SNATCH REARING AND PRE-WEANING KID MANAGEMENT IN GOAT ENTERPRISES

These technical notes outline key advice for veterinarians to help ensure artificially-reared kids acquire immune protection, and should be read in conjunction with the National Kid Rearing Plan, available from Animal Health Australia.

What is snatch rearing?

The National Kid Rearing Plan (Animal Health Australia 2012) aims to minimise the risk of infection of goat kids with Johne's disease and assist with the control of caprine arthritis and encephalitis (CAE) virus infection. A key feature of the Rearing Plan is 'snatch rearing'. Snatch rearing refers to the removal of kids from does immediately after birth, either as assisted natural birthing or caesarean and removing them from the kidding pen immediately.

The kids are dried to remove all birth secretions and membranes, they must not be allowed to suckle from does. The kids are then reared in a clean environment, given colostrum from negative tested goats or a specifically formulated artificial colostrum, or cattle which are from a Johne's disease accreditation program and then raised on milk replacer, water, concentrates and hay.

This practice helps prevent the vertical transmission of these diseases. Ensuring passive transfer of immunoglobulins to snatch-reared kids is critical to reduce disease and mortality.

Successful management of intensively raised kids

When rearing kids in intensively managed systems, excellent hygiene and biosecurity are vital to reduce the risk of kids acquiring infections. Rearing facilities, including feeding and watering equipment, must be well maintained and kept scrupulously clean. Similarly, newborn kids must acquire adequate passive immunity to improve their immune response to infections encountered during early life.

Snatch rearing presents a challenge to managing passive immunity in newborn kids, and excellent colostrum management is essential. Failure to adhere to these practices will increase the likelihood of disease, which may result in kid mortality or failure to thrive. These principles are discussed in more detail in the following sections.

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1. Managing newborn kids in herds without Johne's disease or CAE

In herds tested negative for CAE and Johne's disease, single and twin kids can remain with the doe for 24 hours after birth because there is minimal risk of transmission of either of these diseases. Peak passive transfer of immunity occurs before 12 hours and is complete after kids are 24 hours old (Arguello, Castro *et al*. 2004). Research has shown no difference in immune function between kids snatched when they were 24, 48 or 120 hours old. In fact, leaving the kid with the doe for longer than 24 hours may make the transition from suckling to artificial feeding longer and more stressful for the kid (Castro, Capote *et al*. 2009).

Triplet kids should be removed from their dam at birth and hand-fed colostrum (Castro, Capote *et al*. 2009). Smaller birthweight kids (<2.8kgs) should also be removed and hand fed colostrum. This is because triplets consume less colostrum as they usually start suckling later after birth, suckle less because they must compete for teats with their siblings, and have a smaller gut volume because of their lower birth weight. Therefore, triplets should be managed the same as low birthweight kids (see Section 5).

2. Managing newborn kids in herds with Johne's disease and/or CAE or an unknown status

The National Kid Rearing Plan specifies that kids must be removed from their dam immediately after birth to prevent the transmission of CAE, or within 12 hours of birth to minimise the risk of transmitting Johne's disease. It is vital that newborn kids receive colostrum of adequate quality, which is low risk for *Mycobacterium avium* subsp. *paratuberculosis* (the causative agent for Johne's disease) and CAE, within 12 hours of birth because immunoglobulin G (IgG) absorption decreases rapidly after this time. Colostrum quality is chiefly determined by its IgG concentration. In turn, IgG concentration is affected by the doe, and how the colostrum is stored and pasteurised.

Regardless of the disease status of the herd, optimal growth and survival of kids is strongly influenced by colostrum management and passive transfer of immunity, kid birthweight, and rearing facilities. These are discussed in more detail below.

KEY POINTS

- The timing of removal of kids from the doe depends on the disease status of the herd
- Leave singles and twins with the doe for 24 hours in herds tested negative for Johne's disease and CAE
- Remove triplets or small kids (< 2.8 kg) from the doe at birth and hand-feed to ensure adequate colostrum intake

3. Colostrum management and passive transfer of immunity

Immunoglobulins, particularly IgG, passively acquired from colostrum during the first 12 hours of life are vital to prevent disease in neonates, particularly during the first six to seven weeks of life. Snatch rearing reduces kids' exposure to *M. paratuberculosis* in their dam's faeces, and CAE in colostrum and milk but compromises passive transfer of immunity. Therefore, snatch reared kids must be provided with sufficient good quality colostrum from an alternate source. Research into kid immunity and pre-weaning survival has shown that kids with poor immunoglobulin transfer are more likely to die before weaning as kids with adequate immunoglobulins (O'Brien and Sherman 1993; Arguello, Castro *et al*. 2004).

