



Ringworm procedure

1. What is ringworm?

Ringworm is not caused by a worm, but is the common name given to an infection of the surface of the skin, hair or nails with a type of fungus called a dermatophyte. There are many types of dermatophyte and the most common one that causes ringworm in cats is *Microsporum canis* (*M canis*); it is seen in over 90% of cases. Other causes of ringworm in cats include *Trichophyton spp.* Spores are the infectious stage of the dermatophyte and may be shed on the infected hairs of affected animals or people. These spores are very robust and can remain infectious in the environment for up to two years.

Ringworm is contagious to people and other animals. Care must be taken when handling/dealing with infected cats as it is a zoonotic disease that can be passed from cats to people.

2. How is ringworm diagnosed in CP cats?

When cats, and especially kittens, come in to CP care, carefully inspect their hair coat and skin for lesions. Look for any areas of hair loss, scabbing or crusting, especially focal areas affecting the face, ears, feet and tail.

To diagnose ringworm, for all cats in CP care:

Perform a fungal culture

- if suspicious lesions present (even if Wood's lamp negative) and/or
- Wood's lamp positive

EVERY cat should be screened using a Wood's lamp where this is available, even if the cat appears healthy and free of skin lesions.

A final diagnosis is based on the results of a fungal culture.

1. Wood's lamp

Indications:

An ultraviolet Wood's lamp examination may be useful as a screening tool where *Microsporum canis* infection is suspected. Cats with skin disease who present with hair loss as the primary problem are the most likely candidates. A positive Wood's lamp examination is only suggestive of an infection – confirmation of infection requires fungal culture and microscopic examination of the fungal colony. The Wood's lamp is most useful in cats with skin lesions. Although we use it to screen cats for disease it is not highly specific and should not be relied on. It is not suitable for monitoring infection status.

The Wood's lamp is one of the most misused diagnostic tools in veterinary dermatology and it is important to understand the limitations of its use. It is important the correct technique is followed to give the best results.

Technique

1. The lamp should be turned on five to 10 minutes before use.
2. The lamp should be held over the skin lesions for at least five minutes before making an interpretation. Positive hairs will glow a bright apple green colour. If there is any doubt about the fluorescence, glowing hairs should be plucked in the direction of growth and the end of the hair shaft examined under the Wood's lamp. Dermatophyte growth is often heaviest in the hair follicle. These hairs can then be used for culture. Take care not to shine it directly into the cat's eyes.

Artefacts

Only actively infected growing hairs will show positive fluorescence; positive fluorescence is not seen with scales or debris on the skin. False positive fluorescence may be seen in bacterial infections, which usually show a bluish-white fluorescence. Areas where sebum has accumulated will also give a false positive reaction, but the colour is a dull blue-green.

Interpretation

A positive Wood's lamp examination is only suggestive of a ringworm infection, not diagnostic. Treatment should not be initiated based upon this finding alone and a definitive diagnosis should be obtained via fungal culture. A negative Wood's lamp examination is inconclusive. Only 50% of dermatophyte species fluoresce and some non-fungal materials will fluoresce.

2. Dermatophyte culture

A dermatophyte culture is the 'gold standard' for diagnosing ringworm. It is indicated whenever a Wood's lamp examination or examination of the hair under a microscope is positive, but also in any cat with suspicious skin disease, whether fluorescing or not. Although finding fungal spores is a clear indication for anti-fungal therapy, it is important to identify the organism type by culture. Some vets may offer to culture the sample using an in-house kit, however results from these kits can be less reliable and are hard to interpret. It is recommended that all samples are sent to an external laboratory for culture and identification.

If there is any suspicion over the presence of ringworm then a sample should be sent for culture.

Collecting a sample for sending to an external lab

Equipment

- Forceps
- Toothbrush in original packaging (sterile)
- Universal container or paper envelope or bag for sending to an external lab

Technique

- Hair should be plucked from the outer edge or margin of suspect lesions
- Alternatively, coat brushings using a toothbrush can be carried out. This is particularly useful when collecting samples for culture from cats that have apparent clinical cure and no longer have any visible ringworm lesions. The toothbrush is combed vigorously over the cat's hair coat for several minutes or until hairs are visible on the bristles. Special emphasis should be given to areas where lesions are present, particularly if they are Wood's lamp positive
- Samples must be placed into a universal container or paper bag, not a plastic bag
- Samples (hair pluck or toothbrush) should be submitted to an external lab

Ideally samples should be taken directly before any topical treatment such as Imaverol or Lime sulphur is applied. If this is not possible then leave at least 24 hours after topical treatment before taking a sample for culture.

