Pre-lambing: neonatal survival

This special feature will cover:

- Overview of neonatal survival within UK flocks and its economic impact on sheep farming
- Preventive measures to optimise neonatal survival
- Main causes of neonatal mortality
- Welfare implication of neonatal mortality

Abstract

The first 24 hours of a lamb's life are the most crucial of his entire life, where the risk of dying is at the highest. The ability and speed at which the lamb stands and move to the udder is directly linked to its survival. Our role as vets is to make sure that every lamb born has given the best opportunity to survive in a potentially very harsh environment. Ewe nutrition, both as they prepare for tupping as well as throughout pregnancy is one of the crucial key for success. Good quality and quantity of colostrum is the other main factor that will give every lamb the best possible start in life. The most common causes of neonatal mortality are dystocia, hypothermia/hypoglycaemia and septicaemia which, for the most part, are directly related to management issues. To achieve the highest possible neonatal survival and therefore running a successful enterprise, flock health planning and good management are hence the key.

Key words:

Health planning, lambs, sheep, flock management

Lambing, as we all know, is one of the most stressful and exciting time of the year. Not just for the farmer but for everyone involved and obviously for the sheep themselves. It is also, for the vast majority of sheep farms, a crucial time for making the enterprise profitable, as the main purpose of keeping sheep on pasture is to produce lambs that can be sold fattened or retained for breeding. Neonatal survival is therefore the primary goal at lambing time and something that needs address within every flock health plan.

Benchmarking

It is obviously impossible to expect all lambs born on a farm to survive, but we need to be aware of what is reasonably achievable and what is definitely inacceptable. National figures on lamb mortality show that 15-20% of lambs are lost between scanning and sale/retention (SHAWG report 2016/17[1]), with most losses occurring during pregnancy or in the first week of life. This has two major implication: one on welfare, as one of the pillars of animal welfare is "freedom from pain, injury and disease" and also on profitability, as while costs for running the farm are kept the same, the output is considerably reduced. Neonatal mortality should, therefore, be used as an on farm welfare measures [1] and could be used within assurance schemes to inform consumers of the welfare within farms. Looking at figures on the economic cost of neonatal mortality, AHDB has estimated that each lamb that dies in the neonatal period would cost the farmer around £20-25[2]. It is

[1] http://beefandlamb.ahdb.org.uk/wp-content/uploads/2016/10/SHAWG-report-2016-17-181016.pdf (accessed 02/11/2018)

[2] https://beefandlamb.ahdb.org.uk/wp-content/uploads/2015/11/BRP-Reducing-lamb-losses-for-better-returns-manual-14-231115.pdf (accessed 02/11/2018)

interesting to notice that, like almost all species, males are at higher risk of dying. Not surprising, on the contrary, triplets lambs are also more at risk [2]. A sensible and realistic target for a well-managed flock should therefore be for losses below 5%.

Measures to increase neonatal survival

Ewe management and nutrition. The most important indicator of lamb survival and viability is their birthweight and this is directly linked to optimal ewe nutrition (

Figure 1). There is a crucial balance between low birthweight, which is associated with mortality due to starvation and exposure, and too high birthweight, which is associated with increased mortality due to dystocia. Planning for ewes to be at the optimal conditions pre-tupping (on average at BCS 3 out of 5) is the starting point of a well-managed flock. Therefore, supplementation of ewes in poor body condition in advance (at least 3 weeks) of the breeding season is proven to increase neonatal survival. If nutrition is well planned right throughout pregnancy, ewes will therefore be at the optimal BCS at lambing (on average at 2.5 out of 5). They will produce heavier and more vigorous lambs with a bigger chance of survival, as lambs born from ewes that lost significant body condition are at greatest risk of dying [3].

Colostrum colostrum and more colostrum. The golden rules about colostrum do apply to sheep as much as they do to cattle (Figure 2). Placenta in sheep is epitheliochorial, which means there is no transfer of large molecules between mother and foetus (e.g. antibodies). Lambs are therefore born without any defence to infectious agents. Colostrum, however, is the most powerful source of immunoglobulins, as well as energy. If colostrum management is right, than we are on top of the game. But how much, how soon and how often? The guidelines are on roughly 200ml/kg within 18 hours of birth, with a maximum of 50ml/kg intake on each occasion and ideally a first intake within 2 hours of birth [4]. The quality of the colostrum is also fundamental. Colostrum should have a specific gravity of at least 1.050 and > 60mg/ml immunoglobulin (Ig), but 6 hours after birth Ig has already significantly declined. Furthermore, within 36hours from birth, closure of the intestinal cells starts and by day 4 there is no capacity of absorption of macromolecules (e.g. Ig). It is also reported that the body weight of a ewe has a direct correlation with the concentration of Ig in colostrum samples.