IMPORTANT: Only colostrum from goats, from CAE-test and Johne's disease negative herds should be stored for feeding to kids. If a doe's health status is unknown, colostrum should be pasteurised, or a safe, powdered colostrum source used (see below). If colostrum is not pasteurised, batch feeding could expose large numbers of kids to virus from one infected dam, and the disease can rapidly spread throughout the herd.

3.1 Colostrum quality

IgG concentration in a doe's colostrum depends on the age of the doe, and for how long does are dried off before kidding. Two to five year-old does generally produce the highest quality colostrum. Does should be dried off for at least one month before kidding starts, to allow the udder enough time to recover before the next lactation and improve colostrum production (Caja, Salama *et al*. 2006). Colostrum must be collected and stored hygienically to avoid bacterial contamination and growth.

3.2 Storing Colostrum

A farm usually needs a bank of stored colostrum available to feed to newborn kids, and there are different methods available for the management and storage of colostrum. The methods used will be determined by the need for controlling Johne's disease and CAE, and the quantity of colostrum available. It is recommended that stored colostrum is labelled with the date collected and the donor doe identification so that if the donor's status changes it can be discarded and so that 'freshness' and thus potential IgG concentrations can be more easily monitored.

3.2.1 Refrigeration of fresh colostrum

Fresh colostrum can be stored covered in a refrigerator at 4°C. If it is uncontaminated, it can last for up to three months with only a 25% reduction in IgG concentration (Arguello, Castro *et al*. 2003). However, in practice, it is best to store it for no longer than a few days to avoid bacterial overgrowth. Neither refrigeration nor freezing inactivates CAE virus or kills *M. paratuberculosis*, nor does it reduce the bacterial contamination of milk due to poor hygiene at collection.

3.2.2 Freezing and thawing colostrum

If colostrum must be stored for long periods, it can be frozen and thawed when needed. The thawing method, plus the number of times it is refrozen and thawed, affects IgG concentration. Colostrum can be thawed by leaving it in a refrigerator, leaving it at room temperature, immersing it in hot water (60°C), or thawing it in a microwave until it reaches 55°C. If the correct temperatures are observed, none of these methods significantly reduces IgG concentration. However, repeated refreezing and thawing reduces IgG concentration, by up to 34 per cent after seven refreeze/thaw cycles (Arguello, Castro *et al*. 2003).

3.2.3 Other methods of colostrum storage and provision

There are other, less common methods of storing or treating colostrum, including freeze drying, acidification, buffering or chemical preservation where refrigeration or freezing facilities are not available. Artificial colostrum replacers are also available, but their efficacy varies substantially and is frequently less than pasteurised goat colostrum (Sherman, Arendt *et al*. 1990; Zadoks, Orsel *et al*. 2001; Mellado, Pittroff *et al*. 2008).

The serum IgG concentration of kids fed exclusively with artificial colostrum should be checked between 2 and 4 days of age to ensure it achieves adequate passive transfer of immunity (Arguello, Castro *et al*. 2004).

KEY POINTS

- Do not feed combined batches of unpasteurised colostrum to kids.
- Fresh colostrum can be stored for up to three months at 4°C provided it is collected with strict hygiene, however it is preferable to use refrigerated colostrum within a few days of collection.
- Correct thawing of frozen colostrum does not reduce IgG concentration, but repeated refreezing and thawing does.
- Refrigeration and freezing do not inactivate CAE virus or *M. paratuberculosis* or other bacteria introduced to a sample by poor hygiene at collection.

3.3 Pasteurisation

Colostrum must be pasteurised to control transmission of CAE and Johne's disease to kids. Heating to 56°C for 60 minutes inactivates CAE virus (Rowe and East 1997). Heating colostrum to 63°C for 30 minutes greatly reduces the amount of *M. paratuberculosis* as well as other contaminating bacteria, although pasteurisation for one hour is probably required to completely eliminate *M. paratuberculosis* from colostrum and still may not always be completely effective (Godden, McMartin *et al*. 2006). However, exposure to faeces from shedding adult goats, rather than colostrum, is the most likely source of Johne's disease infection for kids. Under the National Kid Rearing Plan, satisfactory pasteurisation is achieved by holding colostrum at 72°C for 15 seconds in a pressurised pasteuriser, or 63°C for 30 minutes in a conventional pasteuriser. The exit temperature at the end of the pasteurisation process must be checked, as most failures of pasteurisation result from not heating for long enough at a high enough temperature.