If any queries arise regarding the best course of action, contact your Field Vet or the CP Veterinary Department on 01825 741 991 or veterinary@cats.org.uk for advice.

3. What action should be taken as soon as there is suspicion of ringworm?

3.1 Housing of suspect and confirmed cases

All suspect and confirmed cases of ringworm **MUST** be isolated immediately away from other cats/kittens. If this is not possible, at least try to keep separate from highest risk groups – that is kittens, pregnant queens, sick cats and elderly cats.

Any cat that cannot be bathed (see treatment below), must be housed singly and kept in the sleeping area, in order to limit the spread of spores and contamination of the run. This includes kittens once weaned.

Cats which are being bathed may be housed with members of the same social group and/or have access to a run if considered necessary. Although, where possible, confinement to a sleeping area is still preferred.

Clearly identify suspect and confirmed cats with a sign on the pen.

3.2 What to do with cats that have been in contact with a suspect or confirmed case of ringworm

Cats that have been in contact with a cat that has suspected or confirmed ringworm should be housed alone in isolation and a fungal culture should be performed after they have been separated.

Oral treatment should not be started on cats without lesions until a positive culture has been confirmed, however topical treatment can be started before a diagnosis. Always take the sample for fungal culture *before* starting the topical treatment.

3.3 Protective clothing

Protective clothing *must* be worn at all times while working with suspect or confirmed cats. Ringworm is **HIGHLY** infectious. Protective clothing is essential in avoiding the spread of ringworm in order to protect other cats and their carers.

Protective clothing includes:

- disposable overalls
- disposable apron
- gloves
- over-sleeves
- disposable caps
- over-shoes

It is important to remember protective clothing should always be worn even while feeding affected cats.

Use new disposable clothing for each pen and dispose of after use. **Do not** re-use.

Footbaths with a suitable disinfectant should also be used and should be changed or replenished daily.

3.4 Bedding and soft materials

Bedding used should be disposable – for example, old towels which can be thrown away.

Soft toys and scratching posts should be removed from the cat's environment and disposed of as soon as ringworm is suspected or diagnosed. However, alternative enrichment should be provided. These must either be able to be disinfected or be disposable.

3.5 Litter trays

If possible use disposable litter trays and discard at least once daily. If disposable litter trays are unavailable, ensure that the standard litter trays are soaked separately with a suitable disinfectant and returned to the same cat.

3.6 Food and water bowls

Disposable food bowls should be used and discarded daily. Water bowls should be soaked separately in a suitable disinfectant, thoroughly rinsed and returned to the same cat.

3.7 Cleaning and handling

The preferred disinfectants to be used for cases of ringworm are bleach and peroxygen compounds (Virkon).

If using bleach, all surfaces of the pen must be cleaned with detergent first and then disinfected with bleach diluted at 1:32. If using Virkon follow the manufacturer's directions carefully and ensure contact times are observed. Cats should be kept out of the area until all the disinfectant has been removed thoroughly by rinsing with water and has been left to air dry.

If possible have just one person delegated to deal with the ringworm cases. This person should not handle any other cats/kittens or even go into the other areas where cats are housed.

To reduce the risk of spreading the disease, cats that have ringworm should be dealt with last after all the other cats have been cared for.

Pens should be thoroughly cleaned and disinfected daily.

Vacuum and disinfect radiators, vents and floors daily. Vacuum bags should be disposed of carefully, ideally as infectious waste. The aim is to avoid aerosolising the ringworm spores. Where possible use a damp mop to remove debris from the pen. Try to avoid sweeping vigorously with a dry broom.

Cleaning cloths should be disposed of daily.

