

# Australian Bat Lyssavirus guidelines for veterinarians

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Animal Biosecurity and Welfare, NSW DPI

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## Background information on ABLV

Australian bat lyssavirus (ABLV) was first identified in 1996 and there is serological evidence of the virus in flying foxes/fruit bats (megabats) and microbats. All Australian bat species are considered potentially infectious.

Human health is an overriding factor in managing all incidents involving potential ABLV infection of pet animals and their owners.

Since November 1996, three people have died as a result of ABLV infection. All three cases had a history of scratches or bites from bats and the affected people were not previously vaccinated against rabies. In two of these cases the infected bats showed clinical signs consistent with ABLV infection.

The incubation period can be from days to years and death occurs after a short illness of progressive severe nervous signs.

In 2013, two horses were euthanased after being infected with ABLV from bats. Overseas, closely related lyssaviruses cause illness in a wide range of domestic and wild animals. It is possible ABLV infection in other animals may be reported in Australia in the future.

Virus survival outside the host is short and it is inactivated by many disinfectants and soap. Rabies vaccination is thought to provide cross protection against an ABLV challenge.

Australian bat lyssavirus (ABLV) is one of sixteen species types of lyssavirus which are found around the world. Fourteen of these exist in bats but only ABLV is known to occur in Australia. The best known lyssavirus is classical rabies virus.

Australia has a current international health status through the World Organisation for Animal Health (OIE) of 'rabies-free'. The presence of ABLV and the use of rabies vaccine does not affect Australia's rabies-free status.

### **National policy**

National policy and approach to ABLV is presented in the [AUSVETPLAN](#); this contains comprehensive information for the management of animals that have potentially been infected with ABLV.

It is presumed that if an animal of a non-bat species develops clinical disease due to ABLV infection, then that animal has the potential to transmit ABLV to humans and other animals.

### **Categories of risk**

Bats can be categorised based on their potential to transmit ABLV to humans and other animals (i.e. potential for an infected bat to have infectious contact with a human or other animal). These categories are listed from highest to lowest urgency for action:

**Category 3** (high human health risk). Bat that is known or reasonably suspected to have had potentially infectious contact with a human (e.g. has bitten or scratched a person). Within Category 3, bats with clinical signs suggestive of ABLV are of highest risk.

**Category 2** (high animal health risk, medium human health risk). Bats that potentially pose a risk of infection to humans. Disease investigation and exclusion testing is recommended due to either:

- history or clinical signs suggestive of ABLV without a history of a potentially infectious contact with a human (Category 2a)
- history of known or suspected contact with another animal (other animal potentially exposed to ABLV via bat) (Category 2b).

**Category 1** (low risk). Bat that is neither Category 2 nor Category 3 — that is, bat that has no history of known or suspected contact with another animal or person and for which the index of suspicion for ABLV infection is low (e.g. no clinical signs consistent with ABLV).

## Legal considerations

Lyssavirus (including ABLV) is prohibited matter and is notifiable under the *Biosecurity Act 2015*. This means that veterinarians and all other people consulted about the disease must report suspected or confirmed incidents of ABLV infection to an authorised officer ([NSW Department of Primary Industries](#) (DPI) or [Local Land Services](#) (LLS)).

The current Australian Pesticides and Veterinary Medicines Authority (APVMA) permit [PER 14236](#) outlines the permitted use of rabies vaccine in Australia.

## Prevalence of ABLV

The natural reservoir of ABLV in Australia is bats. Wherever bats are located, there is the risk of ABLV infection. Within NSW, positive cases of ABLV in bats have come from across the state.

Research indicates that ABLV is a rare infection, estimated to be present in less than 1% of wild bats. However the prevalence in bats submitted to laboratories for ABLV testing (sick, injured or recently dead bats), is higher. A recent study by Field (2018)<sup>1</sup> indicated the prevalence of current ABLV infection in bats submitted for ABLV testing in Queensland and NSW was 6.8%.

