *Ruminants & Equines* Indicator factsheet – Fitness for transport of bovine animals [3]. Cows in the last month of gestation calculated from the breeding date, and cows within the first week post-partum, are according to the legislation considered not fit for transport [3].

Scientific knowledge

Scientific reports by EFSA [4], Velarde *et al.* (study for the European Parliament's ANIT Committee) [5] and by SLU Scientific Council for Animal Welfare [6] have reviewed and synthesised available scientific evidence on the welfare risks of transporting pregnant animals and have identified multiple welfare concerns of importance related to softening of pelvic ligaments and other physical and physiological changes during gestation. Identified risks are listed below.



Pregnancy and physiology

A cow is pregnant for approximately 9 months (283 days) [7,8]. A uniform definition of abortion and premature birth appears to be lacking and currently used definitions overlap. Premature birth has been defined as birth before 260 days and calves have been defined as premature if they are born alive between gestation day 230 and 260 [9]. Premature birth has also been defined as birth before gestation day 270 [10] or before day 265 [11]. Abortion has been defined as the expulsion of a non-viable foetus [12] but also as expulsion before gestation day 260 [13]. During gestation, foetal fluids and placental mass increase and the cow will grow heavier. The foetus grows and its weight increase from around 5 kg at gestation month 6 to 35 kg in gestation month 9, with mean live weight around 42–43 kg (depending on breed, dam and sire, sex of the calf and gestation age) [14]. The calf can increase its weight with over 15 kg the last month of gestation [11,13].

Gestation also increases the demands on the cardiovascular system, and energy requirements and internal heat production increase. Relaxation of the pelvic ligaments increases as calving approaches. However, Shah *et al.* [1] noticed that the relaxation of ligaments starts already at day 100 of gestation, hence after one trimester. Cervical ripening, with reorganisation and breakdown of collagen in the connective tissue, begins during late gestation around 5–4 weeks before parturition, under the influence of relaxin and/or oestrogens and becomes more pronounced as parturition approaches [15,16].

Cortisol plays a significant role in late gestation. Foetal production of cortisol increases dramatically during the final 10 days of gestation and induces parturition. [15].

Welfare risks with transport during gestation

Transport and handling during transport are among the most stressful moments in an animal's life [6] and a pregnant animal is more vulnerable, due to physical and physiological changes, which requires particular attention. The main welfare risks for pregnant cows are stress-induced abortion or premature parturition, injuries, heat stress, prolonged hunger, dehydration and metabolic diseases [4,5]. In addition, other general stress factors such as social stress, stress from handling, motion stress, restriction of movement, difficulties in laying down to rest and sensory overstimulation can add to the animals' experience of stress [6]. All these risks should be considered when assessing the fitness of a pregnant animal for transport.

Prediction of parturition by measuring physiological parameters

Oestrogen levels increase to reach maximum levels at one day prepartum. Following parturition, the concentration of oestrogens decreases significantly within 24 hours [10,11]. However, neither oestrogen levels nor rectal and vaginal temperature [12] are suitable indicators when evaluating whether animals are fit for transport, as changes in the parameters occur when parturition is imminent and thus impractical for evaluating.

Stress, premature parturition and abortion

Several studies have shown that animals get stressed by being transported, leading to elevated levels of cortisol [4–6]. Stress induced cortisol responses may, like foetal cortisol, induce parturition and lead to abortion or premature birth [6,17]. Giving birth during transport, at reloading centres or at slaughterhouses, prevents the animal to perform natural behaviours before, during and after parturition, which may cause severe stress and frustration [6] and hence poses a threat to the welfare of both the cow and the calf (if born alive). EFSA [4] points out that it is important to consider the impact of the different phases of transport on the pregnant animal, as well as the risk of inducing parturition or abortion, both for the sake of the cow's and the calf's welfare.