All materials that will be disposed of from the pen should be placed in a plastic bag while still in the pen. Protective clothing should be placed in the bag as the pen is vacated and the bag should be sealed before removing it from the pen.

Mop, bucket, sweeping brush, dustpan and brush should all be soaked in 1:10 bleach

solution, or another suitable disinfectant, after use. All the materials/equipment should be kept with the infected cat(s) and not taken to any other location.

Do not groom ringworm-infected cats.

3.8 Waste disposal

Although there is currently no legal requirement, dispose of all protective clothing, bedding, soft materials, soiled litter etc. as infectious waste (so that it will be incinerated). If disposal as infectious waste is not possible, place everything in a separate black bag and when finished tie up the bag securely and dispose of carefully.

3.9 After treated cats have left the pen

Once successfully treated (see section 5: How is successful treatment is determined?), the cat(s) can be moved to the homing wing in a centre or homed from the pen or indoor fostering room in a fostering environment.

Discard all contaminated bedding, toys etc. and dispose of carefully as infectious waste.

Clean and disinfect all non-porous surfaces where the cat has been housed. This includes any exposed radiators, skirting boards and vents. Do this daily for five days using bleach diluted 1:10 (leave for a minimum of 15 minutes) or Virkon. Rinse thoroughly with water after each round of disinfecting and allow to air dry. Be sure to wear full protective clothing when cleaning and rinsing the pen to avoid exposure both to ringworm and to the disinfectant. Dispose of all protective clothing after each round of cleaning.

If vacuuming, be sure to dispose of the vacuum bag daily.

4. How is ringworm treated?

The vet will prescribe the appropriate treatment for ringworm. Cats must not be rehomed until the vet deems the treatment successful (see section 5: How is successful treatment determined?). When to start treatment will be decided by the attending vet. Where practical, we would recommend cats are treated with both oral and topical treatment.

4.1 What is the recommended treatment protocol?

Adult cats and weaned kittens with lesions suspicious of ringworm

- Bathe twice weekly with either Imaverol or lime sulphur dip (see Appendix 1 and 2)
- In addition, treat orally with Itrafungol (one week on, one week off) for a minimum of five weeks (see section 4.3)

Bathing with either Imaverol or lime sulphur dip can be started as soon as the cultures have been taken to reduce the environmental contamination.

Cats that have been in contact with a suspect or confirmed case of ringworm, but aren't showing any signs

Cats (adults and weaned kittens) that have been in contact with a suspected or confirmed case of ringworm that are not showing any skin lesions should be separated from the affected cat(s). A coat brushing sample for culture should be taken before any treatment is given. Start topical treatment as soon as the first culture has been taken. If the culture result is returned as positive, treatment with Itrafungol should be started as soon as possible.

Pregnant or lactating queens and unweaned kittens that have lesions suspicious of ringworm

Pregnant queens cannot be treated with Itrafungol.

In the case of a litter of kittens with the queen where the kittens or the queen are severely affected, the kittens can be treated with Itrafungol if they are over 10 days old, bearing in mind that they may take longer to cure because they are in contact with a potentially infected queen. If kittens are less than 10 days old, treatment must be delayed until they are greater than 10 days old. While the kittens are feeding from the queen, the queen herself cannot be treated with Itrafungol because Itrafungol is secreted in the milk and so there is a potential risk of overdosing. The queen can be treated topically with Imaverol until she has been separated from her kittens.

Kittens should be weaned as early as possible (ideally at around five or six weeks) and separated from the queen, housed singly, in pairs or small groups to allow continued effective treatment of both the queen and the kittens.

If the kittens or queen are not severely affected, the kittens should be weaned as soon as possible, separated and tested by fungal culture to confirm they are positive before any treatment is commenced. If the queen is showing no lesions a couple of weeks before weaning, take a coat brushing sample for culture once she has been separated to confirm whether she is still infected before starting treatment.

Generally, topical treatment for the kittens should not be started until the kittens are weaned, except on the specific advice of a vet.

Unweaned kittens that have been in contact with a suspect or confirmed case of ringworm, but are not showing any signs

If unweaned kittens are not showing any lesions they should be weaned as soon as possible and separated from the queen. They should then be treated as an in-contact by taking a coat brushing sample for culture before any treatment is given. If the culture result is positive, treatment with Itrafungol should be started as soon as possible. Once weaned topical treatment can be started in addition to oral Itrafungol treatment.

