Re: cluster of cases at mink farm

From: Gunvaldsen, Rayna AGRI:EX <Rayna.Gunvaldsen@gov.bc.ca>
To: Clair, Veronic [BCCDC] <veronic.clair@bccdc.ca>
Cc: Newhouse, Emily [FH] <Emily.Newhouse@fraserhealth.ca>, Radke, Brian AGRI:EX <Brian.Radke@gov.bc.ca>, Pasco, Doug WCB:EX <Doug.Pasco@worksafebc.com>, Stone, Jason [FH] <Jason.Stone@fraserhealth.ca>, Fraser, Erin [BCCDC] <Erin.Fraser@bccdc.ca>, Kerwin, Oona [FH] <Oona.Kerwin@fraserhealth.ca>, Henry, Bonnie HLTH:EX <Bonnie.Henry@gov.bc.ca>, XT:HLTH Galanis, Eleni <eleni.galanis@bccdc.ca>, XT:HLTH Brodkin, Elizabeth <elizabeth.brodkin@fraserhealth.ca>, Tyler, Ingrid Dr. HLTH:IN <ingrid.tyler@fraserhealth.ca>, Sekirov, Inna [BCCDC] <inna.sekirov@bccdc.ca>, Sterloff, Trish HLTH:EX <Trish.Sterloff@gov.bc.ca>, XT:Naus, Monika HLTH:IN <monika.naus@bccdc.ca>, Gustafson, Reka [BCCDC] <reka.gustafson@phsa.ca>, Yeong, Siu-Kae [BCCDC] <Siu-Kae.Yeong@bccdc.ca>, Chan, Elaine [BCCDC] <elaine.chan@bccdc.ca>, Parker, Robert Dr. <robert.parker@fraserhealth.ca>
Sent: December 3, 2020 8:41:38 PM PST
Received: December 3, 2020 8:41:38 PM PST

Thank you for the updates. I hope all the farm workers and their families are doing okay. I'm sure this must be frightening for them. We'll be available to provide any assistance needed on animal surveillance and biosecurity.
Rayna

Sent from my iPhone

On Dec 3, 2020, at 8:30 PM, Clair, Veronic [BCCDC] wrote:

Hi Emily and all,

Thank you for your email Emily. Yes, we will do all we can to help.

I am adding Dr. Inna Sekirov for the whole genome sequencing help. She has also agreed today to do animal genome sequencing.

I am adding Dr. Gustafson. and Dr. Naus, as well as the director of health protection provincially Trish Sterloff, to keep them in the loop.

Rob, do you want me to set-up a Zoom call for all involved for tomorow morning? I can set-it up for anytime you would like, and see who can participate, and if they can't look at other times. Just let me know.

Regards,

Veronic

From: Newhouse, Emily [FH]
Sent: December 3, 2020 7:57 PM
To: Clair, Veronic [BCCDC]; Brian.radke@gov.bc.ca [EXT]; Pasco, Doug WCB:EX; Gunvaldsen, Rayna

AGRI:EX; Stone, Jason [FH]; Fraser, Erin [BCCDC]; Kerwin, Oona [FH]; Henry, Bonnie [EXT]; Galanis, Eleni [BCCDC]; Brodkin, Elizabeth Dr. [FH]; Tyler, Ingrid [FH]
Cc: Yeong, Siu-Kae [BCCDC]; Chan, Elaine [BCCDC]; Parker, Robert Dr.
Subject: cluster of cases at mink farm

Hi all,

I wanted to alert you we have found a cluster of 4 Covid-19 cases in mink farm workers in Chilliwack. Case and contact investigation is ongoing, but the earliest symptom onset date is Nov 28 for 3 of the cases (missing data on 1) indicating that introduction was likely an incubation period earlier at least, or a common family exposure.

It appears there are a total of 9 employees, including 4 temporary foreign workers. All of the remaining employees are symptomatic and have gone for testing. One works at a chicken farm as well and we will be assessing whether there has been exposure there tomorrow.

For my BCCDC colleagues, we will want to start WGS very quickly on these cases – can you assist?

We probably need some rapid discussions on what animal surveillance is now required at this farm. Fraser Health would also appreciate working together on inspections as our inspectors will need to get up to speed on biosecurity and obviously are not the experts in these farms' operations.

Dr. Rob Parker will be covering for me tomorrow.

Regards,

Emily

mink results

From: Gunvaldsen, Rayna AGRI:EX <Rayna.Gunvaldsen@gov.bc.ca>
To: Henry, Bonnie HLTH:EX <Bonnie.Henry@gov.bc.ca>
Sent: December 8, 2020 3:27:54 PM PST
Received: December 8, 2020 3:27:54 PM PST

Bonnie, we received results back from the national lab and the mink are confirmed positive. I have not been able to get in touch with the producer just yet. A public announcement will likely not go out until tomorrow morning depending on all the other required notifications.

Will you be updating the folks in BCCDC and Fraser Health that need this information?

If you'd like to chat, or need any additional information, please let me know.

Thank you,
Rayna

Rayna E. Gunvaldsen BSA DVM MSc
Chief Veterinarian
Animal Welfare and Dairy Program Veterinarian
BC Ministry of Agriculture, Food, and Fisheries

Re: Meeting to decide CA Mink next steps

From:	Radke, Brian AGRI:EX <Brian.Radke@gov.bc.ca>
To:	Clair, Veronic [BCCDC] <veronic.clair@bccdc.ca>, Tyler, Ingrid Dr. HLTH:IN <ingrid.tyler@fraserhealth.ca>, Henry, Bonnie HLTH:EX <Bonnie.Henry@gov.bc.ca>, Gunvaldsen, Rayna AGRI:EX <Rayna.Gunvaldsen@gov.bc.ca>, Fraser, Erin [BCCDC] <Erin.Fraser@bccdc.ca>, XT:HLTH Brodkin, Elizabeth <elizabeth.brodkin@fraserhealth.ca>, XT:Krajden, Mel HLTH:IN <mel.krajden@bccdc.ca>
Cc:	Kerwin, Oona [FH] <Oona.Kerwin@fraserhealth.ca>
Sent:	December 11, 2020 1:37:34 PM PST
Received:	December 11, 2020 1:37:35 PM PST

Hello,
The Ministry of Agriculture has 1 suggested addition - Requirement 7 (in red) in Ingrids's email.
MOE legislation applies to infected premises, and it has just come to our attention they might have some concerns with the manure and carcass management on the site. If concerns exist, they would likely need to be addressed before more carcasses were generated (that is, before pelting resumes).
Thanks,
Brian

From: Clair, Veronic [BCCDC]
Sent: December 11, 2020 11:55 AM
To: Tyler, Ingrid Dr. HLTH:IN; Henry, Bonnie HLTH:EX; Gunvaldsen, Rayna AGRI:EX; Fraser, Erin [BCCDC]; XT:HLTH Brodkin, Elizabeth; Radke, Brian AGRI:EX; XT:Krajden, Mel HLTH:IN
Cc: Kerwin, Oona [FH]
Subject: Re: Meeting to decide CA Mink next steps

Hi,
Thank you very much Ingrid. I think you captured the outcome of the discussion very well.
Please see my suggested edits below.
Thanks
Veronic

From: Tyler, Ingrid [FH]
Sent: December 11, 2020 11:45 AM
To: Henry, Bonnie [EXT]; 'Gunvaldsen, Rayna AGRI:EX'; Fraser, Erin [BCCDC]; Brodkin, Elizabeth Dr. [FH]; Clair, Veronic [BCCDC]; Brian.radke@gov.bc.ca [EXT]; Krajden, Mel [BCCDC]
Cc: Kerwin, Oona [FH]
Subject: RE: Meeting to decide CA Mink next steps

Hi there –
Thank you for the call at 10 AM today.
Please see a summary of requirements and recommendations to be communicated with the farmer by the appropriate parties.
I would appreciate any feedback on the content/wording/tone below.

s.13

As noted on the call, please respond with your approval, even if no changes are suggested.

Best, ingrid

From: Tyler, Ingrid [FH] <ingrid.tyler@fraserhealth.ca>
Sent: Friday, December 11, 2020 8:20 AM
To: Henry, Bonnie [EXT] <bonnie.henry@gov.bc.ca>; Gunvaldsen, Rayna AGRI:EX <Rayna.Gunvaldsen@gov.bc.ca>; Fraser, Erin [BCCDC] <Erin.Fraser@bccdc.ca>; Morimoto, Courtney [FH] <Courtney.Morimoto@fraserhealth.ca>
Cc: Brodkin, Elizabeth Dr. [FH] <Elizabeth.Brodkin@fraserhealth.ca>; Clair, Veronic [BCCDC] <veronic.clair@bccdc.ca>; Brian.radke@gov.bc.ca [EXT] <Brian.radke@gov.bc.ca>; Krajden, Mel [BCCDC] <Mel.Krajden@bccdc.ca>
Subject: RE: Meeting to decide CA Mink next steps

Hi Courtney –
Are you able to work with Bonnies EA to find a time we can meet with those copied
Thanks in advance, ingrid

From: Henry, Bonnie HLTH:EX <Bonnie.Henry@gov.bc.ca>
Sent: Thursday, December 10, 2020 7:09 PM
To: Tyler, Ingrid [FH] <ingrid.tyler@fraserhealth.ca>; Gunvaldsen, Rayna AGRI:EX <Rayna.Gunvaldsen@gov.bc.ca>; Fraser, Erin [BCCDC] <Erin.Fraser@bccdc.ca>
Cc: Brodkin, Elizabeth Dr. [FH] <Elizabeth.Brodkin@fraserhealth.ca>; Clair, Veronic [BCCDC] <veronic.clair@bccdc.ca>; Brian.radke@gov.bc.ca [EXT] <Brian.radke@gov.bc.ca>; Krajden, Mel [BCCDC] <Mel.Krajden@bccdc.ca>
Subject: RE: Meeting to decide CA Mink next steps

Thank you that would be very helpful. I am sorry I could not make the call this evening. I was on another that just finished.
These are important considerations.
My best,
Bonnie

Dr Bonnie Henry
Provincial Health Officer
Office of the PHO
Ministry of Health

4th floor, 1515 Blanshard St
Mailing address: PO Box 9648, STN PROV GOVT
Victoria, BC
V8W 9P4
Bonnie.henry@gov.bc.ca

Phone s.17; s.19

I gratefully acknowledge that I live and work on the traditional unceded territory of the Lekwungen Peoples, specifically the Songhees and Esquimalt First Nations. Hay'sxw'qu Si'em

---

From: Tyler, Ingrid [FH] <ingrid.tyler@fraserhealth.ca>
Sent: December 10, 2020 6:02 PM
To: Henry, Bonnie HLTH:EX <Bonnie.Henry@gov.bc.ca>; Gunvaldsen, Rayna AGRI:EX <Rayna.Gunvaldsen@gov.bc.ca>; Fraser, Erin [BCCDC] <Erin.Fraser@bccdc.ca>
Cc: XT:HLTH Brodkin, Elizabeth <elizabeth.brodkin@fraserhealth.ca>; Clair, Veronic [BCCDC] <veronic.clair@bccdc.ca>; Radke, Brian AGRI:EX <Brian.Radke@gov.bc.ca>; XT:Krajden, Mel HLTH:IN <mel.krajden@bccdc.ca>
Subject: Meeting to decide CA Mink next steps
Importance: High

Hi there –
I would like to propose we meet before the end of this week to make some key decisions regarding next steps and deposition on the mink farm.
The BN prepared by Veronic earlier this week is informative.

- Immediate next steps recommended are to :
  s.13

- Additional steps, to be decided will include
  s.13

s.13

Thank you, ingrid

Ingrid Tyler (she/her/hers) MD, CCFP, MHSc, MEd, FRCPC
Excutive Medical Director (Interim), Population and Public Health
Medical Health Officer, Fraser Health Authority
Suite 400, 13450 - 102nd Avenue
Surrey, BC V3T 0H1
Office: 604.587.7890
email: ingrid.tyler@fraserhealth.ca

RE: mink farm requirements -proposed Health Order

From:	Gunvaldsen, Rayna AGRI:EX <Rayna.Gunvaldsen@gov.bc.ca>
To:	Emerson, Brian P HLTH:EX <Brian.Emerson@gov.bc.ca>, Coulter, Tasha [FH] <Tasha.Coulter@fraserhealth.ca>, Henry, Bonnie HLTH:EX <Bonnie.Henry@gov.bc.ca>
Cc:	Tyler, Ingrid Dr. HLTH:IN <ingrid.tyler@fraserhealth.ca>, XT:HLTH Brodkin, Elizabeth <elizabeth.brodkin@fraserhealth.ca>, Newhouse, Emily [FH] <Emily.Newhouse@fraserhealth.ca>
Sent:	December 13, 2020 4:34:31 PM PST
Received:	December 13, 2020 4:34:32 PM PST
Attachments:	Product quarantine order BE - RG edits.docx

Hello everyone. I have added two comments to the order.

This is such an unfortunate turn of events. Is there anything I can do to help gain voluntary compliance?

The producers often call me to ask questions and express concerns and worries. Anything human health related, I certainly advise that they need to call their public health contact person as they are the ones to make the best decisions about human health.

The chair of the association did call me over the weekend asking questions about the worker testing and asking what he should do. I, of course, said I could not tell anyone what to do in this situation but to reach out to their human health contacts and ask any questions they might have.

Again, if there's anything I can do, please let me know.
Rayna

-----Original Message-----
From: Emerson, Brian P HLTH:EX <Brian.Emerson@gov.bc.ca>
Sent: December 13, 2020 4:02 PM
To: Coulter, Tasha [FH] <Tasha.Coulter@fraserhealth.ca>; Henry, Bonnie HLTH:EX <Bonnie.Henry@gov.bc.ca>
Cc: Tyler, Ingrid Dr. HLTH:IN <ingrid.tyler@fraserhealth.ca>; XT:HLTH Brodkin, Elizabeth <elizabeth.brodkin@fraserhealth.ca>; Newhouse, Emily [FH] <Emily.Newhouse@fraserhealth.ca>; Gunvaldsen, Rayna AGRI:EX <Rayna.Gunvaldsen@gov.bc.ca>
Subject: RE: mink farm requirements -proposed Health Order

Attached are my comments on the proposed order.

I am including Rayna because Ingrid's initial email included her in her salutation, but did not include her email.

Thanks.

Brian

Dr. Brian P. Emerson, Deputy Provincial Health Officer (acting) BC Ministry of Health, PO Box 9648 Stn Prov Govt, Victoria, BC V8W 9P1 T 250.952.1701 C 250.514.2219 F. 250.952. 1713 brian.emerson@gov.bc.ca

-----Original Message-----

On Dec 13, 2020, at 1:24 PM, Henry, Bonnie HLTH:EX

<Bonnie.Henry@gov.bc.ca<mailto:Bonnie.Henry@gov.bc.ca>> wrote:

Thank you Ingrid,
I support this approach and it is unfortunate it could not be done voluntarily. I have copied Brian to recheck the orders wording for consistency. It looks fine to me and I support the necessity to inspect and investigate the other farms given the health hazard risk.
My best,
Bonnie

Dr Bonnie Henry
Provincial Health Officer
Office of the PHO
Ministry of Health
4th floor, 1515 Blanshard St
Mailing address: PO Box 9648, STN PROV GOVT Victoria, BC V8W 9P4
Bonnie.henry@gov.bc.ca<mailto:Bonnie.henry@gov.bc.ca>

Phone: s.17; s.19

I gratefully acknowledge that I live and work on the traditional unceded territory of the Lekwungen Peoples, specifically the Songhees and Esquimalt First Nations. Hay'sxw'qu Si'em

From: Tyler, Ingrid [FH] <ingrid.tyler@fraserhealth.ca<mailto:ingrid.tyler@fraserhealth.ca>>
Sent: December 13, 2020 1:15 PM
To: Henry, Bonnie HLTH:EX <Bonnie.Henry@gov.bc.ca<mailto:Bonnie.Henry@gov.bc.ca>>
Cc: XT:HLTH Brodkin, Elizabeth <elizabeth.brodkin@fraserhealth.ca<mailto:elizabeth.brodkin@fraserhealth.ca>>; Newhouse, Emily [FH] <Emily.Newhouse@fraserhealth.ca<mailto:Emily.Newhouse@fraserhealth.ca>>; Coulter, Tasha [FH] <Tasha.Coulter@fraserhealth.ca<mailto:Tasha.Coulter@fraserhealth.ca>>
Subject: FW: mink farm requirements

[EXTERNAL] This email came from an external source. Only open attachments or links that you are expecting from a known sender.

Hi Bonnie and Rayna –

s.13

Please connect with all those copied if you have any concerns or need further info.
I have asked for this to be on the agenda at tomorrow COVID/Mink OB call

All the best, ingrid

From: Newhouse, Emily [FH] <Emily.Newhouse@fraserhealth.ca<mailto:Emily.Newhouse@fraserhealth.ca>>
Sent: Sunday, December 13, 2020 11:59 AM
To: Tyler, Ingrid [FH] <ingrid.tyler@fraserhealth.ca<mailto:ingrid.tyler@fraserhealth.ca>>; Kerwin, Oona [FH] <Oona.Kerwin@fraserhealth.ca<mailto:Oona.Kerwin@fraserhealth.ca>>; Choquette, Blair [FH] <Blair.Choquette@fraserhealth.ca<mailto:Blair.Choquette@fraserhealth.ca>>; Brodkin, Elizabeth Dr. [FH] <Elizabeth.Brodkin@fraserhealth.ca<mailto:Elizabeth.Brodkin@fraserhealth.ca>>; Coulter, Tasha [FH] <Tasha.Coulter@fraserhealth.ca<mailto:Tasha.Coulter@fraserhealth.ca>>
Cc: Wilkinson, Victoria [FH] <Victoria.Wilkinson2@fraserhealth.ca<mailto:Victoria.Wilkinson2@fraserhealth.ca>>; Masse, Jessica [FH] <Jessica.Masse@fraserhealth.ca<mailto:Jessica.Masse@fraserhealth.ca>>; Buchner, Chris [FH] <chris.buchner@fraserhealth.ca<mailto:chris.buchner@fraserhealth.ca>>; Clair, Veronic [BCCDC] <veronic.clair@bccdc.ca<mailto:veronic.clair@bccdc.ca>>; Siebert, Sarah [FH] <Sarah.Siebert@fraserhealth.ca<mailto:Sarah.Siebert@fraserhealth.ca>>
Subject: mink farm requirements

Hi all,

Ingrid and I had a conversation today about how to approach the remaining mink farms.

s.13

I drafted up an Order and I would very much appreciate Blair and Tasha's review. Elizabeth, hoping to confirm if you are in support of this plan. If anyone else has concerns, please feel free to share.

I think we are still open to supporting them by offering testing on-site, particularly at the largest farms, if it is possible to arrange serology. If not, we should designate a site or two where serology is possible and they can have priority access so as to make it as quick as possible for them. They work very long days during pelting season so we want to make it easy for them to comply.

Thanks all,
Emily

Emily Newhouse, MD, MPH, FRCPC
Medical Health Officer
Fraser Health

Administrative assistant:
Christy Burkett
Ph: 604-930-5405, ext 765638
christy.burkett@fraserhealth.ca<mailto:christy.burkett@fraserhealth.ca>

<product quarantine order.docx>

Page 11 of 33 to/à Page 13 of 33

Withheld pursuant to/removed as

s.13

Re: non-negative mink results - new farm

From: Gunvaldsen, Rayna AGRI:EX <Rayna.Gunvaldsen@gov.bc.ca>
To: Clair, Veronic [BCCDC] <veronic.clair@bccdc.ca>
Cc: Henry, Bonnie HLTH:EX <Bonnie.Henry@gov.bc.ca>, Newhouse, Emily [FH] <Emily.Newhouse@fraserhealth.ca>, Parker, Robert Dr. <robert.parker@fraserhealth.ca>, Zbar, Ariella [FH] <ariella.zbar@fraserhealth.ca>, Fraser, Erin [BCCDC] <Erin.Fraser@bccdc.ca>, Pasco, Doug WCB:EX <Doug.Pasco@worksafebc.com>, Nielsen, Mike WCB:EX <Mike.Nielsen@worksafebc.com>
Sent: December 21, 2020 8:10:42 PM PST
Received: December 21, 2020 8:10:43 PM PST

Thanks Veronic. We cannot communicate this outside of the ministry just yet and cannot release results until they are confirmed by ncfad. Maybe best to deal with comms later. Would be best to only share within our organizations on an as needed basis.
Rayna

Sent from my iPhone

On Dec 21, 2020, at 7:56 PM, Clair, Veronic [BCCDC] wrote:

[EXTERNAL] This email came from an external source. Only open attachments or links that you are expecting from a known sender.

Thanks Rayna,

I have created a meeting invite for tomorrow, hopefully at a time that most can join. I send it to the updated list of the OneHealth response group.

I have added Heather Amos, our communication person at BC CDC. I am not sure if any of you want to invite your communication person, or if you prefer we book another call to talk about communication.

Best,

Veronic

From: Gunvaldsen, Rayna AGRI:EX
Sent: December 21, 2020 6:44 PM
To: Henry, Bonnie [EXT]; Newhouse, Emily [FH]; Parker, Robert Dr.; Zbar, Ariella [FH]; Fraser, Erin [BCCDC]; Clair, Veronic [BCCDC]; Pasco, Doug WCB:EX; Nielsen, Mike WCB:EX
Subject: RE: non-negative mink results - new farm

EXTERNAL SENDER. If you suspect this message is malicious, please forward to spam@phsa.ca and **do not** open attachments or click on links.

The owner did not report any illness in the people when I spoke with him this evening.

Rayna

From: Henry, Bonnie HLTH:EX
Sent: December 21, 2020 6:44 PM
To: Gunvaldsen, Rayna AGRI:EX ; Newhouse, Emily [FH] ; Parker, Robert Dr. ; Zbar, Ariella [FH] ; Fraser, Erin [BCCDC] ; 'Clair, Veronic [BCCDC]' ; Pasco, Doug WCB:EX ; Nielsen, Mike WCB:EX
Subject: RE: non-negative mink results - new farm

Thank you. Do we know if any workers or farm family are ill?

bonnie

Dr Bonnie Henry

Provincial Health Officer

Office of the PHO

Ministry of Health

4th floor, 1515 Blanshard St

Mailing address: PO Box 9648, STN PROV GOVT

Victoria, BC

V8W 9P4

Bonnie.henry@gov.bc.ca

Phone: s.17; s.19

I gratefully acknowledge that I live and work on the traditional unceded territory of the Lekwungen Peoples, specifically the Songhees and Esquimalt First Nations. Hay'sxw'qu Si'em

From: Gunvaldsen, Rayna AGRI:EX <Rayna.Gunvaldsen@gov.bc.ca>
Sent: December 21, 2020 6:40 PM
To: Newhouse, Emily [FH] <Emily.Newhouse@fraserhealth.ca>; Parker, Robert Dr. <robert.parker@fraserhealth.ca>; Zbar, Ariella [FH] <ariella.zbar@fraserhealth.ca>; Henry, Bonnie HLTH:EX <Bonnie.Henry@gov.bc.ca>; Fraser, Erin [BCCDC] <Erin.Fraser@bccdc.ca>; 'Clair, Veronic [BCCDC]' <veronic.clair@bccdc.ca>; Pasco, Doug

WCB:EX <Doug.Pasco@worksafebc.com>; Nielsen, Mike WCB:EX <Mike.Nielsen@worksafebc.com>
Subject: non-negative mink results - new farm
Importance: High

Good evening everyone, we have received non-negative results from 3 mink submitted to the Animal Health Centre today from s.79 in Chilliwack. Animals were submitted for work-up for diarrhea and increased mortality over the weekend.