Hunger, thirst and metabolic diseases

Animals may experience both hunger and thirst during transport, especially during long transports [4], and pregnant animals have higher metabolic rate and water demand and may suffer from negative energy balance if not able to feed. Without available feed and water, animals may experience stress by being hungry and thirsty, they may get dehydrated, lose weight [6,18], and it has also been reported that pregnant animals have died post transportation due to metabolic disease [19].



Heat intolerance

Increased metabolic rate and endogenous heat production make the pregnant animal more susceptible to heat stress, especially under late gestation [6,20]. The risk of heat stress must be considered before deciding on transporting an animal or not.

Risk of injuries

The softening of pelvic ligaments results in reduced stability during movement, with risks of injuries during both loading, transportation and unloading [6]. It is therefore important to take pelvic ligament softening into consideration and have sufficient safety margin when transporting pregnant animals or animals shortly after parturition, to avoid transporting them during the period of pelvic instability [6]. In addition, increased weight affects the animal's movement and ability to keep their balance, which may complicate loading and transport, increasing the risk of slipping and splitting injuries [6]. Increased weight may also exacerbate other possible health problems such as joint or hoof diseases [6], which may affect the animal's fitness for transport.

Gestational age at which the risk of transport increases

The basis for the EU rule setting 90 % of gestation as a threshold for transport is unclear and lacks scientific support, and pregnant animals may be vulnerable to transport well before the last 10 % of gestation and at other stages of gestation as well [4,6]. It is rather a process than a cut off.

Risk of transport after abortion or premature parturition

Specific research investigating the risk of transporting a cow after abortion or premature parturition has not been found. While abortion or premature birth may be triggered by acute factors like infections or stress, pelvic ligament laxity is a continuous process during gestation, influenced by different hormones and not by the same factors causing abortion or premature birth. Hence, instability due to relaxation of pelvic ligaments may be less evident. Abortion during the last trimester, when the foetus is larger, may cause dystocia [21], with an immature cervix being a potential contributing factor, since ripening of cervix begins in late gestation. Dystocia may result in consecutive cervical, vaginal and vestibular laceration and bleeding, or necessitate Caesarean section. In addition, abortion and dystocia increase the risk of retained placenta [22] and metritis [23]. Hence, complications associated with abortion may render the cow being unfit for transport.

Individual assessment of Fit for Transport

All animals intended for a journey should be fit for transport; hence an individual assessment should be conducted. Indicators used for such assessment can be found in Indicator factsheet – Fitness for transport of bovine animals [3]. In pregnant animals or animals that have given birth or aborted during the past weeks it is important to ensure that the animals are able to stand and walk properly on all four legs, can keep their balance, do not have any leg or claw injuries, are alert and have a good general condition, are eating and drinking normally with a good body condition score and hydration status, do not suffer from injuries and laceration, uterine prolapse, retained placenta, vaginal discharge and/or fever as signs of metritis or other infections, or suffer from mastitis. A veterinarian should be consulted if any questions arise regarding the animal's fitness for transport. To ensure that an animal is not transported too late in pregnancy or too soon after parturition or abortion, the dates of insemination or breeding and parturition or abortion should be verified [5].

Conclusion

In accordance with the EU legislation, animal transport shall not take place during the last 10 % of pregnancy nor the first week after delivery. The relaxation of ligaments starts at day 100 of gestation, hence after one trimester. Cervical ripening begins during late gestation around 5–4 weeks before parturition. However, all transport involves a physical and physiological strain, and transport of pregnant cows can pose welfare risks throughout gestation, with increasing risks as physiological and physical changes progress. These include stress-induced abortion or premature parturition, increased susceptibility to heat stress and metabolic disturbances, and an increased risk of injury due to increasing body weight, pelvic ligament relaxation and instability. Following abortion or premature parturition, complications such as dystocia, injuries, retained placenta or metritis may compromise fitness for transport. Rather than relying solely on gestational age or time since abortion or parturition, transport decisions should be based on an individual assessment of the animal's physical condition, signs of complications and ability to cope with the intended journey.



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