If the culture result is negative, the kittens should be homed as normal.

4.2 What are the details of the different treatments that are available?

Treatment consists of oral medication and where possible twice weekly applications of either Imaverol or lime sulphur dip. Cats can only be housed in groups and given access to outside runs if they are also receiving topical treatment as this reduces the risk of environmental contamination and spread. It is up to your vet to decide whether they prefer Imaverol or lime sulphur dip. We do not recommend treatment with Griseofulvin, Malasab shampoo or Lufernon.

Itrafungol (Itraconazole)

This is Cats Protection's preferred treatment. It is licensed to treat *Microsporum canis* in cats and is an effective medication that is administered orally. A course of treatment lasts five weeks with dosing on alternate weeks. Itrafungol continues to work for two weeks after the last day of treatment. If a further course of treatment is required, it is advised to wait two to three weeks before restarting treatment. Itrafungol is safe to use in kittens from 10 days old.

Imaverol (Enilconazole)

This product is not currently licensed for use in cats. However, it can be used 'off-licence' to treat *Microsporum canis* or *Trichophyton spp.* It should not be used as the sole treatment for cats with a positive culture, but it can be useful to reduce environmental contamination which is vital if cats are being allowed access to outside pens or there are multiple cats in one pen. It may also reduce treatment times. It can be used in pregnant and lactating animals. Unweaned kittens should not be treated with Imaverol. Treatment involves spraying the animal with a diluted solution of the product twice weekly. It can reduce spread within the environment and increase recovery time. It should not, however, be used as the sole treatment. See Appendix 1 on Protocol for using Imaverol spray.

Lime sulphur dip

This is a non-prescription product which can be used to reduce environmental contamination as an alternative to Imaverol. Lime sulphur or Imaverol should be used when cats are housed together and/or allowed access to outside pens. As with Imaverol it reduces the environmental contamination and may lead to quicker resolution. It must be sprayed on the cat twice weekly. It can be used on unweaned kittens but they need to be separated from the queen until dry, so unless directed by your vet it is best to wait until the kittens are weaned. See Appendix 2 for protocol on using lime sulphur dip.

Clipping

It can be helpful, especially in the shelter environment, to clip the hair at least 6cm around focal lesions. Sometimes the vet may recommend completely clipping cats that have multiple lesions or those with long or dense hair coats. Care should be taken when clipping to avoid traumatising the skin and a designated room should be used just for this purpose. Ideally this would be done at the veterinary practice.