Rayna

Rayna E. Gunvaldsen BSA DVM MSc

Chief Veterinarian

Animal Welfare and Dairy Program Veterinarian

BC Ministry of Agriculture, Food, and Fisheries

Re: second mink farm results

From: Gunvaldsen, Rayna AGRI:EX <Rayna.Gunvaldsen@gov.bc.ca>
To: Henry, Bonnie HLTH:EX <Bonnie.Henry@gov.bc.ca>
Cc: Clair, Veronic [BCCDC] <veronic.clair@bccdc.ca>, Fraser, Erin [BCCDC] <Erin.Fraser@bccdc.ca>, Nielsen, Mike WCB:EX <Mike.Nielsen@worksafebc.com>, Pasco, Doug WCB:EX <Doug.Pasco@worksafebc.com>, Zbar, Ariella [FH] <ariella.zbar@fraserhealth.ca>, Newhouse, Emily [FH] <Emily.Newhouse@fraserhealth.ca>, Choquette, Blair [FH] <Blair.Choquette@fraserhealth.ca>
Sent: December 23, 2020 8:59:25 PM PST
Received: December 23, 2020 8:59:26 PM PST

Thanks Bonnie. I haven't heard any more regarding human cases. The farm was served with a quarantine order on Monday, and that remains in place. My understanding is that Fraser health staff will be on farm tomorrow to do some repeat testing of farm workers and they have offered to deliver mink carcasses to the animal health centre so they can be sampled next week.
Rayna

Sent from my iPhone

> On Dec 23, 2020, at 8:54 PM, Henry, Bonnie HLTH:EX wrote:
>
> Thanks Rayna,
> Any update on human cases? And what are the actions that you are taking on the farm? Happy to set up a call so we can all be clear on next steps and further investigation before this is released publicly.
> Bonnie
>
> Dr Bonnie Henry
> Provincial Health Officer
> Ministry of Health
> Bonnie.henry@gov.bc.ca
> s.17; s.19
>
> > On Dec 23, 2020, at 8:03 PM, Gunvaldsen, Rayna AGRI:EX wrote:
> >
> > Hello everyone.
> >
> > We received results back from the national lab and the mink from the second premises have been confirmed positive.
> >
> > I have spoken with the producer, but am not sure when the results will be released publicly. I will be sure to let you know.
> >
> > Rayna
> >
> > **Rayna E. Gunvaldsen BSA DVM MSc**
> > Chief Veterinarian
> > Animal Welfare and Dairy Program Veterinarian
> > BC Ministry of Agriculture, Food, and Fisheries

RE: second mink farm results, key messages

From:	Gunvaldsen, Rayna AGRI:EX <Rayna.Gunvaldsen@gov.bc.ca>
To:	Clair, Veronic [BCCDC] <veronic.clair@bccdc.ca>, Zbar, Ariella [FH] <ariella.zbar@fraserhealth.ca>, Fraser, Erin [BCCDC] <Erin.Fraser@bccdc.ca>
Cc:	Henry, Bonnie HLTH:EX <Bonnie.Henry@gov.bc.ca>, Nielsen, Mike WCB:EX <Mike.Nielsen@worksafebc.com>, Pasco, Doug WCB:EX <Doug.Pasco@worksafebc.com>, Newhouse, Emily [FH] <Emily.Newhouse@fraserhealth.ca>, Choquette, Blair [FH] <Blair.Choquette@fraserhealth.ca>, Radke, Brian AGRI:EX <Brian.Radke@gov.bc.ca>, Coombe, Michelle AGRI:EX <Michelle.Coombe@gov.bc.ca>, Amos, Heather [BCCDC] <heather.amos@bccdc.ca>
Sent:	December 24, 2020 3:27:12 PM PST
Received:	December 24, 2020 3:27:13 PM PST

Hi everyone, my understanding is that the media release was set for 3pm; OIE reporting will occur next week as an update to the current event rather than a new, separate notification.
Rayna

-----Original Message-----
From: Gunvaldsen, Rayna AGRI:EX
Sent: December 24, 2020 11:01 AM
To: 'Clair, Veronic [BCCDC]' <veronic.clair@bccdc.ca>; Zbar, Ariella [FH] <ariella.zbar@fraserhealth.ca>; Fraser, Erin [BCCDC] <Erin.Fraser@bccdc.ca>
Cc: Henry, Bonnie HLTH:EX <Bonnie.Henry@gov.bc.ca>; Nielsen, Mike WCB:EX <Mike.Nielsen@worksafebc.com>; Pasco, Doug WCB:EX <Doug.Pasco@worksafebc.com>; Newhouse, Emily [FH] <Emily.Newhouse@fraserhealth.ca>; Choquette, Blair [FH] <Blair.Choquette@fraserhealth.ca>; Radke, Brian AGRI:EX <Brian.Radke@gov.bc.ca>; Coombe, Michelle AGRI:EX <Michelle.Coombe@gov.bc.ca>; Amos, Heather [BCCDC] <heather.amos@bccdc.ca>
Subject: RE: second mink farm results, key messages

MAGRI will release the info. I'll make sure you're informed before that happens.
I report pertinent info to CFIA, who is responsible for reporting to OIE; they wait until we release info publicly before reporting to OIE as you are correct, OIE reports are public information.
Rayna

-----Original Message-----
From: Clair, Veronic [BCCDC] <veronic.clair@bccdc.ca>
Sent: December 24, 2020 10:55 AM
To: Zbar, Ariella [FH] <ariella.zbar@fraserhealth.ca>; Fraser, Erin [BCCDC] <Erin.Fraser@bccdc.ca>; Gunvaldsen, Rayna AGRI:EX <Rayna.Gunvaldsen@gov.bc.ca>
Cc: Henry, Bonnie HLTH:EX <Bonnie.Henry@gov.bc.ca>; Nielsen, Mike WCB:EX <Mike.Nielsen@worksafebc.com>; Pasco, Doug WCB:EX <Doug.Pasco@worksafebc.com>; Newhouse, Emily [FH] <Emily.Newhouse@fraserhealth.ca>; Choquette, Blair [FH] <Blair.Choquette@fraserhealth.ca>; Radke, Brian AGRI:EX <Brian.Radke@gov.bc.ca>; Coombe, Michelle AGRI:EX <Michelle.Coombe@gov.bc.ca>; Amos, Heather [BCCDC] <heather.amos@bccdc.ca>
Subject: Re: second mink farm results, key messages

[EXTERNAL] This email came from an external source. Only open attachments or links that you are expecting from a known sender.

Hi Rayna,

Would MAGRI be taking the lead on releasing the results publically for this one, since there are no human cases that we know of?

When will the animal lab nationally do the OIE notification?
Last time, they also send a Promed posting. Will they do one this time?
When that is done, it is like making it public.

Also is there someone from MAGRI, available to have a short touch base about the worker's interaction with minks for the bedding change and perhaps other tasks?

I could suggest a short call around noon if that works for others in FH and MARGRI.
Or Rayna, maybe you can let us know if there is even a 15 minutes that works for you Rayna anytime today?

Thanks

Veronic

From: Zbar, Ariella [FH]
Sent: December 24, 2020 10:02 AM
To: Fraser, Erin [BCCDC]; Gunvaldsen, Rayna AGRI:EX
Cc: Henry, Bonnie [EXT]; Clair, Veronic [BCCDC]; Nielsen, Mike WCB:EX; Pasco, Doug WCB:EX; Newhouse, Emily [FH]; Choquette, Blair [FH]; Brian.radke@gov.bc.ca [EXT]; Coombe, Michelle AGRI:EX [EXT]; Amos, Heather [BCCDC]
Subject: RE: second mink farm results, key messages

Hi Erin,

The information reads accurately to me from a Fraser Health perspective.

-Ariella

-----Original Message-----
From: Fraser, Erin [BCCDC] <Erin.Fraser@bccdc.ca>
Sent: Thursday, December 24, 2020 9:31 AM
To: Zbar, Ariella [FH] <ariella.zbar@fraserhealth.ca>; Gunvaldsen, Rayna AGRI:EX <Rayna.Gunvaldsen@gov.bc.ca>
Cc: Henry, Bonnie [EXT] <bonnie.henry@gov.bc.ca>; Clair, Veronic [BCCDC] <veronic.clair@bccdc.ca>; Nielsen, Mike WCB:EX <Mike.Nielsen@worksafebc.com>; Pasco, Doug WCB:EX <Doug.Pasco@worksafebc.com>; Newhouse, Emily [FH] <Emily.Newhouse@fraserhealth.ca>; Choquette, Blair [FH] <Blair.Choquette@fraserhealth.ca>; Brian.radke@gov.bc.ca [EXT] <Brian.radke@gov.bc.ca>; Coombe, Michelle AGRI:EX [EXT] <Michelle.Coombe@gov.bc.ca>; Amos, Heather [BCCDC] <heather.amos@bccdc.ca>
Subject: RE: second mink farm results, key messages

Hi all,
Please see attached for draft key messages adjusted to reflect confirmation of results at NCFAD. Please confirm accuracy of statements for your respective agencies.

I've cc'd Heather Amos here but don't have other comms contacts at MAgri, Fraser Health or WorkSafe

All the best,

Erin Fraser, DVM MSc
Public Health Veterinarian

Communicable Diseases & Immunization Service BC Centre for Disease Control

Clinical Assistant Professor
School of Population and Public Health
Faculty of Medicine, UBC

655 West 12th Ave
Vancouver, BC V5Z 4R4
Tel. 778-677-7790
www.bccdc.ca

I gratefully acknowledge that I live and work on the traditional unceded territory of the Lekwungen Peoples, specifically the Songhees and Esquimalt First Nations. Hay'sxw'qu Si'em

-----Original Message-----
From: Zbar, Ariella [FH]
Sent: Wednesday, December 23, 2020 9:06 PM
To: Gunvaldsen, Rayna AGRI:EX
Cc: Henry, Bonnie [EXT]; Clair, Veronic [BCCDC]; Fraser, Erin [BCCDC]; Nielsen, Mike WCB:EX; Pasco, Doug WCB:EX; Newhouse, Emily [FH]; Choquette, Blair [FH]
Subject: Re: second mink farm results

Hi Bonnie,

We have arranged for the workers to be retested tomorrow (NP swabs tomorrow and arranging for repeat serology in 2wks), plus s.22 None have declared any symptoms. As Rayna mentioned, we will also have EHOs picking up the remaining 14 mink carcasses for testing.

-Ariella

On Dec 23, 2020, at 8:59 PM, Gunvaldsen, Rayna AGRI:EX <Rayna.Gunvaldsen@gov.bc.ca> wrote:

EXTERNAL SENDER. If you suspect this message is malicious, please forward to spam@phsa.ca and do not open attachments or click on links.

Thanks Bonnie. I haven't heard any more regarding human cases. The farm was served with a quarantine order on Monday, and that remains in place. My understanding is that Fraser health staff will be on farm tomorrow to do some repeat testing of farm workers and they have offered to deliver mink carcasses to the animal health centre so they can be sampled next week.
Rayna

Sent from my iPhone

On Dec 23, 2020, at 8:54 PM, Henry, Bonnie HLTH:EX <Bonnie.Henry@gov.bc.ca> wrote:

Thanks Rayna,
Any update on human cases? And what are the actions that you are taking on the farm? Happy to set up a call so we can all be clear on next steps and further investigation before this is released publicly.
Bonnie

Dr Bonnie Henry
Provincial Health Officer
Ministry of Health
Bonnie.henry@gov.bc.ca
s.17; s.19

On Dec 23, 2020, at 8:03 PM, Gunvaldsen, Rayna AGRI:EX <Rayna.Gunvaldsen@gov.bc.ca> wrote:

Hello everyone.

We received results back from the national lab and the mink from the second premises have been confirmed positive.

I have spoken with the producer, but am not sure when the results will be released publicly. I will be sure to let you know.

Rayna

Rayna E. Gunvaldsen BSA DVM MSc
Chief Veterinarian
Animal Welfare and Dairy Program Veterinarian BC Ministry of
Agriculture, Food, and Fisheries

Questions for CDC and PHO re: human health risk related to mink farms dur to COVID-19

From:	McGuire, Jennifer AGRI:EX <Jennifer.Mcguire@gov.bc.ca>
To:	Henry, Bonnie HLTH:EX <Bonnie.Henry@gov.bc.ca>, veronic.clair@bccdc.ca, 'veronic.clair@bccdc.ca'
Cc:	Hrycuik, Lorie HLTH:EX <Lorie.Hrycuik@gov.bc.ca>, Anderson, Arlene AGRI:EX <Arlene.Anderson@gov.bc.ca>
Sent:	January 28, 2021 8:32:04 PM PST
Received:	January 28, 2021 8:32:05 PM PST
Attachments:	Pathway Component.docx, Mink questions for Health and CDC.docx

Dr. Bonnie Henry
Provincial Health Officer
Office of the PHO
Bonnie.Henry@gov.bc.ca

and

Dr. Veronic Clair, MD, MSc, CCFP, FRCPC, PhD
Physician Epidemiologist
BC Centre for Disease Control
veronic.clair@bccdc.ca

Hello Dr. Henry and Dr. Clair,

The Ministry of Agriculture, Food and Fisheries is currently assessing all options of risk of spread of COVID-19 in mink farming activities as well as seeking to understand where mitigation/actions should be taken to address unacceptable risk to human health (workers and community).

Please find attached a list of questions which we seeking to understand the PHO & CDC perspectives on the level of risk that mink farming activities pose to human health in light of COVID-19 and potential other infectious respiratory diseases (should they occur in the future). The questions are in the context of current, projected and future infectious respiratory diseases.

The mink farm herd population is currently at low (only breeding stock); within a weeks breeding season will begin and the herd size/mink population on the farms will then increase potentially 4 times by April/May. Ministry staff would appreciate discussing the questions with you should clarification be needed, at your earliest convenience. Your responses are important to inform the ministry review of this sector.

Thank-you for all that you are doing for the province of BC!

Thank you

Jennifer McGuire, P.Ag.
Assistant Deputy Minister
Agriculture Science and Policy Division
Ministry of Agriculture, Food and Fisheries
Ph: 778-698-8521 Cell: s.17

Pathway Component	Probability [mode (min-max)]	Uncertainty [mode (min-max)]	Source of variability and uncertainty	Combined Probability [mode (min-max)]	Combined Uncertainty [mode (min-max)]
QUESTION 1: TRANSMISSION FROM HUMAN-MINK					
Exposure and infection of a farmed mink via direct contact with an infected human	Low (Neg-High)	Moderate (Low-High)	• Variability due to: prevalence of human cases in different regions and times in Canada (and potential overlap with mink farm locations), time of year / stage of production cycle and variations in human-animal contact (higher likelihood during activities that take place from April-June), level of biosecurity (especially regarding fomites and droplet transmission from humans)	Low (Neg-High)	Moderate (Low-High)
Exposure and infection of a farmed mink via indirect contact with an infected human	Low (Neg-High)	Moderate (Low-High)			
			Question 1 Total:	**Total Probability**	**Total Uncertainty**
				Low (Neg-High)	Moderate (Low-High)
QUESTION 2: TRANSMISSION FROM HUMAN-MINK-HUMAN (PELTING)					
Exposure and infection of a farmed mink via direct contact with an infected human	Low (Neg-High)	Moderate (Low-High)	• See question 1	Low (Neg-High)	Moderate (Low-High)
Exposure and infection of a farmed mink via indirect contact with an infected human	Low (Neg-High)	Moderate (Low-High)			
Exposure of an employee/contractor via direct contact with an infected mink carcass during pelting (C)	Moderate (Very low-High)	Moderate (Low-High)	• Variability due to: whether mink are pelted on-site versus at pelting plant • Uncertainty regarding: pelt contamination of asymptomatic	Moderate (Very low-High)	Moderate (Low-High)

			animals, how much virus would be removed during cleaning process, and potential cross-contamination of pelts		
			Question 2 Total:	**Total Probability**	**Total Uncertainty**
				Low (Neg-High)	Moderate (Low-High)
QUESTION 3: TRANSMISSION FROM HUMAN-MINK-HUMAN (EMPLOYEES/VETERINARIANS)					
Exposure and infection of a farmed mink via direct contact with an infected human	Low (Neg-High)	Moderate (Low-High)	• See question 1	Low (Neg-High)	Moderate (Low-High)
Exposure and infection of a farmed mink via indirect contact with an infected human	Low (Neg-High)	Moderate (Low-High)			
Exposure of an employee/veterinarian via direct contact with an infected live mink on the farm	Moderate (Very low-High)	Moderate (Low-High)	• Variability due to: time of year / stage of production cycle and variations in human-animal contact (higher likelihood during activities that take place from April-June), stage of illness and amount of shedding, husbandry practices and environmental factors (higher likelihood within mink sheds) • Uncertainty regarding: within-herd prevalence, virus survival in manure and compost piles, extrapolation from ferrets and limited data specifically on mink	Moderate (Very low-High)	Moderate (Low-High)
Exposure of an employee/veterinarian via indirect contact with an infected live mink on the farm	Moderate (Neg-High)	Moderate (Low-High)			
			Question 3 Total:	**Total Probability**	**Total Uncertainty**
				Low (Neg-High)	Moderate (Low-High)

QUESTION 4: TRANSMISSION FROM HUMAN-MINK-HUMAN (GENERAL PUBLIC)					
Exposure and infection of a farmed mink via direct contact with an infected human	Low (Neg-High)	Moderate (Low-High)	• See question 1	Low (Neg-High)	Moderate (Low-High)
Exposure and infection of a farmed mink via indirect contact with an infected human	Low (Neg-High)	Moderate (Low-High)			
Exposure of a member of the general public via indirect contact with an infected mink	Negligible (Neg-Low)	Moderate (Low-High)	• Variability due to: management and handling of manure, stage of illness and amount of shedding • Uncertainty regarding: survival time in manure	Negligible (Neg-Low)	Moderate (Low-High)
			Question 4 Total:	**Total Probability**	**Total Uncertainty**
				Negligible (Neg-Low)	Moderate (Low-High)
QUESTION 5: TRANSMISSION FROM HUMAN-MINK-WILDLIFE					
Exposure and infection of a farmed mink via direct contact with an infected human	Low (Neg-High)	Moderate (Low-High)	• See question 1	Low (Neg-High)	Moderate (Low-High)
Exposure and infection of a farmed mink via indirect contact with an infected human	Low (Neg-High)	Moderate (Low-High)			
Exposure and infection of a wild animal via direct contact with an infected mink	Low (Neg-High)	Moderate (Low-High)	• Variability due to: level of biosecurity and type of housing, husbandry practices and environmental factors, stage of illness and amount of shedding, wild animal species susceptibility	Low (Neg-High)	Moderate-High (Low-High)
Exposure and infection of a wild animal via	Low (Neg-Mod)	Moderate-High			

indirect contact with an infected mink (H)		(Low-High)	• Uncertainty regarding: virus survival in manure and compost piles, susceptibility of wild animal species (especially N. American bats, raccoons, skunks, squirrels), infectious dose		
			Question 5 Total:	**Total Probability**	**Total Uncertainty**
				Low (Neg-High)	Moderate-High (Low-High)

Mink questions for Health and BCCDC

- From your perspective, how high is the risk to human health due to SARS-CoV-2 transmission on mink farms?
- Is the potential of SARS-CoV-2 spread via this pathway of concern to the Ministry of Health (HLTH)?
- From your perspective, what special steps, if any, should the Ministry of Agriculture, Food and Fisheries (AFF) take to minimize the risk?
- In the mink breeding season, the mink populations on farm increase by 3-to-4 times. In your estimation, to what degree would this increase transmission risk?
- In your estimation, to what degree would the combination of an increase in SARS-CoV-2 numbers in the Fraser Valley along with the breeding season on mink farms, elevate the probability of SARS-CoV-2 transmission between humans and mink?
- In the event of this combination would the elevated probability increase HLTH's concern for SARS-CoV-2 spreading and/or justify additional risk reduction steps?
- In your estimation, would the mutation probability of SARS-CoV-2 in the farmed mink population increase dramatically as a result of population increases due to the mink breeding season?
- What other concerns might you have regarding SARS-CoV-2 transmission and the mink breeding on farms?

RE: Questions for CDC and PHO re: human health risk related to mink farms dur to COVID-19

From:	McGuire, Jennifer AGRI:EX <Jennifer.Mcguire@gov.bc.ca>
To:	Clair, Veronic [BCCDC] <veronic.clair@bccdc.ca>, Henry, Bonnie HLTH:EX <Bonnie.Henry@gov.bc.ca>
Cc:	Hrycuik, Lorie HLTH:EX <Lorie.Hrycuik@gov.bc.ca>, Anderson, Arlene AGRI:EX <Arlene.Anderson@gov.bc.ca>
Sent:	January 31, 2021 7:41:42 PM PST
Received:	January 31, 2021 7:41:42 PM PST

Hello Dr. Clair

The Pathway Document was prepared by AGRI staff to for the purpose of organizing the information that had been provided to AGRI by CDC.

I understand the time demand and constraints.
Thank you for your attention as time permits.

Jennifer McGuire, P.Ag.
Assistant Deputy Minister
Agriculture Science and Policy Division
Ministry of Agriculture, Food and Fisheries
Ph: 778-698-8521 Cell: s.17

From: Clair, Veronic [BCCDC]
Sent: January 29, 2021 10:06 AM
To: McGuire, Jennifer AGRI:EX ; Henry, Bonnie HLTH:EX
Cc: Hrycuik, Lorie HLTH:EX ; Anderson, Arlene AGRI:EX
Subject: Re: Questions for CDC and PHO re: human health risk related to mink farms dur to COVID-19

Thank you for your email and involving us in this assessment.

The BC CDC works very closely with Fraser Health, WorkSafe and across several ministries, including the Ministry of Agriculture, Food and Fisheries to manage the risks that might arise from an infected mink herd. I would qualify the current level of risk management as effective, and evolving as the situation and evidence evolves.

Answering the list of questions you provided will take some time, in order to ensure agreement across relevant health stakeholders, including the health authority managing more closely the situation with the farms on the ground.

Thank you for circulating the pathway document. I don't recall seeing this specific document before. Can you clarify where this document comes from and who contributed to filling it out?

Best,

Dr. Veronic Clair, MD, MSc, CCFP, FRCPC, PhD
Physician Epidemiologist
BC Centre for Disease Control
veronic.clair@bccdc.ca

From: McGuire, Jennifer AGRI:EX <Jennifer.Mcguire@gov.bc.ca>
Sent: January 28, 2021 8:32 PM
To: Henry, Bonnie [EXT]; Clair, Veronic [BCCDC]
Cc: Hrycuik, Lorie [EXT]; Anderson, Arlene AGRI:EX
Subject: Questions for CDC and PHO re: human health risk related to mink farms dur to COVID-19

Dr. Bonnie Henry
Provincial Health Officer
Office of the PHO
Bonnie.Henry@gov.bc.ca

and

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Thank-you for all that you are doing for the province of BC!

Thank you

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From:	McGuire, Jennifer AGRI:EX <Jennifer.Mcguire@gov.bc.ca>
To:	Clair, Veronic [BCCDC] <veronic.clair@bccdc.ca>, Henry, Bonnie HLTH:EX <Bonnie.Henry@gov.bc.ca>
Cc:	Hrycuik, Lorie HLTH:EX <Lorie.Hrycuik@gov.bc.ca>, Anderson, Arlene AGRI:EX <Arlene.Anderson@gov.bc.ca>
Sent:	February 4, 2021 11:06:46 AM PST
Received:	February 4, 2021 11:06:47 AM PST

Hello Dr Henry and Dr Clair,

My minister office is interested in the mink farming risk to humans – and is seeking an opinion from health professionals. Your opinion is important to inform now urgent decisions regarding the mink farming sector. When can the ministry expect to receive a response?
Thank you

Jennifer McGuire, P.Ag.
Assistant Deputy Minister
Agriculture Science and Policy Division
Ministry of Agriculture, Food and Fisheries
Ph: 778-698-8521 Cell: s.17

From: McGuire, Jennifer AGRI:EX
Sent: January 31, 2021 7:42 PM
To: 'Clair, Veronic [BCCDC]' ; Henry, Bonnie HLTH:EX
Cc: Hrycuik, Lorie HLTH:EX ; Anderson, Arlene AGRI:EX
Subject: RE: Questions for CDC and PHO re: human health risk related to mink farms dur to COVID-19

Hello Dr. Clair

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Cc: Hrycuik, Lorie HLTH:EX <Lorie.Hrycuik@gov.bc.ca>; Anderson, Arlene AGRI:EX <Arlene.Anderson@gov.bc.ca>
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Dr. Veronic Clair, MD, MSc, CCFP, FRCPC, PhD
Physician Epidemiologist
BC Centre for Disease Control
veronic.clair@bccdc.ca

From: McGuire, Jennifer AGRI:EX <Jennifer.Mcguire@gov.bc.ca>
Sent: January 28, 2021 8:32 PM
To: Henry, Bonnie [EXT]; Clair, Veronic [BCCDC]
Cc: Hrycuik, Lorie [EXT]; Anderson, Arlene AGRI:EX
Subject: Questions for CDC and PHO re: human health risk related to mink farms dur to COVID-19

Dr. Bonnie Henry
Provincial Health Officer
Office of the PHO
Bonnie.Henry@gov.bc.ca

and

Dr. Veronic Clair, MD, MSc, CCFP, FRCPC, PhD
Physician Epidemiologist

BC Centre for Disease Control
veronic.clair@bccdc.ca

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Thank-you for all that you are doing for the province of BC!

Thank you

Jennifer McGuire, P.Ag.
Assistant Deputy Minister
Agriculture Science and Policy Division
Ministry of Agriculture, Food and Fisheries
Ph: 778-698-8521 Cell: s.17

RE: cluster of cases at mink farm

From:	Hrycuik, Lorie HLTH:EX <Lorie.Hrycuik@gov.bc.ca>
To:	Sterloff, Trish HLTH:EX <Trish.Sterloff@gov.bc.ca>
Sent:	December 4, 2020 9:52:07 AM PST
Received:	December 4, 2020 9:52:08 AM PST
Attachments:	image001.jpg

The Chief vet is already engaged and involved to help manage the outbreak.

Lorie Hrycuik
Executive Lead, Population & Public Health Division
Ministry of Health
Phone: (778) 974-3766 | Lorie.Hrycuik@gov.bc.ca

From: Sterloff, Trish HLTH:EX <Trish.Sterloff@gov.bc.ca>
Sent: December 4, 2020 9:52 AM
To: Hrycuik, Lorie HLTH:EX <Lorie.Hrycuik@gov.bc.ca>
Subject: RE: cluster of cases at mink farm

Helpful to share with AGRI?

