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| **Toronto Humane Society: Ringworm Outbreak Protocol** | | |
| Approved by: Linda Jacobson | | Effective date: December 13, 2014 |
| Author: Linda Jacobson | | Revision Date: January 30, 2018 (LJ)  Jan 6, 2020 (KW – staff section based on UW correspondence) |
| **Purpose** | This protocol describes how to prevent spread of ringworm through the shelter and how to manage an outbreak situation. | |
| **Related Protocols** | Ringworm Treatment Protocol  Biosecurity Protocol  Sanitation for Fosters and Rescues | |
| **Associated Risks** | Risk of spread to humans and animals; risk of spread through the shelter; contamination of environment resulting in fomite transmission | |
| **Main Sources** | 1. Newbury S, Moriello K 2014 Feline dermatophytosis: Steps for investigation of a suspected shelter outbreak. JFMS 16: 407-418  2. Moriello K 2014 Feline dermatophytosis: Aspects pertinent to disease management in single and multiple cat situations. JFMS 16: 419-431  3. University of Florida Ringworm outbreak Response SOP from UF Online Shelter Certificate course, 2013  4. Ringworm (Dermatophytosis) UC Davis Koret Shelter Medicine http://www.sheltermedicine.com/node/56 | |

**Definitions**

* **Dematophytosis (ringworm):** Contagious fungal skin disease of mammals, including humans. Kittens are most likely to be infected.
* **Clean break:** Cleaned and disinfected rooms to house **unexposed uninfected** animals that are new to the shelter
* **Pre-break:** Contaminated or potentially contaminated area containing **existing possibly exposed** animals that were already in the shelter at the time the outbreak started
* **Community acquired infection:** Animal already infected on arrival at the shelter
* **Dust-mop or fomite carrier:** Animal with positive ringworm culture but: (1) does not develop skin lesions; (2) few colonies on culture plate
* **Exposure:** Animals are considered exposed if they have been:
* (1) **housed in the same room as a ringworm-positive** animal;
* (2) housed in a **ringworm-contaminated environment with inadequate or unknown sanitation protocols**;
* (3) handled by a **ringworm-infected staff member** not on treatment and not using adequate barrier protection.
* **Confirmatory test:** Test that confirms than animal is positive or negative for the condition. Also called “gold standard”. For ringworm, this is fungal culture.
* **Fomite transmission:** Spread of a disease from one individual to another via a pre-break object
* **Incubating infection:** Early stage of infection; fungus established in hair follicles, culture-positive but not yet lesional. Difficult to distinguish from fomite carrier initially.
* **Incubation period:** Time between infection and onset of clinical signs. The incubation period for ringworm is **4 days to 4 weeks**.
* **Isolation:** Separate housing of **high-level suspects** to physically segregate them from the general population
* **Lesional:** Having skin lesions suspicious of ringworm - alopecia with or without crusting.
* **Outbreak:** More cases of a disease than are normally expected. A single shelter-acquired case of ringworm is therefore considered an “outbreak”, as no shelter transmission is normally expected (or tolerated!).
* **Ringworm Species:**
* ***Microsporum canis***: Most common species in cats and shelters; spread from contact with an infected animal or a pre-break environment; of **most concern** as a cause of an outbreak
* ***Microsporum gypseum*:** Most likely contracted from pre-break soil; can spread from animal to animal but outbreak potential considered lower than *M. canis*.
* ***Trichophyton mentagrophytes***: Most likely contracted from rodents’ nests; can spread from animal to animal but outbreak potential considered lower than *M. canis*.
* **Screening tests:** Tests that help to increase or decrease suspicion of a disease but are not definitive. Include lesion, check, Woods lamp, trichogram.
* **Shelter-acquired infection:** Animal became infected in the shelter

**Abbreviations**

* **DO:** Director of Operations
* **DSM**: Director/Deputy Director Shelter Medicine (“chief vets”)
* **ICO**: Infection Control Officer
* **SC**: Situation Coordinator

