INDUSTRY REVIEW

Beef Blood Disposition Australia 2025

V.RMH.2402: Program evaluation and prototype development

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Blood volumes

Blood yields

The total volume of blood from cattle has been reported to vary between 5–9% of the liveweight. According to the *MLA Co-products Compendium*, (MLA, 2009) Fig 1.2, the blood yields from a steer with live weight 465kg and carcase weight of 270kg are:

- whole blood 18kg
- edible blood 11kg.

Recoverable blood yields depend on many factors including animal size, animal breed, killing speed, rate and time of draining, sticking techniques and experience of the stickers. What isn't recovered during the bleed out is retained in the capillary system throughout the body, then lost as the carcase is dressed through the abattoir.

Meat Industry Services (2003) reported the measured amount of blood collected at one-minute intervals for five minutes after sticking from 207kg dressed-weight Friesian-cross cattle.

At one minute, 20g blood/kg of liveweight is drained, rising to 29g/kg at three minutes. Blood continues to drain from the carcase at a decreasing rate along the processing line and at 10 minutes after sticking it is still dripping at about 190g/minute. In most plants, the blood draining along the line cannot be directed to the blood drain and is hosed away instead.

Blood collected for one minute at 20g/kg equates to 9.3kg for a dressed weight of 270kg.

Spooncer B (2011) reviewed blood collection data from various reports and observations and summarised as follows:

> The amount of blood that can be collected hygienically in an open collection system (i.e. not through a hollow handled knife) in 60 seconds is Blood weight = 7.67 + 0.007 x carcase weight. This equates to **9.5 litres from a 260kg carcase**.
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> Blood loss from stuck cattle is 20g/kg liveweight in 60 seconds. This is equivalent to about **9kg from a 450kg (body or about 260kg carcase weight)**.
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> Collectors have indicated that it is possible to recover up to 12kg/body in 30 seconds, but recovery of about 8–9kg is expected.
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> The expected yield through a hollow-handled knife is about 8kg/head from individual animals.
>
> **The average target yield at manual collection establishments is about 9 litres/head from adult cattle.**

The September update of MLA Industry Projections for 2024(MLA, 2024) reported that beef carcase weights in 2025 will average 304.7kg, rising to 305.1kg in 2026.

If we consider that today an average beef carcase weight is 305kg, the average target recovery yield is 9.8kg/head.

Halal slaughter blood collection

Yields of whole blood from halal-slaughtered cattle are lower. Typical yields appear to be 4.5–6 litres/head, although yields over 10 litres/head are apparently possible. Blood is collected from halal-slaughtered cattle from a thoracic stick wound, which is applied as soon as possible after the halal stick, with up to 30 seconds between.

Blood processors appear to avoid recovering blood from halal-stuck cattle in Australia. Two processors have reported that the quality of blood from halal-stuck cattle is suspect due to the risk of ingesta contamination, with low yields due to slow bleeding. However, pharmaceutical-grade blood is collected from halal-stuck adult cattle in New Zealand.

In New Zealand, halal slaughter typically includes a thoracic stick performed seconds after the halal neck cut, enabling more efficient blood collection without violating halal requirements, provided it follows the initial religious incision. Yields of 4.5–6 litres per cattle are common, and when collection equipment is sterile and the process is rapid, blood has been deemed suitable for pharmaceutical processing.

Slaughter Volumes

The National Livestock and Reporting Service reported a national cattle slaughter of 6.7 million head in 2024. Queensland accounted for 52% of the slaughter at 3.5 M followed by NSW at 25%, 1.7 M.

Considering the slaughter data for 2024, an average carcase weight of 305 kg, and an average target blood recovery yield of 9.8 kg per head we can determine the potential volume of blood that could be recovered from all animals slaughtered (**Table 1**). The table also demonstrates the equivalent volume of blood meal if the wet blood, at 18–20% solids, was all dried to blood meal with 4% moisture.

Table 1 Annual cattle slaughter and potential blood and meal volumes by state 2024

State	Slaughter head	Percent	Wet blood, tonnes	Blood meal, tonnes
NSW	1,665,549	25%	16,322	3,428
QLD	3,459,015	52%	33,898	7,119
SA	168,867	3%	1,655	348
TAS	231,134	3%	2,265	476
VIC	1,038,221	15%	10,175	2,137
WA	146,402	2%	1,435	301
Australia	6,709,188	100%	65,750	13,808

A study (Fan L, 2007) estimated that the Australian red meat industry produces 200 million tonnes of blood from sheep and cattle combined.