Trish Sterloff
A/Executive Director
Health Protection Branch
British Columbia Ministry of Health
PO Box 9646 Stn Prov Govt, Victoria BC V8W 9P1
Physical location: 1515 Blanshard Street, Victoria, BC
Tel: 778 678-1720
Email: trish.sterloff@gov.bc.ca

From: Hrycuik, Lorie HLTH:EX <Lorie.Hrycuik@gov.bc.ca>
Sent: December 4, 2020 9:51 AM
To: Sterloff, Trish HLTH:EX <Trish.Sterloff@gov.bc.ca>
Subject: RE: cluster of cases at mink farm

Bonnie mentioned on the VP call today. Thanks for sharing (in case)

Lorie Hrycuik
Executive Lead, Population & Public Health Division
Ministry of Health
Phone: (778) 974-3766 | Lorie.Hrycuik@gov.bc.ca

From: Sterloff, Trish HLTH:EX <Trish.Sterloff@gov.bc.ca>
Sent: December 4, 2020 9:50 AM
To: Hrycuik, Lorie HLTH:EX <Lorie.Hrycuik@gov.bc.ca>
Subject: FW: cluster of cases at mink farm

FYI

Trish Sterloff
A/Executive Director
Health Protection Branch
British Columbia Ministry of Health
PO Box 9646 Stn Prov Govt, Victoria BC V8W 9P1
Physical location: 1515 Blanshard Street, Victoria, BC
Tel: 778 678-1720
Email: trish.sterloff@gov.bc.ca

From: Sekirov, Inna [BCCDC] <inna.sekirov@bccdc.ca>
Sent: December 3, 2020 11:35 PM
To: Tyler, Ingrid Dr. HLTH:IN <ingrid.tyler@fraserhealth.ca>; Prystajecky, Natalie [BCCDC] <Natalie.Prystajecky@bccdc.ca>; Hoang, Linda [BCCDC] <Linda.Hoang@bccdc.ca>
Cc: Clair, Veronic [BCCDC] <veronic.clair@bccdc.ca>; Newhouse, Emily [FH] <Emily.Newhouse@fraserhealth.ca>; Radke, Brian AGRI:EX <Brian.Radke@gov.bc.ca>; Pasco, Doug WCB:EX <Doug.Pasco@worksafebc.com>; Gunvaldsen, Rayna AGRI:EX <Rayna.Gunvaldsen@gov.bc.ca>; Stone, Jason [FH] <Jason.Stone@fraserhealth.ca>; Fraser, Erin [BCCDC] <Erin.Fraser@bccdc.ca>; Kerwin, Oona [FH] <Oona.Kerwin@fraserhealth.ca>; Henry, Bonnie HLTH:EX <Bonnie.Henry@gov.bc.ca>; XT:HLTH Galanis, Eleni <eleni.galanis@bccdc.ca>; XT:HLTH Brodkin, Elizabeth <elizabeth.brodkin@fraserhealth.ca>; Sterloff, Trish HLTH:EX <Trish.Sterloff@gov.bc.ca>; XT:Naus, Monika HLTH:IN <monika.naus@bccdc.ca>; Gustafson, Reka [BCCDC] <reka.gustafson@phsa.ca>; Yeong, Siu-Kae [BCCDC] <Siu-Kae.Yeong@bccdc.ca>; Chan, Elaine [BCCDC] <elaine.chan@bccdc.ca>; Parker, Robert Dr. <robert.parker@fraserhealth.ca>; nata@healthbc.org
Subject: Re: cluster of cases at mink farm

Thank you for getting me into the loop, I'm also including Natalie Prystajecky and Linda Hoang as an FYI for the WGS component.
I'm sure this information is being gathered now - we'd need the demographics of the workers to look for their samples and coordinate for WGS.
I am on call this weekend and can help with the testing component, as needed.

Best regards,
Inna

Inna Sekirov, MD, PhD, FRCPC
Medical Microbiologist
BCCDC Public Health Laboratory

Sent from my iPhone

> On Dec 3, 2020, at 9:05 PM, Tyler, Ingrid [FH] <ingrid.tyler@fraserhealth.ca> wrote:
>
> If there is a call please include me as I am also covering the weekend - thanks, Ingrid
>
> > On Dec 3, 2020, at 8:30 PM, Clair, Veronic [BCCDC] <veronic.clair@bccdc.ca> wrote:

Hi Emily and all,

Thank you for your email Emily. Yes, we will do all we can to help.

I am adding Dr. Inna Sekirov for the whole genome sequencing help. She has also agreed today to do animal genome sequencing.

I am adding Dr. Gustafson. and Dr. Naus, as well as the director of health protection provincially Trish Sterloff, to keep them in the loop.

Rob, do you want me to set-up a Zoom call for all involved for tomorow morning? I can set-it up for anytime you would like, and see who can participate, and if they can't look at other times. Just let me know.

Regards,

Veronic

From: Newhouse, Emily [FH]
Sent: December 3, 2020 7:57 PM
To: Clair, Veronic [BCCDC]; Brian.radke@gov.bc.ca [EXT]; Pasco, Doug WCB:EX; Gunvaldsen, Rayna AGRI:EX; Stone, Jason [FH]; Fraser, Erin [BCCDC]; Kerwin, Oona [FH]; Henry, Bonnie [EXT]; Galanis, Eleni [BCCDC]; Brodkin, Elizabeth Dr. [FH]; Tyler, Ingrid [FH]
Cc: Yeong, Siu-Kae [BCCDC]; Chan, Elaine [BCCDC]; Parker, Robert Dr.
Subject: cluster of cases at mink farm

Hi all,

I wanted to alert you we have found a cluster of 4 Covid-19 cases in mink farm workers in Chilliwack. Case and contact investigation is ongoing, but the earliest symptom onset date is Nov 28 for 3 of the cases (missing data on 1) indicating that introduction was likely an incubation period earlier at least, or a common family exposure.

It appears there are a total of 9 employees, including 4 temporary foreign workers. All of the remaining employees are symptomatic and have gone for testing. One works at a chicken farm as well and we will be assessing whether there has been exposure there tomorrow.

For my BCCDC colleagues, we will want to start WGS very quickly on these cases – can you assist?

We probably need some rapid discussions on what animal surveillance is now required at this farm. Fraser Health would also appreciate working together on inspections as our inspectors will need to get up to speed on biosecurity and obviously are not the experts in these farms' operations.

Dr. Rob Parker will be covering for me tomorrow.

Regards,
Emily

FW: Mink farm workers: notes from Dec 4, 4pm

From: Clair, Veronic [BCCDC] <veronic.clair@bccdc.ca>

To: Choquette, Blair [FH] <Blair.Choquette@fraserhealth.ca>, Brian.radke@gov.bc.ca [EXT] <Brian.radke@gov.bc.ca>, Fraser, Erin [BCCDC] <Erin.Fraser@bccdc.ca>, Gunvaldsen, Rayna AGRI:EX <Rayna.Gunvaldsen@gov.bc.ca>, Millard, Timothy [FH] <Timothy.Millard@fraserhealth.ca>, Tyler, Ingrid [FH] <ingrid.tyler@fraserhealth.ca>, Kerwin, Oona [FH] <Oona.Kerwin@fraserhealth.ca>, Parker, Robert Dr. <robert.parker@fraserhealth.ca>, Deo, Hermandeep [FH] <Hermandeep.Deo@fraserhealth.ca>, Pasco, Doug WCB:EX <Doug.Pasco@worksafebc.com>, Coombe, Michelle AGRI:EX [EXT] <Michelle.Coombe@gov.bc.ca>, rosebelle.mcdonald@worksafebc.com, Sekirov, Inna [BCCDC] <inna.sekirov@bccdc.ca>, Chan, Elaine [BCCDC] <elaine.chan@bccdc.ca>, Skowronski, Danuta [BCCDC] <Danuta.Skowronski@bccdc.ca>, Wong, Jason [BCCDC] <Jason.Wong@bccdc.ca>, sterloff, trish [BCCDC] <trish.sterloff@gov.bc.ca>, Corneil, Trevor [BCCDC] <trevor.corneil@bccdc.ca>, Gill, Gurpreet [FH] <Gurpreet.Gill@fraserhealth.ca>, McDonald, Rose <Rose.McDonald@worksafebc.com>, Radke, Brian AFF:EX, Gunvaldsen, Rayna AFF:EX, Tyler, Ingrid Dr. HLTH:IN, Coombe, Michelle AFF:EX, 'rosebelle.mcdonald@worksafebc.com', Sterloff, Trish HLTH:EX, McDonald, Rosebelle WCB:EX

Sent: December 4, 2020 6:05:03 PM PST

Received: December 4, 2020 6:05:11 PM PST

Hi all,
Here are the updated, still draft, notes from the call. Please amend as needed.
Thank you all again so much for all the work!

And can someone let me know who Mike Nielsen? He was on the call, from the list of participants, but I am not sure which organization he is with, and I don't seem to have his email to check that. Thanks

Veronic

Topic	Discussion	Action	Updates from Dec 4th 4pm meeting	New actions: 4pm Dec 4th meeting
History	5 COVID-19 cases in mink farm workers in Chilliwack. Earliest symptom onset was Nov28 for 3 of the cases indicating introduction was "likely and incubation period earlier at least, or a common family		s.3	

	exposure"	s.3		
	s.3			
Notification	PHO, Min of Health, Min of Ag, WorkSafe, BCCDC have all been informed and are involved in response.			Rayna to draft letter for BC mink producers. Purpose: inform that individuals associated with a BC mink farm have tested positive and to share latest recommendations on biosecurity (document from CFIA, with specific recommendation of what we recommend in BC) Draft to be shared with group for comment, there are pros and cons of doing such a letter. Rayna will inform Bonnie and Fraser Health before letter is distributed to producers, if letters is decided

				to be circulated Need to inform MoE and FLNORD if mink test positive.
Lab investigation - human	Whole genome sequencing (WGS) of virus from human cases	Inna Sekirov to lead WGS at PH lab.	Fraser Health to provide PHN and demographic info on sequencing request form for the workers who have gone for testing already	Herman Deo (FH) to send to demographic info/sequencing request to Inna at BCCDC PHL
	additional PCR testing of farm workers and their contacts More rapid results, and easier to track samples will be obtained if samples send directly to BC CDC for testing and WGS.	Fraser Health will coordinate as needed, would be helpful to have Veronic Clair's billing number on the rec for tracking. BC CDC to send pre-populated req for in the future	All symptomatic individuals associated with the farm were informed to get tested and most, if not all, have already done so. Req were sent to FH with VC billing number and instructions to send samples to the BC CDC lab directly; for future testing	To use the new pre-populated req for future testing, even if sending workers to testing sites.
	Serology: BCCDC to lead serological testing.	Veronic Clair as ordering physician on requisition Fraser Health and BC CDC to determine if best to have someone from BC CDC, or Fraser sent to collect the samples, or to send people to LifeLab and instruct Lifelabs to forward serology	s.13 Fraser Health doesn't have capacity to send nurses. Logistics of collecting sera. If needed at this point, Individuals need to transport themselves to private lab/testing sites with precautions. Purpose of serological testing:	Hold off on serology decision until next week

		samples to BCCDC PHL	s.13	
Lab investigation - animal	Urgent testing of mink mortalities. Animal Health Centre (AHC) lab will conduct testing with confirmatory testing at the National Foreign Animal disease lab in Winnipeg.	Rayna G to communicate with producer to request submissions or collect samples as needed Testing to be performed at AHC for virology Samples to be sent to BC CDC lab for WGS	Assess whether this is first or second generation Samples from 5 minks being tested tonight by animal lab If positive: -samples need to be sent to NCFAD for confirmation -duplicate sample collected, one for local animal lab and one for confirmatory testing to NCFAD To do WGS, BC CDC can use the swabs and do not need the pcr extract, even after pcr extract done	Rayna to report results tonight (Dec 4) Group will meet tomorrow morning (Dec5) if mink results are positive, at 10, otherwise Monday am MAGRI to investigate if possible to send samples to BC CDC with the current batch or if will need to do it prospectively
	s.13		s.13	
Field investigation - human	Fraser health nurses were interviewing cases this morning (Dec 4)	Veronic to resend PHAC case investigation form for COVID-19 in mink workers - done		Erin to send the form to MAGRI, to make sure they know which one that is. MAGRI to assess if has the info they need and though might be collected with perhaps a different form.

s.13 s.3

Separate meeting planned for 12.30 on Dec 4 MAGRI, FH, WS

No mink have tested positive in BC or Canada. But no active surveillance has yet been conducted.

s.13

Rayna G will also ask about increase in mortalities or presence of clinical signs compatible with SARS-Cov-2

Field investigation - mink farm

s.13

	truly needs to be conducted urgently).	
Measures on other farms	To discuss plan for that in subsequent meeting	Communication to all BC producers is being discussed as mentioned above

Dr. Veronic Clair, MD, MSc, CCFP, FRCPC, PhD
Physician Epidemiologist
BC Centre for Disease Control
veronic.clair@bccdc.ca

I respectfully acknowledge that I live and work on the unceded territory of the xʷməθkwəy̓əm, Skwxwú7mesh, Stó:lō and Səl̓ílwətaʔ/Selilwitulh Nations.

mink results

From:	Gunvaldsen, Rayna AGRI:EX <Rayna.Gunvaldsen@gov.bc.ca>, Gunvaldsen, Rayna AFF:EX <Rayna.Gunvaldsen@gov.bc.ca>
To:	Sterloff, Trish HLTH:EX <Trish.Sterloff@gov.bc.ca>, Clair, Veronic [BCCDC] <veronic.clair@bccdc.ca>
Cc:	Choquette, Blair [FH] <Blair.Choquette@fraserhealth.ca>, Radke, Brian AGRI:EX <Brian.Radke@gov.bc.ca>, Fraser, Erin [BCCDC] <Erin.Fraser@bccdc.ca>, Millard, Timothy [FH] <Timothy.Millard@fraserhealth.ca>, Tyler, Ingrid Dr. HLTH:IN <ingrid.tyler@fraserhealth.ca>, Kerwin, Oona [FH] <Oona.Kerwin@fraserhealth.ca>, Parker, Robert Dr. <robert.parker@fraserhealth.ca>, Deo, Hermandeep [FH] <Hermandeep.Deo@fraserhealth.ca>, Pasco, Doug WCB:EX <Doug.Pasco@worksafebc.com>, Coombe, Michelle AGRI:EX <Michelle.Coombe@gov.bc.ca>, rosebelle.mcdonald@worksafebc.com, Sekirov, Inna [BCCDC] <inna.sekirov@bccdc.ca>, Chan, Elaine [BCCDC] <elaine.chan@bccdc.ca>, Skowronski, Danuta [BCCDC] <Danuta.Skowronski@bccdc.ca>, Wong, Jason [BCCDC] <Jason.Wong@bccdc.ca>, Corneil, Trevor [BCCDC] <trevor.corneil@bccdc.ca>, Gill, Gurpreet [FH] <Gurpreet.Gill@fraserhealth.ca>, McDonald, Rosebelle WCB:EX <Rose.McDonald@worksafebc.com>, Radke, Brian AFF:EX, Coombe, Michelle AFF:EX
Sent:	December 4, 2020 9:01:45 PM PST
Received:	December 4, 2020 9:01:46 PM PST

Good evening everyone,

PCR testing for SARS-CoV-2 was performed on 5 swabs from mink mortalities submitted from the farm this afternoon.

4/5 tested non-negative

Samples will be sent to the national lab for confirmation on Monday.
I spoke with the producer and placed a verbal quarantine on the premises.

I hope I included everyone, please let me know if anyone was missed with this notification.

Thank you,
Rayna

Rayna E. Gunvaldsen BSA DVM MSc
Chief Veterinarian
Animal Welfare and Dairy Program Veterinarian
BC Ministry of Agriculture, Food, and Fisheries

RE: mink results

s.15

From:	Pasco, Doug <Doug.Pasco@worksafebc.com>, Pasco, Doug WCB:EX <Doug.Pasco@worksafebc.com>
To:	Clair, Veronic [BCCDC] <veronic.clair@bccdc.ca>, Skowronski, Danuta [BCCDC] <Danuta.Skowronski@bccdc.ca>, Gunvaldsen, Rayna AGRI:EX <Rayna.Gunvaldsen@gov.bc.ca>, sterloff, trish [BCCDC] <trish.sterloff@gov.bc.ca>, Choquette, Blair [FH] <Blair.Choquette@fraserhealth.ca>, Brian.radke@gov.bc.ca [EXT] <Brian.radke@gov.bc.ca>, Fraser, Erin [BCCDC] <Erin.Fraser@bccdc.ca>, Millard, Timothy [FH] <Timothy.Millard@fraserhealth.ca>, Tyler, Ingrid [FH] <ingrid.tyler@fraserhealth.ca>, Kerwin, Oona [FH] <Oona.Kerwin@fraserhealth.ca>, Parker, Robert Dr. <robert.parker@fraserhealth.ca>, Deo, Hermandeep [FH] <Hermandeep.Deo@fraserhealth.ca>, Coombe, Michelle AGRI:EX [EXT] <Michelle.Coombe@gov.bc.ca>, Sekirov, Inna [BCCDC] <inna.sekirov@bccdc.ca>, Chan, Elaine [BCCDC] <elaine.chan@bccdc.ca>, Wong, Jason [BCCDC] <Jason.Wong@bccdc.ca>, Gill, Gurpreet [FH] <Gurpreet.Gill@fraserhealth.ca>, McDonald, Rose <Rose.McDonald@worksafebc.com>, Nielsen, Mike <Mike.Nielsen@worksafebc.com>, Wilkinson, Victoria [FH] <Victoria.Wilkinson2@fraserhealth.ca>, Loadman, Susan [FH] <Susan.Loadman@fraserhealth.ca>, Gunvaldsen, Rayna AFF:EX, Sterloff, Trish HLTH:EX, Radke, Brian AFF:EX, Tyler, Ingrid Dr. HLTH:IN, Coombe, Michelle AFF:EX, McDonald, Rosebelle WCB:EX, Nielsen, Mike WCB:EX
Cc:	Masse, Jessica [FH] <Jessica.Masse@fraserhealth.ca>
Sent:	December 5, 2020 8:57:32 AM PST
Received:	December 5, 2020 8:57:37 AM PST

Hi Veronic,

We had our officer make contact with the farmer in an attempt to get him to hold off on feeding until we learned more later this morning.

The farmer was on the farm [s.22] The farmer advised he will stop feeding now and return to self-isolation at home.

Doug

From: Clair, Veronic [BCCDC] [mailto:veronic.clair@bccdc.ca]
Sent: Saturday, December 05, 2020 7:16 AM
To: Skowronski, Danuta [BCCDC] <Danuta.Skowronski@bccdc.ca>; Gunvaldsen, Rayna AGRI:EX <Rayna.Gunvaldsen@gov.bc.ca>; sterloff, trish [BCCDC] <trish.sterloff@gov.bc.ca>; Choquette, Blair [FH] <Blair.Choquette@fraserhealth.ca>; Brian.radke@gov.bc.ca [EXT] <Brian.radke@gov.bc.ca>; Fraser, Erin [BCCDC] <Erin.Fraser@bccdc.ca>; Millard, Timothy [FH] <Timothy.Millard@fraserhealth.ca>; Tyler, Ingrid [FH] <ingrid.tyler@fraserhealth.ca>; Kerwin, Oona [FH] <Oona.Kerwin@fraserhealth.ca>; Parker, Robert Dr. <robert.parker@fraserhealth.ca>; Deo, Hermandeep [FH] <Hermandeep.Deo@fraserhealth.ca>; Pasco, Doug <Doug.Pasco@worksafebc.com>; Coombe, Michelle AGRI:EX [EXT] <Michelle.Coombe@gov.bc.ca>; Sekirov, Inna [BCCDC] <inna.sekirov@bccdc.ca>; Chan, Elaine [BCCDC] <elaine.chan@bccdc.ca>; Wong, Jason [BCCDC] <Jason.Wong@bccdc.ca>; Gill, Gurpreet [FH] <Gurpreet.Gill@fraserhealth.ca>; McDonald, Rose <Rose.McDonald@worksafebc.com>; Nielsen, Mike <Mike.Nielsen@worksafebc.com>; Wilkinson, Victoria [FH] <Victoria.Wilkinson2@fraserhealth.ca>; Loadman, Susan [FH] <Susan.Loadman@fraserhealth.ca>

Cc: Masse, Jessica [FH] <Jessica.Masse@fraserhealth.ca>
Subject: Re: mink results https://phsa.zoom.us/j/63296600411?pwd=NHpBejVwSGgrbEtRazQyNGNqOFBKZz09

WARNING: This email originated from outside of our organization. Do not click any links or open attachments unless you trust the sender and know the content is safe.

Hi,
In light of the non-negative results, is there a need to reach out to the farm operator to ensure the person going to feed the animal today will use appropriate PPE?
I am pasting below the extract of the outbreak precaution from the PHAC/FIA guidelines
It might be very difficult to get a properly fitted respirator for that person today. If so, should we at least ensure that person does not go on the premise without a medical mask and staying away from the mink (I am not sure if 2 meters is possible) and ensure that this person is not one with high risk factors for severe illness from COVID (no above 60 - a bit arbitrary; no other chronic conditions or risk factor putting him/her at risk such as cardiovascular disease, COPD, diabetes, obesity, cancer, smoking, or immunosupressive drug)?

Should we ask that the animal not be fed until we have our call to discuss further?

Veronic

From the outbreak section:
· Review biosecurity measures and make improvements, when possible. These may include, but are not limited to:
ü Fencing/containment and preventing escapees.
ü Cleaning and disinfection protocols, using approved products.
ü Manure and mortality management to prevent inadvertent exposure to other animals (feral, wild, domestic).
ü Pest control and preventing exposure to other animals on the premises (e.g. cats, dogs).
· Ensure adequately fitted PPE for all persons working around the animals and train personnel on the proper use of PPE. Those at higher risk for severe COVID-19 illness should not work around infected animals. The number of people interacting with these animals should be kept to a minimum. Staff that must have contact with these animals should wear gloves, eye protection (e.g. goggles, face shield) and respiratory protection (e.g. N95 respirator or equivalent) instead of a facemask. When respirators are used to protect users from hazardous exposures such as the virus that causes COVID-19 a respiratory protection program which includes components such as medical screening, fit-testing and training and education should be developed. The Canadian Standards Association has developed CAN/CSA Z94.4-18 on selection, use and care of respirators. Appendix E contains some resources on respiratory protection program.

From the biosecurity requirement otherwise even without an outbreak:

- Promoting and facilitating personal preventative practices through:
    - Use of dedicated outer clothing and footwear when working on the farm.
        - Clean and disinfect footwear using approved products, before and after entering mink sheds and pelting areas.
        - Launder farm clothing daily. If outerwear cannot be laundered onsite, it should be placed in a closed bag or container for transport and handled as potentially contaminated material. Items should be routinely laundered and hot-air dried. Public laundry facilities should not be used.

· To prevent transmission of virus, the following Personal Protective Equipment are recommended for all people working on the mink farm, even with no known exposure to COVID-19 or any symptoms:
o Gloves
o Eye protection (goggles, face shield)
o Mask:
§ If available, adequately fitted respiratory* protection (N95 respirator or equivalent).
§ If a respirator is not available, a medical mask should be worn.
§ If that is not available, a 3-layer non-medical mask should be worn. People who are at high risk of more severe illness should not work on the farms.

From: Clair, Veronic [BCCDC]
Sent: December 4, 2020 11:01 PM
To: Skowronski, Danuta [BCCDC]; Gunvaldsen, Rayna AGRI:EX; sterloff, trish [BCCDC]; Choquette, Blair [FH]; Brian.radke@gov.bc.ca [EXT]; Fraser, Erin [BCCDC]; Millard, Timothy [FH]; Tyler, Ingrid [FH]; Kerwin, Oona [FH]; Parker, Robert Dr.; Deo, Hermandeep [FH]; Pasco, Doug WCB:EX; Coombe, Michelle AGRI:EX [EXT]; Sekirov, Inna [BCCDC]; Chan, Elaine [BCCDC]; Wong, Jason [BCCDC]; Gill, Gurpreet [FH]; McDonald, Rosebelle WCB:EX; mike.nielsen@worksafebc.com; Wilkinson, Victoria [FH]; Loadman, Susan [FH]
Cc: Corneil, Trevor [BCCDC]; Gustafson, Reka [BCCDC]; Henry, Bonnie [EXT]; Masse, Jessica [FH]
Subject: Re: mink results https://phsa.zoom.us/j/63296600411?pwd=NHpBejVwSGgrbEtRazQyNGNqOFBKZz09

Hi,
in light of the non-negative results on 4/5 minks I am sending this invitation for a Saturday 10 am conference call.

Non-negative = virus found in local BC animal lab, but because the test needs to be repeated by the national lab, it can't be declared positive.

Veronic
(as sending from home, it is not letting me do it as a calendar invite, for some reason, sorry about that)

Hello,
You are invited to a Zoom Virtual Health Visit.

Join the Virtual Health Visit
s.15; s.17
Meeting ID: s.15; s.17
Password: s.15;
Can't join by computer or mobile device? Join by telephone:
s.15; s.17 (Toll-free)

From: Skowronski, Danuta [BCCDC]
Sent: December 4, 2020 9:20 PM
To: Gunvaldsen, Rayna AGRI:EX
Cc: sterloff, trish [BCCDC]; Clair, Veronic [BCCDC]; Choquette, Blair [FH]; Brian.radke@gov.bc.ca [EXT]; Fraser, Erin [BCCDC]; Millard, Timothy [FH]; Tyler, Ingrid [FH]; Kerwin, Oona [FH]; Parker, Robert Dr.; Deo, Hermandeep [FH]; Pasco, Doug WCB:EX; Coombe, Michelle AGRI:EX [EXT]; rosebelle.mcdonald@worksafebc.com; Sekirov, Inna [BCCDC]; Chan, Elaine [BCCDC]; Wong, Jason [BCCDC]; Corneil, Trevor [BCCDC]; Gill, Gurpreet [FH]; McDonald,

Rosebelle WCB:EX; Gustafson, Reka [BCCDC]; Henry, Bonnie [EXT]
Subject: Re: mink results

Many thanks -

We should proceed with the 10AM t/c tomorrow. Has a zoom link been shared? Veronic will you host that?

I have added Reka and Bonnie to this distribution list. Ingrid and other FHA colleagues you will inform Elizabeth and others as needed?