1. Field HE. Evidence of Australian bat lyssavirus infection in diverse Australian bat taxa. *Zoonoses Public Health*. 2018;00:1–7. <https://doi.org/10.1111/zph.12480>

## Clinical signs in bats

Bats showing clinical disease caused by ABLV can present with a range of non-specific clinical signs that may include one or more of the following:

- Overt aggression,
- Paresis and paralysis
- Seizures, tremors and weakness
- Respiratory difficulties, change of voice
- Located on the ground or low in a tree with inability to take off or to fly in a normal manner
- Bats in unusual locations during the daytime. i.e. not in normal roosts

All bats should be treated as potentially infectious even if they appear normal.

## Differential diagnosis of central nervous signs (CNS) in bats

- Head trauma and
- *Angiostrongylus spp* infection

- ABLV infection.

If the course of the illness is longer than seven days and not progressive, angiostrongyliasis may be more likely.

All three conditions have a poor prognosis and because of the risks involved, caring for bats with central nervous system signs should be discouraged and it is recommended that the bat is euthanased.

### **Infection in humans and animals**

ABLV causes meningoencephalomyelitis, which is invariably fatal and is indistinguishable from rabies in humans and other animals.

People are at risk of contracting ABLV if they handle bats without taking precautions. Lyssaviruses are usually transmitted to humans via bites or scratches. This provides direct access of the virus in saliva to exposed tissue and nerve endings. Exposure to virus in bat saliva via mucous membranes (eyes, nose and mouth) and open wounds (bites, sores) can also occur.

ABLV has also infected horses in Australia. There have been no reported cases of ABLV in other animals in Australia yet, but the potential is always there. Any bat-animal interaction is potentially serious. A bat that is found on the ground or in unusual roosting locations has a higher likelihood of being infected with ABLV. It is unknown if a Lyssavirus positive animal (besides bats) can transfer infection to humans or other animals.

There is no effective treatment for ABLV once clinical signs are seen. Prevention by pre-exposure vaccination or post exposure prophylaxis is the best method. Both these approaches involve the use of rabies vaccine.

Reports are regularly received by the Animal Biosecurity Emergency Hotline of domestic pets, particularly dogs or cats, coming into close physical contact with bats. This close contact forms a theoretical risk of transmission of ABLV to dogs and cats and theoretically to their owners.

## **Actions following an animal bat exposure**

### **1. Notify suspected ABLV incidents**

There is a legal requirement to notify an authorised officer of all suspected ABLV incidents (discussed under legal considerations)

Please contact:

- An authorised officer with your [Local Land Services](#), or
- An authorised officer with [NSW DPI Biosecurity](#), or [animal biosecurity](#) or Animal Biosecurity Emergency Hotline 1800 675 888 (any time).

NSW DPI Biosecurity & Food Safety staff take a precautionary approach to potential exposures to ABLV while scientific knowledge continues to be accumulated. This precautionary approach assumes that possible exposures between animals and bats may transmit ABLV to the in-contact animals.

Further it is assumed that an animal infected with ABLV may progress to develop rabies-like clinical disease and may then pose a risk of transmitting ABLV to humans and other animals.

## 2. Obtain the history

It is important to include details such as:

- Where and when the animal came in contact with the bat.
- The clinical condition of the bat. If the bat appeared ill at the time of the incident it is more likely to be infected with ABLV.
- Is the bat is dead or still alive? If still alive it becomes a priority to provide advice on safe handling and personal protection.
- If the client has been scratched or bitten by a bat, [NSW Health](#) (phone 1300 066 055) must be informed immediately.

## 3. Reporting potential human exposure to NSW Health

When a human/bat interaction has occurred, the person should be advised to immediately ring their local [Public Health Unit](#) (phone 1300 066 055)

These bats are described as C3 (Risk Category 3).

Advice should be given to isolate the bat or avoid further contact. Wash the affected area with soap and water (further details under section 7. Emergency treatment if bitten or scratched by a bat).

If the bat is available it should be safely kept for testing. NSW DPI is responsible for laboratory testing of C3 bats.

## 4. Personal Protective Equipment (PPE)

PPE should be worn to minimise the risk of exposure to ABLV. It should be selected based upon the assessed level of risk and the task. PPE may include:

- Puncture resistance gloves (e.g. Nitrile gloves (double) or thicker gloves e.g. Kevlar or suede/leather welding type gloves)
- Long sleeved clothing and long pants
- Puncture resistant gauntlets to protect the forearms
- Safety eyewear or a face shield
- Towel to hold the bat

Wash hands after contact with bats and removing PPE. All cuts should be covered with a water-resistant dressing.

