GOATMAP

CAEMAP
(CAPRINE ARTHRITIS ENCEPHALITIS)

Protecting you, your property, your animals, your industry

animalhealth AUSTRALIA

CAEMAP (for CAPRINE ARTHRITIS ENCEPHALITIS)

Protecting you, your property, your animals, your industry

GoatMAP is a multi-disease market assurance program for goats. The current modules are General Biosecurity (GOATBIO), Johne's Disease (JDMAP) and **Caprine Arthritis Encephalitis (CAEMAP)**.

Version 1.2
Released August 2024

Version control

Version	Date released	Comments
1.0	August 2023	First version
1.1	January 2024	Figure 1 flow diagram improved, and testing times made clearer
1.2	August 2024	Herd introductions aligned with other MAPs, more clarity around the use of ELISA and PCR testing in the program

ACKNOWLEDGEMENT

GoatMAP is the Market Assurance Program for important endemic diseases of goats, it contains three modules: General Biosecurity (GOATBIO), Johne's Disease (JDMAP), and Caprine Arthritis Encephalitis (CAEMAP). GoatMAP has been developed by members of the Goat Industry Council of Australia and associated industry organisations, jurisdictions and Animal Health Australia (AHA).
Advice on its development has also been received from the state and territory government animal health authorities and goat vets and breeders.

PRIVACY STATEMENT

Animal Health Australia utilises, but does not collect information in relation to the Market Assurance Program. However, state and territory authorities provide Animal Health Australia with information for the following purposes to:

- Maintain a public on-line register of MAP assessed herds and flocks to promote disease status of program participants' flocks to clients

- Generate random lists for auditing, if required
- Mail out information materials related to the program.

AHA is committed to the protection of your personal information and will only use the information provided in accordance with the requirements of the Commonwealth *Privacy Act 1988* and the *Privacy Amendment (Private Sector) Act 2000*.

INFORMATION USED

The following information is provided to AHA for the purposes listed above:

- Certificate number
- Property ID
- Owner name
- Property name
- Postal address
- Phone number
- Email address
- Status
- Breed
- Expiry date
- Year that current status was achieved.

If you do not want your information visible in the public database, you should let your GoatMAP Administrator know.
Individuals should note that it is a requirement of the program that herd/herd owners may need to participate in an external audit in accordance with GOATBIO and individual disease module requirements.

DISCLOSURE OF INFORMATION

The information provided to AHA is strictly confidential. AHA will not reveal, disclose, sell, distribute, rent, licence, share or pass your information on to any other parties without your consent, other than those who are contracted to implement any of the purposes above, or except where AHA may be required by law to disclose it.
At your request, we will provide you with any information which we have been provided about you in accordance with National Privacy Principle 6, Privacy Act 1988. To gain access to your information you should contact our Privacy Officer at the address below:

Privacy Officer
AHA
243 Northbourne Ave, Lyneham, ACT 2602

If you believe that any of the information provided to AHA is inaccurate, incomplete or out of date, please contact your state Agricultural Department to have it corrected.

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INTRODUCTION TO CAEMAP

Welcome to the first edition of CAEMAP, the Caprine Arthritis Encephalitis module of the Market Assurance Program for Goats. CAEMAP has been fully integrated into GoatMAP. This program is part of an organised industry approach to control Caprine arthritis encephalitis (CAE) in Australia.

This introduction contains background on CAEMAP, the quality assurance system. Read this along with the GoatMAP biosecurity module (GOATBIO) to ensure you understand the program.

CAPRINE ARTHRITIS ENCEPHALITIS IN GOATS

CAE in goats is a slowly progressive disease characterised by worsening arthritis. Other clinical signs of infection can include viral mastitis, wasting and pneumonia. In mainly younger animals, neurological deficits leading to paralysis and death may also occur. There is no cure for the disease and death can occur at any stage of life. There is no vaccine against CAE. The disease and virus mainly occur in dairy goat herds and can have a profound impact on production. Whilst the virus does not survive for very long in the environment, infected animals will shed virus for life. While there are several routes of transmission, the greatest risk is from ingestion of colostrum or milk from infected goats. Any contact that has the potential to transfer body fluids between goats can result in infection.
Equipment and facilities that are contaminated with milk and other secretions from infected goats present a risk of virus transmission.

LEVELS OF ASSURANCE FOR CAE

The CAE module aims to identify, protect, and promote herds at low risk of being infected with CAE. The module is based on testing to detect infection and property and biosecurity management that minimises the risk of introducing and spreading CAE in the herd. Veterinarians assess these management strategies to determine risk and test the goats to determine status.

CAE testing is used to assess the likelihood of infection being present in the herd. This may be achieved by individual-animal testing or by regular testing of bulk milk for dairy herds.

The Herd Test (CAEHT) pathway for CAE uses a CAE ELISA test to detect antibodies in blood or milk against CAE in either individual goat samples, or small pools containing samples from up to five goats, from all eligible goats in the herd, with follow-up investigation of reactors. A series of negative Herd Tests conducted at defined intervals is required for a herd to obtain and then to retain ‘Monitored Negative’ (CAEMN) status through the Herd Test pathway.

Dairy herds may choose to use the Bulk Milk Test (CAEBMT) pathway to test for the presence of CAE in the milking herd. A sample of vat milk is tested for CAE using a CAE ELISA. This may be supplemented by blood tests of male goats but is not essential to enter the program because a series of CAEBMTs is required for initial accreditation and this sequence of tests will detect spill-over of disease from infected males into the milking herd within this time. Note that once you have entered the program, all introduced animals must be individually tested and confirmed to be negative to CAE to retain accreditation.