Best wishes,
Danuta Skowronski MD, FRCPC
Epidemiology Lead, Influenza & Emerging Respiratory Pathogens
BC Centre for Disease Control
Ph: 604-707-2511

> On Dec 4, 2020, at 9:01 PM, Gunvaldsen, Rayna AGRI:EX <Rayna.Gunvaldsen@gov.bc.ca> wrote:
>
> EXTERNAL SENDER. If you suspect this message is malicious, please forward to spam@phsa.ca and do not open attachments or click on links.
> ---
>
>
> Good evening everyone,
>
> PCR testing for SARS-CoV-2 was performed on 5 swabs from mink mortalities submitted from the farm this afternoon.
>
> 4/5 tested non-negative
>
> Samples will be sent to the national lab for confirmation on Monday.
> I spoke with the producer and placed a verbal quarantine on the premises.
>
> I hope I included everyone, please let me know if anyone was missed with this notification.
>
> Thank you,
> Rayna
>
> Rayna E. Gunvaldsen BSA DVM MSc
> Chief Veterinarian
> Animal Welfare and Dairy Program Veterinarian
> BC Ministry of Agriculture, Food, and Fisheries

Re: Follow-up on Mink Farm

From:	Clair, Veronic [BCCDC] <veronic.clair@bccdc.ca>
To:	Wong, Jason [BCCDC] <Jason.Wong@bccdc.ca>, Skowronski, Danuta [BCCDC] <Danuta.Skowronski@bccdc.ca>, Gunvaldsen, Rayna AGRI:EX <Rayna.Gunvaldsen@gov.bc.ca>, sterloff, trish [BCCDC] <trish.sterloff@gov.bc.ca>, Choquette, Blair [FH] <Blair.Choquette@fraserhealth.ca>, Brian.radke@gov.bc.ca [EXT] <Brian.radke@gov.bc.ca>, Fraser, Erin [BCCDC] <Erin.Fraser@bccdc.ca>, Millard, Timothy [FH] <Timothy.Millard@fraserhealth.ca>, Tyler, Ingrid [FH] <ingrid.tyler@fraserhealth.ca>, Kerwin, Oona [FH] <Oona.Kerwin@fraserhealth.ca>, Parker, Robert Dr. <robert.parker@fraserhealth.ca>, Deo, Hermandeep [FH] <Hermandeep.Deo@fraserhealth.ca>, Pasco, Doug WCB:EX <Doug.Pasco@worksafebc.com>, Coombe, Michelle AGRI:EX [EXT] <Michelle.Coombe@gov.bc.ca>, Sekirov, Inna [BCCDC] <inna.sekirov@bccdc.ca>, Chan, Elaine [BCCDC] <elaine.chan@bccdc.ca>, Gill, Gurpreet [FH] <Gurpreet.Gill@fraserhealth.ca>, McDonald, Rosebelle WCB:EX <Rose.McDonald@worksafebc.com>, mike.nielsen@worksafebc.com, Wilkinson, Victoria [FH] <Victoria.Wilkinson2@fraserhealth.ca>, Loadman, Susan [FH] <Susan.Loadman@fraserhealth.ca>, Corneil, Trevor [BCCDC] <trevor.corneil@bccdc.ca>, Gustafson, Reka [BCCDC] <reka.gustafson@phsa.ca>, Henry, Bonnie [EXT] <bonnie.henry@gov.bc.ca>, Masse, Jessica [FH] <Jessica.Masse@fraserhealth.ca>, Krajden, Mel [BCCDC] <Mel.Krajden@bccdc.ca>, Yeong, Siu-Kae [BCCDC] <Siu-Kae.Yeong@bccdc.ca>, Gunvaldsen, Rayna AFF:EX, Sterloff, Trish HLTH:EX, Radke, Brian AFF:EX, Tyler, Ingrid Dr. HLTH:IN, Coombe, Michelle AFF:EX, Nielsen, Mike WCB:EX, Henry, Bonnie HLTH:EX, XT:Krajden, Mel HLTH:IN
Sent:	December 5, 2020 7:55:46 PM PST
Received:	December 5, 2020 7:55:56 PM PST
Attachments:	MinkOutbreakMinutes dec 5 pm.docx

Good evening,
please find attached draft minutes, sligh modification in format compared to prior. Thanks Siu-Kae for drafting.
Best,
Veronic

From: Wong, Jason [BCCDC]
Sent: December 5, 2020 11:37 AM
To: Wong, Jason [BCCDC]; Clair, Veronic [BCCDC]; Skowronski, Danuta [BCCDC]; Gunvaldsen, Rayna AGRI:EX; sterloff, trish [BCCDC]; Choquette, Blair [FH]; Brian.radke@gov.bc.ca [EXT]; Fraser, Erin [BCCDC]; Millard, Timothy [FH]; Tyler, Ingrid [FH]; Kerwin, Oona [FH]; Parker, Robert Dr.; Deo, Hermandeep [FH]; Pasco, Doug WCB:EX; Coombe, Michelle AGRI:EX [EXT]; Sekirov, Inna [BCCDC]; Chan, Elaine [BCCDC]; Gill, Gurpreet [FH]; McDonald, Rosebelle WCB:EX; mike.nielsen@worksafebc.com; Wilkinson, Victoria [FH]; Loadman, Susan [FH]; Corneil, Trevor [BCCDC]; Gustafson, Reka [BCCDC]; Henry, Bonnie [EXT]; Masse, Jessica [FH]; Krajden, Mel [BCCDC]
Subject: Follow-up on Mink Farm
When: December 5, 2020 4:30 PM-5:30 PM.
Where: Zoom

Hello,

You are invited to a Zoom Virtual Health Visit.
Time: Dec 5, 2020 04:30 PM Pacific Time (US and Canada)
Topic: Follow-up on Mink Farm

Join the Virtual Health Visit
s.15; s.17

Meeting ID s.15; s.17
Password: s.15;

Can't join by computer or mobile device? Join by telephone:

s.15; s.17 Toll-free)

- Visit our online instructions on how to get started with Virtual Health Visits using Zoom: http://www.phsa.ca/health-professionals/professional-resources/office-of-virtual-health/covid-19-virtual-health-toolkit/zoom-for-healthcare/patient-resources

- If you encounter any problems connecting to your Virtual Health Visit, you can call the helpdesk at 1-844-442-4433 (Toll-free) for support. Interpreting services can be requested during your call.

NOTE: This invitation should not be shared with others. It contains a unique link created for you.

Discussion/action Dec 4th am	Updates from Dec 4th 4pm meeting	Updates 430pm Dec 5th meeting
FH outbreak investigation, case and contact management 5 COVID-19 cases in mink farm workers in Chilliwack. Earliest symptom onset was Nov28 for 3 of the cases indicating introduction was "likely and incubation period earlier at least, or a common family exposure"	s.3	s.3
s.3		
Fraser health nurses were interviewing cases this morning (Dec 4) Higher probability that cases were exposed in community and not by mink. Testing of minks and WGS will inform this assessment **Veronic to resend PHAC case investigation form for COVID-19 in mink workers – done** Need for environmental exposure assessment on farm by EHO in collaboration with WorkSafe BC and Min of Ag. Advice needed on appropriate biosafety measures for EHOs and other that visit farm both to protect themselves as well as the mink	s.3 **Erin to send the form to MAGRI, to make sure they know which one that is.** **MAGRI to assess if has the info they need and though might be collected with perhaps a different form.**	**FHA will communicate with site about isolation dates TBD due to rolling exposure and uncertain WGS strains. Workers cannot travel until isolation date if finished as determined by FHA.** **Follow up meeting with everyone for updates on Monday Dec 7, 2020.** s.3 Surgical masks being worn.

Discussion/action Dec 4th am	Updates from Dec 4th 4pm meeting	Updates 430pm Dec 5th meeting
Separate meeting planned for 12.30 on Dec 4 MAGRI, FH, WS	s.13; s.3	**Respirators, N95 or equivalent to be used for all activities where minks are located.**
s.13; s.3		
		s.3
		MAGRI will lead about what activities are considered absolutely essential, and WorkSafe will determine how this can be done safely with appropriate PPE, and bring concerns back to this group as appropriate
Rayna G to speak with producer to discuss animal management contingencies and other related concerns (ie stage of pelting, and recommend to stop work other than work that truly needs to be conducted urgently).		
Notification and communication PHO, Min of Health, Min of Ag, WorkSafe, BCCDC have all been informed and are involved in response.	s.3	Information to be shared tomorrow pm or later to the public. There has been a decision to not share the name of the affected farm.

Discussion/action Dec 4th am	Updates from Dec 4th 4pm meeting	Updates 430pm Dec 5th meeting
	s.3	**Actions:** **1. FH communication drafting public communication for public dissemination similar to outbreak bulleting with high level information; to be circulated for comments as soon as feasible** **2. FH draft public communication to be reviewed by PHSA, BCCDC, Ministry of Agriculture, Ministry of Health, feedback expected back to FH in early pm.** **3. Erin will draft a letter for mink farms, by tomorrow morning. All mink farms need to be informed and reminded about biosafety protocol and proposal of human surveillance, as well as informed with similar info as will go in public communication -by end of morning** **4. All parties: Review of letter by 3pm, send feedback back to Erin and Veronic.** **5. No communication out before coordination of notification organized for industry and public notification in very similar timeframe** **6. Ministry of Agriculture plans to communicate with the farms, about questions to be clarified, animal health, and animal surveillance further needed.** **7. Mike and Doug will put together a list of mink farm locations and number of workers and send to BCCDC Dr. Veronic Clair; to facilitate planning of human**
	MAGRI notified CFIA **Rayna to draft letter for BC mink producers. Purpose: inform that individuals associated with a BC mink farm have tested positive and to share latest recommendations on biosecurity (document from CFIA, with specific recommendation of what we recommend in BC)** **Draft to be shared with group for comment, there are pros and cons of doing such a letter.** **Rayna will inform Bonnie and Fraser Health before letter is distributed to producers, if letters is decided to be circulated**	

Discussion/action Dec 4th am	Updates from Dec 4th 4pm meeting	Updates 430pm Dec 5th meeting
		surveillance and communication with farms
Outbreak Lab investigation - human Whole genome sequencing (WGS) of virus from human cases **Inna Sekirov to lead WGS at PH lab.** Additional PCR testing of farm workers and their contacts More rapid results, and easier to track samples will be obtained if samples send directly to BC CDC for testing and WGS. **Fraser Health will coordinate as needed** Veronic Clair's billing number on the rec for tracking. **BC CDC to send pre-populated req for in the future**	Fraser Health to provide PHN and demographic info on sequencing request form for the workers who have gone for testing already **Herman Deo (FH) to send to demographic info/sequencing request to Inna at BCCDC PHL** All symptomatic individuals associated with the farm were informed to get tested and most, if not all, have already done so. Req were sent to FH with VC billing number and instructions to send samples to the BC CDC lab directly, for future testing **To use the new pre-populated req for future testing, even if sending workers to testing sites.**	WGS of humans samples already at BC CDC likely available by week of the 14th, animal soon after, as human sequencing will be prioritized; to sequence other samples as received and as needed **BC CDC lab will notify others about new human test results and WGS results**
Serology: BCCDC to lead serological testing related to outbreak **Veronic Clair as ordering physician on requisition** **Fraser Health and BC CDC to determine if best to have someone from BC CDC, or Fraser sent to collect the samples, or to send people to LifeLab and instruct Lifelabs to forward serology samples to BCCDC PHL**	s.13 Fraser Health doesn't have capacity to send nurses. Logistics of collecting sera. If needed at this point, Individuals need to transport themselves to private lab/testing sites with precautions. s.13	

Discussion/action Dec 4th am	Updates from Dec 4th 4pm meeting	Updates 430pm Dec 5th meeting
	Assess whether this is first or second generation **Hold off on serology decision related to outbreak farm until next week**	
OB Lab investigation - animal Urgent testing of mink mortalities. Animal Health Centre (AHC) lab will conduct testing with confirmatory testing at the National Foreign Animal disease lab in Winnipeg. **Rayna G to communicate with producer to request submissions or collect samples as needed** **Testing to be performed at AHC for virology** **Samples to be sent to BC CDC lab for WGS** s.13	Samples from 5 minks being tested tonight by animal lab If positive: -samples need to be sent to NCFAD for confirmation -duplicate sample collected, one for local animal lab and one for confirmatory testing to NCFAD To do WGS, BC CDC can use the swabs and do not need the pcr extract, even after pcr extract done s.13 **Rayna to report results tonight (Dec 4)** **Group will meet tomorrow morning (Dec5) if mink results are positive, at 10, otherwise Monday am** **MAGRI to investigate if possible to send samples to BC CDC with the current batch or if will need to do it prospectively**	Awaiting positive confirmation by national lab. No public or other notification from MAGRI until that occurs; acting on the basis of suspect case at the moment (with non-negative results); implication for mink industry and exports country wide **MAGRI and BCCDC lab will connect offline about all the testing confirmation.**
Farm field investigation and management No mink have tested positive in BC or Canada. But no active surveillance has yet been conducted. s.13 s.13	s.3	Goal to assess genetic variation in mink acquired SARS-CoV-2, now and during the course of the outbreak, as could mutate during the course of the oubreak **MAGRI to continue collect mortality samples for WGS and discuss with BC CDC lab further about extend of animal related viral sampling to assess mutations sufficiently**

Discussion/action Dec 4th am Rayna G will also ask about increase in mortalities or presence of clinical signs compatible with SARS-Cov-2	Updates from Dec 4th 4pm meeting s.13; s.3	Updates 430pm Dec 5th meeting **MAGRI to ask where the mortality samples collected originated from in term of geographical locations (all same area or different far apart ones)** Oregon is managing an outbreak with positive minks started 10 days ago, considering allowing pelting if 3 samples collected at least a week to two weeks apart are negative **MAGRI and others will research more about management of such outbreaks in jurisdiction where they have not culled the minks.** **MAGRI, BCCDC and WorkSafe will meet for a preliminary discussion related to which circumstances, if any, under which safe resuming of pelting could occur, and time pressure related to that.**
	Remaining questions: **-composting of carcasses - time to virus inactivation?** **-when did pelting start on farm?** **-risk to/from any domestic or feral cats on the farm?** **-wildlife considerations?** **Inform MoE and FLNORD if mink test positive.** **They are planning wildlife surveillance for COVID to be added to regular other surveillance of wild animal in the GVA, including of wild minks**	

Discussion/action Dec 4th am	Updates from Dec 4th 4pm meeting	Updates 430pm Dec 5th meeting
Measures on other farms		s.13
To discuss communicating with them at a subsequent meeting, considering the urgency of dealing with the current outbreak **To discuss plan for that in subsequent meeting**	Communication to all BC producers is being discussed as mentioned above	**BCCDC and FHA will work out logistics for human surveillance program of other farms.** **BCCDC and FHA will meet to plan human surveillance for other farms.** **MAGRI will continue planning for animal surveillance on other farms**

Re: CCM update - CA mink

From:	Nielsen, Mike <Mike.Nielsen@worksafebc.com>, Nielsen, Mike WCB:EX <Mike.Nielsen@worksafebc.com>
To:	Tyler, Ingrid [FH] <ingrid.tyler@fraserhealth.ca>, Tyler, Ingrid Dr. HLTH:IN
Cc:	Clair, Veronic [BCCDC] <veronic.clair@bccdc.ca>, Wong, Jason [BCCDC] <Jason.Wong@bccdc.ca>, Skowronski, Danuta [BCCDC] <Danuta.Skowronski@bccdc.ca>, Gunvaldsen, Rayna AGRI:EX <Rayna.Gunvaldsen@gov.bc.ca>, sterloff, trish [BCCDC] <trish.sterloff@gov.bc.ca>, Choquette, Blair [FH] <Blair.Choquette@fraserhealth.ca>, Brian.radke@gov.bc.ca [EXT] <Brian.radke@gov.bc.ca>, Fraser, Erin [BCCDC] <Erin.Fraser@bccdc.ca>, Millard, Timothy [FH] <Timothy.Millard@fraserhealth.ca>, Kerwin, Oona [FH] <Oona.Kerwin@fraserhealth.ca>, Parker, Robert Dr. <robert.parker@fraserhealth.ca>, Deo, Hermandeep [FH] <Hermandeep.Deo@fraserhealth.ca>, Pasco, Doug <Doug.Pasco@worksafebc.com>, Coombe, Michelle AGRI:EX [EXT] <Michelle.Coombe@gov.bc.ca>, Sekirov, Inna [BCCDC] <inna.sekirov@bccdc.ca>, Chan, Elaine [BCCDC] <elaine.chan@bccdc.ca>, Gill, Gurpreet [FH] <Gurpreet.Gill@fraserhealth.ca>, McDonald, Rose <Rose.McDonald@worksafebc.com>, Wilkinson, Victoria [FH] <Victoria.Wilkinson2@fraserhealth.ca>, Loadman, Susan [FH] <Susan.Loadman@fraserhealth.ca>, Corneil, Trevor [BCCDC] <trevor.corneil@bccdc.ca>, Gustafson, Reka [BCCDC] <reka.gustafson@phsa.ca>, Henry, Bonnie [EXT] <bonnie.henry@gov.bc.ca>, Masse, Jessica [FH] <Jessica.Masse@fraserhealth.ca>, Krajden, Mel [BCCDC] <Mel.Krajden@bccdc.ca>, Yeong, Siu-Kae [BCCDC] <Siu-Kae.Yeong@bccdc.ca>, Gunvaldsen, Rayna AFF:EX, Sterloff, Trish HLTH:EX, Radke, Brian AFF:EX, Pasco, Doug WCB:EX, Coombe, Michelle AFF:EX, McDonald, Rosebelle WCB:EX, Henry, Bonnie HLTH:EX, XT:Krajden, Mel HLTH:IN
Sent:	December 6, 2020 1:23:46 PM PST
Received:	December 6, 2020 1:23:51 PM PST

We agreed to one worker. We just received part of their C19 safety plan and it also stated one worker.
s.22 we are following up NOW.

Mike Nielsen, RPF
Prevention Field Services Manager
WorkSafeBC
604-276-3100

On Dec 6, 2020, at 12:46 PM, Tyler, Ingrid [FH] <ingrid.tyler@fraserhealth.ca> wrote:

Hi there – I am writing with a brief update from the case and contact management (public health) this AM regarding this situation of common interest.

We have confirmed 1 additional positive case. This means that we now have 8/11 confirmed cases associated with this OB.

Of these cases 1/4 is a TFW. Two (2) additional TFW have returned indeterminate results, and we will epi link these and treat them as positive.
Of the 11 tests conducted on symptomatic employees, 1 was negative. As previously reported, all employees on the site were symptomatic.
All cases/contacts continue to isolating from each other and restricted to animal care activities on their property only.

In our case interviews this AM we learned that there are s.22 who are coughing and sneezing. These animals belong to one of the cases.
Erin, I am not sure what to make of this and hope you may weigh in on whether further information or management is needed.

We also learned that there are apparently 3 individuals caring for the animals this AM. All are reported to be wearing disposable overalls, respirators and gloves.
Mike, I wanted to make you aware that 3 individuals were caring for the animals. I think that as long as they are al distancing from each other and using appropriate PPE when interacting with the animals this is reasonable, but hoping to clarify that this is also in line with the advice provided to them yesterday by your team.

Looking forward to further discussions tomorrow.
Best, ingrid

Re: draft letter from public health to industry - feedback asap please, uncertain of timeline of release of FH bulletin, potentially at 2

From:	Sekirov, Inna [BCCDC] <inna.sekirov@bccdc.ca>
To:	Skowronski, Danuta [BCCDC] <Danuta.Skowronski@bccdc.ca>, Henry, Bonnie [EXT] <bonnie.henry@gov.bc.ca>, Clair, Veronic [BCCDC] <veronic.clair@bccdc.ca>, Wong, Jason [BCCDC] <Jason.Wong@bccdc.ca>, Gunvaldsen, Rayna AGRI:EX <Rayna.Gunvaldsen@gov.bc.ca>, sterloff, trish [BCCDC] <trish.sterloff@gov.bc.ca>, Choquette, Blair [FH] <Blair.Choquette@fraserhealth.ca>, Brian.radke@gov.bc.ca [EXT] <Brian.radke@gov.bc.ca>, Fraser, Erin [BCCDC] <Erin.Fraser@bccdc.ca>, Millard, Timothy [FH] <Timothy.Millard@fraserhealth.ca>, Tyler, Ingrid [FH] <ingrid.tyler@fraserhealth.ca>, Kerwin, Oona [FH] <Oona.Kerwin@fraserhealth.ca>, Parker, Robert Dr. <robert.parker@fraserhealth.ca>, Deo, Hermandeep [FH] <Hermandeep.Deo@fraserhealth.ca>, Pasco, Doug WCB:EX <Doug.Pasco@worksafebc.com>, Coombe, Michelle AGRI:EX [EXT] <Michelle.Coombe@gov.bc.ca>, Chan, Elaine [BCCDC] <elaine.chan@bccdc.ca>, Gill, Gurpreet [FH] <Gurpreet.Gill@fraserhealth.ca>, McDonald, Rosebelle WCB:EX <Rose.McDonald@worksafebc.com>, Nielsen, Mike WCB:EX <Mike.Nielsen@worksafebc.com>, Wilkinson, Victoria [FH] <Victoria.Wilkinson2@fraserhealth.ca>, Loadman, Susan [FH] <Susan.Loadman@fraserhealth.ca>, Corneil, Trevor [BCCDC] <trevor.corneil@bccdc.ca>, Gustafson, Reka [BCCDC] <reka.gustafson@phsa.ca>, Masse, Jessica [FH] <Jessica.Masse@fraserhealth.ca>, Krajden, Mel [BCCDC] <Mel.Krajden@bccdc.ca>, Yeong, Siu-Kae [BCCDC] <Siu-Kae.Yeong@bccdc.ca>, Henry, Bonnie HLTH:EX, Gunvaldsen, Rayna AFF:EX, Sterloff, Trish HLTH:EX, Radke, Brian AFF:EX, Tyler, Ingrid Dr. HLTH:IN, Coombe, Michelle AFF:EX, XT:Krajden, Mel HLTH:IN
Sent:	December 6, 2020 1:34:35 PM PST
Received:	December 6, 2020 1:34:52 PM PST
Attachments:	mink producer letter public health Dec 6 2020 (2)bh_IS.docx

I've added a few edits to Bonnie's version too.
I think it's great information in the document, but agree with Danuta that it might be better to separate some parts as an appendix, to make the main points easier to identify.
Also considering that the audience of this is the mink producers, I wonder if it's maybe a bit technical of a language. Should there be a more lay language short summary to describe the most key points? I've drafted a lay language summary, it's in the first comment. It would make the document even longer though...

From: Skowronski, Danuta [BCCDC]
Sent: Sunday, December 6, 2020 1:19 PM
To: Henry, Bonnie [EXT]; Clair, Veronic [BCCDC]; Wong, Jason [BCCDC]; Gunvaldsen, Rayna AGRI:EX; sterloff, trish [BCCDC]; Choquette, Blair [FH]; Brian.radke@gov.bc.ca [EXT]; Fraser, Erin [BCCDC]; Millard, Timothy [FH]; Tyler, Ingrid [FH]; Kerwin, Oona [FH]; Parker, Robert Dr.; Deo, Hermandeep [FH]; Pasco, Doug WCB:EX; Coombe, Michelle AGRI:EX [EXT]; Sekirov, Inna [BCCDC]; Chan, Elaine [BCCDC]; Gill, Gurpreet [FH]; McDonald, Rosebelle WCB:EX; Nielsen, Mike WCB:EX; Wilkinson, Victoria [FH]; Loadman, Susan [FH]; Corneil, Trevor [BCCDC]; Gustafson, Reka [BCCDC]; Masse, Jessica [FH]; Krajden, Mel [BCCDC]; Yeong, Siu-Kae [BCCDC]
Subject: RE: draft letter from public health to industry - feedback asap please, uncertain of timeline of release of FH bulletin, potentially at 2

Hi -

Thank you for pulling this together so quickly on a Sunday!

My suggested comments/edits in addition to Bonnie's in the attached.

Main comment: it is rather long. To get their attention consider moving the specific advice into an associated Appendix, keeping the main messages in the main letter which would ideally be a single page.

A tall order I know but it would mostly just be cutting and pasting into the Appendix and some suggestions attached.

Best wishes,
Danuta M. Skowronski MD, MHSc, FRCPC
Epidemiology Lead, Influenza & Emerging Respiratory Pathogens
BC Centre for Disease Control
Ph: 604-707-2511

From: Henry, Bonnie HLTH:EX [Bonnie.Henry@gov.bc.ca]
Sent: December 6, 2020 12:57 PM
To: Clair, Veronic [BCCDC]; Wong, Jason [BCCDC]; Skowronski, Danuta [BCCDC]; Gunvaldsen, Rayna AGRI:EX; sterloff, trish [BCCDC]; Choquette, Blair [FH]; Brian.radke@gov.bc.ca [EXT]; Fraser, Erin [BCCDC]; Millard, Timothy [FH]; Tyler, Ingrid [FH]; Kerwin, Oona [FH]; Parker, Robert Dr.; Deo, Hermandeep [FH]; Pasco, Doug WCB:EX; Coombe, Michelle AGRI:EX [EXT]; Sekirov, Inna [BCCDC]; Chan, Elaine [BCCDC]; Gill, Gurpreet [FH]; McDonald, Rosebelle WCB:EX; Nielsen, Mike WCB:EX; Wilkinson, Victoria [FH]; Loadman, Susan [FH]; Corneil, Trevor [BCCDC]; Gustafson, Reka [BCCDC]; Masse, Jessica [FH]; Krajden, Mel [BCCDC]; Yeong, Siu-Kae [BCCDC]; Chan, Elaine [BCCDC]
Subject: RE: draft letter from public health to industry - feedback asap please, uncertain of timeline of release of FH bulletin, potentially at 2

EXTERNAL SENDER. If you suspect this message is malicious, please forward to spam@phsa.ca and do not open attachments or click on links.

