



Tools to determine colostrum quality

- Colostrum quality should be routinely checked to ensure that calves get sufficient antibodies (IgG) for successful transfer of passive immunity.
- An indirect method of measuring IgG is most practical for rapid on-farm assessment of colostrum quality
- A Brix refractometer is a simple yet effective tool to assess colostrum quality.
- A colostrometer is a fragile instrument that lacks accuracy. Best results are obtained if colostrum is consistently measured at a temperature of between 20-22°C, after waiting at least 10-20 minutes after collection and making sure there is minimal froth at the top of the sample.
- Taking a good look at the colour and consistency of the colostrum (visual assessment) is better than nothing and can help to confirm readings obtained from the colostrometer.
- Poor quality colostrum should not be fed to calves in the first 24 hours of life, but is still a valuable food for calves in their 2nd or 3rd day when they can no longer absorb IgG.

How to assess colostrum quality

Colostrum management is one of the most important factors in protecting calf health for the first 6 weeks of life. All calves need to be fed good quality colostrum as soon as possible after birth, so they will obtain the antibodies they need to fight disease. Colostrum quality can now be easily identified from a single drop, so it makes good sense to routinely assess the quality of each colostrum sample you collect.

Colostrum quality depends primarily on the amount of the antibody (IgG) it contains. High quality colostrum is defined as having an IgG concentration of greater than 50mg/ml (Table 1).

Rating	Measure of quality Milligrams of IgG in each ml of colostrum
Very good	60 mg per ml
Good	50 mg per ml
Poor	30 mg per ml

Table 1: defining colostrum quality

Direct measurement tools

Direct measurement tools such as the Radial Immunodiffusion (RID) assay measure the actual levels of antibodies in the colostrum. RID assays are the gold standard in testing and are often used during experimental trials. These tests are carried out in a laboratory using standardised protocols, and provide very accurate and repeatable results. However RID assays are costly and the results often take more than 24 hours, so this method is not a practical way to assess colostrum quality on a day-to-day basis. However direct testing can be used to verify the accuracy of other indirect measurements.

Indirect measurement tools

An indirect tool measures something that is related to the property that you want to assess.

1. Refractometer

A refractometer is a device that uses light to determine the density of a liquid. Refractometers are commonly used in medicine to determine concentrations of body fluids and also in agriculture to measure the sugar content of grapes.

Refractometers have different measurement scales depending on their intended use. For measuring colostrum, a refractometer calibrated in the Brix scale is used. Values are read as a percentage.

The refractometer works by shining a beam of light through a sample of liquid. The device measures the amount of light that is refracted (or bent) from the light path when passing through the sample. In colostrum, the proteins cause light to bend. The greater the protein level, the more light is bent from the light path.



As a large proportion of the protein in colostrum is IgG, samples with high IgG levels will cause more bending of the light.

Refractometers are pocket-sized devices that are quite robust so are well suited for the dairy environment. Results are quite accurate and repeatable and only a single drop of sample is required.

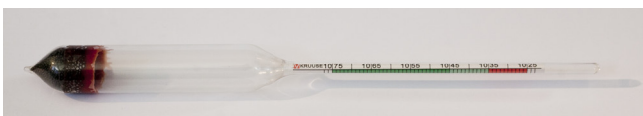
Sometimes the reading on the scale of an optical refractometer can be a bit fuzzy (wide band reading). High fat content is believed to affect the reading. If a reading appears fuzzy, wiping the face of the refractometer clean and re-applying a smaller drop may help. Alternatively, choose a point midway between the end and start of the blue fading. This problem can be overcome by using a digital Brix refractometer. The digital version does not need a bright light source to read the scale, and they take the guess work out of the reading by supplying an exact number.

Brix calibrated refractometers are quite accurate in measuring IgG levels in colostrum. Researchers have found a strong relationship between the actual concentration of IgG and the reading from the refractometer.¹ A Brix score (or density) of 22% is the cut off for detecting good quality colostrum (50mg/ml). This is true for both fresh and frozen colostrum and for optical or digital refractometers.

If you measure your colostrum sample and find it has a value below 20% it should be considered as poor quality (less than 30mg/ml). Do not feed it to calves during the first 24 hours of life. Save it for feeding calves at days 2 and 3 of age.

The sensitivity (percentage of good quality samples that are read as good) is 90.5-92.5% and specificity (percentage of poor quality samples that are read as poor) is 80-85%, indicating that this is a very accurate testing tool. Suitable refractometers can be easily purchased on-line, through some veterinary clinics or local scientific suppliers. Prior to purchasing one check that it is measuring on the Brix scale with a range of at least 15-25%.

2. Colostrometer



A colostrometer is a very simple instrument designed to float in a sample of colostrum and measure specific gravity. As a rule the more IgG in the colostrum the more dense it will be and the higher the specific gravity reading. A colostrometer will float higher in a good sample and lower in a poorer sample. Colostrometers are made of glass and are easily broken particularly when they are coated in colostrum and become very slippery.

Colostrometers tend to overestimate the quality of colostrum, and on average classify two out of every three low quality samples as acceptable. This means that you can trust a low quality reading but a good quality reading may not actually contain sufficient antibodies.

Colostrometer readings are also affected by temperature, frothiness of the sample and the fat/total solid content.

Freshly collected, machine milked colostrum will have large amounts of small air bubbles (not always visible to the eye) which reduce the density of the sample. This gives a falsely low reading on the colostrometer. Also the froth on the top of the sample can make it difficult to read the scale on the colostrometer.

If the colostrum is high in fat or total solids the density of the sample will also go up and lead to falsely high readings. Despite all of these drawbacks, a colostrometer can be a handy tool, particularly to eliminate colostrum of poor quality if used as follows:

- Leave fresh colostrum to settle for at least 10-20 minutes to reduce air bubbles
- Allow the sample to cool to 20-22°C
- Remove any froth from the top of the sample
- Float the colostrometer in the colostrum and take the reading off the scale
- If the colostrometer indicates poor quality colostrum, do not feed it to calves during the first 24 hours. Save it for feeding to calves at days 2 and 3 of age.

Visual assessment



Judging the quality of colostrum by looking at its colour and consistency (visual assessment) is the least accurate method when used alone. Visual testing is based on the notion that thicker, darker coloured colostrum will be more concentrated and therefore have higher IgG levels. Unfortunately breed and fat content can affect colostrum appearance regardless of IgG

concentration. A cooler solution will also appear more dense. However a visual assessment is better than none, and becomes more valuable when used in combination with another indirect test such as colostrometer or refractometer.

Further resources

The information in this fact sheet should be used in conjunction with the publication "Rearing Healthy Calves – how to raise calves that thrive", a comprehensive guide to calf management.

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¹ Biemann JD et al(2010). An evaluation of Brix refractometry instruments for the measurement of colostrum quality in dairy cattle. *J Dairy Science* 93:3713-3721.