It is the series of regular and spaced negative CAEBMTs that provides the necessary assurances for a

dairy herd to obtain and then retain 'Monitored Negative' (CAEMN) status through this pathway.

A key requirement of CAEMN accreditation is demonstration of effective property and herd biosecurity. These stipulated requirements are assessed on a regular basis by the contracted GoatMAP Veterinarian.

The testing pathways and assurance levels are summarised below in **Table 1**.

Table 1. CAEMAP assurance levels and testing pathways.

ASSURANCE LEVEL	PATHWAY	HOW ACHIEVED	RELATIVE MERIT
Monitored Negative 1 ($CAEMN1_x$)	Herd Test (Individual-animal or Pooled-animal ELISA testing)	Complete 2 negative tests of all animals over 3 months of age using an ELISA (individual or pooled milk or blood samples) undertaken between 9–27 months apart (i.e. annually or biennially). A Herd Management Plan must be in place and a Veterinary Review completed every 12 months.	High CAE assurance level
Monitored Negative 1 ($CAEMN1_x$)	Bulk Milk Test (vat milk ELISA testing)	Complete 4 negative bulk (vat) milk tests using an ELISA test, conducted 6–9 months apart. A Herd Management Plan must be in place and a Veterinary Review completed every 12 months.	High CAE assurance level
Monitored Negative 2 ($CAEMN2_x$)	Herd Test (Individual-animal or Pooled-animal ELISA testing)	Complete 1 negative test of all animals over 3 months of age using an ELISA (individual or pooled milk or blood samples) undertaken between 9–27 months after the preceding herd test. A Herd Management Plan must be in place and a Veterinary Review completed every 12 months.	Very high CAE assurance level
Monitored Negative 2 ($CAEMN2_x$)	Bulk Milk Test (vat milk ELISA testing)	Complete 2 negative bulk (vat) milk tests using an ELISA test conducted 6–9 months after the preceding BMT and 6–9 month apart. A Herd Management Plan must be in place and a Veterinary Review completed every 12 months.	Very High CAE assurance level
	x is the year the herd first attains MN1 accreditation (e.g. $CAEMN1_{2023}$)		

TESTING AND MANAGEMENT

VETERINARY MANAGEMENT

The responsibilities of your veterinarian are outlined in the checklists available on the AHA website.

One of the responsibilities of the veterinarian is testing. All eligible goats must be available for testing through both the Herd Test (by the veterinarian) and Bulk Milk Testing (samples may be collected by the farmer on approval by the veterinarian) pathways.

Because tests are not 100% sensitive (due to the time it can take some animals to develop antibodies after infection), even testing all animals would not guarantee that the herd was free of CAE. For the Herd Test pathway, all goats of the appropriate age (>3 months) are tested, and two rounds of testing conducted 9–27 months apart are required to attain CAEMN1$_x$ status. For the CAEBMT pathway, a minimum of four rounds of vat milk testing conducted 6–9 months apart are necessary to attain CAEMN1$_x$ status.

The interval between tests is to allow recently infected goats time to produce sufficient antibodies that can be detected at the later tests. The CAEBMT interval of 6–9 months between tests is to allow antibodies to be produced in newly-infected goats and to ensure that all milking goats are likely to be tested when in early to mid-lactation on least one of the two tests in this period.

Providing that the herd is appropriately managed to prevent the introduction of disease, confidence that the herd is not infected increases as the number of negative tests accrue. Therefore, the year that the herd first attained CAEMN1 status is recorded with herd status as this provides an additional measure of confidence in the disease-free status of the herd as the ensuing years pass.

Goats with clinical signs of CAE must be investigated, irrespective of CAEMN status. These animals must have an EDTA blood sample (and milk if lactating) collected for serology and PCR to detect virus. The investigation of suspect clinical cases increases confidence in negative herd test results.

The antibody ELISA blood tests are not 100% specific, and this means a small number of false positive reactions (goats returning a positive test are called *reactors*) may occur. Any reactors must be investigated promptly via repeat individual blood and/or milk testing (serology and PCR). These tests are used to establish the true status of the reactor animal. Herds with suspect reactors must not sell goats to other CAEMAP herds until all reactor statuses have been clarified. The herd is classified as Suspect until all reactors have been appropriately investigated. Any reactor that is negative on follow-up test reverts to a negative test result and herd CAEMN status is restored. If a reactor returns a positive follow-up test, the herd is classified as Infected and removed from CAEMAP. Reactors that are not investigated within one month are assumed to be positive and herd CAEMAP status will be lost.

PROPERTY MANAGEMENT

You must comply with the requirements of GoatMAP (GOATBIO) to enter CAEMAP.

THE CAEMAP MODULE

This module outlines the activities you must undertake, the herd and property management practices you must implement (including testing) and the records you need to keep in order to comply with CAEMAP requirements.

STRUCTURE

As well as this introductory section, the module contains eight Elements. These describe any CAEMAP-specific requirements that build upon GOATBIO biosecurity requirements.

ICONS

The icons used below to highlight the Element sections are the same as in the GOATBIO module:

This section is important for Herd Managers

This section is important for Veterinarians

DEFINITIONS

ADULT ANIMAL

A goat 12 months of age and over.

ANNUAL VETERINARY REVIEW

A review undertaken every year by the veterinarian to ensure that the herd has met the management requirements of the program. It includes examination of records, individual identification of animals at testing and records of goat movements on and off the property.

BARRIER

A physical separation which minimises the risk of environmental spread of infection. Suitable barriers include unstocked land, land grazed by non-susceptible species, tree lots, contour banks or stone walls.