Some suggested edits in the attached.
Thanks,
Bonnie

Dr Bonnie Henry
Provincial Health Officer
Office of the PHO
Ministry of Health
4th floor, 1515 Blanshard St
Mailing address: PO Box 9648, STN PROV GOVT
Victoria, BC
V8W 9P4
Bonnie.henry@gov.bc.ca<mailto:Bonnie.henry@gov.bc.ca>

Phone: s.17; s.19

I gratefully acknowledge that I live and work on the traditional unceded territory of the Lekwungen Peoples, specifically the Songhees and Esquimalt First Nations. Hay'sxw'qu Si'em

From: Clair, Veronic [BCCDC] <veronic.clair@bccdc.ca>
Sent: December 6, 2020 12:29 PM
To: Wong, Jason [BCCDC] <Jason.Wong@bccdc.ca>; Skowronski, Danuta [BCCDC] <Danuta.Skowronski@bccdc.ca>; Gunvaldsen, Rayna AGRI:EX <Rayna.Gunvaldsen@gov.bc.ca>; Sterloff, Trish HLTH:EX <Trish.Sterloff@gov.bc.ca>; Choquette, Blair [FH] <Blair.Choquette@fraserhealth.ca>; Radke, Brian AGRI:EX <Brian.Radke@gov.bc.ca>; Fraser, Erin [BCCDC] <Erin.Fraser@bccdc.ca>; Millard, Timothy [FH] <Timothy.Millard@fraserhealth.ca>; Tyler, Ingrid Dr. HLTH:IN <ingrid.tyler@fraserhealth.ca>; Kerwin, Oona [FH] <Oona.Kerwin@fraserhealth.ca>; Parker, Robert Dr. <robert.parker@fraserhealth.ca>; Deo, Hermandeep [FH] <Hermandeep.Deo@fraserhealth.ca>; Pasco, Doug WCB:EX <Doug.Pasco@worksafebc.com>; Coombe, Michelle AGRI:EX <Michelle.Coombe@gov.bc.ca>; Sekirov, Inna [BCCDC] <inna.sekirov@bccdc.ca>; Chan, Elaine [BCCDC] <elaine.chan@bccdc.ca>; Gill, Gurpreet [FH] <Gurpreet.Gill@fraserhealth.ca>; McDonald, Rosebelle WCB:EX <Rose.McDonald@worksafebc.com>; Nielsen, Mike WCB:EX <Mike.Nielsen@worksafebc.com>; Wilkinson, Victoria [FH] <Victoria.Wilkinson2@fraserhealth.ca>; Loadman, Susan [FH] <Susan.Loadman@fraserhealth.ca>; Corneil, Trevor [BCCDC] <trevor.corneil@bccdc.ca>; Gustafson, Reka [BCCDC] <reka.gustafson@phsa.ca>; Henry, Bonnie HLTH:EX <Bonnie.Henry@gov.bc.ca>; Masse, Jessica [FH] <Jessica.Masse@fraserhealth.ca>; XT:Krajden, Mel HLTH:IN <mel.krajden@bccdc.ca>; Yeong, Siu-Kae [BCCDC] <Siu-Kae.Yeong@bccdc.ca>; Chan, Elaine [BCCDC] <elaine.chan@bccdc.ca>

Subject: draft letter from public health to industry - feedback asap please, uncertain of timeline of release of FH bulletin, potentially at 2

[EXTERNAL] This email came from an external source. Only open attachments or links that you are expecting from a known sender.

Hi,

as discussed yesterday, attached is a draft letter that could be sent to mink producers to recommend enhancing their COVID-19 safety plans taking into accound the recent recommendations, as well as WorkSafe requirement.

I would appreciate feedback ASAP, in the next hour if at all possible.

I am not sure if the intend to release the FH outbreak bulletin at 2 still stands or not. But if it still stands, it does not leave us much time to finalize that letter for the industry to receive it at the same time as the bulletin goes public.

As it was discussed that FH would be leading public health communication with the farms, should this letter come from FH while being distributed by the Ministry of Agriculture?

The only mention about a potential surveillance program while logistics are bieng sorted out is: BC CDC in collaboration with Fraser Health intends to facilitate testing for mink farm workers starting as soon as possible. Details of this program are being finalized and information will be shared when available.

s.13

Warm regards,

Veronic

_____
From: Clair, Veronic [BCCDC]
Sent: December 5, 2020 7:55 PM
To: Wong, Jason [BCCDC]; Skowronski, Danuta [BCCDC]; Gunvaldsen, Rayna AGRI:EX; sterloff, trish [BCCDC]; Choquette, Blair [FH]; Brian.radke@gov.bc.ca<mailto:Brian.radke@gov.bc.ca> [EXT]; Fraser, Erin [BCCDC]; Millard, Timothy [FH]; Tyler, Ingrid [FH]; Kerwin, Oona [FH]; Parker, Robert Dr.; Deo, Hermandeep [FH]; Pasco, Doug WCB:EX; Coombe, Michelle AGRI:EX [EXT]; Sekirov, Inna [BCCDC]; Chan, Elaine [BCCDC]; Gill, Gurpreet [FH]; McDonald, Rosebelle WCB:EX; mike.nielsen@worksafebc.com<mailto:mike.nielsen@worksafebc.com>; Wilkinson, Victoria [FH]; Loadman, Susan [FH]; Corneil, Trevor [BCCDC]; Gustafson, Reka [BCCDC]; Henry, Bonnie [EXT]; Masse, Jessica [FH]; Krajden, Mel [BCCDC]; Yeong, Siu-Kae [BCCDC]; Chan, Elaine [BCCDC]
Subject: Re: Follow-up on Mink Farm

Good evening,

please find attached draft minutes, sligh modification in format compared to prior. Thanks Siu-Kae for drafting.

Best,

Veronic

_____
From: Wong, Jason [BCCDC]
Sent: December 5, 2020 11:37 AM
To: Wong, Jason [BCCDC]; Clair, Veronic [BCCDC]; Skowronski, Danuta [BCCDC]; Gunvaldsen, Rayna AGRI:EX; sterloff, trish [BCCDC]; Choquette, Blair [FH]; Brian.radke@gov.bc.ca<mailto:Brian.radke@gov.bc.ca> [EXT]; Fraser, Erin [BCCDC]; Millard, Timothy [FH]; Tyler, Ingrid [FH]; Kerwin, Oona [FH]; Parker, Robert Dr.; Deo, Hermandeep [FH]; Pasco, Doug WCB:EX; Coombe, Michelle AGRI:EX [EXT]; Sekirov, Inna [BCCDC]; Chan, Elaine [BCCDC]; Gill, Gurpreet [FH]; McDonald, Rosebelle WCB:EX; mike.nielsen@worksafebc.com<mailto:mike.nielsen@worksafebc.com>; Wilkinson, Victoria [FH]; Loadman, Susan [FH]; Corneil, Trevor [BCCDC]; Gustafson, Reka [BCCDC]; Henry, Bonnie [EXT]; Masse, Jessica [FH]; Krajden, Mel [BCCDC]
Subject: Follow-up on Mink Farm
When: December 5, 2020 4:30 PM-5:30 PM.
Where: Zoom

Hello,

You are invited to a Zoom Virtual Health Visit.

Time: Dec 5, 2020 04:30 PM Pacific Time (US and Canada)

Topic: Follow-up on Mink Farm

Join the Virtual Health Visit
s.15; s.17

Meeting ID: s.15; s.17

Password: s.15;

Can’t join by computer or mobile device? Join by telephone:

s.15; s.17 (Toll-free)

- Visit our online instructions on how to get started with Virtual Health Visits using Zoom:

http://www.phsa.ca/health-professionals/professional-resources/office-of-virtual-health/covid-19-virtual-health-toolkit/zoom-for-healthcare/patient-resources

- If you encounter any problems connecting to your Virtual Health Visit, you can call the helpdesk at 1-844-442-4433 (Toll-free) for support. Interpreting services can be requested during your call.

NOTE: This invitation should not be shared with others. It contains a unique link created for you.

Page 033 of 169 to/à Page 035 of 169

Withheld pursuant to/removed as

s.13 ; s.16

draft surveillance summary and fuller proposal

From:	Clair, Veronic [BCCDC] <veronic.clair@bccdc.ca>
To:	Gustafson, Reka [BCCDC] <reka.gustafson@phsa.ca>, Wong, Jason [BCCDC] <Jason.Wong@bccdc.ca>, Skowronski, Danuta [BCCDC] <Danuta.Skowronski@bccdc.ca>, Gunvaldsen, Rayna AGRI:EX <Rayna.Gunvaldsen@gov.bc.ca>, sterloff, trish [BCCDC] <trish.sterloff@gov.bc.ca>, Choquette, Blair [FH] <Blair.Choquette@fraserhealth.ca>, Brian.radke@gov.bc.ca [EXT] <Brian.radke@gov.bc.ca>, Fraser, Erin [BCCDC] <Erin.Fraser@bccdc.ca>, Millard, Timothy [FH] <Timothy.Millard@fraserhealth.ca>, Tyler, Ingrid [FH] <ingrid.tyler@fraserhealth.ca>, Kerwin, Oona [FH] <Oona.Kerwin@fraserhealth.ca>, Parker, Robert Dr. <robert.parker@fraserhealth.ca>, Deo, Hermandeep [FH] <Hermandeep.Deo@fraserhealth.ca>, Pasco, Doug WCB:EX <Doug.Pasco@worksafebc.com>, Coombe, Michelle AGRI:EX [EXT] <Michelle.Coombe@gov.bc.ca>, Sekirov, Inna [BCCDC] <inna.sekirov@bccdc.ca>, Chan, Elaine [BCCDC] <elaine.chan@bccdc.ca>, Gill, Gurpreet [FH] <Gurpreet.Gill@fraserhealth.ca>, McDonald, Rosebelle WCB:EX <Rose.McDonald@worksafebc.com>, mike.nielsen@worksafebc.com, Wilkinson, Victoria [FH] <Victoria.Wilkinson2@fraserhealth.ca>, Loadman, Susan [FH] <Susan.Loadman@fraserhealth.ca>, Corneil, Trevor [BCCDC] <trevor.corneil@bccdc.ca>, Henry, Bonnie [EXT] <bonnie.henry@gov.bc.ca>, Masse, Jessica [FH] <Jessica.Masse@fraserhealth.ca>, Krajden, Mel [BCCDC] <Mel.Krajden@bccdc.ca>, Yeong, Siu-Kae [BCCDC] <Siu-Kae.Yeong@bccdc.ca>, Gunvaldsen, Rayna AFF:EX, Sterloff, Trish HLTH:EX, Radke, Brian AFF:EX, Tyler, Ingrid Dr. HLTH:IN, Coombe, Michelle AFF:EX, Nielsen, Mike WCB:EX, Henry, Bonnie HLTH:EX, XT:Krajden, Mel HLTH:IN
Sent:	December 6, 2020 5:57:26 PM PST
Received:	December 6, 2020 5:57:35 PM PST
Attachments:	mink COVID surveillance summary_IS (1)vc.docx, Surveillance_proposal_COVID-19_mink_in_BC_draft_2020_12_03vc.docx

Hi,
A couple of colleagues send me the attached two documents.
Both are still drafts but they constitute the essence of what is proposed and why.
The surveillance summary has the overarching goals and is phrased a bit differently than the document the field epi had been working on.
I hope this helps.

Veronic

From: Clair, Veronic [BCCDC]
Sent: December 6, 2020 5:23 PM
To: Gustafson, Reka [BCCDC]; Wong, Jason [BCCDC]; Skowronski, Danuta [BCCDC]; Gunvaldsen, Rayna AGRI:EX; sterloff, trish [BCCDC]; Choquette, Blair [FH]; Brian.radke@gov.bc.ca [EXT]; Fraser, Erin [BCCDC]; Millard, Timothy [FH]; Tyler, Ingrid [FH]; Kerwin, Oona [FH]; Parker, Robert Dr.; Deo, Hermandeep [FH]; Pasco, Doug WCB:EX; Coombe, Michelle AGRI:EX [EXT]; Sekirov, Inna [BCCDC]; Chan, Elaine [BCCDC]; Gill, Gurpreet [FH]; McDonald, Rosebelle WCB:EX; mike.nielsen@worksafebc.com; Wilkinson, Victoria [FH]; Loadman, Susan [FH]; Corneil, Trevor [BCCDC]; Henry, Bonnie [EXT]; Masse, Jessica [FH]; Krajden, Mel [BCCDC]; Yeong, Siu-Kae [BCCDC]; Chan, Elaine [BCCDC]
Subject: Re: draft letter from public health to industry - feedback asap please, uncertain of timeline of release of FH bulletin, potentially at 2

Hi Reka,

I am happy to share the latest draft we had circulated with the objectives and what was proposed.

I do not have those on my home desktop.
I am trying to access them via remote access but it seems the network drive is not well mapped and not allowing me access to the shared mink folder.

If you want this tonight, I will go into BC CDC and retrieve it.

Otherwise, I can send it first thing tomorrow morning.

Let me know,

Veronic

From: Gustafson, Reka [BCCDC]
Sent: December 6, 2020 5:07 PM
To: Clair, Veronic [BCCDC]; Wong, Jason [BCCDC]; Skowronski, Danuta [BCCDC]; Gunvaldsen, Rayna AGRI:EX; sterloff, trish [BCCDC]; Choquette, Blair [FH]; Brian.radke@gov.bc.ca [EXT]; Fraser, Erin [BCCDC]; Millard, Timothy [FH]; Tyler, Ingrid [FH]; Kerwin, Oona [FH]; Parker, Robert Dr.; Deo, Hermandeep [FH]; Pasco, Doug WCB:EX; Coombe, Michelle AGRI:EX [EXT]; Sekirov, Inna [BCCDC]; Chan, Elaine [BCCDC]; Gill, Gurpreet [FH]; McDonald, Rosebelle WCB:EX; mike.nielsen@worksafebc.com; Wilkinson, Victoria [FH]; Loadman, Susan [FH]; Corneil, Trevor [BCCDC]; Henry, Bonnie [EXT]; Masse, Jessica [FH]; Krajden, Mel [BCCDC]; Yeong, Siu-Kae [BCCDC]; Chan, Elaine [BCCDC]
Subject: Re: draft letter from public health to industry - feedback asap please, uncertain of timeline of release of FH bulletin, potentially at 2

Hi Veronic,

Can you provide some clarification on your suggestion of testing all workers? I would like to understand the surveillance objective, the resources and the actions we would take based on the results.

Many thanks,

Reka

From: Clair, Veronic [BCCDC]
Sent: December 6, 2020 12:28 PM
To: Wong, Jason [BCCDC]; Skowronski, Danuta [BCCDC]; Gunvaldsen, Rayna AGRI:EX; sterloff, trish [BCCDC]; Choquette, Blair [FH]; Brian.radke@gov.bc.ca [EXT]; Fraser, Erin [BCCDC]; Millard, Timothy [FH]; Tyler, Ingrid [FH]; Kerwin, Oona [FH]; Parker, Robert Dr.; Deo, Hermandeep [FH]; Pasco, Doug WCB:EX; Coombe, Michelle AGRI:EX [EXT]; Sekirov, Inna [BCCDC]; Chan, Elaine [BCCDC]; Gill, Gurpreet [FH]; McDonald, Rosebelle WCB:EX; mike.nielsen@worksafebc.com; Wilkinson, Victoria [FH]; Loadman, Susan [FH]; Corneil, Trevor [BCCDC]; Gustafson, Reka [BCCDC]; Henry, Bonnie [EXT]; Masse, Jessica [FH]; Krajden, Mel [BCCDC]; Yeong, Siu-Kae [BCCDC]; Chan, Elaine [BCCDC]
Subject: draft letter from public health to industry - feedback asap please, uncertain of timeline of release of FH bulletin, potentially at 2

Hi,

as discussed yesterday, attached is a draft letter that could be sent to mink producers to recommend enhancing their COVID-19 safety plans taking into accound the recent recommendations, as well as WorkSafe requirement.

I would appreciate feedback ASAP, in the next hour if at all possible.

I am not sure if the intend to release the FH outbreak bulletin at 2 still stands or not. But if it still stands, it does not leave us much time to finalize that letter for the industry to receive it at the same time as the bulletin goes public.

As it was discussed that FH would be leading public health communication with the farms, should this letter come from FH while being distributed by the Ministry of Agriculture?

The only mention about a potential surveillance program while logistics are bieng sorted out is: BC CDC in collaboration with Fraser Health intends to facilitate testing for mink farm workers starting as soon as possible. Details of this program are being finalized and information will be shared when available.

Even if we do not set up a full surveillance program, we can facilitate testing with the pre-populated requisitions we have discussed in the past, enabling testing to the extend we judge adequate through regular testing sites.

Warm regards,

Veronic

From: Clair, Veronic [BCCDC]
Sent: December 5, 2020 7:55 PM
To: Wong, Jason [BCCDC]; Skowronski, Danuta [BCCDC]; Gunvaldsen, Rayna AGRI:EX; sterloff, trish [BCCDC]; Choquette, Blair [FH]; Brian.radke@gov.bc.ca [EXT]; Fraser, Erin [BCCDC]; Millard, Timothy [FH]; Tyler, Ingrid [FH]; Kerwin, Oona [FH]; Parker, Robert Dr.; Deo, Hermandeep [FH]; Pasco, Doug WCB:EX; Coombe, Michelle AGRI:EX [EXT]; Sekirov, Inna [BCCDC]; Chan, Elaine [BCCDC]; Gill, Gurpreet [FH]; McDonald, Rosebelle WCB:EX; mike.nielsen@worksafebc.com; Wilkinson, Victoria [FH]; Loadman, Susan [FH]; Corneil, Trevor [BCCDC]; Gustafson, Reka [BCCDC]; Henry, Bonnie [EXT]; Masse, Jessica [FH]; Krajden, Mel [BCCDC]; Yeong, Siu-Kae [BCCDC]; Chan, Elaine [BCCDC]
Subject: Re: Follow-up on Mink Farm

Good evening,

please find attached draft minutes, sligh modification in format compared to prior. Thanks Siu-Kae for drafting.

Best,

Veronic

From: Wong, Jason [BCCDC]
Sent: December 5, 2020 11:37 AM
To: Wong, Jason [BCCDC]; Clair, Veronic [BCCDC]; Skowronski, Danuta [BCCDC]; Gunvaldsen, Rayna AGRI:EX; sterloff, trish [BCCDC]; Choquette, Blair [FH]; Brian.radke@gov.bc.ca [EXT]; Fraser, Erin [BCCDC]; Millard, Timothy [FH]; Tyler, Ingrid [FH]; Kerwin, Oona [FH]; Parker, Robert Dr.; Deo, Hermandeep [FH]; Pasco, Doug WCB:EX; Coombe, Michelle AGRI:EX [EXT]; Sekirov, Inna [BCCDC]; Chan, Elaine [BCCDC]; Gill, Gurpreet [FH]; McDonald, Rosebelle WCB:EX; mike.nielsen@worksafebc.com; Wilkinson, Victoria [FH]; Loadman, Susan [FH]; Corneil, Trevor [BCCDC]; Gustafson, Reka [BCCDC]; Henry, Bonnie [EXT]; Masse, Jessica [FH]; Krajden, Mel [BCCDC]
Subject: Follow-up on Mink Farm

When: December 5, 2020 4:30 PM-5:30 PM.
Where: Zoom

Hello,

You are invited to a Zoom Virtual Health Visit.
Time: Dec 5, 2020 04:30 PM Pacific Time (US and Canada)
Topic: Follow-up on Mink Farm

Join the Virtual Health Visit
s.15; s.17

Meeting ID: s.15; s.17
Password: s.15;

Can't join by computer or mobile device? Join by telephone:

s.15; s.17 (Toll-free)

- Visit our online instructions on how to get started with Virtual Health Visits using Zoom: http://www.phsa.ca/health-professionals/professional-resources/office-of-virtual-health/covid-19-virtual-health-toolkit/zoom-for-healthcare/patient-resources

- If you encounter any problems connecting to your Virtual Health Visit, you can call the helpdesk at 1-844-442-4433 (Toll-free) for support. Interpreting services can be requested during your call.

NOTE: This invitation should not be shared with others. It contains a unique link created for you.

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Withheld pursuant to/removed as

s.13 ; s.17

RE: N95's - Mink Farm Association request

From:	Massey, Keren L HLTH:EX <Keren.Massey@gov.bc.ca>
To:	Hrycuik, Lorie HLTH:EX <Lorie.Hrycuik@gov.bc.ca>, Sterloff, Trish HLTH:EX <Trish.Sterloff@gov.bc.ca>
Cc:	Galt, Jamie HLTH:EX <Jamie.Galt@gov.bc.ca>, McGuire, Caitlin HLTH:EX <Caitlin.McGuire@gov.bc.ca>
Sent:	December 8, 2020 10:08:22 AM PST
Received:	December 8, 2020 10:08:23 AM PST
Attachments:	image001.jpg

Hi, Trish and Lorie

Trish, I would suggest that AG put their query to EMBC via the Provincial Emergency Coordination Centre. Their general intake email is pecc.ops1@gov.bc.ca.

I will give the PECC a heads up that AG may be in touch about this.

Let me know if you have any questions about this approach.

Thanks,

Keren Massey
Emergency Manager – Emergency Management Unit
BC Ministry of Health
Work: 1(250)952-1929 Cell: 1(250)213-5427

I respectfully acknowledge the unceded territories of the Songhees, Esquimalt and WSÁNEC peoples'.

From: Hrycuik, Lorie HLTH:EX <Lorie.Hrycuik@gov.bc.ca>
Sent: December 8, 2020 10:01 AM
To: Sterloff, Trish HLTH:EX <Trish.Sterloff@gov.bc.ca>
Cc: Massey, Keren L HLTH:EX <Keren.Massey@gov.bc.ca>
Subject: RE: N95's - Mink Farm Association request

Trish, I would suggest AGRI contact EMBC to see what access to supply them may have. Keren may have a contact for AGRI to follow up with.
Lorie

Lorie Hrycuik
Executive Lead, Population & Public Health Division
Ministry of Health
Phone: (778) 974-3766 | Lorie.Hrycuik@gov.bc.ca

From: Sterloff, Trish HLTH:EX <Trish.Sterloff@gov.bc.ca>
Sent: December 8, 2020 9:40 AM
To: Hrycuik, Lorie HLTH:EX <Lorie.Hrycuik@gov.bc.ca>
Subject: N95's - Mink Farm Association request

Hi Lorie,

Just on the call on Mink Farms, and Rayna (AGRI) has been asked by the Mink Farming Association(?) as to whether someone can help with procuring N95s; AGRI is working within to see what they can do. If they cannot procure them, is this something HLTH does, or RHA, or WorkSafe/other?

Thanks,

Trish

Trish Sterloff
A/Executive Director
Health Protection Branch
British Columbia Ministry of Health
PO Box 9646 Stn Prov Govt, Victoria BC V8W 9P1
Physical location: 1515 Blanshard Street, Victoria, BC
Tel: 778 678-1720
Email: trish.sterloff@gov.bc.ca

pelting recommendation

From: Clair, Veronic [BCCDC] <veronic.clair@bccdc.ca>

To: Choquette, Blair [FH] <Blair.Choquette@fraserhealth.ca>, Brian.radke@gov.bc.ca [EXT] <Brian.radke@gov.bc.ca>, Coombe, Michelle AGRI:EX [EXT] <Michelle.Coombe@gov.bc.ca>, sterloff, trish [BCCDC] <trish.sterloff@gov.bc.ca>, Fraser, Erin [BCCDC] <Erin.Fraser@bccdc.ca>, Gunvaldsen, Rayna AGRI:EX <Rayna.Gunvaldsen@gov.bc.ca>, Millard, Timothy [FH] <Timothy.Millard@fraserhealth.ca>, Tyler, Ingrid [FH] <ingrid.tyler@fraserhealth.ca>, Kerwin, Oona [FH] <Oona.Kerwin@fraserhealth.ca>, Parker, Robert Dr. <robert.parker@fraserhealth.ca>, Deo, Hermandeep [FH] <Hermandeep.Deo@fraserhealth.ca>, Pasco, Doug WCB:EX <Doug.Pasco@worksafebc.com>, rosebelle.mcdonald@worksafebc.com, Sekirov, Inna [BCCDC] <inna.sekirov@bccdc.ca>, Chan, Elaine [BCCDC] <elaine.chan@bccdc.ca>, Skowronski, Danuta [BCCDC] <Danuta.Skowronski@bccdc.ca>, McDonald, Rose <Rose.McDonald@worksafebc.com>, Corneil, Trevor [BCCDC] <trevor.corneil@bccdc.ca>, Gill, Gurpreet [FH] <Gurpreet.Gill@fraserhealth.ca>, Brownrigg, Bobbi [BCCDC] <Bobbi.Brownrigg@bccdc.ca>, Arkles Schwandt, Jillian [BCCDC] <Jillian.Schwandt@bccdc.ca>, mike.nielsen@worksafebc.com, Yeong, Siu-Kae [BCCDC] <Siu-Kae.Yeong@bccdc.ca>, Newhouse, Emily [FH] <Emily.Newhouse@fraserhealth.ca>, Radke, Brian AFF:EX, Coombe, Michelle AFF:EX, Sterloff, Trish HLTH:EX, Gunvaldsen, Rayna AFF:EX, Tyler, Ingrid Dr. HLTH:IN, 'rosebelle.mcdonald@worksafebc.com', McDonald, Rosebelle WCB:EX, Nielsen, Mike WCB:EX

Cc: Helen.Schwantje@gov.bc.ca [EXT] <Helen.Schwantje@gov.bc.ca>, Masse, Jessica [FH] <Jessica.Masse@fraserhealth.ca>, Wilkinson, Victoria [FH] <Victoria.Wilkinson2@fraserhealth.ca>, Loadman, Susan [FH] <Susan.Loadman@fraserhealth.ca>, Ofosuhene, Ophelia [FH] <Ophelia.Ofosuhene@fraserhealth.ca>, van Lierop, Rachia <Rachia.VanLierop@worksafebc.com>, Van Der Westhuizen, Amanda [FH] <Amanda.VanDerWesthuizen@fraserhealth.ca>, Schwantje, Helen FLNR:EX, van Lierop, Rachia WCB:EX

Sent: December 11, 2020 3:37:07 PM PST

Received: December 11, 2020 3:37:14 PM PST

Hi,

Please see below what will be communicated to the farm owner.

I hope you all have a good week-end.

Veronic

Recommendations and Requirements for Pelting at CA Mink Farm

Pelting may proceed under the following conditions:

1. Appropriate PPE are used and work safety procedures are developed, considered satisfactory by Worksafe, and implemented adequately
    a. It is shown though public health inspection that adequate PPE is available and all workers are adequately trained in its appropriate use. Operator to book inspection with FH prior to starting pelting by contacting <Blair.Choquette@fraserhealth.ca>
2. All individuals who participate in pelting must isolate on site for 14 days after the last day of pelting
    a. No currently unexposed individual is allowed to come on site to support pelting (ie no new staff)

b. It is recommend that the TFW on site do not participate in pelting given the results of their COVID testing

i. Any TFW participating in pelting needs to have a consent conversation, including advocate representation from their Consulate, and consent to 14 day isolation.