**When is this protocol needed?**

1. Not every ringworm case is an outbreak!
2. Use this protocol if there is:
3. **ANY** known or suspected **shelter-acquired** infection
4. **Community-acquired** cases that were **not identified at intake** and have exposed animals already in the shelter
5. **Known or suspected infected staff** who have been in close contact with shelter animals

**Outbreak Task force**

**CEO and/or ED; Director of Operations, Director and/or Deputy Director, Shelter Medicine, Infection Control Officer** to meet when outbreak is suspected and then weekly or as needed until it is resolved. Designate two members of the group as **Situation Coordinator** (typically DO and DSM).

Agenda items for all task force meetings:

1. Confirmed cases
2. New cases?
3. Location(s)? All rooms? Only some? One species? More than one?
4. Contained or still spreading?
5. Should intake and appointments be stopped? For how long?
6. Can the shelter stay open?
7. Room designation: Clean rooms, exposed, isos – update as needed
8. Screen and dip only certain areas or whole shelter?
9. Examine biosecurity measures, change if needed
10. Plan and communication

**Responsibilities**

* **Task force:** Formulate action plan, designate one or two
* **SC:** Central communications point, collect and document clinical information, plans, lab results. Track source and location history of all affected and suspect animals and document. **Documentation to be stored in “Infection Control” folder on “Protocols and Policies” Drive.**
* **CEO, ED:** High-level decisions – e.g. media releases, stopping intakes or adoptions, shelter closure, authorization for shelter-wide testing
* **DSM:** Diagnosis, risk assessment, treatment, population management, track cases. Communicate with Director, Operations, supervisors and medical staff
* **DO:** Implementation of action plan, population management, coordinate response, oversee quality control. Communicate with other departments.
* **ICO, Shelter Supervisors**: Execute action plan under direction of Director, Operations. Strictly enforce PPE compliance. ICO to assist SC as needed.

**Communication Board**

* Key communications for medical staff will be placed on the Infection Control section of the corkboard outside the prep room. It is the staff members’ responsibility to check the board regularly. These communications will be stored in the Infection Control folder on the hard drive.
* Template for these communications is in the Infection Control folder.

**OUTBREAK MANAGEMENT PLAN**

**STEP 1: CONTAINMENT**

**Initial biosecurity**

1. Escalate biosecurity level to at least LEVEL 2 throughout the shelter until situation has been fully assessed.
2. All medical staff and supervisors to review this protocol.

**B. Stop movement of animals**

1. Move animals ONLY if:
   1. Moving to RW or parvo isolation
   2. Severe URI
   3. Medical emergency
2. Place temporary hold on already-adopted animals until screened (see below) and cleared by SC
3. Hold fosters (in and out)
4. No moves to outside adoption sites until cleared by SC

**C. Isolation**

1. Isolate **ALL cats** with undiagnosed or new areas of alopecia or crusting
   1. Experienced technicians should NOT wait for a veterinarian to check the cat first
   2. Inexperienced technicians consult another tech or a vet
2. Flag lesional **dogs or special species** for a same-day vet check
3. Designate additional isolation areas if needed

**Managing litters of kittens**

1. Isolate the whole litter and the queen if ANY ONE animal is lesional
2. Where feasible, separate lesional and non-lesional littermates into different cages, but don’t leave any kittens on their own

**Managing single orphan kittens**

1. COMBINE single kittens in isolation if similar age, size and health status
   1. Ringworm treatment is prolonged, with potentially serious behavioural conseqences

**Managing cohorts from a shelter or rescue/rescuer**

1. If any one is lesional, isolate entire cohort until test results obtained

**D. Suspend new admissions and appointments**

1. Suspend routine intakes and appointments until extent of outbreak is known and it is adequately contained – this may take 2-4 weeks
2. Divert or delay emergency walk-ins and stray intake where possible until a clean break area has been established