BULK MILK TEST (BMT)

Dairy goat herds may use bulk milk for testing, as an alternative to the Herd Test. The CAEBMT involves the collection of one or more sequential samples of vat (bulk) milk and testing of the milk with a CAE ELISA. Sampling must occur when most goats are lactating (ideally most in early lactation). The CAEBMT is a convenient and low-cost screening tool but has lower sensitivity than individual animal tests. A positive CAEBMT result indicates the presence of infected animal(s), but a negative result does not guarantee that the herd is free. A very low level of infection may not be detected. The status of young and non-lactating animals cannot be determined. Herds using CAEBMT for accreditation require more testing over a longer period to provide a similar assurance of disease freedom.

CONTAMINATED LAND

Land that has been contaminated by infected animals or herds and has not been satisfactorily decontaminated in accordance with a program that has been approved by the GoatMAP veterinarian or administrator of the jurisdiction.

DAIRY GOAT HERDS

Any goat herd that is subject to the regular harvesting of all lactating females (does) with pooling of collected milk into a vat or equivalent is a dairy goat herd for purpose of CAEMAP.

DISEASES OF CONCERN

A disease of concern is the list of all goat disease that have individual disease accreditation modules in GoatMAP. Currently this is Johne's disease and caprine arthritis encephalitis. GOATBIO accredited herds must not allow contact between their goats and goats from infected or suspect herds or eligible species with these diseases.

ELIGIBLE GOATS

For CAEHT or any introductions, this is all herd goats aged three months or older. For the CAEBMT this is all lactating goats.

ELIGIBLE SPECIES

Sheep that co-habit with goats (i.e. share the same land or facilities or can make physical contact with each other, such as through a fence). While this program is primarily intended for goats, sheep may become infected and act as reservoirs for CAE. Where sheep are run together or on the same land as goats, they must not be from flocks known or suspected of being infected with CAE. Sheep flocks that are maintained totally separate from the goat herd (i.e. they never graze the same land or use the same facilities and cannot contact each other directly or indirectly such as through a fence) are not eligible.

FOREIGN ANIMALS

Foreign Animals are any Eligible Species (i.e. goats and sheep) that may enter the property which originate from another herd or property of origin or are feral. These animals are subject to restrictions, quarantine and testing. This is described in the relevant sections of this module.

GOATMAP ADMINISTRATOR

A state department representative who is charged with administration of GoatMAP within the state according to the rules of the program and in line with animal health legislation in that state. The GoatMAP administrator can be a national representative where a state coordinator is not available.

GOATMAP VETERINARIAN

A veterinarian who has signed an agreement accepting the responsibilities of and to undertake duties as required and described in the GoatMAP modules. Only a contracted veterinarian, or an employed veterinarian under the direct supervision of a contracted veterinarian, can provide veterinary services required by GoatMAP. Veterinarians can attain competency to meet the requirements for contracting through self-education or by completing APAV and MAP training courses.

HERD

The group comprising all goats and/or other eligible species that have grazed the land during a 12-month period and/or that have shared facilities, such as yards or a shearing shed. A herd may be run on separate blocks of land that are not adjoining, however the movement of eligible species between these blocks must be undertaken to comply with GOATBIO requirements.
Where a new herd is established, it may enter the CAEMAP when it satisfies the requirements outlined in GOATBIO and Element 1.

HERD STATUS CERTIFICATE

A certificate issued to the herd owner by the GoatMAP Veterinarian or downloaded from the AHA website. It describes the status of the herd following the most recent assessment by the veterinarian and is valid for 12 months or may be revoked at any time for non-compliance.

HERD TEST

An individual test of all goats aged 3 months or older using a serological test (CAE ELISA), including the investigation of reactors. There are two ways to conduct a Herd Test:

Pooled Sample Herd Test – samples of either milk or blood that have been collected from each individual animal in the herd are combined into small pools at the time of testing. Very weakly reacting animals may be missed in a pooled sample test or if too many samples are included in the pool. Where validated by the testing laboratory, blood or milk samples may be tested in pools of up to five (5) samples. Any positive pool requires separate testing of samples from each of the individual goats that have been included in that pool using a CAE ELISA test.

Individual Sample Herd Test - samples of either milk or blood that have been collected from each individual animal in the herd are tested individually. This testing approach has the highest sensitivity.

LAND

The area of land including yards and other facilities on which the herd is run.

MARKET ASSURANCE PROGRAM (MAP)

A MAP is a formal program designed to highlight herds with low risk of infection by applying rigorous standards of biosecurity, monitoring for disease, and regular testing of the herd for the presence of infection.

MATING AREA

An area of land separate to the quarantine area, described in the herd management plan that is used only for the purposes of supervised mating with visiting goats. Visiting Goats to an accredited herd should be the same or higher status as the herd. This land will not otherwise be used by the herd.

MOB

A discrete group of goats, often of similar age or sex that are run together within a herd.

NEIGHBOURING PROPERTY

Any landholding which adjoins land on which an assessed herd is run.

QUARANTINE AREA

An area of land or a building in which animals that are newly introduced or return a suspect test can be isolated. Hand mating goats from untested herds or herds of lower levels should not be allowed.

REACTOR

An animal which is positive or inconclusive to a serological test (blood and/or milk).

SEROLOGICAL TEST

The CAEMAP serological test for goats is the CAE ELISA. Note that not all CAE ELISA test kits are suitable for testing of milk or bulk tank milk samples. Only validated kits should be used for this purpose.