3. Pelting should be done in an outdoor area if possible. This area may be tented.
   a. If this is not possible, doors and windows of pelting area to be open at all times to maximize ventilation
4. Animal samples to be collected according to Min Ag specifications
5. All materials related to pelting to remain onsite, as per Min Ag specification.
6. Option to check serology (ie. may provide reassurance of individual immunity to COVID strain) should be offered to all workers involved, but is not required for pelting to proceed.
7. Comply with Ministry of Environment requirements for disposal of infected animals by-products including manure and carcasses.

RE: HLTH implications of COVID in mink

From:	Clair, Veronic [BCCDC] <veronic.clair@bccdc.ca>
To:	Daniels, Gray AGRI:EX <Gray.Daniels@gov.bc.ca>, Helen.Schwantje@gov.bc.ca [EXT] <Helen.Schwantje@gov.bc.ca>, Fraser, Erin [BCCDC] <Erin.Fraser@bccdc.ca>, Daniels, Gray AFF:EX, Schwantje, Helen FLNR:EX
Cc:	sterloff, trish [BCCDC] <trish.sterloff@gov.bc.ca>, Yeong, Siu-Kae [BCCDC] <Siu-Kae.Yeong@bccdc.ca>, Sterloff, Trish HLTH:EX
Sent:	January 4, 2021 1:56:40 PM PST
Received:	January 4, 2021 1:57:14 PM PST
Attachments:	RRA-SARS-CoV-2-in-mink-12-nov-2020 ECDC.pdf, CFIA_ACIA-#14081244-v2F-Farmed_mink_RQRA_-_Iteration_2.DOCX, 20201110_EI_RA_SARS-CoV02_Mustelinae UK risk ass.pdf, InfectedMinkFarmRiskAssessmentVersion2vc.docx

Hi Daniels,

Thank you for the information. There is still a lot of uncertainty about the risk of potential for mink farms to serve as a mutation reservoirs of the virus and then transmit it to people and wild mink populations and other animal (cats, dogs etc.).
The CVIA-ACIA document is the Canadian Risk Assessment, latest version I have, which does talk a bit about that. Attached you will find also a very early draft of the risk assessment in BC, that got interrupted by the outbreak that started in Dec. There is also some other jurisdictions risk assessment.

Helen Schwantje, of the Ministry of Forest, Lands and Natural Resource Operations, is the expert we have in relation to wildlife and COVID.
Erin Fraser is the Public Health Veterinarian at BC CDC who had been working closely with me and the rest of the inter-sectoral group convene to discuss and manage the mink and COVID BC situation. I am not sure if that helps. You might have already seen all those, especially that Brian Radke and Rayna Gunvaldsen have been part of that group, from MAGRI.

Perhaps if you think it is still needed, a call with Helen and Erin (copied above) with myself and anyone else recommended by those on this email trail, could be organized.

Let me know what you think might be a good next step.

Best,

Veronic

Dr. Veronic Clair, MD, MSc, CCFP, FRCPC, PhD
Physician Epidemiologist
BC Centre for Disease Control
veronic.clair@bccdc.ca

I respectfully acknowledge that I live and work on the unceded territory of the xʷməθkwəy̓əm, Skwxwú7mesh, Stó:lō and Səl̓ílwətaʔ/Selilwitulh Nations.

From: Daniels, Gray AGRI:EX [mailto:Gray.Daniels@gov.bc.ca]
Sent: Monday, January 04, 2021 11:55 AM
To: Clair, Veronic [BCCDC]; sterloff, trish [BCCDC]
Subject: RE: HLTH implications of COVID in mink

Hi Veronic!

No problem! We are investigating the potential for mink farms to serve as a mutation reservoirs of the virus and then transmit it to people and wild mink populations and other animal (cats, dogs etc.). How much of a potential concern would it be from the perspective of disease specialists?

So you said you haven't talked much about it, do you see this becoming more of an issue?
In your professional opinions, given mink susceptibility, mutation probabilities, transmission probabilities etc.. how likely is it that mink farms are a potential health risk in this respect?

Is that helpful context Veronic?

Kind regards,
Gray

From: Clair, Veronic [BCCDC] <veronic.clair@bccdc.ca>
Sent: January 4, 2021 11:27 AM
To: Daniels, Gray AGRI:EX <Gray.Daniels@gov.bc.ca>; Sterloff, Trish HLTH:EX <Trish.Sterloff@gov.bc.ca>
Subject: RE: HLTH implications of COVID in mink

Hi Gray,
Happy to help. I have the portfolio of zoonosis as a physician epidemiologist at BC CDC. It would be very helpful to know a bit more what you are working on and the exact questions you have, ahead of booking a chat. Is it possible for you to be a bit more explicit on your goal and related questions?

It might be that your questions are best answered by our Canadian colleagues, or could be circulated to members of our biosecurity group related to mink farms. But we have not talked that much about the COVID-19 reservoir issue in wild minks or other wild species from a spill over of mink farm infections, or infection of other animals (farm/barn cats…).

Thanks

Veronic

Dr. Veronic Clair, MD, MSc, CCFP, FRCPC, PhD
Physician Epidemiologist
BC Centre for Disease Control
veronic.clair@bccdc.ca

I respectfully acknowledge that I live and work on the unceded territory of the xʷməθkwəy̓əm, Skwxwú7mesh, Stó:lō and Səl̓ílwətaʔ/Selilwitulh Nations.

From: Daniels, Gray AGRI:EX [mailto:Gray.Daniels@gov.bc.ca]
Sent: Monday, January 04, 2021 11:14 AM
To: sterloff, trish [BCCDC]; Clair, Veronic [BCCDC]
Cc: Hrycuik, Lorie [EXT]
Subject: RE: HLTH implications of COVID in mink

Hi Lorie!
Thank you so much, this is really helpful!

Hi Trish and Veronic!

I'd love a chat to chat in the next day or two if you've got the time. Would be grateful for your perspective on this issue!

Best wishes,
Gray

From: Hrycuik, Lorie HLTH:EX <Lorie.Hrycuik@gov.bc.ca>
Sent: January 4, 2021 11:04 AM
To: Daniels, Gray AGRI:EX <Gray.Daniels@gov.bc.ca>
Cc: Sterloff, Trish HLTH:EX <Trish.Sterloff@gov.bc.ca>; 'Clair, Veronic [BCCDC]' <veronic.clair@bccdc.ca>
Subject: RE: HLTH implications of COVID in mink

HI Gray, Happy 2021 to you as well.

I have included Dr. Veronic Clair from BCCDC, as a contact that you can discuss your question/interest on mink farms below. Her contact is also below:

Dr. Veronic Clair, MD, MSc, CCFP, FRCPC, PhD
Physician Epidemiologist
BC Centre for Disease Control
veronic.clair@bccdc.ca

Lorie

Lorie Hrycuik
Executive Lead, Population & Public Health Division
Ministry of Health
Phone: (778) 974-3766 | Lorie.Hrycuik@gov.bc.ca

From: Daniels, Gray AGRI:EX <Gray.Daniels@gov.bc.ca>
Sent: January 4, 2021 9:58 AM
To: Hrycuik, Lorie HLTH:EX <Lorie.Hrycuik@gov.bc.ca>
Subject: HLTH implications of COVID in mink

Hi Lorie!

Happy New Year!!

I'm writing up an IN regarding COVID on mink farms.

I was hoping I could talk to someone at HLTH that might have eyes on this issue from the HLTH perspective, i.e. current situation in the world re: potential of mink farms to be reservoir of COVID virus mutations and transmission to humans.

Do you have any recommendations of who I could talk to?

Kind regards,
Gray

RAPID RISK ASSESSMENT

Detection of new SARS-CoV-2 variants related to mink

12 November 2020

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RAPID QUALITATIVE RISK ASSESSMENT (RQRA):
SARS Coronavirus 2 (SARS-CoV-2) in Farmed Mink

Iteration #2: August 20, 2020

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Probability	Points to consider	Probability estimate [mode (min-max)]	Uncertainty [mode (min-max)]
contaminated by mink from an infected farm and at least some of the virus has survived, what is the probability that a farm/feral cat would come into contact with an infectious dose of the virus?	• Although discouraged due to the diseases they carry, feral cats commonly get into compost, and steal mink food within inches of the mink (the other side of the wire)		
I4. If a farm/feral cat had sufficient contact with the virus in the environment, what is the probability that the animal develops infection?	• Assuming same susceptibility to infection between pet cats and farm/feral cats • Some, but not all, cats from COVID-19 positive households become infected • Experiments suggest at least some level of susceptibility • It was noted that cats may be exposed and infected from sources other than infected mink	Moderate (Low-High)	Moderate (Low-High)
Exposure of an employee/veterinarian via indirect contact with an infected farm/feral cat			
J1. What is the probability that an infected farm/feral cat sheds the virus in respiratory secretions, urine, or feces?	• Assuming same likelihood of shedding between pet cats and farm/feral cats • Experiments suggest some level of shedding, at least for short periods	Moderate (Low-High)	Moderate (Low-High)
J2. What is the probability that at least some of the virus survives in cat excretions, including fomites, feces and dust, in the farm environment for a sufficient length of time to expose an employee or veterinarian?	• See H2	High (Very low-High)	Moderate (Low-High)
J3. If the environment (including fomites, dust, etc.) has been contaminated by an infected farm/feral cat and at	• No current evidence of cat to human transmission • It's unclear if cats would be able to contaminate the environment with a sufficient amount of virus to result in infectious contact with an employee/vet	Very low (Neg-Mod)	Moderate (Low-High)

Probability	Points to consider	Probability estimate [mode (min-max)]	Uncertainty [mode (min-max)]
least some of the virus has survived, what is the probability that an employee/veterinarian would come into contact with an infectious dose of the virus?	• People may not be frequently contacting the same surfaces that the feral cats would be contaminating • Higher likelihood of contact for farm cat than feral cat • Cats tend to be fastidious in terms of hiding/burying feces		
Exposure of a member of the general public via indirect contact with an infected farm/feral cat			
K1. What is the probability that an infected farm/feral cat sheds the virus in respiratory secretions, urine, or feces?	• See J1	Moderate (Low-High)	Moderate (Low-High)
K2. What is the probability that at least some of the virus survives in cat excretions, including fomites, feces and dust, in the environment for a sufficient length of time to expose a member of the general public?	• Farms are in very rural areas, and feral cats are unlikely to range far • Human contact with environments contaminated by these cats is likely infrequent, and virus survival time is limited	Very low (Neg-Mod)	Moderate (Low-High)
K3. If the environment (including fomites, dust, etc.) has been contaminated by an infected farm/feral cat and at least some of the virus has survived, what is the probability that a member of the general public would come into contact with an infectious dose of the virus?	• Farm cats are exposed to few people, and feral cats tend to keep their distance from people • Farms are in very rural areas, and feral cats are unlikely to range far	Very low (Neg-Low)	Low (Low-High)

Probability	Points to consider	Probability estimate [mode (min-max)]	Uncertainty [mode (min-max)]
Exposure and infection of a wild animal via indirect contact with an infected farm/feral cat			
L1. What is the probability that an infected farm/feral cat sheds the virus in respiratory secretions, urine, or feces?	• See J1	Moderate (Low-High)	Moderate (Low-High)
L2. What is the probability that at least some of the virus survives in cat excretions, including fomites, feces and dust, in the farm or surrounding environment for a sufficient length of time to expose a potentially-susceptible wild animal?	• See H2	Low (Neg-Mod)	Moderate (Low-High)
L3. If the environment (including fomites, dust, etc.) has been contaminated by an infected farm/feral cat and at least some of the virus has survived, what is the probability that a potentially-susceptible wild animal would come into contact with an infectious dose of the virus?	• Unlikely that a wild animal would contact the same environment that a cat passed through for long enough to contact an infectious dose • Cats appear to excrete virus for a short period of time, and more in respiratory secretions than feces; respiratory droplets and feces not large volume or concentrated • Higher likelihood with feral cats that go outside farm property, than with farm cats that stay within • Feral cats are not an issue in high-biosecurity farms • Uncertainty regarding infectious dose, and whether cats would contaminate the environment with a sufficient amount of virus • Potentially susceptible wild animals (e.g., mustelids) and feral cats are unlikely to live in close proximity • Transmission to other feral cats more likely	Very low (Neg-Mod)	Moderate-High (Low-High)
L4. If a potentially-susceptible wild animal had sufficient contact with the virus in the environment, what is the	• See G3	Moderate (Neg-High)	Moderate (Low-High)

Probability	Points to consider	Probability estimate [mode (min-max)]	Uncertainty [mode (min-max)]
probability that the animal develops infection?			
Exposure and infection of a susceptible farmed mink via indirect contact with an infected farm/feral cat			
M1. What is the probability that an infected farm/feral cat sheds the virus in respiratory secretions, urine, or feces?	• See J1	Moderate (Low-High)	Moderate (Low-High)
M2. What is the probability that at least some of the virus survives in cat excretions, including fomites, feces and dust, in the farm environment for a sufficient length of time to expose a susceptible farmed mink?	• See H2	High (Very low-High)	Moderate (Low-High)
M3. If the environment (including fomites, dust, etc.) has been contaminated by an infected farm/feral cat and at least some of the virus has survived, what is the probability that a susceptible farmed mink would come into contact with an infectious dose of the virus?	• Depends on type of housing (open or closed) • Depends on whether cats are able to reach the minks' food • High uncertainty regarding whether cats would contaminate the environment with a sufficient amount of virus	Very low-Low (Neg-High)	Moderate (Low-High)
M4. If a susceptible farmed mink had sufficient contact with the virus in the environment, what is the probability that the animal develops infection?	• See B5	High	Low

Combining Probabilities and Uncertainties

It is important to remember that probabilities represent values between zero and one. Therefore, in this assessment, probabilities are combined as per accepted methodologies in qualitative risk assessments, adopting the lowest value for dependent events (i.e., where probabilities would be multiplied) and the highest value for independent events (i.e., where probabilities would be added) (Cox, 2008; Cudmore et al., 2012; Gale et al., 2010). However, when events are independent but not mutually exclusive (i.e., could occur concurrently) the adoption of the highest likelihood might underestimate the overall probability.

Methodology for combining qualitative uncertainty rankings in risk assessments is not as clearly defined as for combining probabilities. Some authors report uncertainty for every step without combination (Jones et al., 2015; Peeler & Thrush, 2009), others adopt the highest uncertainty (Mandrak et al., 2012) while finally others adopt the highest uncertainty associated with the lowest likelihood for dependent events (Cudmore et al., 2012; Mimeault et al., 2017). This assessment will adopt the highest uncertainty of the tied probabilities. The combined probabilities and uncertainties for this scenario pathway are shown in Table 2: Combined qualitative probabilities

Pathway Component	Probability [mode (min-max)]	Uncertainty [mode (min-max)]	Source of variability and uncertainty	Combined Probability [mode (min-max)]	Combined Uncertainty [mode (min-max)]
QUESTION 1: TRANSMISSION FROM HUMAN-MINK					
Exposure and infection of a farmed mink via direct contact with an infected human (A)	Low (Neg-High)	Moderate (Low-High)	• Variability due to: prevalence of human cases in different regions and times in Canada (and potential overlap with mink farm locations), time of year / stage of production cycle and variations in human-animal contact (higher likelihood during activities that take place from April-June), level of biosecurity (especially regarding fomites and droplet transmission from humans)	Low (Neg-High)	Moderate (Low-High)
Exposure and infection of a farmed mink via indirect contact with an infected human (B)	Low (Neg-High)	Moderate (Low-High)			
			Question 1 Total:	**Total Probability**	**Total Uncertainty**
				Low (Neg-High)	Moderate (Low-High)
QUESTION 2A: TRANSMISSION FROM HUMAN-MINK-HUMAN (PELTING)					
Exposure and infection of a farmed mink via	Low (Neg-High)	Moderate (Low-High)	• See question 1	Low (Neg-High)	Moderate (Low-High)

direct contact with an infected human (A)					
Exposure and infection of a farmed mink via indirect contact with an infected human (B)	Low (Neg-High)	Moderate (Low-High)			
Exposure of an employee/contractor via direct contact with an infected mink carcass during pelting (C)	Moderate (Very low-High)	Moderate (Low-High)	• Variability due to: whether mink are pelted on-site versus at pelting plant • Uncertainty regarding: pelt contamination of asymptomatic animals, how much virus would be removed during cleaning process, and potential cross-contamination of pelts	Moderate (Very low-High)	Moderate (Low-High)
			Question 2a Total:	**Total Probability**	**Total Uncertainty**
				Low (Neg-High)	Moderate (Low-High)
QUESTION 2B: TRANSMISSION FROM HUMAN-MINK-HUMAN (EMPLOYEES/VETERINARIANS)					
Exposure and infection of a farmed mink via direct contact with an infected human (A)	Low (Neg-High)	Moderate (Low-High)	• See question 1	Low (Neg-High)	Moderate (Low-High)
Exposure and infection of a farmed mink via indirect contact with an infected human (B)	Low (Neg-High)	Moderate (Low-High)			
Exposure of an employee/veterinarian via direct contact with an infected live mink on the farm (D)	Moderate (Very low-High)	Moderate (Low-High)	• Variability due to: time of year / stage of production cycle and variations in human-animal contact (higher likelihood during activities that take place from April-June), stage of illness and amount of shedding, husbandry practices and	Moderate (Very low-High)	Moderate (Low-High)
Exposure of an employee/veterinarian	Moderate (Neg-High)	Moderate (Low-High)			

via indirect contact with an infected live mink on the farm (E)			environmental factors (higher likelihood within mink sheds) • Uncertainty regarding: within-herd prevalence, virus survival in manure and compost piles, extrapolation from ferrets and limited data specifically on mink		
			Question 2b Total:	**Total Probability** Low (Neg-High)	**Total Uncertainty** Moderate (Low-High)
QUESTION 2C: TRANSMISSION FROM HUMAN-MINK-HUMAN (GENERAL PUBLIC)					
Exposure and infection of a farmed mink via direct contact with an infected human (A)	Low (Neg-High)	Moderate (Low-High)	• See question 1	Low (Neg-High)	Moderate (Low-High)
Exposure and infection of a farmed mink via indirect contact with an infected human (B)	Low (Neg-High)	Moderate (Low-High)			
Exposure of a member of the general public via indirect contact with an infected mink (F)	Negligible (Neg-Low)	Moderate (Low-High)	• Variability due to: management and handling of manure, stage of illness and amount of shedding • Uncertainty regarding: survival time in manure	Negligible (Neg-Low)	Moderate (Low-High)
			Question 2c Total:	**Total Probability** Negligible (Neg-Low)	**Total Uncertainty** Moderate (Low-High)
QUESTION 3: TRANSMISSION FROM HUMAN-MINK-WILDLIFE					
Exposure and infection of a farmed mink via direct contact with an infected human (A)	Low (Neg-High)	Moderate (Low-High)	• See question 1	Low (Neg-High)	Moderate (Low-High)

Exposure and infection of a farmed mink via indirect contact with an infected human (B)	Low (Neg-High)	Moderate (Low-High)			
Exposure and infection of a wild animal via direct contact with an infected mink (G)	Low (Neg-High)	Moderate (Low-High)	• Variability due to: level of biosecurity and type of housing, husbandry practices and environmental factors, stage of illness and amount of shedding, wild animal species susceptibility • Uncertainty regarding: virus survival in manure and compost piles, susceptibility of wild animal species (especially N. American bats, raccoons, skunks, squirrels), infectious dose	Low (Neg-High)	Moderate-High (Low-High)
Exposure and infection of a wild animal via indirect contact with an infected mink (H)	Low (Neg-Mod)	Moderate-High (Low-High)			
			Question 3 Total:	**Total Probability** Low (Neg-High)	**Total Uncertainty** Moderate-High (Low-High)
QUESTION 4A: TRANSMISSION FROM HUMAN-MINK-CAT-EMPLOYEE/VETERINARIAN					
Exposure and infection of a farmed mink via direct contact with an infected human (A)	Low (Neg-High)	Moderate (Low-High)	• See question 1	Low (Neg-High)	Moderate (Low-High)
Exposure and infection of a farmed mink via indirect contact with an infected human (B)	Low (Neg-High)	Moderate (Low-High)			
Exposure and infection of a farm/feral cat via indirect contact with an infected mink (I)	Moderate (Very low-High)	Moderate (Low-High)	• Variability due to: stage of illness and amount of shedding, husbandry practices and environmental factors	Moderate (Very low-High)	Moderate (Low-High)

			• Uncertainty regarding: virus survival in manure and compost piles		
Exposure of an employee/veterinarian via indirect contact with an infected farm/feral cat (J)	Very low (Neg-Mod)	Moderate (Low-High)	• Variability due to: type of cat (farm vs feral), husbandry practices and environmental factors • Uncertainty regarding: extent of shedding by cats	Very low (Neg-Mod)	Moderate (Low-High)
			Question 4a Total:	**Total Probability**	**Total Uncertainty**
				Very low (Neg-Mod)	Moderate (Low-High)
QUESTION 4B: TRANSMISSION FROM HUMAN-MINK-CAT-GENERAL PUBLIC					
Exposure and infection of a farmed mink via direct contact with an infected human (A)	Low (Neg-High)	Moderate (Low-High)	• See question 1	Low (Neg-High)	Moderate (Low-High)
Exposure and infection of a farmed mink via indirect contact with an infected human (B)	Low (Neg-High)	Moderate (Low-High)			
Exposure and infection of a farm/feral cat via indirect contact with an infected mink (I)	Moderate (Very low-High)	Moderate (Low-High)	• See question 4a	Moderate (Very low-High)	Moderate (Low-High)
Exposure of a member of the general public via indirect contact with an infected farm/feral cat (K)	Very low (Neg-Low)	Moderate (Low-High)	• See question 4a	Very low (Neg-Low)	Moderate (Low-High)
			Question 4b Total:	**Total Probability**	**Total Uncertainty**
				Very low (Neg-Low)	Moderate (Low-High)
QUESTION 4C: TRANSMISSION FROM HUMAN-MINK-CAT-WILDLIFE					

Exposure and infection of a farmed mink via direct contact with an infected human (A)	Low (Neg-High)	Moderate (Low-High)	• See question 1	Low (Neg-High)	Moderate (Low-High)
Exposure and infection of a farmed mink via indirect contact with an infected human (B)	Low (Neg-High)	Moderate (Low-High)			
Exposure and infection of a farm/feral cat via indirect contact with an infected mink (I)	Moderate (Very low-High)	Moderate (Low-High)	• See question 4a	Moderate (Very low-High)	Moderate (Low-High)
Exposure and infection of a wild animal via indirect contact with an infected farm/feral cat (L)	Very low (Neg-Mod)	Moderate-High (Low-High)	• Variability due to: type of cat (farm vs feral), husbandry practices and environmental factors, wild animal species susceptibility • Uncertainty regarding: extent of shedding by cats, susceptibility of wild animal species (especially N. American bats, raccoons, skunks, squirrels), infectious dose	Very low (Neg-Mod)	Moderate-High (Low-High)
			Question 4c Total:	**Total Probability**	**Total Uncertainty**
				Very low (Neg-Mod)	Moderate-High (Low-High)
QUESTION 4D: TRANSMISSION FROM HUMAN-MINK-CAT-MINK					
Exposure and infection of a farmed mink via direct contact with an infected human (A)	Low (Neg-High)	Moderate (Low-High)	• See question 1	Low (Neg-High)	Moderate (Low-High)
Exposure and infection of a farmed mink via indirect contact with an infected human (B)	Low (Neg-High)	Moderate (Low-High)			

Exposure and infection of a farm/feral cat via indirect contact with an infected mink (I)	Moderate (Very low-High)	Moderate (Low-High)	• See question 4a	Moderate (Very low-High)	Moderate (Low-High)
Exposure and infection of a susceptible farmed mink via indirect contact with an infected farm/feral cat (M)	Very low-Low (Neg-High)	Moderate (Low-High)	• Variability due to: husbandry practices and environmental factors • Uncertainty regarding: extent of shedding by cats	Very low-Low (Neg-High)	Moderate (Low-High)
			Question 4d Total:	**Total Probability**	**Total Uncertainty**
				Very low-Low (Neg-High)	Moderate (Low-High)

.