Hygiene. This is the other pillar for success in rearing healthy and happy lambs. A properly cleaned pen (Figure 3), with bedding carried out daily, navel treatment with iodine solution as soon as they are born and provision of an isolation pen for sick lambs are all fundamental requirements to reduce neonatal mortality.

Other measures to consider are a more compact lambing, which will avoid mixing of ages and a more focused time, although this has to be balance with labour availability. Frequent lambing supervision, in particular, plays a fundamental role since ease of delivery has a great impact on lamb survival. Fostering seems to be connected to increase lamb mortality, either because there are too many triplets or because of poor milk production. Again, data on fostering numbers should be evaluated as they might indicate an underling problem. Vaccination is obviously another major factor. A good protocol would be for all animals on farms to be vaccinated for clostridial diseases, with lambing ewe booster carried out annually 4-6 weeks pre-lambing. Another thing to consider is the frequency of ewes' replacement. High ewe replacement is linked with higher lamb mortality. This can be explain by either general poor ewe management which leads to high culling rate [2] or by the fact that lambs from primiparous ewes are more likely to die (due to either a less maternal/inexperienced behaviour, smaller lamb birthweight or lower quality colostrum production) [3].

Common causes of neonatal mortality

One thing that might need clarification is what we define as neonatal period. This conventionally goes from the moment the lamb is born to a more flexible timeline from 24hours up to 7 days. For the purpose of this article, the common causes will be considered up to 48hours. However useful is to ascertain the case definition for neonatal mortality, it is fundamental to remember that what affects neonates might have occurred during the foetal stage (e.g. abortifacient agents or impaired placental development and poor foetal growth due to undernutrition). The three most common causes of neonatal mortality in lambs are intrapartum hypoxia/dystocia, hypothermia/hypoglycaemia and septicaemia (see Table 1 for the most common infectious agents). Intrapartum hypoxia/dystocia is either due to unsupervised prolonged labour or because of ewe-lamb disproportion. The complex hypothermia/hypoglycaemia is usually related to lack of colostrum (starvation), rather than direct cold exposure (apart from specific situation), while septicaemia is usually a combination of lack of hygiene, poor colostrum management and infectious agents present on farm. Less common causes include congenital malformations and trace elements (mainly selenium) deficiency. Congenital malformations are mostly due to either genetic or environmental factors (toxic plants or teratogenic compounds). Usually they account for a very small percentage of neonatal losses. However, the recent appearance of SBV, has shown how intrauterine virus infection can present in the form of outbreaks of neonatal malformation. Also wide access to a toxic compound (e.g. *Veratrum californicum* or the use of benzimidazole in pregnant sheep), could cause outbreaks of malformed lambs as well as a single sire carrying a lethal gene, but these tend to be fairly rare. The most common lethal congenital malformations of neonates are: ventricular septal defects (VSD), schistosomus reflexus and central nervous system defects (anencephaly, hydrocephalus and hydranencephaly). The latter one should always raise prompt investigation for intra-uterine viral infections (BTV, BDV and SBV), but it is also important to remember that not all of them would be due to these aetiological agents.

Diagnosis and intervention to reduce neonatal mortality

The first step to improve neonatal survival is gathering reliable data and attempt a diagnosis for the most common causes of neonatal mortality in each specific farm. The most important data are the actual number of lambs expected (calculated from scanning data), the number of lambs born alive, dead or stillbirth, the timeframe of losses (beginning vs end of lambing or throughout), the age group/location of ewes where losses are occurring. Gathering reliable information is probably the most challenging part of our job. Data are often recalled by memory or scribbled on a piece of paper and it is worth investing some time explaining the power and necessity of gathering information and then looking at them.