ELEMENT 1: HERD ENTRY REQUIREMENTS, HERD STATUS AND PROPERTY/ HERD RISK ASSESSMENT

The herd's eligibility to participate in and remain in CAEMAP must be established and reviewed regularly.

Refer also to **GOATBIO Element 1** for essential biosecurity details.
Specific components relevant to CAEMAP are described below.

BIOSECURITY ONGOING RISK ASSESSMENT

Key points:

- Goats and sheep are the Eligible Species (susceptible to CAE virus infection) within CAEMAP. This includes farmed and feral goats.
- Sheep can be infected by CAEV, and sheep can be a reservoir of CAEV infection on properties holding goats and sheep. However, sheep that co-habit are not eligible for testing for CAEV because the tests are not suitable.
- The required stock-free period for land grazed by eligible species of unknown or lower CAEMAP status is one month.
- There are no approved CAE vaccinations in CAEMAP. Accreditation is based on the biosecurity and testing history of the herd.

1. DETERMINING HERD STATUS

Herds are not eligible to submit for CAE testing until they satisfy the GoatMAP biosecurity requirements as described in the GOATBIO module.

The minimum age for individual-animal (or pooled-animal) testing is 3 months.

The minimum interval of time following introduction of goats of unknown status or after grazing of potential contaminated land before testing is one month. Any introduced goat that is less than 3 months of age must be individually tested after they attain 3 months of age and before they attain 12 months of age or before mating.

Non milking herds can only achieve accreditation through the Herd Test (individual-animal or pooled-animal blood ELISA) pathway. Dairy herds may choose between the CAEHT (individual-animal or pooled-animal blood or milk ELISA) or CAEBMT pathways.

For milking herds of unknown CAE infection status, a vat Bulk Milk Test (CAEBMT) should be considered prior to any initial individual-animal or pooled-animal herd test as this is a fast and cost-effective way to investigate status before embarking on entry to CAEMAP. A negative bulk milk screening test allows progression to Herd Test (CAEHT) via individual-animal or pooled-animal pathways, or to continue along the slower but more economical CAEBMT pathway to accreditation. The sequence of CAEBMTs must be spaced 6–9 months apart to ensure that all adult females (does) contribute milk to at least one of the CAEBMTs and to ensure all does contribute milk for testing when in early to mid-lactation.

ALLOCATING AND MAINTAINING STATUS OF CAEMAP HERDS

Figure 1 outlines how your herd can attain, progress, or maintain CAEMAP status. Herds already in state-based accreditation schemes e.g. in NSW or Qld can go directly into the relevant category i.e. $CAEMN2_x$ with the number of years in the scheme also reported.

Key points for entering, progressing, or maintaining CAEMAP status are:

- You require a contracted GoatMAP veterinarian to work with you to ensure you meet the requirements of CAEMAP and to undertake annual reviews to confirm your herd and farm remains compliant with the program.
- All CAE-positive animals must be removed from the herd and necessary corrective actions taken before entry can be approved (relevant Corrective Action form is on the AHA GoatMAP webpage). There is a 6-month wait period for completion of all necessary corrective action before entry is allowed.
- You can choose one of two testing pathways in CAEMAP:
    - **The Bulk Milk testing pathway (CAEBMT)** requires a bulk milk sample test for CAE every 6–9 months. The minimum interval between CAEBMT is 6 months as this ensures that dry goats at one test are likely to be lactating and in early lactation at the subsequent test. The CAEBMT test is less sensitive than the CAEHT (see below), so more frequent testing of the herd is required under this pathway to attain and retain Negative status.
    - The **Herd Test (CAEHT)** requires all goats aged three months or older to submit to individual-animal or pooled blood or milk tests for CAE. This is a sensitive test, so fewer tests are required to obtain and retain Negative status than for the CAEBMT. Samples from up to five (5) animals may be pooled to reduce costs. Non-dairy herds must use this pathway (blood). Dairy herds may utilise either this pathway (blood or milk) or the CAEBMT.
- Once a status is obtained or retained, you may swap testing pathways (e.g. from CAEHT to CAEBMT) to advance or retain status but cannot combine CAEBMT and CAEHT pathways within a step (e.g. to move from $CAEMN1_x$ to $CAEMN2_x$).
- Each testing pathway requires an Annual Veterinary Review by your CAEMAP veterinarian. This is to ensure that all biosecurity and records requirements of CAEMAP continue to be met.
- The CAEHT pathway is designed to allow annual or biennial testing and so will require:
    - Between 9 months and 27 months to attain $CAEMN1_x$ status.
    - Between 9 and 27 months to advance from $CAEMN1_x$ to $CAEMN2_x$ status. This allows at least one CAEHT conducted 9–27 months after the preceding CAEHT and an annual veterinary review 9–15 conducted months after the preceding review.
- The CAEBMT pathway will require:
    - Between 18 and 30 months to complete all 4 tests required for $CAEMN1_x$ status.
    - Between 12 and 18 months to advance from $CAEMN1_x$ to $CAEMN2_x$ status. This is to allow at least two CAEBMTs conducted 6–9 months after each preceding test.
- The CAEHT pathway is flexible and supports longer intervals between tests and longer maintenance of current status than the CAEBMT, but is typically more expensive than the CAEBMT pathway (especially in large herds).