Current disposition of blood

The current options for handling blood from slaughter are:

1. Allow blood to drain to wastewater treatment plant.
2. Collect, coagulate and process into blood meal.
3. Collect and send to integrated rendering line with other material.
4. Collect blood and send to service processor for blood meal or plasma/ haemoglobin powders.
5. Collect blood and process into plasma and haemoglobin powders.

In 2017, the Australian Renderers Association surveyed all 77 operating rendering establishments to determine the production of various rendered products including blood meal (Australian Renderers Association Inc, 2015–16). In 2023, these figures were reviewed and re-estimated across 70 establishments.

Blood to wastewater

The majority of processors, representing all species, do not collect blood from slaughter. Instead, 66% of them allow the blood to be washed down to the wastewater treatment plant.

Research determined the characteristics of whole blood as a wastewater influent stream (Fan L, 2007) as shown in **Table 2**.

The COD, or chemical oxygen demand, measures the polluting potential of an effluent. For comparison, domestic sewage typically has a COD of less than 1000mg/L. Though blood significantly burdens the wastewater treatment plant, processors with effective anaerobic treatment capacity and methane capture systems no longer view sending blood to wastewater treatment as a major issue. Since no additional action is required on the slaughter floor other than hosing the blood into the drain, this method is the default solution.

Table 2 Characteristics of whole blood effluent stream

Characteristic	Value
Chemical oxygen demand (COD), mg/L	291,000
Total nitrogen as N, mg/L	20,600
Total phosphate as P, mg/L	260
Total solids, wt. %	11

Improvements to the wastewater treatment systems have been preferred to investing in blood capture and processing, especially where blood product markets are not assured.

Assuming the percentage of all processors that do not collect blood (66%) applies equally to cattle processors, 43,400 tonnes of blood is sent to wastewater from cattle processors annually.

Blood meal

(Australian Renderers Association Inc, 2015-16) determined that the production of blood meal from all species – bovine, ovine and poultry – was 27,610 tonnes.

In 2023, this estimate was revised to 22,000 tonnes of blood meal annually.

A review of 70 rendering establishments found that 24 (34%) of them coagulated blood into blood meal.

Coagulated blood is primarily mixed into rendered offal bone meal or converted into blood meal which is generally restricted for use in non-ruminant animal feed.

The average price for blood meal with 80% protein in March 2025 was $1,400/tonne. The blood meal market and customers of blood meal are well understood and established. Processors that are currently collecting blood and have existing connections with customers for blood meal favour this market. However, once processing costs are deducted, the margin for blood meal is around $70–100/tonne, or about 20¢/head.

Although adding blood meal with 80% protein into meat and bone meal can increase the meal protein content, ensuring the protein is above 50%, the addition of blood can lead to a darker meal. Some markets, especially halal markets, do not permit the inclusion of blood in MBM.

There are various methods used for blood collection (Spooncer B, 2011), and a process for blood meal with a mass balance of the streams (Fan L, 2007). This is depicted in **Figure 1**.

For blood meal, blood can simply be collected in trays or from floor drains with no additional labour. Steam is used to coagulate the blood and dewatered in a decanter. The separated solids can be dried in hot air ring driers, rotary dryers, or steam heated contact dryers.