## 5. Disinfection

The virus is short lived outside the host being rapidly inactivated by heat, direct sunlight and lipid solvents including soap. It lasts up to 24 hours in saliva but less when unprotected and exposed to the elements.

## 6. Handling a live bat

**Live bats should only be handled by trained people who have received rabies vaccination.**

Members of the public are strongly advised not to attempt to handle any bats. They should contact a wildlife care group (e.g. WIRES 1300 094 737) who can then transport these bats to a private veterinarian who normally deals with wildlife.

AUSVETPLAN states that 'Animals potentially infected with Australian bat lyssavirus should be approached with extreme caution. ...Only experienced bat handlers who have been vaccinated for rabies should attempt to capture and care for sick or injured bats'.

The following precautions should be taken when handling bats:

- Only vaccinated people with titres >0.5IU/ml should handle bats.
- Prevent mucous membrane exposure (eyes/mouth) by using PPE.
- Wear appropriate PPE to minimise risk of significant contact through bites and scratches.
- Where possible have a vaccinated, experienced bat handler hold the bat when conducting a clinical examination or euthanasia.

## 7. Emergency treatment if bitten or scratched by a bat

If bitten or scratched, proper cleansing of the wound is the single most effective measure for reducing transmission:

- Do not scrub the wound.
- Immediately wash the wound with soap and water for at least 5 minutes.
- Apply an antiseptic with anti-viral action, such as povidine-iodine, iodine tincture, aqueous iodine solution or alcohol (ethanol) after washing.
- If saliva enters the eyes, nose or mouth, the area should be flushed thoroughly with water.
- Contact your General Practitioner or [NSW Health](#) immediately

## 8. Handling a dead bat

If the bat is dead, it should be collected and placed inside a secure and waterproof container.

Exposure of skin or mucous membranes to the secretions or excretions of the bat must be avoided. Handling the carcass remotely (e.g. using a garden fork, spade or other implements) and using rubber gloves are recommended methods of preventing direct exposure.

## 9. Euthanasia of a bat

Bats can be euthanased using pentobarbitone solution injected intra-peritoneal. Ideally this should be done after the bat has been anaesthetised. To reduce the risk of being scratched during euthanasia, the bat can also be placed in a bag and anaesthetised using gaseous induction.

## 10. Storage or disposal of a bat carcass

Whole bat carcasses should be submitted to [NSW DPI Laboratory Services](#) as soon as possible to minimise post-mortem decomposition. They should be double bagged in leak-proof and puncture resistant bags with a warning label (bat for ABLV testing) affixed to the outer bag.

All bat carcasses should be refrigerated only (not frozen) until submission.

If a client elects not to submit a dead bat for testing, the carcass must be disposed of by:

- routine clinic biological waste, or
- deep burial where dogs cannot dig them up, or
- check with your local council as to which local council service may be used.

## 11. Sample submission

The advantage of testing the bat for ABLV is that a negative result will exclude the risk of ABLV transmission to other animals or humans.

Testing is best done on the brain tissue, so it is important to **submit whole bat carcasses**, including the head. Undertaking autopsy first and submitting tissue specimens is not recommended because of the risk of exposure or injury to the operator.

When to submit a bat to NSW DPI Laboratory Services:

- In cases of known or probable exposure of an animal to a bat (C2 bat)
- where a bat shows clinical signs suggestive of ABLV
- Where there has been known, probable or possible human exposure to ABLV from the bat (C3 bat) [NSW Health](#) must be notified too.

### **a. Submission of the bat for testing**

NSW DPI will pay for the cost of the courier and the laboratory testing for bat submissions.

#### ***Submissions during business hours***

Contact NSW DPI Laboratory Services Customer Service Unit:

Phone: 1800 675 623 prior to submitting any samples for notifiable disease testing.

Email: [laboratory.services@dpi.nsw.gov.au](mailto:laboratory.services@dpi.nsw.gov.au)

Visit the [NSW DPI Laboratory Services Customer Service webpage](#) for more information.

#### ***Submissions during after hours***

Contact the Animal Biosecurity Emergency Hotline for arrangement of couriers outside of normal working hours.