**E. Suspend dog play groups**

1. Hold dog play groups temporarily until the extent of the outbreak is known

**STEP 2: IDENTIFY EXPOSED ANIMALS AND PRE-BREAK AREAS**

**A. Identify pre-break rooms and exposed animals**

1. Track intake and location history of lesional animals
2. Provide this information to SC
3. Rooms that have held ringworm suspects are pre-break
4. Sign rooms with appropriate biosecurity levels and ringworm isolation signs as needed
5. Animals are considered exposed if they were:
   1. Housed in the same room as a lesional animal
   2. Housed in a ringworm-pre-break environment with inadequate or unknown sanitation protocols
   3. Handled by a ringworm-infected staff member not on treatment and/or not using adequate barrier protection
6. Who is NOT considered exposed?
   1. An animal exposed to an exposed, non-lesional animal is not considered exposed

**B: Identify infected staff**

1. Supervisors to speak to staff to establish if anyone has lesions consistent with ringworm
2. If yes, staff member must be instructed to see a doctor and start treatment immediately
   1. Encourage the person to have diagnostics done for specific diagnosis and request that they share the information with us
3. Staff with lesions consistent with ringworm MUST:
   1. Cover lesion(s) completely at all times (Band-aid, bandage, long sleeved scrub top or lab coat etc.)
   2. For lesions on hands wear gloves at all times when in shelter until lesions resolved
   3. NOT work in the clean break area (where applicable)
4. SHOULD ideally work in ringworm iso or not work directly with cats, until lesions are clinically improved.
5. When resolved, ideally provide a doctor’s letter to say they are clear of infection

**C. Biosecurity**

1. Adjust biosecurity levels as needed and label rooms accordingly
2. Adjust staffing and staff flow as needed – staff to move from clean to pre-break to isolation areas
   1. Specifically, infected staff to initially work only in ringworm isos
3. Aggressively clean, disinfect and declutter
   1. First create clean rooms for new animals
   2. Then common areas – surgery, clinic, prep room, intake exam rooms, X-ray
   3. Then pre-break rooms

**D. Contact fosters and adopters of high-risk exposed animals**

1. SC to provide a list – high-risk only - members of infected cohort, animals with positive test results
2. Communication RVT to call FPs, adopters
3. Arrange recheck by vet: lesion check, culture, dip, start full treatment if needed
   1. Fosters – return to shelter for treatment if lesional, option to treat in home if willing
   2. Adopters - option to treat in home or surrender to shelter (treat and return)
      1. PetPoint popup for animals to be returned to owner
   3. Provide and discuss:
      1. “Sanitation for Fosters and Rescues” document [in Cleaning and Biosecurity folder]
      2. Veterinary Partner ringworm handout

**E. Establish a clean break**

1. Designate clean-break area(s) of the shelter for new animals
2. Confirm effectiveness of cleaning: Swiffer-culture rooms as soon as they are clean and dry
   1. Swiffer square approx 5x5cm
   2. Clean gloves for each sample collection
   3. One sample from floor, surfaces
   4. One from ceiling air vent
   5. One Ziploc bag per Swiffer square, labelled with date and location/part of room
3. Results to SC for collation