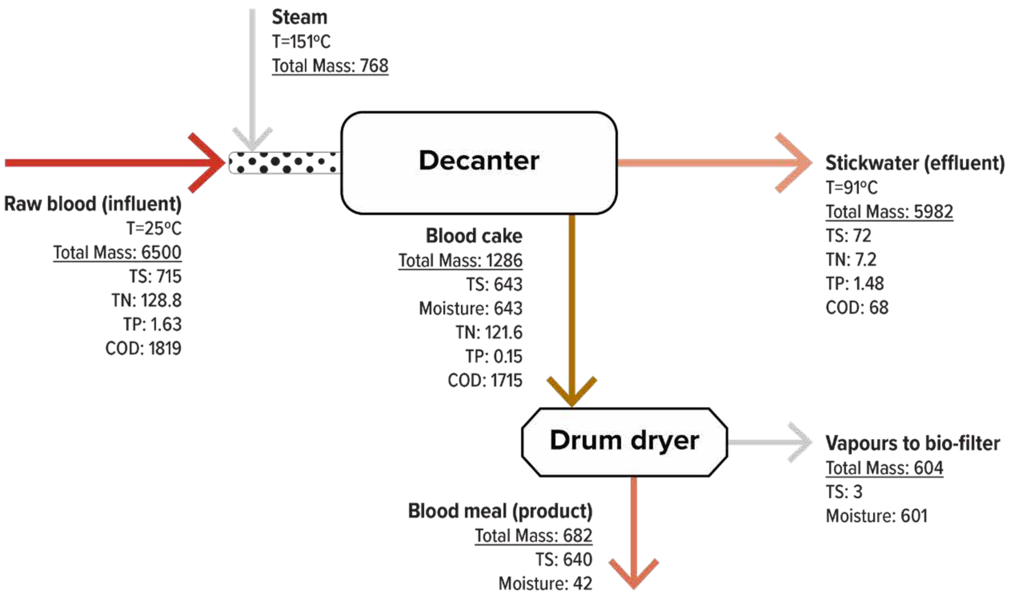

Figure 1 Diagram of blood meal processing (Fan L, 2007)

As Fan (2007) describes, there is still considerable loss of protein and COD load in the stickwater separated in the decanter, especially at high decanter feed rates. Additional protein recovery can be achieved by use of membrane separation processes on the stickwater.

A number of equipment suppliers provide stainless steel collection trays with an integrated screen filter and pump attachment for blood transfer. These trays can be positioned under the chain to collect the blood draining from the animal.

Batch rendering cookers can also be used to coagulate and dry blood, or the collected wet blood can be mixed and processed with other rendering inputs.

Collection of inedible blood for processing by service processor

Where services are available, collected blood can also be sent to independent processors for drying. While the value for the blood is low, no local investment is required, and all blood is removed from the site without loss to the wastewater plant.

The inclusion of added water, collection, handling, and transport delays all affect the quality of the finished product. Blood can be sent on its own, or together with other rendering inputs, to the service renderer.

One service provider in Victoria is processing 100 tonnes per day of blood products.

Plasma and haemoglobin powders

The Australian Renderer's Association survey estimates completed in 2023 identified two small companies producing plasma and haemoglobin powders for pig feed and aquaculture.

Blood for haemoglobin and plasma must be free from added water, contaminant proteins and tissues. Blood is collected in containers with an anticoagulant, e.g., sodium citrate, and held for release following post-mortem inspection of the carcase. The collected blood is removed to a separate enclosed on-site facility or a third-party processing facility.

Serum can also be derived from clotted blood by cutting the clotted blood into cubes and collecting the serum expressed from the clot. Serum is collected from clotted whole blood for markets such as Japan which do not permit the addition of citrate to pharmaceutical blood.

Centrifugation separates the red blood cells from the plasma. Both streams can be concentrated and spray dried separately to dried haemoglobin meal and dried plasma meal or further processed into bioactive peptides, serum albumin (BSA), and immunoglobulins (IgG).

Whole blood can be spray dried like plasma. Market reviews (Glen D, 2015) for blood-based proteins – including BSA and IgG for pig and poultry feed ingredients, in fish and prawn feeds, and in pet foods – found that while animal-derived blood products have long been used in the food and food ingredients industry, regulatory hurdles and cost competition are disincentives for new market entrants. In addition, consumer resistance to blood-based ingredients limits uptake of these products by the nutraceutical industry. Glen (2015) also provides a comparison of the value of uplift of bovine-derived blood products for the feed industry as shown in **Table 3**. No processing cost information was provided but this is expected to increase considerably as the complexity of the refining technology increases.

Table 3 Relative value uplift of blood products (Glenn D, 2015)

Product	Refining technology	Value AUD/tonne (2015)
Whole blood	None	$195
Blood meal	Drying only	$230
Haemoglobin meal	Separation, drying	$3,000
Plasma meal	Separation, drying	$5,000
Serum albumin	Separation, fractionation, drying	$7,390
Immunoglobulins	Separation, fractionation, drying	$16,280

The processing costs – except for drying of whole blood to blood meal – was estimated to be $0.022–$0.085/kg of whole blood (Spooncer B, 2011).