A very valuable and cost-effective tool is on farm post mortem (PM) of a percentage (rather than a single case) of dead lambs. Cases of dystocia will often present with fractured ribs or limbs, ruptured liver, internal bleeding or petechiation of the myocardium, while meconium staining, swollen head, neck or tongue are often signs of prolonged labour. It is also important to estimate when death occurred: pulmonary inflation will provide indication if the animal was born alive (pieces of lungs will float in water) or dead (pieces of lungs will sink). Tissue decay (if carcasses are examined fresh) will also suggest death in uterus few days before examination. Hypothermia/starvation are usually presented with complete lack of brown fat around the kidneys, which is replaced by red gelatinous fluid and an empty stomach (no milk clots in abomasum). Finally, assess the navel and in particular evidence and location of iodine staining. Blood samples can also be collected up to a week after birth to assess failure of passive immunity transfer (insufficient colostrum intake). Test available are measures of total protein using a refractometer (with guidelines of <20mg/ml showing failure),

quantitative zinc sulphate turbidity test (<15 units indicative of relative failure) or GGT (with <277U/l indicative of failure). Ideally serum IgG should be> 1600mg/dl (with levels <600mg/dl indicative of failure of passive transfer and between 600 and 1600 of inadequate transfer) [5]. For the common infectious causes of neonatal mortality, gross pathology alone would be suggestive, but will likely require collection of samples for further diagnostic tests (see Table 1). If, however, the confidence or time for on farm post mortem are limited, than submitting carcasses to the regional laboratory for further investigation would be a valid alternative.

Once data have been gathered and analysed, the discussion will focus on the target area(s) for improvement (pre-tupping, pregnancy period or neonatal period). If problems seem to be related to pre-tupping and tupping, consider reviewing the replacement policy (young animals and sire size/genetics), BCS of ewes in advance of the breeding season and ewe management after weaning. Within the pregnancy period, since most will be related to ewe nutrition, BCS of ewes should be carried out throughout pregnancy (or at least in the last trimester) and a pre-lambing metabolic profile could be carried out to evaluate energy and protein levels. Finally lambing management (frequency of supervision, experience and number of staff, lambing pen facilities, hygiene measures, colostrum management and vaccination history). Although many interventions will be aimed at the next crop of lambs, some measures can be put in place already in the current lambing season (e.g. lambing management).

Conclusion

Lambing time is the most crucial and stressful time for any sheep enterprise. Although problems are identified at this time (high neonatal mortality), factors leading to it are likely to have occurred even before pregnancy. To increase flock welfare and profitability, careful planning and good animal management are therefore paramount and should be addressed well in advance of the lambing season.

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Table 1 – Most common infectious agents of neonatal mortality.

Disease	Aetiological agent	Main clinical signs	Diagnosis	Prevention
Colisepticaemia	*Escherichia coli*	depression, recumbency and cold extremities	PM (petechiations, serosanguineous peritoneal, pericardial or pleural fluid, pulmonary congestion) and	colostrum hygiene

			culture from blood and tissues	
Lamb dysentery	*Clostridium perfringens* type B	sudden death, abdominal pain, neurological signs and diarrhoea	PM (area of haemorrhagic enteritis, mainly ileum, with ulceration of the mucosa and serosanguineous peritoneal fluid) and toxins in intestinal content	vaccination colostrum hygiene
Watery mouth	*Escherichia coli*	depression, constipation/abdominal distension and hyper salivation	clinical signs and low serum IgG, PM (distended abomasum with unclotted milk, gas in the intestine and meconium retention)	colostrum hygiene
Colibacillosis	*Escherichia coli* K99 (ETEC)	sudden death and severe brown-coloured diarrhoea	PM (diarrhoea and dehydration) and faecal culture with stereotyping, histopathology	colostrum hygiene
Salmonellosis	*Salmonella typhimurim* and *dublin*	profuse blood tinted diarrhoea	PM (diarrhoea and dehydration), faecal culture, PCR, histopathology	colostrum hygiene bio-security
Haemorrhagic enteritis (or yellow lamb disease)	*Clostridium perfringens* type A	sudden death, diarrhoea	PM (generalised haemorrhagic enteritis with bloody diarrhoea) and toxins in intestinal content	vaccination colostrum hygiene

Figure 1 – Ewe nutrition is the key to neonatal survival.

Figure 2 – The most important moment of a lamb's life.

Figure 3 – Provision of a well-designed, clean pen which allows proper ewe-lamb interaction.