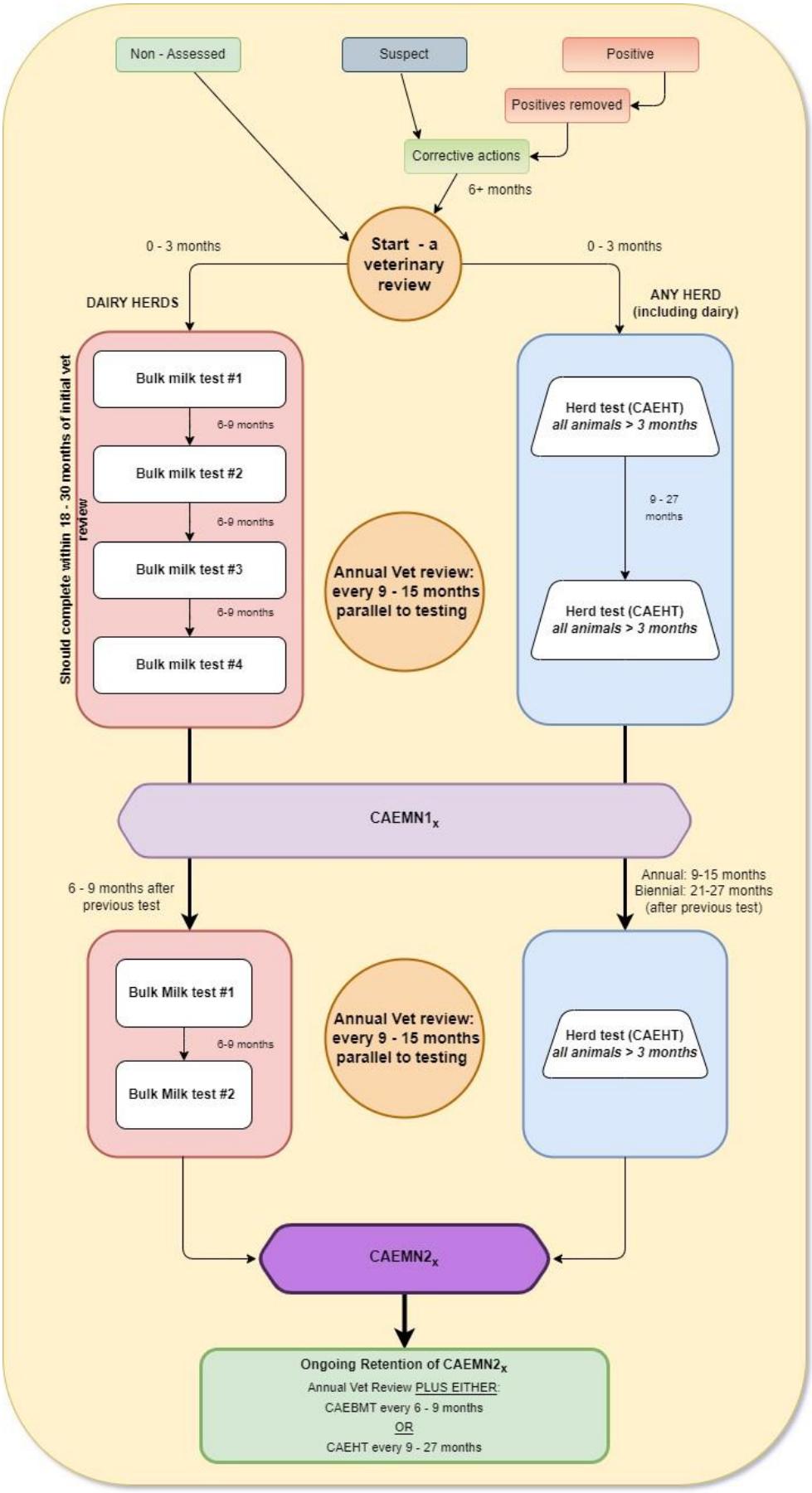

Figure 1: CAEMAP testing and accreditation flow chart

ELEMENT 2: INTRODUCED GOATS (INCLUDING STRAYS)

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You must follow the CAEMAP requirements when you introduce goats into your herd. Introduced goats must be identified and their movements recorded. Records that enable traceability must be kept.

Refer also to **GOATBIO Element 2** for essential biosecurity details.

Goats include farmed and feral goats. Sheep that co-habit with goats are Eligible Species (susceptible to CAE virus infection) within CAEMAP (but are not tested). Sheep can be infected with CAE so they should be kept away from all positive and suspect goats and their milk.

Specific extra requirements as they pertain to CAEMAP are presented below.

1. WHICH ANIMALS CAN BE INTRODUCED?

GOATBIO base biosecurity requirements must be met for all introductions, including introduced breeding goats. It should be noted that CAE can be spread in semen and embryos.

INTRODUCING BREEDING GOATS

In addition to GOATBIO requirements for introduced breeding goats, all introduced animals (Foreign Animals) should ideally be sourced from CAEMAP accredited herds of the same or higher status. However, up to 5% of the adult herd number may be introduced from a herd of one lower status.

All introduced goats (from herds that are less than CAEMN2 status) over 3 months of age must be blood tested for CAE using an ELISA before being introduced to the main herd from the property's quarantine area. If goats under 3 months of age are introduced, they must remain separated from the herd in the quarantine area; and be tested between attaining 3 months of age but before 12 months of age or before mating. They must return a negative test result before being introduced to the herd.

2. RECORD KEEPING

You must comply with all GoatMAP requirements. See the GOATBIO manual for general record keeping requirements.

ELEMENT 3: MOVEMENT OF ASSESSED GOATS

HM

To maintain CAEMAP status, property management must minimise the risk of infection in goats from CAEMAP herds when they are moved to or from the property.

Refer also to **GOATBIO Element 3** for essential biosecurity details.