Avoid prolonged heating above about 60°C, as this tends to denature immunoglobulins and clumps colostrum, and can cause osmotic diarrhoea (Rowe and East 1997; Callan and Van Metre 2004). Overheating also reduces passive transfer of immunity. Thus, measure IgG content of pasteurised colostrum before use, as described in section 3.4.

KEY POINTS

- Only pasteurisation controls transmission of CAE or Johne's disease in colostrum.
- Incorrect pasteurisation can significantly reduce IgG concentration – check IgG concentration before feeding pasteurised colostrum to kids.

3.4 IgG concentration in colostrum

'Ideal' colostrum has an IgG concentration greater than 33 g/L, but must contain at least 21 g/L of IgG (Constant, Leblanc *et al*. 1994; Castro, Capote *et al*. 2005). IgG concentration of goat colostrum can be measured on-farm, but be aware that the scales used on equipment designed for cattle, such as bovine colostrometers, cannot be directly translated to goats. Using a hydrometer is currently the best method, though it is still not completely accurate. An approximate relationship between goat colostrum density and IgG concentration is shown in Table 1. Both the colostrum and hydrometer must be at one of the temperatures shown in the table, because temperature affects density. For testing at 37°C (body temperature), warm both the hydrometer

and colostrum sample in your hands or an inside pocket for a number of minutes, and read the result immediately.

Table 1: Correlation between density and IgG concentration of goat colostrum at different temperatures (Source: Rudovsky, 2008).

Density (g/L), measured at		IgG concentration (g/L)
20°C	37°C	
1042	1035	12
1043	1036	16
1044	1037	21
1045	1038	25
1046	1039	30
1047	1040	34
1048	1041	38
1049	1042	43
1050	1043	47
1051	1044	51
1052	1045	56
1053	1046	60
1054	1047	64
1055	1048	69
1056	1049	73
1057	1050	77

3.5 Volume of colostrum required by kids

Kids should generally receive a volume equivalent to 10–20% of their birthweight of 'good quality' colostrum (Arguello, Castro *et al*. 2004).
More precisely, kids require a total of 3 g/kg of IgG within 12 hours of birth (Constant, Leblanc *et al*. 1994; Castro, Capote *et al*. 2005). The required volume of colostrum can therefore be determined using the formula:

$$v = \frac{bw}{IgG} \times 3000$$

where

v = volume (mL)
bw = birthweight (kgs)
IgG = IgG concentration in (g/L)

This total volume of colostrum should be given over several feeds within 12 hours of birth. The required volume of colostrum with various IgG concentrations using this formula is shown in Table 2.

Table 2: Amount of colostrum (mL) of differing IgG concentrations required by kids of different birthweights within 12 hours of birth

Kid birth-weight (kg)	IgG concentration of colostrum (g/L)				
	16	21	26	31	36
1.5	280	210	170	150	130
2.0	380	290	230	190	170
2.5	470	360	290	240	210
3.0	560	430	350	290	250
3.5	660	500	400	340	290
4.0	750	570	460	390	330
4.5	840	640	520	440	380
5.0	940	710	580	480	420
5.5	1030	790	630	530	460

EXAMPLE

A kid has a birthweight of 3.5 kg. The density of the available colostrum is measured with a hydrometer and is 1038 g/L at 37°C. Table 1 shows this is equivalent to 25 g/L of IgG. The volume of colostrum to be fed in the first 12 hours of life to the kid is:

Using the formula: 3.5 ÷ 25 x 3000 = 420 mL

From Table 2: Between 400 & 500 mL

3.6 Checking effectiveness of colostrum feeding

As kids consume colostrum their serum IgG concentrations peak 24–48 hours after birth. Concentrations greater than 8–12 mg/mL are associated with better survival (O'Brien and Sherman 1993; Arguello, Castro *et al*. 2004). In reality, these figures are somewhat arbitrary—in some studies mortality amongst kids with serum IgG > 12 mg/mL has still exceeded 10%. Serum IgG should be assessed in several kids that are 2–4 days old, to verify that kid rearing and colostrum management practices are not compromising passive transfer of immunity. Commercial testing of IgG in goat serum is not always available and tests used in other species can be unreliable. However, the glutaraldehyde coagulation test (GCT) has been validated in kids and provides a broad 'satisfactory/unsatisfactory' result for assessing IgG concentrations in kid serum. To perform this test, add 50 µL of glutaraldehyde to 0.5 mL of kid serum and gently mix. Samples with adequate IgG will coagulate into a firm gel within 60 minutes, whereas inadequate samples will only partially coagulate or remain liquid (Vihan 1989).