Phone: 1800 675 888

#### ***Submission information:***

- Samples can only be submitted by a veterinarian.
- All sample submissions must have a completed [Veterinary Specimen Advice Submission Form](#).
- Information required includes:
  1. the location the bat was found, or where the bite/scratch occurred
  2. Clinical information (e.g. human exposure vs animal exposure), neurological state of bat, if it was dead or alive upon arrival at the vet clinic, and the method of euthanasia.
  3. Contact details for the submitter
  4. The name and age of the human exposed.

### **b. Packaging diagnostic specimens**

Packaging and transport of dead bats needs to meet relevant transport and packaging guidelines (IATA packing instruction).

- Ensure safety of all personnel involved
- Triple bag bat in sealed watertight plastic bag. Ensure sufficient absorbent material to absorb all the fluid in the first bag. .
- Indelibly label the secondary container with the owner's name.
- Put [Specimen Submission Form\(s\)](#) into a separate plastic bag.
- Put specimens, Specimen Submission Form(s), cooler bricks and tight packing into an esky. Crumpled newspaper will suffice for tight packing.

- Put a note on top of samples inside the esky 'Caution ABLV exclusion' (don't write this on the outside)
- If the esky is foam, seal it into a cardboard box.
- Attach the courier consignment note to the outside of the package (NB: NSW DPI Laboratory Services CSU will email you the courier consignment note to print out)
- Make sure the packaging complies with the [IATA packing instructions](#)

## 12. Tests performed

Two separate real time PCR assays are run that detect the two known genotypes of lyssavirus found in bats in Australia (these are the insectivorous and flying fox strains of ABLV). The real time PCR assays are not only highly sensitive and specific, they are more tolerant of poor sample quality.

Testing at Australian Animal Health Laboratory (AAHL) is also done as it offers the immunofluorescence antibody test (IFAT) test and the results from AAHL are used as a verification.

It is believed that in theory if there was another strain of lyssavirus present in Australian bats then the IFAT may detect it more readily if it was genetically very different to the current strains.

If a positive is detected on PCR by NSW DPI Laboratory Services, it is recommended that treatment of the pet commence immediately while verification from AAHL is pending.

Results may be available within 24 hrs and even in 4-5 hours in high risk cases.

## Actions based on tests results

**Situations occur where the animal may be exposed to more than one bat. The risk of exposure may not be resolved by testing only one bat. In this situation the veterinarian may decide to proceed with vaccination of the pet as the disease status of the interactions is unclear.**

### 1. Bat tests negative for ABLV

When the bat tests negative for ABLV, there is no risk to the in-contact animal and the no further action is required (unless additional exposures may have occurred).

## **2. Bat tests positive for ABLV or is not available for testing**

If the bat is available and tests positive or is not available for testing, there is a real risk of the pet owners or other in-contact humans contracting ABLV infection from the pet. To date, transmission from an affected pet to a human has never been reported. Public health guidance is that the risk of transmission of ABLV from a dog or a cat to a person is very low but the risk exists. If such transmission was to occur, the potential outcomes are obviously extremely serious as reported cases of ABLV infection in humans have been fatal.

Advice to the owner should include the following options:

### **a. Vaccination**

Vaccinate the affected pet with inactivated rabies vaccine as soon as possible after the contact with the bat to reduce the risks of clinical ABLV infection. This mirrors the current public health recommendation for post-exposure treatment of people against ABLV infection. The rabies vaccine is used on the basis of the limited available animal data and clinical experience supporting its use. Vaccinated pets that are known to have had interaction with a positive or an untested bat should be monitored for neurological signs; if these signs develop the affected animal should be seen by a veterinarian ASAP.

For details of the vaccination protocol, please see section – Vaccination of the animal with rabies vaccine.

For the costs associated with vaccination, please see section – Responsibility for costs.

### **b. Euthanasia**

To avoid any potential risk of humans contracting ABLV infection from the pet some owner may request euthanasia of the pet.

### **c. Monitor the animal for at least two years**

The pet owner can keep the animal at home but should be advised to observe their pet closely at least two years for any changes in behaviour or signs of ill-health (due to the possible long incubation period). Any changes should be immediately reported to an authorised officer at [Local Land Services, animal biosecurity](#) or the Animal Biosecurity Emergency Hotline 1800 675 888 (any time). The owner needs to also understand that taking no action does nothing to lower the potential risk of ABLV infection. If clinical signs suggesting ABLV disease are reported, it is likely to be recommended that the animal be euthanased and samples taken for examination.