Goats usually become infected with CAE by direct contact with infected milk, colostrum or individuals, but infection from contaminated facilities (yards, sheds, troughs, and milking equipment, shared equipment (such as vaccinators, drench guns, AI equipment, trailers)), food or water is possible. It is essential that goats in a CAEMAP herd are not allowed to eat or drink from potentially infected sources. You must observe the procedures outlined in **GOATBIO Element 3** when moving goats on to or off your land.

A minimum stock-free period of one month is required for potentially contaminated land or facilities following removal of goats of unknown or lower CAEMAP status.

1. AGISTMENT AND HOLDING GOATS ON OTHER LAND

You may want to move goats to leased land, for agistment or to a group rearing scheme. Your goats retain their CAEMAP status when they return to your land if you meet all GOATBIO requirements. You also must obtain a written statement from the owner/manager of the land that your goats were not held on land or within facilities that have held goats of lower or unknown status during the past one month. Suspect or contaminated land must not have held goats for one month before use. The use of National Goat Health Declarations are recommended for this purpose.

ELEMENT 4: LIVESTOCK IDENTIFICATION

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Permanent individual animal identification and recording systems must be implemented that meet GOATBIO biosecurity requirements (see Element 4).

Individual permanent animal identification of all goats is required. This is necessary to ensure that individual goats can be appropriately identified and managed following testing for CAE.

Refer also to **GOATBIO Element 4** for essential biosecurity details.

ELEMENT 5: HERD MANAGEMENT PLAN

A Herd Management Plan must be prepared for each herd enrolled in CAEMAP according to GOATBIO requirements.

Refer also to **GOATBIO Element 5** for essential biosecurity details.

Goats includes farmed and feral goats. Sheep that co-habit with goats are Eligible Species in CAEMAP (susceptible to CAE virus infection) for management purposes (but are not included in testing).

ELEMENT 6: TESTING STRATEGIES

You must test the herd before it gains a status as a CAEMAP herd. Further testing at prescribed intervals is required to monitor the status of the herd.

1. GETTING STARTED

It is your responsibility to arrange for the veterinarian to test goats in the herd at the times required by CAEMAP.

Well ahead of the date you have agreed for testing:

- ensure that adequate goat handling facilities are available for herd testing and that a suitable livestock identification system is in place to record the animals tested and their results
- arrange the initial test requirements with your veterinarian – date, time, type of testing, which animals to be sampled including number of mobs to be sampled, and number of animals in each mob to be sampled.

On the day(s) the samples are to be collected, ensure your goats are yarded in time and ready for sampling. Does should not be blood tested within one month of the estimated kidding date or one month after kidding.

There are two testing pathways in CAEMAP. Milking herds may choose the pathway that best meets herd objectives. Non-milking herds must follow the Herd Test pathway. Both pathways are described below:

- **Herd Test (CAEHT)**. Herd Testing can be conducted using either individual-animal or pooled- animal testing of blood or milk samples collected from individual goats using an ELISA. Samples must be submitted to the laboratory as individual samples. A Herd Test is the only testing pathway available for non- milking goat herds. A Herd Test is used to attain CAEMAP accreditation (CAEMN1$_x$) and to advance to or retain CAEMN2$_x$ status.
- **Bulk Milk Test (CAEBMT)**. The CAEBMT is an ELISA test of one or more sequential samples of milk from the bulk milk vat. The CAEBMT is only available for milking herds. A sequence of negative CAEBMTs on milk samples taken at regularly spaced intervals is required for a

dairy herd to attain CAEMAP accreditation (CAEMN1$_x$) and to advance to or retain CAEMN2$_x$ status. Dairy herds may choose either the CAEBMT or CAEHT pathway to attain, advance or retain CAEMAP accreditation.

Bulk milk can be used for testing the CAE status of the milking herd on goat dairy properties. The CAEBMT involves the collection of one or more sequential samples of vat (bulk) milk and testing of the vat milk sample(s) with a CAE ELISA. Sampling must occur when most goats are lactating, and ideally when most goats are in early to mid-lactation. This testing approach has a lower sensitivity than CAEHT, so more (negative) tests and a longer time is required to attain accreditation or to advance status via this pathway.

A dairy herd may choose to use the CAEHT or CAEBMT pathways to attain, advance or retain CAEMAP accreditation. Once status has been attained, advanced or retained, the alternative pathway may be chosen to meet the next accreditation requirement.

Individually reacting animals and positive bulk milk tests are investigated further to confirm or rule out infection. The follow-up testing requirements are different for CAEHT and CAEBMT pathways.

You must ensure that adequate goat handling facilities are available for herd testing and that a suitable livestock identification system is in place to record the animals tested and their results.

The GoatMAP veterinarian is responsible for the collection, identification and submission of samples to a laboratory for testing, and for veterinary interpretation and advice regarding the results. Usually, blood sampling will be conducted by the veterinarian, and milk sampling (individual animal samples or bulk tank milk sample) will be conducted either by the veterinarian or under the direct and present supervision of the veterinarian.

The veterinarian may delegate collection of the milk sample to the farm manager if confident that fully compliant sampling will be undertaken without direct supervision. To justify that confidence, the veterinarian should consider whether they have regularly attended the farm, over what duration, and whether they have been consulted in cases of animal ill-health; the observed standards of care and competence in the husbandry of animals on the farm; and the competence and integrity of the herd owner or manager based on existing relationship and not just the immediate claims or demands of the owner.

2. HERD TESTING (CAEHT)

A CAE Herd Test (CAEHT) involves testing samples from all goats aged 3 months or older. The CAEHT may be conducted on individual-animal samples or on pooled-animal samples. The pooled-animal sample involves pooling of individual animal samples of blood or milk at the laboratory from up to five (recorded) individuals and the testing of the pooled sample. The pooled-animal test can offer savings for farmers in large herds.