**STEP 3: INITIAL POPULATION SCREENING AND DECONTAMINATION**

**A. Lesion-check and screen all animals in designated locations**

1. Locations to be identified by SC or Task Force:
   1. Start with highest risk areas
   2. Cats first, then other species if needed
2. Strict PPE during screening
   1. New gown and hair cover for each room
   2. Change gloves between cages
   3. CHANGE GOWN, GLOVES, HAIR COVER after handling a lesional animal
3. Lesion check as follows –
   1. See **Lesion check video and photos of true positives and negatives** in the Ringworm folder in THS Clinic SOPs
      1. Thorough lesion check in good light, check everywhere but particularly the face and insides of the ears
      2. Interpretation – see Appendix 2
      3. Document as a test in PetPoint (for negative lesion checks, Test and Result only, no Condition; for positives, add condition “Ringworm, suspected”)
4. Woods lamp ALL lesional cats
   1. See **ringworm positive and negative photos** in the Ringworm folder in THS Clinic SOPs
      1. Document as a test in PetPoint (Test and Result only for negatives, if not already entered add “Ringworm, suspected” for positives)
5. PCR ALL lesional cats or cage groups
   1. **One sample per cage group**, focus on lesional cats, can pool samples.
   2. To get sufficient sample for PCR, MUST **brush close to the skin AND pluck hairs** from lesions or areas prone to infection (especially the head and ears)
   3. DO NOT re-use forceps between animals, mechanically clean first and soak in Accel at least 10 min, avoid cross-contamination

**B. “Population shuffle” and dip**

1. Decide whether to move animals and where after lesion-checking WHOLE ROOM **– USE DECISION TREE APPENDIX 1**
2. Move lesional cats to isolation WITHOUT waiting for a veterinarian to check
3. **Dip screened cats if directed by the veterinary Situation Coordinator**
   1. Enter Lime dip as a treatment in PetPoint

**C. Adjust biosecurity levels in rooms based on visual screening**

1. SC to be updated and decide on levels

**STEP 4: CONFIRMATORY TESTING**

1. Ringworm PCR and culture:
   1. Follow decision tree in APPENDIX 1
   2. **PCR is test of choice for initial diagnosis** (rapid turnaround, 99% negative predictive value in our hands)
   3. **Culture is test of choice for confirming cure** (PCR is too sensitive)
2. **FIRST SAMPLE FOR INITIAL DIAGNOSIS** - submit for PCR ONLY
   1. If PCR negative and suspicious lesions, repeat PCR or submit a culture before clearing
3. **SUBSEQUENT SAMPLES TO DETERMINE CLINICAL CURE** - submit for CULTURE ONLY
   1. Culture all lesional animals and animals in isolation per the Ringworm Treatment Protocol
4. **Population PCR** may be used as rapid population screen if extent of spread is unknown or uncertain
   * 1. To be determined by Task Force
     2. For population PCR, ask IDEXX to hold samples and culture if positive (only for the FIRST batch)

**STEP 5: CLEARING ANIMALS AND ROOMS**

**A. Readjust biosecurity levels in rooms based on test results**

1. SC to be updated and decide on levels
2. Task Force to decide when to give the “all-clear” and resume business as usual

**B. Isolation**

1. Release animals from ringworm isolation ONLY when are cleared based on culture AND clinical signs, following the Ringworm Treatment Protocol
2. Cleared cats can move to “pre-break” rooms
3. No disclosure

**C. Quarantine**

1. Group exposed animals together in a single room or behind barriers in separate rooms (depending on risk)
2. Lesion check once a week for 4 weeks from the last time of exposure
3. Ringworm exposure disclosure, remove at the end of the 4 week quarantine
4. At the veterinarian’s discretion, room to be open to the public or closed; animals available for adoption in most cases; quarantine period can be shortened if risk judged to be low.

**D. When can we move available cats to adoption or foster from pre-break NON-ADOPTION rooms?**

1. Refer to **APPENDIX 1**

**E. Members of the public viewing exposed cats in non-adoption rooms**

1. With adoption agent
2. Follow Biosecurity level for room

**F. New admissions and appointments**

1. When outbreak is contained and adequate clean break areas established
   1. To be determined by the Task Force

**G. Confirm effectiveness of cleaning**

1. Schedule deep cleaning of pre-break rooms as soon as possible (4 weeks after last suspected case, or when the room is empty)
2. Swiffer-culture - see Section 2E

**H. Confirm foster homes are safe**

1. Swiffer-culture foster homes – see Appendix 3
2. Foster manager to coordinate
3. Must culture negative before new fosters allowed to go to home

**STEP 6: DEBRIEFING**

Task Force to hold debriefing meeting as soon. Agenda items:

1. General review
2. Outstanding tasks
3. Weaknesses identified
4. Remedies
5. Communication required

**APPENDIX 1: DECISION TREE FOR “POPULATION SHUFFLE” AND CAT MOVEMENTS AFTER LESION-CHECKING A ROOM OR OBTAINING TEST RESULTS**

Leave in room

Lesion check

Precautionary dip

Available with RW exposure condition and disclosure

Non-lesional, NOT part of infected cohort

Non-lesional

Part of infected cohort

Lesional

Leave in room

Diagnostic sampling only if required by SC

Available without disclosure

Keep with cohort

Room closed if high risk

Room open with quarantine barrier if low risk

No or short (1-3d) exposure to positive case or strong suspect

Weekly lesion checks until directed (approx. 4 weeks)

Can move to adoption room or foster from non-adoption room after “all clear” given. DO NOT move to off-site adoption sites from pre-break rooms.

Prolonged (>3d) exposure to positive case or strong suspect

If becomes lesional:

Isolate, diagnostics and treatment per ringworm treatment protocol

Keep with cohort

Isolate, diagnostics and treatment per ringworm treatment protocol

Remove condition and disclosure after 4 weeks; sooner per DVM discretion based on risk assessment

**APPENDIX 2: INTERPRETATION OF RINGWORM TEST RESULTS**

**Screening tests**

1. Skin lesions:
   1. Low specificity (false positives are common)
   2. “Ringworm until proven otherwise” in an outbreak situation
      1. “A break in the skin lets fungus in!” Pre-existing skin disease increases risk of ringworm infection
2. Woods lamp:
   1. Tests for fluorescing fungal metabolites on hair shafts
   2. Positive test is very helpful
   3. Low sensitivity (most THS ringworm cats test negative)
   4. False positives possible as interpretation is subjective
   5. Negative result does not affect decision-making
3. Trichogram:
   1. Microscopic examination of hairs for fungal spores.
   2. Selecting fluorescing hairs markedly improves results
   3. Positive test is very helpful
   4. Low overall sensitivity
   5. Negative result does not affect decision-making

**Confirmatory tests**

1. Fungal culture:
   1. Test for ringworm growth on culture medium
   2. Considered the gold standard test, but sensitivity is low, only around 75%
   3. Slow. Positive results typically within 7-14 days; must wait 14 days to call negative for *Microsporum* and 21 days for *Trichophyton*
   4. Positive culture: True positive vs fomite carrier
      1. Colony count or P-score helps to distinguish these (see below)
   5. Culture with a contaminant growing but no dermatophyte colonies is still considered negative UNLESS the contaminant totally overwhelms the whole plate. A few contaminant colonies will not prevent growth of dermatophytes (personal communication, Dr Hani Dick, IDEXX).
   6. P-score: Scoring of infection level based on number of colonies on culture plate:
      1. P1: 1-4 colonies per plate - fomite carrier vs true infection
      2. P2: 5-9 colonies per plate - fomite carrier vs true infection
      3. P3: 10+ colonies per plate – true infection regardless of whether lesions are seen
2. PCR:
   1. Test for ringworm DNA (we are using the IDEXX test only)
   2. Accuracy compared with fungal culture not yet known
   3. Based on preliminary THS data at the current (2014) IDEXX cut-off between a positive and negative result:
      1. Specificity (likelihood that the test is negative if the disease is truly not present) appears to be excellent – **if the PCR is negative, the animal is very unlikely to have ringworm**
      2. Sensitivity (the likelihood that the test is positive if the disease is truly present) seems to be lower, ESPECIALLY DURING TREATMENT – so **false positives are likely to occur but the test is not likely to miss a positive**
   4. Quick. Results usually within 1-3 days
   5. Useful for quick decision making; can be used to screen the whole population if major decisions (shelter-closure) have to be made
   6. Positive PCR: True positive vs fomite carrier vs lab error