## Vaccination of the animal with rabies vaccine

### 1. General information

When the bat tests positive or is not available for testing (including cases of repeat exposure to bats), the owner should be offered the option of vaccinating the animal/s with rabies vaccine.

They should also be advised that NSW DPI Biosecurity & Food Safety staff will determine further action required should the animal/s develop clinical signs of ABLV infection at any time.

**If the owner is considering the vaccination program, it should be commenced as soon as possible after the bat/animal interaction.** The earlier the vaccine is given to the dog or cat after potential exposure to ABLV (via the bat), the less likely they will develop the disease before the post exposure prophylaxis (PEP) can take effect. This will also lower the risk to any dog, cat or humans associated with the animal.

Vaccination should still be administered to healthy animals even if there has been a delay post the exposure as the vaccine still has the potential to prevent infection.

The incubation period for ABLV is most commonly 28 – 60 days but can be shorter or much longer.

If a veterinarian suspects ABLV infection of the animal/s at any time, then phone the Animal Biosecurity Emergency Hotline (1800 675 888 24 hours/ 7 days) urgently for advice on the appropriate course of action.

The owner is responsible for:

- Observing the exposed animal closely for any changes in behaviour for 60 days following vaccination and return the animal to the veterinarian for examination should there be any concerns.
- Presenting their animal to their private veterinarian at the required times to meet all the requirements of the vaccination program.
- Complying with the requirement to microchip the animal/s.
- Payment for all costs associated with PEP (including vaccinations, microchips, consultations and lab charges).

### 2. Rabies vaccine

Vaccination with an inactivated rabies vaccine is used to protect both people and animals against ABLV. Information to date supports that cross protection occurs against ABLV from the rabies vaccine ([AUSVETPLAN disease strategy for ABLV](#)). Both people and animals exposed or potentially exposed to ABLV should undergo PEP which involves the use of rabies

vaccine. [NSW Health](#) is responsible for PEP in people; the animal owner in conjunction with private veterinarians, is responsible for PEP in animals.

### 3. APVMA Permit PER14236

The Nobivac Rabies Inactivated Rabies Vaccine is an **unregistered veterinary chemical product**. Its use in ABLV incidents is covered by a Permit to allow supply and minor use of an unregistered Agvet chemical product, [PER14236](#), issued by the [Australian Pesticides and Veterinary Medicines Authority](#) (APVMA) and held by the Australian Chief Veterinary Officer, Commonwealth Department of Agriculture, Fisheries and Forestry.

Any registered veterinarian can stock Nobivac Rabies Inactivated Rabies Vaccine for use as per the permit conditions. Nobivac Rabies Inactivated Rabies Vaccine supplied by Intervet (Australia) Pty Ltd is the only approved vaccine.

PER14236 also allows emergency use of this inactivated rabies vaccine to vaccinate 'animals held in Australia in the event of a rabies outbreak'.

A condition of the permit is that 'Persons who wish to use the products for the purposes specified in this permit must read, or have read to them, this permit'.

### 4. Approval to administer rabies vaccination

The NSW CVO has approved the administration of Nobivac Inactivated Rabies vaccine to terrestrial mammals (except pigs) that have had direct exposure to a suspected or confirmed diagnosed case of ABLV in NSW

The approval is under the [Biosecurity \(Rabies vaccination for Australian bay lyssavirus\) Control Order 2018](#). It allows the vaccine to be administered by registered veterinarians, as per permit, label and CVO directions. Note: individual animal approval is no longer required.

Animals must be microchipped prior to administration of the vaccine.

The Order requires the administering veterinarian to keep accurate vaccination records including the:

- species
- microchip number
- vaccination date
- vaccine batch number

These records must be maintained for the life of the animal, and made available at the request of an authorised officer.

## 5. Safety when administering the vaccine

The veterinarian and assistants are advised to wear suitable long-sleeved protective clothing when administering the vaccine to a possible positive lyssavirus case. Use suitable restraint measures to minimise the risk of being bitten or scratched by the pet animal. Caution should also be taken to avoid contamination of unhealed cuts or abraded skin.