CAEHTs are conducted using a serological test (CAE ELISA) on blood or milk. Any animals that return a positive or inconclusive result on the CAE ELISA (called reactors) require further investigation. If a pooled-animal sample is positive, an individual animal test is required to be conducted on each animal within the pool.

Herd Testing (or a CAEBMT) is required when a herd enrols in CAEMAP to attain CAEMN1$_x$ status. A

CAEHT can also be used to advance to or retain CAEMN2$_x$ status.

HOW IS THE TESTING DONE?

When the herd is first enrolled in CAEMAP all goats 3 months of age or older, no matter how long they have been part of the herd, are sampled and tested. If the Herd Test returns any positive results, these are investigated further. To progress to CAEMN1$_x$ status, a second Herd Test must be conducted 9–27 months after the first negative herd test. If this test is negative, and the property meets necessary biosecurity requirements as determined by veterinary review inspection, the herd is classified as CAEMN1$_x$, where x is the year of first accreditation.

To progress from CAEMN1$_x$ to CAEMN2$_x$, or to retain CAEMN2$_x$ status using the Herd Testing pathway, a subsequent negative Herd Test conducted 9–27 months after the last Herd Test and satisfactory veterinary review completed 12 months after the last veterinary review is required. The interval 9 – 27 months allows for testing to be conducted either annually or biennially, depending on the herd manager's preference.

REACTOR / FOLLOW-UP TESTING

A positive CAEHT must be followed up to confirm presence of infection or to identify false-positive test reactions. This is as follows:

- Resampling and retesting of suspect animal(s) with CAE ELISA
- Retesting the samples using an alternate CAE ELISA test (if available).

qRT-PCR testing of EDTA-treated whole blood or milk may also be performed as part of the investigation. A positive result is definitive and confirms infection; a negative result does not exclude infection.

A reactor animal may be considered a false positive if both follow-up ELISA test on samples taken within one month[1] of the original positive sample are negative. Reactors that return a positive result on one or more of the follow-up tests, or fail to be re-tested within one month of the original positive sample, are confirmed as infected. A herd test is positive only if infection is confirmed in one or more individual animal samples.

3. BULK MILK (VAT) TESTING (CAEBMT)

A CAE Bulk Milk Test (CAEBMT) is a test applied to a sample of vat milk. Dairy herds can use the CAEBMT to attain, progress and retain CAEMAP status. A CAEBMT consists of a single or sequential sample of bulk milk that is tested using a GoatMAP ELISA. The CAEBMT is an alternative to a CAEHT.

HOW IS THE TESTING DONE?

Four consecutive CAEBMTs are conducted 6–9 months apart, with negative results required. This testing should be completed within 18–30 months of the initial veterinary biosecurity review. A second veterinary biosecurity review is required between the second and third CAEBMT to attain CAEMN1$_x$ status, where x is the year of first accreditation.

To progress from CAEMN1$_x$ to CAEMN2$_x$, or to retain CAEMN2$_x$ status using the CAEBMT pathway, two subsequent negative CAEBMTs, each conducted 6–9 months apart and with the first test

[1] Note: where the animal was vaccinated at the same time as the original sample was taken, an additional two weeks is allowed before resampling to account for any possible effect from the vaccine on the test (i.e. six weeks in total). This should be confirmed by the veterinarian inspecting the farm veterinary chemical register.

conducted 6–9 months after the preceding CAEBMT, and a satisfactory veterinary review completed 9–15 months after the last veterinary review, are required. This will require between 12–18 months to complete.

Large herds may take sequential drip samples from the vat inflow milk line into two or more vat sub-samples, with all sub-samples sent for testing. This approach can improve the sensitivity of the CAEBMT. Smaller herds without milk vats may collect and submit samples from all lactating does to the lab for a pooled milk test.

REACTOR / FOLLOW-UP TESTING

A positive CAEBMT must be followed up to confirm the presence of infection. This is as follows:

- qRT-PCR testing of vat milk. A positive result is definitive and confirms infection; a negative result does not exclude infection.
- Resampling and retesting of the vat milk (CAEBMT) within 1 month. Any goat present in the milking herd at the time of the initial positive sample but subsequently not lactating or not in the milking herd must be individually tested using a blood test as described in the CAEHT.
- Retesting the samples using an alternate CAE ELISA test (if available), within 1 month; **OR**
- Sampling and testing of all individual animals using a CAEHT.

A positive CAEBMT milk test result may be resolved to negative only when:

- subsequent vat testing (including qRT-PCR) is negative, and
- all goats that were not included in the positive BMT test are either included in the subsequent BMT test, or have tested negative using individual blood or milk CAE tests, and
- all goats that were included in the positive BMT test and were not included in the subsequent negative BMT test, including those that have since left the herd, have tested negative using individual blood or milk CAE tests; **OR**
- all animals are individually tested (using CAEHT) with all returning negative results.

The herd is classified as Suspect (CAESU) until the positive CAEBMT is confirmed (in which case it loses status and is removed from CAEMAP). If the follow-up tests are all negative, the $CAEMN_x$ status is returned.

4. TESTING INTRODUCED BREEDING ANIMALS

You must not introduce animals into an accredited herd from herds of unknown or lower CAEMAP status. All introduced goats (or co-habiting sheep) must be sourced from an equivalent or higher CAEMAP-accredited herd. You must also not introduce animals from herds infected or suspected to be infected with a Disease of Concern.