Table 2: Combined qualitative probabilities

Pathway Component	Probability [mode (min-max)]	Uncertainty [mode (min-max)]	Source of variability and uncertainty	Combined Probability [mode (min-max)]	Combined Uncertainty [mode (min-max)]
QUESTION 1: TRANSMISSION FROM HUMAN-MINK					
Exposure and infection of a farmed mink via direct contact with an infected human (A)	Low (Neg-High)	Moderate (Low-High)	• Variability due to: prevalence of human cases in different regions and times in Canada (and potential overlap with mink farm locations), time of year / stage of production cycle and variations in human-animal contact (higher likelihood during activities that take place from April-June), level of biosecurity (especially regarding fomites and droplet transmission from humans)	Low (Neg-High)	Moderate (Low-High)
Exposure and infection of a farmed mink via indirect contact with an infected human (B)	Low (Neg-High)	Moderate (Low-High)			
				Total Probability	**Total Uncertainty**

			Question 1 Total:	Low (Neg-High)	Moderate (Low-High)
QUESTION 2A: TRANSMISSION FROM HUMAN-MINK-HUMAN (PELTING)					
Exposure and infection of a farmed mink via direct contact with an infected human (A)	Low (Neg-High)	Moderate (Low-High)	• See question 1	Low (Neg-High)	Moderate (Low-High)
Exposure and infection of a farmed mink via indirect contact with an infected human (B)	Low (Neg-High)	Moderate (Low-High)			
Exposure of an employee/contractor via direct contact with an infected mink carcass during pelting (C)	Moderate (Very low-High)	Moderate (Low-High)	• Variability due to: whether mink are pelted on-site versus at pelting plant • Uncertainty regarding: pelt contamination of asymptomatic animals, how much virus would be removed during cleaning process, and potential cross-contamination of pelts	Moderate (Very low-High)	Moderate (Low-High)
			Question 2a Total:	**Total Probability**	**Total Uncertainty**
				Low (Neg-High)	Moderate (Low-High)
QUESTION 2B: TRANSMISSION FROM HUMAN-MINK-HUMAN (EMPLOYEES/VETERINARIANS)					
Exposure and infection of a farmed mink via direct contact with an infected human (A)	Low (Neg-High)	Moderate (Low-High)	• See question 1	Low (Neg-High)	Moderate (Low-High)
Exposure and infection of a farmed mink via indirect contact with an infected human (B)	Low (Neg-High)	Moderate (Low-High)			

Exposure of an employee/veterinarian via direct contact with an infected live mink on the farm (D)	Moderate (Very low-High)	Moderate (Low-High)	• Variability due to: time of year / stage of production cycle and variations in human-animal contact (higher likelihood during activities that take place from April-June), stage of illness and amount of shedding, husbandry practices and environmental factors (higher likelihood within mink sheds) • Uncertainty regarding: within-herd prevalence, virus survival in manure and compost piles, extrapolation from ferrets and limited data specifically on mink	Moderate (Very low-High)	Moderate (Low-High)
Exposure of an employee/veterinarian via indirect contact with an infected live mink on the farm (E)	Moderate (Neg-High)	Moderate (Low-High)			
			Question 2b Total:	**Total Probability**	**Total Uncertainty**
				Low (Neg-High)	Moderate (Low-High)
QUESTION 2C: TRANSMISSION FROM HUMAN-MINK-HUMAN (GENERAL PUBLIC)					
Exposure and infection of a farmed mink via direct contact with an infected human (A)	Low (Neg-High)	Moderate (Low-High)	• See question 1	Low (Neg-High)	Moderate (Low-High)
Exposure and infection of a farmed mink via indirect contact with an infected human (B)	Low (Neg-High)	Moderate (Low-High)			
Exposure of a member of the general public via indirect contact with an infected mink (F)	Negligible (Neg-Low)	Moderate (Low-High)	• Variability due to: management and handling of manure, stage of illness and amount of shedding • Uncertainty regarding: survival time in manure	Negligible (Neg-Low)	Moderate (Low-High)
			Question 2c Total:	**Total Probability**	**Total Uncertainty**
				Negligible	Moderate

				(Neg-Low)	(Low-High)
QUESTION 3: TRANSMISSION FROM HUMAN-MINK-WILDLIFE					
Exposure and infection of a farmed mink via direct contact with an infected human (A)	Low (Neg-High)	Moderate (Low-High)	• See question 1	Low (Neg-High)	Moderate (Low-High)
Exposure and infection of a farmed mink via indirect contact with an infected human (B)	Low (Neg-High)	Moderate (Low-High)			
Exposure and infection of a wild animal via direct contact with an infected mink (G)	Low (Neg-High)	Moderate (Low-High)	• Variability due to: level of biosecurity and type of housing, husbandry practices and environmental factors, stage of illness and amount of shedding, wild animal species susceptibility • Uncertainty regarding: virus survival in manure and compost piles, susceptibility of wild animal species (especially N. American bats, raccoons, skunks, squirrels), infectious dose	Low (Neg-High)	Moderate-High (Low-High)
Exposure and infection of a wild animal via indirect contact with an infected mink (H)	Low (Neg-Mod)	Moderate-High (Low-High)			
			Question 3 Total:	**Total Probability**	**Total Uncertainty**
				Low (Neg-High)	Moderate-High (Low-High)
QUESTION 4A: TRANSMISSION FROM HUMAN-MINK-CAT-EMPLOYEE/VETERINARIAN					
Exposure and infection of a farmed mink via direct contact with an infected human (A)	Low (Neg-High)	Moderate (Low-High)	• See question 1	Low (Neg-High)	Moderate (Low-High)
Exposure and infection of a farmed mink via	Low (Neg-High)	Moderate (Low-High)			

indirect contact with an infected human (B)					
Exposure and infection of a farm/feral cat via indirect contact with an infected mink (I)	Moderate (Very low-High)	Moderate (Low-High)	• Variability due to: stage of illness and amount of shedding, husbandry practices and environmental factors • Uncertainty regarding: virus survival in manure and compost piles	Moderate (Very low-High)	Moderate (Low-High)
Exposure of an employee/veterinarian via indirect contact with an infected farm/feral cat (J)	Very low (Neg-Mod)	Moderate (Low-High)	• Variability due to: type of cat (farm vs feral), husbandry practices and environmental factors • Uncertainty regarding: extent of shedding by cats	Very low (Neg-Mod)	Moderate (Low-High)
			Question 4a Total:	**Total Probability**	**Total Uncertainty**
				Very low (Neg-Mod)	Moderate (Low-High)
QUESTION 4B: TRANSMISSION FROM HUMAN-MINK-CAT-GENERAL PUBLIC					
Exposure and infection of a farmed mink via direct contact with an infected human (A)	Low (Neg-High)	Moderate (Low-High)	• See question 1	Low (Neg-High)	Moderate (Low-High)
Exposure and infection of a farmed mink via indirect contact with an infected human (B)	Low (Neg-High)	Moderate (Low-High)			
Exposure and infection of a farm/feral cat via indirect contact with an infected mink (I)	Moderate (Very low-High)	Moderate (Low-High)	• See question 4a	Moderate (Very low-High)	Moderate (Low-High)
Exposure of a member of the general public via indirect contact with an	Very low (Neg-Low)	Moderate (Low-High)	• See question 4a	Very low (Neg-Low)	Moderate (Low-High)

infected farm/feral cat (K)					
			Question 4b Total:	**Total Probability**	**Total Uncertainty**
				Very low (Neg-Low)	Moderate (Low-High)
QUESTION 4C: TRANSMISSION FROM HUMAN-MINK-CAT-WILDLIFE					
Exposure and infection of a farmed mink via direct contact with an infected human (A)	Low (Neg-High)	Moderate (Low-High)	• See question 1	Low (Neg-High)	Moderate (Low-High)
Exposure and infection of a farmed mink via indirect contact with an infected human (B)	Low (Neg-High)	Moderate (Low-High)			
Exposure and infection of a farm/feral cat via indirect contact with an infected mink (I)	Moderate (Very low-High)	Moderate (Low-High)	• See question 4a	Moderate (Very low-High)	Moderate (Low-High)
Exposure and infection of a wild animal via indirect contact with an infected farm/feral cat (L)	Very low (Neg-Mod)	Moderate-High (Low-High)	• Variability due to: type of cat (farm vs feral), husbandry practices and environmental factors, wild animal species susceptibility • Uncertainty regarding: extent of shedding by cats, susceptibility of wild animal species (especially N. American bats, raccoons, skunks, squirrels), infectious dose	Very low (Neg-Mod)	Moderate-High (Low-High)
			Question 4c Total:	**Total Probability**	**Total Uncertainty**
				Very low (Neg-Mod)	Moderate-High (Low-High)
QUESTION 4D: TRANSMISSION FROM HUMAN-MINK-CAT-MINK					
Exposure and infection of a farmed mink via	Low (Neg-High)	Moderate (Low-High)	• See question 1	Low (Neg-High)	Moderate (Low-High)

direct contact with an infected human (A)					
Exposure and infection of a farmed mink via indirect contact with an infected human (B)	Low (Neg-High)	Moderate (Low-High)			
Exposure and infection of a farm/feral cat via indirect contact with an infected mink (I)	Moderate (Very low-High)	Moderate (Low-High)	• See question 4a	Moderate (Very low-High)	Moderate (Low-High)
Exposure and infection of a susceptible farmed mink via indirect contact with an infected farm/feral cat (M)	Very low-Low (Neg-High)	Moderate (Low-High)	• Variability due to: husbandry practices and environmental factors • Uncertainty regarding: extent of shedding by cats	Very low-Low (Neg-High)	Moderate (Low-High)
			Question 4d Total:	**Total Probability**	**Total Uncertainty**
				Very low-Low (Neg-High)	Moderate (Low-High)

Assessment of Consequence

Mink health impact from exposure to infected humans

Assuming the infection of at least one farmed mink from exposure to an infected human, the most likely scenario is an acute outbreak on one or a few epidemiologically linked farms, with similar morbidity and mortality to that being seen in the Netherlands.

The magnitude of the effects on affected mink producers would most likely be significant. Given that the morbidity and mortality rates are not high, the direct effects of the disease might be minor, especially at certain times of the year. However, larger effects would be seen from the costs associated with control measures taken to prevent further spread, such as improvements to fences, personal protective equipment, cleaning and disinfection. The need for increased labour to handle the outbreak, as well as absenteeism due to illness or fear of becoming ill, would likely be one of the greatest expenses.

Transient outbreaks on a small proportion of farms would likely have minor effects on the industry in terms of production. It is likely, however, that the effects of public perception would have significant effects on an industry that is already struggling. For some producers, these effects might be irreversible, forcing them out of business. There may also be some losses of international market for pelts, though this might be managed with post-processing treatment measures.

The overall national-scale impact on mink health and the mink industry of this scenario is therefore considered to range from moderate to high, depending on public perception and its long-term impact on the industry.

Human health impact from exposure to infected mink

Based on the probability assessment, the exposure of humans would most likely involve employees or veterinarians on an affected farm, rather than the general public.

Assuming the exposure of at least one susceptible employee or veterinarian to an infectious dose from a farmed mink, the most likely scenario is one or a small number of resulting human cases. The impact of this must be assessed in the context of a global pandemic, with a vast number of cases resulting from other exposures. Cases resulting from exposure to farmed mink are unlikely to contribute significantly to the epidemiology of the pandemic, nor is the prevention of such cases likely to have a significant effect on control of the pandemic. Thus, the impact of this scenario at the national and regional levels is considered to be indiscernible to minor.

Exposure at the individual level could have a variety of consequences. The vast majority of human infections would not result in severe illness; however, even mild illness could have significant mental health and economic effects due to self-isolation. Greater impacts could be seen in vulnerable populations, such as the elderly and those with immunosuppression or comorbidities. However, vulnerable populations are less likely to be exposed to farmed mink than to companion animals.

The overall national-scale impact on human health of this scenario is therefore considered to range from negligible to low.

Impacts from exposure of wildlife to infected mink

Assuming the infection of at least one wild animal from exposure to an infected farmed mink, the most likely scenario is infection of one or a small number of wild animals only. However, due to the lack of

information on infection in wild species, there is a high level of uncertainty with this, and transient transmission within a wild animal population is also possible. This would depend on the species exposed, their susceptibility to a productive infection, home ranges and social habits. Wild mustelids are most likely to be exposed to infected farmed mink and susceptible to infection, but transmission amongst wild mustelids would be fairly limited, since they tend to be solitary and territorial. On the other hand, transmission between individuals would be more likely in social or colonial species, such as bats. This could also be affected by seasonality, since more transmission is likely during the breeding season (which is spring for most mustelids). Transmission is more likely among feral cat populations, since they live in social groups and breed all year.

The probability that an ongoing virus reservoir develops within a wild animal population is considered to be low, but with a high level of uncertainty. For an animal species to act as a reservoir, rather than a transiently-infected species, the virus has to be well adapted to spread efficiently in that species. This virus is well-adapted to humans, and it is unlikely that it would spread efficiently and continuously in a wild animal population in the absence of significant mutation. Infections in animals have so far resulted in virus shedding for a relatively short period of time, and no long-term carrier state has been identified. In addition, the virus seems to transmit best in enclosed/partially enclosed indoor spaces with high density of people/animals. These points suggest that the virus is unlikely to be maintained in dispersed wild populations.

If it were to happen, the effects of such a wild animal reservoir in Canada could be significant, depending on the species affected, the morbidity and mortality experienced, and the extent of contact that species has with humans and other animals. If it affected a rare wildlife species, it could present a conservation concern (e.g., some pine marten populations). It could result in an ongoing zoonotic risk, though this is highly dependent on species and might only apply to certain occupational groups, such as trappers. Human to human transmission is likely to remain the most important route of transmission for the foreseeable future. A wildlife reservoir could also result in ongoing challenges for mink farmers, requiring enhanced biosecurity. The existence of a reservoir would create opportunity for the virus to mutate into something more pathogenic for humans or animals. Other effects could include a fear of wildlife by humans, with potential consequences to wildlife due to human interference.

Conclusions

Question 1

What is the probability of exposure of Canadian farmed mink to SARS-CoV-2, and subsequent infection, through direct or indirect contact with infected humans (i.e., human-mink transmission), and what are the resulting health impacts on the mink and mink industry?

The probability of the exposure and infection of Canadian farmed mink to SARS-CoV-2 from infected humans is most likely low, but ranging from negligible to high due to variability. The outbreaks currently occurring in the Netherlands reveal that mink are clearly susceptible to infection. In Canada, the probability of exposure for mink farms is more limited, since they are in rural locations and they employ a small number of staff. Biosecurity in the mink industry is guided by the National Farm-Level Mink Biosecurity Standard. Generally, biosecurity measures targeting the exclusion of visitors and preventing access to mink are good. The uncertainty is moderate.

If infection does occur, the magnitude of the effects on affected mink producers and the mink industry would most likely be significant. This would not necessarily be due to the disease itself, which seems to have relatively low morbidity and mortality in mink, but rather due to control measures taken to prevent further spread, labour issues, and the results of public perception. **The overall national-scale impact on farmed mink and the mink industry of this scenario is therefore considered to be moderate to high**.

The large amount of variability in the probability estimate is dependent on the geographical and temporal distribution of human cases in Canada, and this should be assessed regionally. Other risk factors causing variability include: seasonality (with a greater amount of human-mink contact from April to June), and the biosecurity practices employed by the farm. Key uncertainties include: regional prevalence of symptomatic and asymptomatic human cases, the amount of shedding by asymptomatic people, virus survival in the environment, and infectious dose.

Question 2

What is the probability of exposure of humans to SARS-CoV-2 in Canada through direct or indirect contact with live farmed mink or mink carcasses (i.e., human-mink-human transmission), and what is the resulting human health impact at the national level?

SARS-CoV-2 is primarily a human pathogen. The probability of human exposure to SARS-CoV-2 from infected farmed mink in Canada is first dependent on the mink becoming infected from exposure to an infected human, as in question 1. The mink must then shed sufficient virus (or have virus present in exposed tissues), and sufficiently expose a susceptible human, to transmit the infection. The probability can be considered in terms of the overall pathway (i.e., human-mink-human transmission), or just the probability of mink-human transmission in cases where the mink have been infected (i.e., assuming the first part of the pathway has already occurred).

For employees and contractors involved in pelting:

- **The probability of human-mink-human transmission is most likely low**, but ranging from negligible to high due to variability. This is primarily a result of the probability of human-mink transmission, as in question 1.

- **Where mink have been infected, the probability of mink-human transmission is most likely moderate**, but ranging from very low to high due to variability. Before being cleaned, the pelts of infected animals would probably be contaminated with feces, respiratory droplets and saliva, and employees/contractors often have close contact with the fur soon after euthanasia.
- The uncertainty is moderate.

For employees and veterinarians working with live mink on the farm:

- **The probability of human-mink-human transmission is most likely low,** but ranging from negligible to high due to variability. This is primarily a result of the probability of human-mink transmission, as in question 1.
- **Where mink have been infected, the probability of mink-human transmission is most likely moderate**, but ranging from very low to high due to variability. Information from the Netherlands suggests that this transmission is plausible, and dust particles in the air within the sheds have been shown to be positive by PCR. Other routes of exposure include contaminated cages, door handles, feed carts, and floor dust.
- The uncertainty is moderate.

For the general public:

- **The probability of human-mink-human transmission is most likely negligible**, but ranging from negligible to low due to variability. Biosecurity measures are in place to separate the public from farmed mink. Information from the Netherlands suggests that virus was not present in dust samples outside the mink sheds, and mink farms are typically located in sparsely-populated areas. Although manure-spreading is a potential pathway of transmission, manure is generally held on the farm before partially composted manure is spread on fields once a year. It is unlikely that the general public would contact a sufficient dose of virus via this route. **This probability does not change in cases where mink have been infected.**
- The uncertainty is moderate.

Given the current context of a global pandemic, with a vast number of cases resulting from exposure to sources other than farmed mink, **the overall national-scale impact on human health associated with this hazard is considered to be negligible to low**. The impact could be higher in cases involving highly susceptible individuals, though, on average, these individuals are unlikely to have contact with farmed mink.

In addition to the risk factors mentioned in question 1, other sources of variability in the probability estimates include: increased human-mink contact from August to November for pelting, whether mink are pelted on-site versus at a pelting plant, stage of illness in the animals and therefore the amount of shedding, husbandry practices, manure management, and environmental factors. The probability of a person being infected by another person is notably higher than any probability of being infected via farmed mink.

Key uncertainties include: extent of pelt contamination in symptomatic and asymptomatic animals, virus survival throughout the pelt-cleaning process and potential cross-contamination of pelts, within-herd prevalence, virus survival in manure and compost piles, and lack of transmission and pathology information from experimental studies in mink.

Question 3

What is the probability of exposure of wildlife to SARS-CoV-2 in Canada, and subsequent infection, through direct or indirect contact with live farmed mink or mink carcasses (i.e., human-mink-wildlife transmission), and what are the resulting impacts (including potential development of a virus wildlife reservoir)?

The probability of the exposure and infection of a wild animal in Canada to SARS-CoV-2 from farmed mink is most likely low, but ranging from negligible to high due to variability. Wild mustelids and felids are most likely to be susceptible. Mink farms generally have a perimeter fence and traps within compounds, which are meant to keep wildlife out and prevent mink from escaping; however, these measures are not necessarily consistent across the country. Housed in raised pens, contact with some pests and wildlife is mitigated and pest management practices are used to manage insects, rodents and where necessary wildlife. Mink are solitary and territorial. Direct contact between them and other animals is likely infrequent, except for escaped and wild mink (especially during interbreeding or at bait stations). This would require, though, that mink escape while infectious, which would be less likely once an outbreak is identified on a farm. Transmission via indirect contact would be more likely on the farm, due to wildlife contact with improperly managed manure/compost piles, since virus survival is likely longest under these conditions. Manure is generally composted in a fenced area, and carcasses are buried or transported to a landfill to minimize exposure to a variety of pathogenic organisms. The uncertainty is moderate to high.

If infection does occur in a wild animal, the spread of infection would most likely be limited and transient, though the exact extent of spread would depend on the species exposed. Wild mustelids are most likely to be exposed and susceptible, but their solitary and territorial nature makes widespread transmission amongst them unlikely. In addition to host considerations, the virus must be well-adapted to spread efficiently in a reservoir species. SARS-CoV-2 appears well-adapted to humans, and infections in animals have so far resulted in virus shedding of short duration, if at all. In addition, the virus is adapted to transmit best in areas of high density. **The probability that an ongoing virus reservoir develops within a wild animal population in Canada is considered to be low**, but with a high level of uncertainty.

Despite this low probability, the effects of such a scenario were explored. These effects could be significant, depending on the species affected, the morbidity and mortality experienced, and the extent of contact that species has with humans and other animals. Effects could include conservation concerns (if a rare wildlife species is affected), ongoing challenges for mink farmers, or an ongoing zoonotic risk (if a species with frequent human contact is affected). However, human to human transmission is likely to remain the most important route of transmission for the foreseeable future. The existence of a reservoir would also create opportunity for the virus to mutate into something more pathogenic for humans or animals. Other effects could include a fear of wildlife by humans, with potential consequences to wildlife due to human interference.

In addition to the risk factors mentioned in question 1, other sources of variability in the probability estimate includes: type of housing, stage of illness in the animals and therefore the amount of viral shedding, husbandry practices, environmental factors, and wild animal species susceptibility. Key uncertainties include: virus survival in manure and compost piles, infectious dose, and the susceptibility of wild animal species in North America, such as bats, raccoons, skunks, and squirrels.

Question 4

What is the probability of exposure of farm or feral cats to SARS-CoV-2 in Canada through indirect contact with farmed mink, and subsequent exposure (with or without infection) of humans and animals (i.e., human-mink-cat-human/other transmission)? Impacts are assumed to be the same as in questions 1 to 3.

The probability of the exposure of humans (without infection) and animals (with infection) in Canada to SARS-CoV-2 from farm or feral cats on mink farms is:

- **Most likely very low for employees and veterinarians on the farm**, but ranging from negligible to moderate due to variability. Although it is fairly likely that cats on affected farms would be exposed and infected, as has been observed in the Netherlands, it is unclear if cats would be able to contaminate the environment with a sufficient amount of virus to result in effective transmission. There has currently been no evidence of cat-human transmission of this virus, but it has been demonstrated that cats can transmit it to other cats. Direct contact between humans and these cats is often minimal, especially for feral cats. The uncertainty is moderate.
- **Most likely very low for the general public**, but ranging from negligible to low due to variability. In addition to the above considerations regarding transmission by cats, farms are in very rural areas and cats are unlikely to range far from the farms. Farm cats are exposed to few people, and feral cats tend to keep their distance from people. The uncertainty is moderate.
- **Most likely very low for wildlife**, but ranging from negligible to moderate due to variability. In addition to the above considerations regarding transmission by cats, the nature of interaction between cats and susceptible wildlife is an important consideration. Cats appear to excrete virus for a short period of time, and it is unlikely that a wild animal would contact the same environment that a cat passed through for long enough to contact an infectious dose.. The exception is transmission between feral cats and other feral cats. Transmission among feral cat populations is also more likely to be prolonged, since they live in social groups. The uncertainty is moderate to high.
- **Most likely very low to low for farmed mink**, but ranging from negligible to high due to variability. In addition to the above considerations regarding transmission by cats, direct or indirect contact between cats and mink (including contact with cat feces) is unlikely unless the cats were to access mink feed on the cages. The uncertainty is moderate.

In addition to the risk factors mentioned in question 1, other sources of variability in the estimates include: type of cat (farm versus feral), type of housing, stage of illness in the animals and therefore the amount of shedding, husbandry practices, environmental factors, and wild animal species susceptibility. It should be noted that farm/feral cats may be exposed and infected from sources other than infected mink. Key uncertainties include: virus survival in manure and compost piles, extent of shedding by cats, infectious dose, and the susceptibility of wild animal species in North America.

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[3] The findings and conclusions do not represent the views of the participants' respective organizations.

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Appendix

The following tables provide descriptive definitions for the qualitative estimates used in this assessment. Table 3 defines the probability (i.e., likelihood) estimates, and Table 4 defines the uncertainty estimates. Table 5 defines the estimates of the magnitude of the effects, which can be assessed for multiple scale levels (e.g., individual effects, regional effects, national effects). Table 6 defines impact estimates for an overall national-scale assessment of the scenario.

Table 3 - Likelihood Definitions

Likelihood of event occurring	Descriptive Definition	Likelihood of event NOT occurring
Negligible	The likelihood of the event is virtually zero	High
Very low	The event is very unlikely	Moderate
Low	The event is unlikely	Low
Moderate	The event is fairly likely	Very low
High	The event is likely	Negligible

Table 4 – Uncertainty categories[4]

Uncertainty category	Interpretation
Low	There are solid and complete data available; strong evidence is provided in multiple references; authors report similar conclusions. Several experts have multiple experiences of the event, and there is a high level of agreement between experts.
Moderate	There are some but not complete data available; evidence is provided in a small number of references; authors report conclusions that vary from one another. Experts have limited experience of the event and/or there is a moderate level of agreement between experts.
High	There are scarce or no data available; evidence is not provided in references but rather in unpublished reports or based on observations, or personal communication; authors report conclusions that vary considerably between them. Very few experts have experience of the event and/or there is a very low level of agreement between experts.

[4] Source: Fournie G, Jones BA, Beauvais W, Lubroth J, Njeumi F, Cameron A & Pfeiffer DU, 2014. The risk of rinderpest re-introduction in post-eradication era. *Prev Vet Med* 113 (2): 175-184.

Table 5. Description of the magnitude of the effects

Magnitude of the effect	Description of the effect
Indiscernible	Not usually distinguishable from normal day-to-day variation
Minor	Recognisable, but minor and/or reversible
Significant	Serious and substantive, but usually reversible
Severe	Extremely serious and/or irreversible

Table 6. Guidelines for determining the overall, national-scale impact of establishment and/or spread[5]

Overall impact	Description of impact
Extreme	The effects are likely to be severe at the national level. Implies that economic stability, societal values or social well-being would be significantly affected.
High	The effects are likely to be significant at the national level and severe within affected zones. Implies that the effects would be of national concern. However, significant effects on economic stability, societal values or social well-being would be limited to a given zone.
Moderate	The effects are likely to be minor on a national level and significant within affected zones. The effects are likely to be severe for directly affected parties.
Low	The effects are likely to be minor within affected zones and significant to directly affected parties. The effects are likely to be minor at the national level.
Very low	The effects are likely to be minor to directly affected parties. The effects are likely to be indiscernible at any other level.
Negligible	The effects are likely to be indiscernible at any level within Canada.

[5] Modified from: Biosecurity Australia, 2009. Draft Import risk analysis report for horses from approved countries: final policy review [Internet]. Available at: http://www.daff.gov.au/__data/assets/pdf_file/0018/1410651/2009_28_Horses_draft_IRA_report.pdf (last accessed 2014-04-04).

Public Health England

Protecting and improving the nation's health

Human Animal Infections and Risk Surveillance (HAIRS) group

Qualitative assessment of the risk that SARS-CoV-2 infection in UK captive *Mustelinae* populations presents to the UK human population

About Public Health England

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About the Human Animal Infections and Risk Surveillance group

This document was prepared by Public Health England (PHE) on behalf of the joint Human Animal Infections and Risk Surveillance (HAIRS) group.