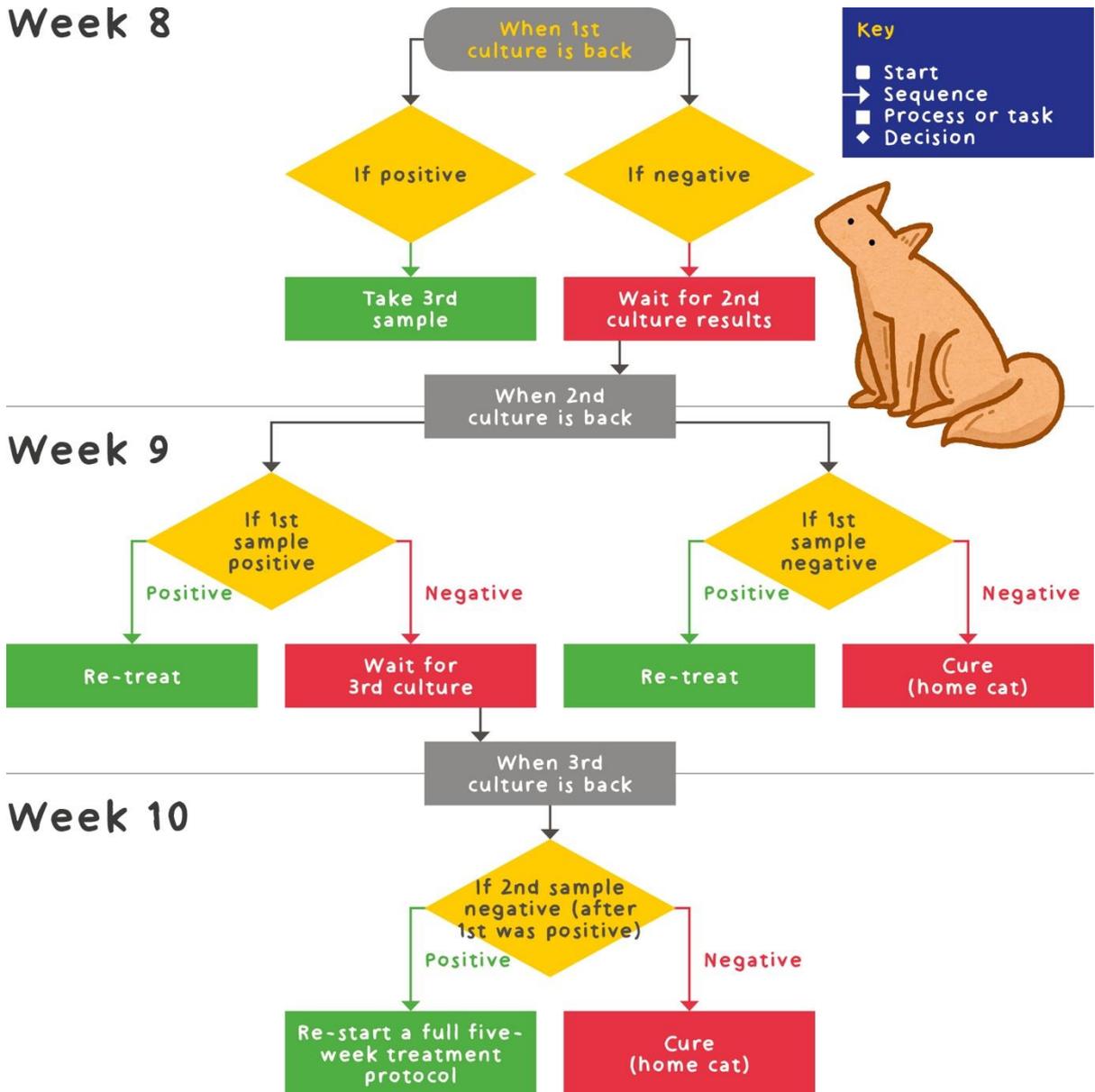
Clipped hair should be placed in a clinical waste bag for incineration. Vacuum the room thoroughly after use, taking care to dispose of the vacuum bag carefully, then disinfect the room with bleach solution (1:10) or other suitable disinfectant. Disinfect clippers and scissors carefully after use.

It is important to take the vet's advice on which cases are most appropriate for clipping, as clipping will increase the spores in the environment and therefore may increase the risk of spreading the disease.

4.3 Protocol for Itrafungol treatment and post-treatment culture	
Week 1	on treatment
Week 2	off treatment
Week 3	on treatment
Week 4 <i>continued overleaf</i>	off treatment

Week 5	on treatment, end of course
End week 5/beginning week 6	take first sample for culture
Week 7	take second sample for culture
Week 8	follow flow chart

Week 8



If any queries arise regarding the best course of action, contact your Field Vet or the CP Veterinary Department on 01825 741 991 or veterinary@cats.org.uk for advice.

5. How is successful treatment determined and when is the cat ready to be homed?

Mycological cure

This is defined as having two consecutive negative ringworm cultures carried out at weekly intervals, starting from the end of treatment usually after five weeks. These cultures should be sent to an external laboratory for fungal culture, using the CP laboratory discount scheme. Be aware that cats may not have any visible signs of ringworm long before mycological cure has been achieved.

Cats may *not* be homed until mycological cure has been achieved, due to the zoonotic and infectious risk of ringworm.

When to test if the cat is receiving topical treatment

If in addition to Itrafungol oral medication the cat is also receiving twice weekly topical treatment with Imaverol or lime sulphur dip, the sample taken for fungal culture should be timed carefully. Take the sample in the timescale as indicated above, but ensure samples are taken PRIOR to the next topical treatment. If this is not possible leave at least 24 hours after the last bath. Do not take a sample directly after topical treatment with Imaverol or lime sulphur dip as this may produce a falsely negative result.