Having vaccinated staff members, with appropriate titre levels, handle these animals further minimises the risk of zoonotic transfer of ABLV in the workplace.

## 6. Vaccination protocol – Post-exposure Prophylaxis (PEP)

All costs associated with post exposure rabies vaccination of domestic animals are the responsibility of the owner. This includes vaccinations, microchips, consultations and laboratory charges.

The primary objective of the PEP vaccination schedule is to reduce the risk of the exposed animal developing clinical ABLV.

Vaccination should commence as soon as possible after suspected exposure to provide the best chance of protection. Two doses of vaccine are required post-exposure to ensure a rapid and effective immune response.

By 21 days post last vaccination dose, exposed animals should be protected but observation should be continued until 60 days post vaccination before allowing unrestricted contact with the animal.

Table 1. Post-Exposure prophylaxis (PEP) program

Visit	Day	Action
First vetvisit for PEP	Day 0	<ul style="list-style-type: none"> <li>• Microchip animal if not already microchipped. A microchip number is needed before administering the rabies vaccine</li> <li>• Vaccination with 1 ml dose of Nobivac Rabies Inactivated Rabies Vaccine (Intramuscular or subcutaneous injection)</li> </ul>
Second vet visit for PEP	Day 5-7	<ul style="list-style-type: none"> <li>• Repeat vaccination with 1 ml dose of Nobivac Rabies Inactivated Rabies Vaccine (intramuscular or subcutaneous injection)</li> <li>• Advise owner to monitor animal closely for 60 days.</li> </ul>

## 7. Collecting serum to measure response to vaccination

Serum can be collected if the owner wants to monitor the response to vaccination. This is optional and gives information about the pet's protection. If serum is collected, then collect

both the day 0 and 28 samples to show the level of response to the vaccine. Testing of the serum is at the expense of the owner. An appropriate rise in titre between day 0 and day 28 will provide a basis for declaring the animal no longer a risk to others.

- Serum should be removed after clotting and labelled with identification details, date of collection and the day **relative to vaccination** e.g. day 0 (day of first vaccination). Freeze samples after collection.
- Submit serum samples to the NSW DPI Laboratory Services with a [veterinary specimen advice submission form](#) for antibody testing
- The specimen advice should indicate "Post-bat exposure vaccination-paired samples for serology".
- **Contact details for NSW DPI Laboratory Services:**  
Phone: 02 4640 6327 or 1800 675 623 during office hours.  
Email: [laboratory.services@dpi.nsw.gov.au](mailto:laboratory.services@dpi.nsw.gov.au)  
Visit the [NSW DPI Laboratory Services Customer Service webpage](#) for more information.

## Animals showing clinical signs consistent with ABLV

NSW DPI Biosecurity & Food Safety staff will coordinate the investigation of animals showing clinical signs consistent with ABLV infection.

Animals exhibiting classical rabies-like signs, particularly if the animal is aggressive or unmanageable, will usually be euthanased. A post mortem will be done to find the cause of the signs. NSW DPI Biosecurity & Food Safety will cover the costs for the investigation.

Manageable animals may be kept in a secure facility to allow safe monitoring of clinical signs and any testing required.

## Responsibility for costs

The owner will be responsible for costs associated with:

- Collecting the bat
- All veterinary consultations
- the rabies vaccine
- microchipping of the animal
- vet and lab charges for collection of serum to measure response to vaccination
- euthanasia of the animal if the owner elects that course of action

NSW DPI Biosecurity & Food Safety will cover the following costs:

- initial testing of the bat/s for ABLV

- courier charges to submit the bat to SVDL
- ABLV testing of animals suspected of being infected with ABLV.

## More information

For further information visit the [NSW DPI webpage](#) or contact NSW DPI Animal Biosecurity on 1800 808 095 (business hours) / Animal Biosecurity Emergency Hotline on 1800 675 888 (24 hours).

## Acknowledgments

NSW Health

Your Reference number (generally CM9)

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**Disclaimer:** The information contained in this publication is based on knowledge and understanding at the time of writing (August 2018). However, because of advances in knowledge, users are reminded of the need to ensure that information upon which they rely is up to date and to check currency of the information with the appropriate officer of the Department of Primary Industries or the user's independent adviser.