KEY POINTS

- Ideal colostrum contains ≥ 33 g/L of IgG—check by measuring colostrum specific gravity.
- Kids require 3 g/kg of IgG, divided over several feeds, within 12 hours of birth.
- Serum IgG should be > 8–12 mg/mL several days after birth, reflected by a GCT time < 60 minutes.

4. Rearing sheds

The rearing shed needs to be dry, clean, well-drained and free from any draughts. It should be easily cleaned and disinfected between batches of kids, to reduce cross-contamination between batches and the spread of disease.

There are different options for flooring, including concrete slabs with clean straw topped up regularly, or raised open floors made of mesh or wooden slats. Open floors provide good hygiene but allow drafts. Dirt floors are undesirable because they are difficult to thoroughly clean between batches of kids.

Floor space requirements are 0.6 m^2 per kid on concrete and 0.2 m^2 on raised open floors. Between 15 and 25 kids of about the same age should be housed in one pen. Producers should ensure that there will be enough floor space for all kids before kidding starts to prevent mixing and moving of kids during kidding. Sequentially filling one pen after the other during kidding will help prevent the spread of infectious disease, such as respiratory disease or gastroenteritis, between pens. Pens of kids should not be mixed until weaning.

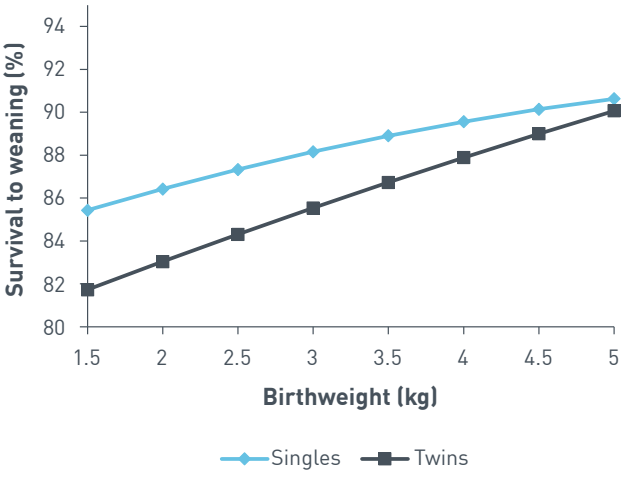
KEY POINTS

- Sheds must be dry, clean and draught-free
- Clean sheds thoroughly between batches of kids
- Provide 0.6 m^2 of space per kid housed on concrete floors
- Replenish bedding with clean straw daily
- 15 to 25 kids per pen
- Do not mix groups of kids until weaning

5. Birthweight

Birthweight is associated with survival to weaning, and weighing kids as soon as they are snatched from the doe will help allocate attention and resources to the kids that need them most (Figure 1). The survival of twins with lower birthweights is less than that of corresponding singles (Snyman 2010). Low birthweight kids (< 2.8 kg) need extra attention to ensure they receive adequate colostrum in the first 12 hours after birth (Castro, Capote *et al*. 2009). They should ideally also be reared in a separate pen away from larger kids to reduce competition for milk and other feed.

Figure 1: Survival to weaning of single and twin kids of different birthweights (Source: Snyman, 2010)



KEY POINTS

- Lower birthweight kids have poorer chances of survival
- Pay special attention to colostrum management and housing for kids less than 2.8 kg

6. Summary

Snatch rearing kids is important to reduce transmission of Johne's disease and CAE. However, it must be carefully managed to ensure kids still receive enough colostrum in the first 12 hours of life to protect them from other infectious diseases. Kids removed from their dam at birth need to receive enough colostrum of sufficient quality before they are 12 hours old to achieve protective IgG levels in blood. Low birthweight kids and triplets are particularly susceptible to poor passive transfer of immunity. Blood tests are available to check that a farm's colostrum management—including colostrum storage, pasteurisation, feeding and timing—is effective for kids removed from their dams. The risk of infection can be further reduced by ensuring that kid-rearing pens are clean and not overcrowded, and different groups of kids are not mixed. These steps underpin the successful rearing of healthy goat kids, and good farm productivity and animal welfare.

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