Animal blood processors

Four significant animal feed and pet food companies with global reach were profiled (Glen D, 2015): Sonac and Nutreco (the Netherlands), and American Protein Corp and Mars Inc. (US).

Sonac Australia Pty Ltd, a subsidiary of Sonac, produces blood plasma and haemoglobin from animal blood. Formerly known as BAIC Protein Pty Ltd, founded in 2005 and based in Maryborough, Victoria, the company changed its name to Sonac Australia in April 2012.

Sonac operates an animal blood processing facility at Maryborough, manufacturing haemoglobin and plasma powders for pet food ingredients and non-ruminant animal feed supplements. Bovine, ovine and porcine blood collected from abattoirs is chilled and delivered by tanker trucks; the material is unloaded, processed into dried powders, then packaged and shipped to the end user.

A visit report by the Maryborough Rotary Club (Maryborough Rotary Club, 2022) describes the process as follows. In Maryborough, Sonac uses a unique process to process their products. This involves the collection of blood from a number of abattoirs in Victoria and New South Wales such as Ararat, Warrnambool, Murray Bridge and Wagga Wagga. Sonac sets up the equipment required to collect the blood at their chosen abattoirs and transfer it hygienically into stainless-steel tanker trucks. The tankers have a limited time to transport the blood to Maryborough where the blood is uniquely separated into the two components of plasma and haemoglobin before further processing. Other factories do not do this separation. The fluid is then drained from each product to produce a fine powder that is easily transported to companies that use it for other products. Annually they produce 1,600 tonnes of plasma powder and 2,800 tonnes of haemoglobin powder.

The Maryborough Advertiser reported on Sonac's $17 million expansion of production capabilities and waste management (Maryborough Advertiser, 2024). The installation of a new wastewater treatment plant and box drying equipment is estimated to nearly double the facility's ability to turn blood waste from abattoirs to protein powders for animal consumption to 55,000 tonnes (blood)/annum.

In 2016, **Proliant Health and Biologicals** established a BSA (bovine serum albumin) processing plant in Fielding, New Zealand. The PHB facility was constructed to replicate the closed-loop manufacturing process which was initially developed and implemented in their US facility based in Boone, Iowa. The Feilding plant was designed to functionally duplicate the vertically integrated raw material to finished product control used in the US facility, and utilises equipment from the same manufacturers to ensure a truly uniform process.

The Feilding facility is currently in a long-term supply agreement with Silver Fern Farms, the largest bovine packing company in New Zealand, ensuring a steady supply of raw materials. Under this agreement, PHB controls all of the processes used in the raw material collection and owns all of the processing equipment for separating out the plasma at each collection facility.

The Feilding BSA plant can process 1,000–1,500 tonnes of blood plasma, with the ability to expand up to 3,000t a year. The BSA produced will primarily be exported overseas to large global clients. Currently around 1,500 tonnes of blood plasma is produced in New Zealand, of which 99% was exported unprocessed.

Impediments and opportunities

A detailed review (Spooncer B, 2011) of blood collection requirements and capabilities at Australian meatworks discusses the impediments to blood collection and value adding. Blood processors and exporters indicated that they could source blood from the existing capacity to collect pharmaceutical grade blood in Australia and New Zealand.

The easiest route for processors is to let the blood run to the drain. Hollow knife sticking requires extra labour to collect and process the blood. Halal slaughter reduces the period when blood can be collected, reducing yield. Blood can be collected in stainless-steel collection tanks under the chain without additional labour.

While the value of more refined blood products increases markedly (Glen D, 2015), so too do the processing costs. Greater returns can be achieved in larger blood processing plants which collect blood from multiple meat works.

The global trend for specialty proteins and bioactives for food and feed is undoubtedly increasing.

To increase the take up of blood for value-added products requires positioning Australia as an ideal location for supply and set up of processing facilities by ingredient manufacturers.

Meat processors look for a long-term, guaranteed sale outlet for their co-products that justifies implementing the necessary labour and infrastructure, and with minimal impact on the chain.

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