All introduced goats over three months of age must also return a negative individual-animal test for CAE on a blood or milk sample using a GoatMAP ELISA test before entry. Introduced animals less than 3 months of age must be held in isolation of the herd and tested with an individual-animal ELISA tests when they attain 3 months of age and before they reach 12 months of age (and before they are used for breeding) and return a negative test result before being allowed full entry to the herd.

5. TESTING OUTCOMES

You cannot dispose of tested goats until test results are confirmed as negative or follow-up investigations are completed. Tested goats should be run as a group separated from the herd until

the test results are known.

WHAT CONSTITUTES A NEGATIVE TEST?

A CAEHT conducted using blood or individual milk samples is deemed to be negative if:

- all goats tested are negative; **OR**
- all reactors (animals which initially test positive) are followed up by one or more of the methods below and subsequently found to be negative:
  - Resampling and retesting of the animal.
  - Testing the samples with an alternate CAE ELISA test.
  - qRT-PCR testing of EDTA blood or milk (a positive result confirms infection; a negative result does not exclude infection).

A CAEBMT is deemed negative if:

- The test of all BMT sub-samples (if more than one was collected) are negative on ELISA **OR**
- After a positive CAEBMT, follow-up repeat CAEBMT testing by both ELISA and qRT-PCR, plus individual testing by both ELISA and qRT-PCR of blood or milk samples from any lactating goat that has not been included in both the first (positive) and second (follow-up) BMT samples, including any lactating goat that has left the herd since the first test (see above under section 3, CAEBMT), all with negative results; **OR**
- After a positive CAEBMT, follow-up CAEHT testing by ELISA of all animals in the herd aged 3 months or older (see above under section 2, CAEHT) is negative, including any lactating goat at the initial positive test that has subsequently left the milking herd.

WHAT MUST YOU DO IF YOU GET A POSITIVE TEST RESULT?

If the CAEHT or CAEBMT yields a positive result, you must undertake additional follow-up investigations with your veterinarian **within one month of the date of the laboratory results**, unless the GoatMAP Administrator agrees to a different timeframe.

Positive results on the CAEHT require further investigation. Any positive follow-up test confirms infection within the herd and the herd is removed from CAEMAP. If all follow-up tests are negative, the herd remains within CAEMAP and the $CAEMN_x$ pathway is restored.

A positive CAEBMT requires additional follow-up testing of the vat sample (using qRT-PCR and alternative ELISA, if available) and resampling and retesting of the vat milk (CAEBMT) within 1 month. If negative, a second CAEBMT is undertaken 6–9 months later or a CAEHT is undertaken. All follow-up tests are required to be negative for the herd to remain within CAEMAP and for the $CAEMN_x$ pathway to be restored. Any positive follow-up test confirms infection in the herd and the herd is removed from CAEMAP. All goats that were present in the milking herd at the original positive CAEBMT must be retested — either as part of the milking herd or by individual blood test if subsequently dry. During this interim 7-10 month testing period, any animal in the herd that is to be culled must be individually tested before removal; and should any animal in the herd die during this interim testing period, contact your veterinarian immediately.

Herds with a reactor on CAEHT retain their existing CAEMAP status whilst awaiting results of follow-up testing provided this investigation occurs within one month of the positive CAEHT. Failure to investigate a positive CAEHT appropriately or within the timeframe will result in removal from CAEMAP and the assigning of a Suspect (CAESU) herd status.

A status of Suspect (CAESU) is assigned to herds with a positive CAEBMT under investigation. The original CAEMAP status and CAEMN$_x$ pathway is restored if follow-up tests are negative. Herds that have positive follow-up tests, or who do not commence follow-up testing within the required time frame of one month from the original positive CAEBMT, are removed from CAEMAP and retain the CAESU herd status.

EFFECTS OF TEST RESULTS ON HERD STATUS

The outcome of the combined results of the initial **serological** (blood/milk) test and follow up tests on herd status is presented in **Table 2**.

Table 2. Test results effect on CAE herd status.

INITIAL TEST	ADDITIONAL FOLLOW-UP TEST	RESULT	HERD STATUS
Herd Test (CAEHT) Negative	Not required	Negative	Maintain/progress status
Bulk Milk Test (CAEBMT) Negative	Not required	Negative	Maintain/progress status
Herd Test (CAEHT) Positive	Not done	Suspect	Suspect. Removed from CAEMAP
Bulk Milk Test (CAEBMT) Test Positive	Herd Test (CAEHT)	Negative	Maintain/progress status
Herd Test (CAEHT) Positive	Repeat individual test of the animals pooled in positive sample	Negative	Maintain/progress status
Bulk Milk Test (CAEBMT) Test Positive	Herd Test (CAEHT)	Positive	Infected. Remove from CAEMAP
Bulk Milk Test (CAEMBT) ELISA Positive	CAEBMT (ELISA + PCR)	Negative	Maintain/progress status
Herd Test (CAEHT) Positive	ELISA or PCR	Positive	Infected. Removed from CAEMAP

If an infected animal is detected at any stage of the testing process, the herd status will become "Infected", and the herd is removed from CAEMAP.

If a herd is withdrawn from CAEMAP, all animals which were reactors in a laboratory test (ELISA or PCR) must be permanently identified. Your program veterinarian must notify the GoatMAP Administrator and investigate all reactors according to the requirements of the policy in your state.

ELEMENT 7: OTHER APPROVED CONTROLS

There is no approved vaccine for CAE and no disease-specific approved controls for CAE.

ELEMENT 8: MAINTAINING YOUR CAEMAP SYSTEMS HM

Record keeping requirements have been described in the GoatMAP Element 8 section.

Refer also to **GOATBIO Element 8** for essential biosecurity details.