5.1 Interpretation of culture results after a full course of treatment with Itrafungol

First sample is taken at the end of week five of treatment

Scenario	1	2	3	4	5
Culture #1	N	N	P	P	P
Culture #2	N	P	P	N	N
Culture #3	-	-	-	N	P
Culture #4	-	-	-	-	-
Action	CURE	RE-TREAT	RE-TREAT	CURE	RE-TREAT

Key

N = negative after two weeks of culture

P = positive within two weeks of culture

- = culture not needed

CURE = mycological cure, cat can be homed

RE-TREAT = restart a full course of Itrafungol treatment

6. What if the initial course of treatment fails?

The initial course of treatment has failed when:

- the first and second post-treatment cultures are positive (P,P)
- the first post-treatment culture is negative, but the second one is positive (N,P)
- the first post-treatment culture is positive, the second sample is negative, but the third one is positive (P,N,P)

If the first course of treatment fails, the cat should start another full five-week course of treatment with Itrafungol. In addition, consider:

- if the cat is not housed individually, it should be moved to a pen on its own
- the cleaning and disinfectant protocol should be reviewed to ensure there are no breaches in biosecurity
- treatment with Imaverol/lime sulphur topically in addition to Itrafungol

If the cat has no skin lesions when starting the second course of treatment, consider submitting culture samples sooner than the end of the second course of treatment where it has been possible to implement some or all of the steps suggested above.

If the cat still has skin lesions when starting the second course or if the first two post-treatment cultures were positive, further culture samples should not be taken until the end of the second course of treatment.

If any queries arise regarding the best course of action, contact your Field Vet or the CP Veterinary Department on 01825 741 991 or veterinary@cats.org.uk for advice.

Appendix 1

Protocol for treatment of cats with Imaverol spray

Dilute the Imaverol 1:50 with warm water. For example, mix 4ml of Imaverol with 200ml of warm water. The diluted solution can be made up directly into the spray bottle. Once made up the solution will last six weeks. Imaverol can be used on pregnant and lactating queens but should not be used on unweaned kittens. When taking hair samples for culture these ideally should be taken just before bathing. If this is not possible then leave at least 24 hours between bathing and taking samples.

- Wear an apron, over sleeves, rubber gloves, safety glasses and a mask and apply the spray in a well ventilated area
- Ideally have one person restrain the cat at the head end while the other sprays the cat all over, avoiding the eyes, nose and mouth. While spraying the solution on the cat, rub thoroughly in the direction opposite to hair growth to make sure that the skin is thoroughly wet
- Fit an Elizabethan collar on the cat until the coat is dry. Imaverol has a low toxicity so it is ok if a small amount is ingested by licking
- Place the cat in a clean pen and keep in the cabin area until the coat is dry (allow to dry naturally)
- Remove protective clothing and wash hands

Appendix 2

Protocol for treatment of cats using lime sulphur dip

Lime dip can be used on pregnant and lactating females, but in lactating females avoid the nipple area. It can be used in kittens over three weeks of age but they need to be separated from their mother until fully dry, for this reason generally we recommend waiting until the kittens are weaned. Early weaning should be attempted for all kittens with signs of ringworm or in contact with a queen with ringworm. When taking hair samples for culture these ideally should be taken just before bathing. If this is not possible then leave at least 24 hours between bathing and taking samples.

Wear gloves and eye protection. Do not allow the undiluted product to come in to contact with your skin. Use in a well ventilated area.

- Mix 30ml of lime sulphur with 1000ml of warm water in a spray bottle
- Stand cat in litter tray or on towel in run
- Spray cat thoroughly from head to tail avoiding the face
- Using a cloth rub the spray in to the coat trying to get the liquid in contact with the skin.
- Gently wipe over the face and ears (inside and out)
- Wrap the cat in a dry towel to remove excess water and then return to the bed area to dry
- Dispose of all towels/litter trays/clothes/PPE used and wash hands

Make the solution up fresh on a daily basis.