HAIRS is a multi-agency cross-government horizon scanning and risk assessment group, which acts as a forum to identify and discuss infections with potential for interspecies transfer (particularly zoonotic infections).

Members include representatives from PHE, Department for the Environment, Food and Rural Affairs (Defra), Department of Health and Social Care (DHSC), Animal and Plant Health Agency, Food Standards Agency, Public Health Wales, Welsh Government, Public Health Scotland, Scottish Government, Public Health Agency of Northern Ireland and the Department of Agriculture, Environment and Rural Affairs for Northern Ireland.

Qualitative assessment of the risk that SARS-CoV-2 infection in UK captive *Mustelinae* populations presents to the UK human population

Date of this assessment	10 November 2020
Version	1.0
Reason for assessment	Reports of an emergence of a mink variant of SARS-CoV-2 with reduced sensitivity to neutralising antibodies
Completed by	HAIRS Members
External experts consulted	Christianne Glossop, CVO Wales Richard Griffiths, Welsh Government Anthony J Wilson, FSA Katie Russell, PHE Ian Brown, APHA Matt Heydon, Natural England
Date of previous risk assessment	N/A
Date of initial risk assessment	November 2020

Information about the risk assessment processes used by the HAIRS group can be found at: https://www.gov.uk/government/publications/hairs-risk-assessment-process

Summary of risk assessment for SARS-COV-2 infection in UK captive *mustelinae* populations and the risk it presents to the UK human population		
Overview	On 4 November 2020, Danish authorities reported the emergence of a SARS-CoV-2 variant in mink and a small number of associated human cases which, on preliminary investigations, demonstrated reduced sensitivity to neutralising antibodies when tested against antibodies collected from people with previous SARS-CoV-2 infection. Although investigations are ongoing, these preliminary findings have raised concerns over the risk of this or other variants arising in *Mustelinae* species which may potentially hamper COVID-19 intervention efforts (vaccine and therapeutics). In the UK, the only *Mustelinae* species kept in high-density settings are ferrets in large-scale breeders, working animal collections or in animal research sites. Ferrets kept in low-density domestic premises are not believed to present a significant risk, given large numbers of naïve animals are presumed to be required to allow sufficient virus passage and selection for adapted variants. Thus, individuals in contact with ferrets in high density settings are regarded as the highest risk group for exposure to a *Mustelinae* adapted variant of SARS-CoV-2 in the UK This risk assessment does not assess the impact in the event of human-to-human SARS-CoV-2 (human or animal variant strain) transmission.	
Assessment of the risk of infection in the UK	**Probability**	General population – very low; High risk group (handlers of ferrets at high density) - high
	Impact	Low for animal-to-human transmission, due to the low numbers of likely contacts and available preventive measures
Level of confidence in assessment of risk	For most of the questions there was a good or satisfactory level of confidence in the assessment. Only for the areas of understanding the disease manifestation and current level of infection in ferrets or wild *Mustelinae* was the level of confidence either unsatisfactory or poor.	
Action(s) and recommendation(s):	• to consider the risk from commercial imports of *Mustelinae* from countries which have reported mink farm outbreaks (1) or have a large mink or raccoon dog fur farming population • to adapt current content and increase communications and biosecurity messaging to appropriate keepers and veterinarians regarding the potential risks and mitigation strategies,	

	taking into account recently published OIE draft guidance on working with farmed animals of species susceptible to infection with SARS-CoV-2 • to provide information for the public and animal keepers seeking advice on how to minimise risk of infection • to increase surveillance in *Mustelinae* populations • any isolates from *Mustelinae* species or known human handlers of *Mustelinae* species should be reported promptly to the relevant incident control team, sequenced and information shared with relevant animal health **and** human health counterparts • review current UK guidance on preventing spread of SARS-CoV-2 infection from humans-to-animals, and animals-to-humans • review this risk assessment as new evidence emerges

Please note

This risk assessment addresses:

i. the risk of SARS-CoV-2 infection in captive *Mustelinae* species (for example, ferrets, weasels, mink and polecats) in the UK and not other potential zoonotic sources (including *Mustelidae* species, for example, badgers and otters) of SARS-CoV-2 infection

ii. the risk of UK's captive *Mustelinae* population producing *Mustelinae* specific variants

iii. the risk of direct *Mustelinae*-to-human contact transmission of SARS-CoV-2. While the Group recognises that if or once a *Mustelinae* adapted strain infects direct human contacts, there is a risk of onward, and possibly, sustained transmission within the human population, an assessment of the impact of this possibility sits outside the scope of this risk assessment

As this is an emerging disease, there are knowledge gaps and a degree of uncertainty in the assessment outcomes. According to the established HAIRS risk assessment procedures, uncertainty is clearly documented throughout the risk assessment. However, given the fast pace of availability of new evidence and its potential impact on the outcome of this risk assessment, this caveat is reiterated here and readers should refer to the date stamp on page 4, or contact the HAIRS Group Secretariat (HAIRS@phe.gov.uk) to ensure the latest possible version is reviewed.

Due to the very specific nature of the risk questions addressed in this risk assessment, a number of our standard risk assessment questions have been expanded to clarify the question being addressed.

The impact of a pathogen mutating is not usually considered in the HAIRS risk assessment algorithm, but it was agreed by the group that it is important in this instance to note that it has occurred.

It is noted that the likelihood of mutation of the current dominant human SARS-CoV-2 variant within an animal population will depend on several factors: the mutation (and recombination) rate, the length of time virus is circulating in a population, the number of naïve animals and effective population size. Evidence from Danish mink outbreaks shows the virus enters the mink population and spreads very quickly (within a few days) before an antibody response is raised in mink. But generally, after 2 to 3 weeks the mink have all seroconverted and no virus is detected in samples from these animals. Each farm in Denmark, where mink variants have been detected, had around 1,000 to 3,000 animals per epidemiological group.

Assessing the risk to the UK population from new and emerging infections

Step 1: Assessment of the probability of infection in UK population

This section of the assessment examines the likelihood of an infectious threat causing infection in the UK human population. Where a new agent is identified there may be insufficient information to carry out a risk assessment and this should be clearly documented. Please read in conjunction with the Probability Algorithm following the boxes shaded green. Where the evidence may be insufficient to give a definitive answer to a question the alternative is also considered with the most likely outcome shown in solid colour and the alternative outcome in hatched colour. The text alternative to the probability algorithm can be found in Annex A.

Question	Outcome	Quality of evidence
1. Is this a recognised human disease? Note: this question also focuses on current knowledge of SARS-CoV-2 infection in *Mustelinae* species	**Yes**	**Good – humans and mink** **Satisfactory – ferrets** **Poor – other species**

SARS-CoV- 2

In December 2019, the World Health Organization was notified of a pneumonia outbreak in the city of Wuhan in Hubei Province of China, by the Health Commission of the city. The cause for the infection was identified as a novel betacoronavirus (1 of 4 genera: Alpha-, Beta-, Gamma-, and Delta-). Subsequently, the virus rapidly spread in China as well as in over 100 other countries causing a global pandemic to be declared in mid-March 2020 (2). As of 9 November 2020, over 50.2 million SARS-COV-2 human infection cases have been confirmed in 235 countries, states and territories. Over 1.25 million associated deaths have been reported (3). In the UK as of 9 November, there have been over 1.2 million confirmed cases, with over 49,000 deaths (within 28 days of a positive test) (4).

The origin or source species of SARS-CoV-2 is still unknown, and studies are ongoing (5). However, its genetic sequence shares 96.2% similarity with coronavirus RaTG13 (betacoronavirus, subgenus sarbecovirus) which was detected in horseshoe bats (genus Rhinolophus) in 2016 in Yunnan province, China (6). Similar bat coronaviruses have caused 2 other major outbreaks of severe respiratory disease in the last 2 decades: Middle East Respiratory Syndrome Coronavirus (MERS-CoV) and Severe Acute Respiratory Syndrome Coronavirus (SARS-CoV). Other than these, 4 other coronaviruses belonging to Alpha and Beta subtypes

have caused zoonotic infections in humans (and infections in other mammals) in the past whereas Gamma and Delta subtypes have mainly infected non-mammals (7).

SARS-CoV-2 is spread by infected respiratory droplets and possibly via faeces, although transmission by contact with contaminated objects or materials is also suggested, as well as spread by aerosols (8, 9). SARS-CoV-2 infection in humans has a wide clinical spectrum, ranging from asymptomatic, or mild symptoms (such as fever, cough, loss of taste and/or smell), to severe pneumonia resulting in respiratory failure (9-11). The current primary diagnosis method used to detect the virus in the UK is RT-PCR using samples from both the upper and lower respiratory tract (9-11). No specific anti-viral treatment or vaccine is currently available.

Genetic sequencing studies suggest that SARS-CoV-2 virus's spike protein (S) binds to the same human cell receptor (Angiotensin I Converting Enzyme 2 -ACE2) which SARS-CoV uses (12, 13). There is considerable interest in host-virus spike protein-ACE2 receptor interactions not only to determine host susceptibility, but also as a target for therapeutics and vaccine development.

There have been several reports of isolation of SARS-CoV-2 by PCR and subsequent serology in companion animals (mostly cats and dogs) in several countries in the world, in a limited number of zoo animals and on mink farms [APHA collated data, (1)]. Domestic cats, big cats, non-human primates, ferrets, mink and raccoon dogs seem to also show signs of infection (virus has been isolated), disease (namely, a combination of fever, inappetence, respiratory and gastroenteric clinical signs), and in the case of mink, increased mortality rate on some farms. The majority of these reports suggest infected humans as the source of infection, or at least the source of the index case for the sustained transmission between animals observed in some animal production facilities (for example, mink farms). Other animals that are known to have low susceptibility to SARS-CoV-2 infection, either naturally derived or experimentally, include dogs, rabbits, cattle and golden hamsters. Poultry, pigs and aquatic finfish or shellfish are unlikely to be susceptible (14).

SARS-CoV-2 in *Mustelinae*

Mustelinae, a subfamily of the family *Mustelidae*, are a collection of small carnivores, including mink, polecats, weasels and ferrets. This risk assessment is limited to this subfamily and excludes the wild animals of the wider order, *Mustelidae*, present in the UK, such as otters, pine martens and badgers from other families. Reasons for restricting this assessment to only *Mustelinae* species include (i) current available evidence (natural and experimental) suggesting the susceptibility of both mink and ferrets to SARS-CoV-2, (ii) the ability of these species to spread infection within their own species, and in mink, to humans, and (iii) the presence in the UK of ferrets in low- to high-densities in settings with the possibility of close-contact human interactions.

Mink appear to be particularly susceptible to SARS-CoV-2 infection and widescale outbreaks have been reported in mink farms, where they are raised for fur production, in the Netherlands, Spain, the United States, Sweden, Italy and Denmark (1). As of 8 November 2020, over 300 mink farms globally have reported SARS-CoV-2 infection with 229 in Denmark (all in North Jutland), 69 in the Netherlands and 20 in Sweden (1, 15) [APHA collated data]. To date, the other large producers of mink fur, Poland and China (16), have not reported infections in their mink farms.

Dutch authorities were first to report outbreaks in mink farms in April 2020. Since then and as of early November, 69 of the 120 mink fur farms in the Netherlands have been affected (1). Sequencing analysis of isolates from mink and in-contact humans from a small selection of these farms (first 16 farms affected) has shown that while workers were likely to have been the source of the mink outbreak in these farms, widescale circulation amongst mink in these high-density settings allowed for the virus to mutate in the animals and to become regarded as distinct mink variants (17). Epidemiological and sequence analysis of mink and human strains showed that although mink-to-human transmission did occur in farm workers, there was limited spread of the observed mink variants in the local or national human population. The Dutch Outbreak Management Team for Zoonoses has advised that people in contact with infected mink on mink farms are at a higher risk of infection with SARS-CoV-2 than transmission within a family/household setting (18, 19). All mink on SARS-CoV-2 positive Dutch mink farms to date have been culled and producers will not be allowed to restart mink farming. The government is discontinuing mink farming from spring 2021 (18, 20, 21).

As of early November 2020, Denmark, one of the world's largest mink fur farming sectors alongside China (16, 22), has reported SARS-CoV-2 infection in animals in 229 mink farms. The first affected farms were detected in June 2020, which were controlled through culling, with a 'second wave' starting in August, which spread very rapidly between mink on each farm premise. Within these farms 7 different groups/clusters of mink-specific variants of SARS-CoV-2 have been identified based on whole genome sequencing. Five of these clusters have been detected in humans (23). In these mink variants, 7 different mutations have been seen in the spike protein on the surface of the virus with between 1 and 4 different changes in the spike protein observed in each cluster. These mink variants have been detected in 214 people among 5,102 samples (4.2%) taken from Danish human cases detected between mid-June to mid-October (23). These individuals infected with SARS-CoV-2 mink variants primarily resided in North Jutland Region (200/214, 94%) and comprised individuals who worked in mink farms, and individuals in local surrounding populations, including a nursing home, many of whom had no known contact with mink. It is possible that not all historical cases of mink variants have been detected in this region due to the low proportion (<15%) of total samples sequenced so far. To date, human-to-mink, mink-to-human and subsequent human-to-human transmission of mink variants of SARS-CoV-2 have been recorded in Denmark (24).

The virus variant with 4 changes in the spike protein, referred to as cluster 5, was found on 5 mink farms and in 12 human cases all residing in North Jutland (ages ranging from 7 to 79 years). Eight of these individuals infected with cluster 5 virus had links to the mink farming industry and the remaining 4 cases are reported from the local community with no known link to mink at this stage (24). All cluster 5 human cases were diagnosed in August and September 2020. Further spread of this cluster 5 variant within and outside Denmark cannot be excluded, but comprehensive actions taken by Danish authorities (including animal culling and enhanced non-pharmaceutical interventions for the population in North Jutland) should reduce this ongoing risk. Based on initial investigations, this cluster 5 virus demonstrates reduced sensitivity to neutralising antibodies when tested *in vitro* against antibodies collected from people with previous SARS-CoV-2 infection (23). Further scientific and laboratory-based studies are ongoing to verify these preliminary findings and to understand any potential implications in terms of diagnostics, therapeutics and vaccines in development (24).

Swedish authorities have reported that none of the mutations described in the Danish Cluster 5 mink variant have been observed in Swedish mink SARS-CoV-2 variants, but work continues to sequence viruses from the latest confirmed positive cases in mink and human cases from the same municipalities as affected mink farms (25) (Personal communications, Swedish authorities).

To date, SARS-CoV-2 natural infection has been reported in a small number of captive ferrets (in Spain) (Personal Communications, Spanish authorities), although 3 studies have shown that infected ferrets are able to transmit the virus to other ferrets under experimental conditions and that transmission was observed under both direct and indirect contact (permeable partition separating infected from uninfected animals) (26-28). For completeness, another small-scale US study that has yet to be peer-reviewed suggests ferrets may not be susceptible under natural exposure conditions after testing several ferrets in 1 household with PCR-positive human cases (29). This study is a pre-print publication and was carried out in 1 domestic setting with only limited virological investigation of the humans in the household. This investigation need to be repeated and results replicated to be considered appropriately.

To date, there are no reports in the scientific literature of SARS-CoV-2 infection in other members of the family of *Mustelinae* (for example, weasels, stoats and polecats), but given their close genetic relationship with mink and ferrets, they are presumed to be susceptible as they will share common receptor binding domains for the virus. The lack of reports of natural infection are likely to be related to their wild/feral status, the limited human contact (identifying humans as the most likely source of SARS-CoV-2 infection) and the absence of mass production facilities of these species.

2. Is this disease endemic in the UK? Note: in this assessment, this question specifically refers to whether SARS-CoV-2 is endemic in the UK *Mustelinae* population	**No**	**Unsatisfactory**

Although SARS-CoV-2 is currently endemic in the UK human population, there is currently no evidence to suggest that it is present in either the wild, or captive populations of *Mustelinae*. Infection of animals with SARS-CoV-2 meets the World Organisation for Animal Health's (OIE's) criteria of an emerging infection, and as a consequence, veterinarians should report any positive test results for SARS-CoV-2 from animals they receive to the chief veterinary officer in the administration where the virus was detected.
See:

- guidance on the case definition, testing and reporting requirements for SARS-CoV-2 for vets
- advice for veterinarians and clients for pets at the veterinary surgery

No reports of SARS-CoV-2 infection in *Mustelinae* species in the UK have been recorded to date. Due to the wide variation in habitat, human interactions and husbandry of *Mustelinae* in the UK [APHA collated data], they are considered in 3 separate categories:

Wild mink, wild ferret and other wild *Mustelinae*

There are an estimated 120,000 wild mink in Great Britain (GB) of the species *Neovison vison* (American vison). A non-native species, it became established in the wild following escapes or releases from fur farms in the early twentieth century and is known to be present across the vast majority of GB (30). The European vison mink species (*Mustela nutreola*) is not known to be present in GB.

Ferrets, another non-native species, established in the wild from those recently released from captivity, as well as those from more established feral populations (31). As ferrets are widely kept throughout Britain, feral ferrets are likely to have a broad geographical range. No specific density estimates are available but are likely to be lower than other wild *Mustelinae* species (30).

Wild populations of polecats, including hybrid polecat-ferrets, are widely established throughout Wales and in western and southern England, with the population expanding eastwards. Only small numbers have been reported in Scotland, most of which will be hybrids or feral ferrets. The GB population is estimated at 83,000 (30).

Wild populations of weasels and stoats are also present in GB in high numbers (450,000 and 438,000) respectively (30).

To date, there is no evidence to suggest infection in wild *Mustelinae* populations in the UK. It is our understanding that no SARS-CoV-2 testing has been undertaken in these species to date, but no increased reports of clinically unwell animals or increased mortality events have been recorded by or reported to the APHA wildlife team.

Domestic ferrets kept at low to medium density

The UK domestic pet ferret population is estimated at between 800,000 to 1,000,000 (32). Within households, they are often kept in low density (the minimum recommendation is pairs). Small-scale breeders (for domestic pet purposes) and small collections of working ferrets may have low to medium density collections of ferrets (where low would be single numbers, and medium several tens) [APHA collated data].

To date, information collated by the small animal veterinary surveillance network (SAVSNET) show no records of suspected SARS-CoV-2 infection in ferrets, or ferrets being tested for SARS-CoV-2 (Personal communications, SAVSNET).

Ferrets kept at higher density

In the UK there are a small number of holdings with high densities of ferrets (more than 100). These animals are produced mostly for, and used in, medical research or used as working animals for vermin control or flushing rabbits. As of 9 November, no SARS-CoV-2 infection in these higher-density premises have been officially reported in the UK, but this may reflect a lack of testing to date. Enhanced surveillance in these populations is required.

Further evidence gained from enhanced surveillance is required to provide an accurate answer to this question.

3. Are there routes of introduction into the UK? Note: in this assessment, this question specifically refers to possible routes of SARS-CoV-2 (human and *Mustelinae* adapted variants) introduction into the UK *Mustelinae* population	**Yes**	**Satisfactory**

Since March 2020, SARS-CoV-2 has been endemic in the UK human population at varying prevalences over time, and infected individuals would be regarded as the most likely source of SARS-CoV-2 infections for UK *Mustelinae*. As of 6 November, only 1 confirmed case and 1 suspect case (which was positive on unofficial tests only) of SARS-CoV-2 infection in animals have been reported in the UK, both in cats for which the most likely source was determined to be an infected owner. There have been no reports of any *Mustelinae* adapted strains in *Mustelinae* in the UK.

Testing and sequencing are ongoing in the UK to determine if any of the mink-adapted strains reported from Denmark or other countries are present in the UK human population. This risk assessment will be reviewed based on the outcome of these investigations.

The following sections look at the risk of human contacts introducing SARS-CoV-2 into specific *Mustelinae* populations

Wild mink, wild ferret and other wild *Mustelinae*

Due to the limited human contact with wild *Mustelinae* species, direct human to wild *Mustelinae* transmission is thought unlikely. People involved in working with wild animals are advised to wear protective equipment but not full PPE. Natural England is providing guidance to these settings (Personal communications, Natural England). There is a theoretical possibility of indirect transmission via contact with contaminated human waste.

Domestic ferrets kept at low density

Given the endemic nature of SARS-CoV-2 in the human population, and the close contact between most owners and their ferrets in domestic or other low-density settings (for example, petshops), ferret exposure to SARS-CoV-2 from infected in contact humans is possible. Prior to November 2020, there was no specific guidance for owners on how to prevent SARS-CoV-2 spread to ferrets, but general advice included good hygiene practice to prevent transmission of SARS-CoV-2 to pets. Due to COVID-19 restriction on gatherings, there have been very limited opportunities for interactions between ferrets from different households since early in 2020 at shows, fairs, racing events, therefore ferret-to-ferret transmission of infection is likely to be restricted to within these low-density settings.

Pet ferrets, accompanied by their owners, may travel to the UK provided animals are compliant with the pet travel rules: ferrets must (i) be identifiable by microchip, (ii) have a valid passport and (iii) have a current rabies vaccination. These animals are likely to have significant human contact and could be exposed to SARS-CoV-2 if their owner, handler or a household member is infected. In these circumstances, ferret-to-human transmission of infection presents no greater risk than human-to-human transmission. Guidance is being updated to ensure any pet ferrets arriving into the UK with people who are required to self-isolate should also remain in isolation and not leave the house or property for 3 weeks following return to the UK. Note, this is a longer period specified for self-isolation compared to current human guidance, but it is based on experimental infections of ferrets where virus is cleared after 2 to 3 weeks.

Ferrets kept at higher density

The risk of exposure of ferrets kept in high density settings will be dependent on biosecurity measures applied. But extrapolating from outbreaks in other *Mustelinae* high-density settings (mink farms), infected workers have been identified as the source of infection for substantial outbreaks in these settings. In the UK, no specific guidance for keepers was available before November 2020. The OIE released draft guidance for these circumstances in early November 2020 (33). It should be noted that for ferrets used in medical research they are likely raised and managed in strict biosecurity so as to minimise the effect of external factors on outcomes of the research.

Other sources

Non-human sources (for example, infected companion animals) – cats and dogs have tested positive for SARS-CoV-2 in households with infected humans. It would not be possible to differentiate between the likely exposure of a companion ferret in such a household to the other infected companion animals or to an infected human (or contaminated environment). Nevertheless, evidence suggests dogs are unlikely to become infectious, while cats have only limited transmission potential under experimental conditions. In COVID-19 positive households with multiple companion animals, not all become infected (1).

Legal importations of infected *Mustelinae* – commercial imports of *Mustelinae* must be in accordance with European Directive 92/65 (EEC) and accompanied by a veterinary health certificate. They should be consigned to approved or registered premises, and for entry into the UK must enter with a licence under the Rabies Import Order. There are no requirements for pre-import testing for SARS-CoV-2; all health conditions relate to rabies. All people keeping mink, which are invasive non-native species, must apply for a license from their relevant authority.

Illegal importations or stowaways of infected *Mustelinae* – it is not possible to provide data to support an estimate of this risk, but this pathway of introduction is thought to be unlikely. In Denmark, there are few wild-living mink (estimated between 4,000 and 10,000) (Personal communications, Danish authorities) and mink farms are very secure due to the value of the pelts, thus wild-farmed mink interactions are unlikely to occur. Wild mink are wary of humans, therefore it is not believed they would readily enter a vehicle or cargo.

At this time, if *Mustelinae* exposure to SARS-CoV-2 were to occur, it will most likely to be one of the UK human circulating variants. In low density settings, it is presumed that there would be an insufficient naïve population to permit enough virus passage to allow functional mutations to occur and be maintained within that population. The highest risk of functional *Mustelinae*-adapted mutations occurring to human variant strains in the UK are likely to be in high ferret density settings.		
4. Are there effective control measures in place to mitigate against these?	**No**	**Satisfactory**
At this current stage of the COVID-19 pandemic, humans in the UK present a persistent source of onward transmission of SARS-CoV-2 virus until eradication or significant management is achieved by non-pharmaceutical or pharmaceutical interventions. Guidance does exist on ways to prevent onward transmission of SARS-CoV-2 from infected individuals to in-contact animals and on having animals tested, but it is unclear how widely this guidance is followed (33-38). The Group recognises that given the latest developments in our knowledge on infection in *Mustelinae*, there needs to be more awareness raised on these guidance documents and recommendations.		
5. Do environmental conditions in the UK support the natural reservoirs?	**Yes**	**Good**
In this circumstance, and at this point in the epidemic, humans will be regarded as the natural reservoir of SARS-CoV-2.		
6. Will there be human exposure? Note: in this assessment, this question specifically refers to will or could there be human exposure to SARS-CoV-2 infected *Mustelinae* in the UK?	**No - general population Yes - high risk group**	**Good**
For the majority of the UK human population there will be no contact with *Mustelinae* species, wild or domesticated, thus no risk of exposure to infected *Mustelinae*. **Wild mink, wild ferret and other wild *Mustelinae*** Given the propensity for wild *Mustelinae* to avoid human contact, there will be very limited risk of exposure to infected wild *Mustelinae* for the general public. The risk of exposure to these infected animals will be those involved in care of wild *Mustelinae*. We estimate there are over 50 wildlife rescue centres in GB and 20 ferret rescue centres. For this small group of individuals, given the risk of SARS-CoV-2 infection in these *Mustelinae* species is believed to be very low, there will be only a limited risk of exposure.		

Domestic ferrets kept at low density

In low-density settings, there is a possibility of human exposure to infected ferrets if SARS-CoV-2 has been introduced by infected handlers. As discussed above, in these domestic or low-density settings the strain of exposure will most likely be those circulating in the human population, and not ferret-adapted strains. Nevertheless, there would also be a risk of transmission from human-to-human in the same household setting, not involving the ferrets.

Ferrets kept at higher density

In high-density ferret settings, there is also a possibility of human exposure to infected ferrets if SARS-CoV-2 has been introduced by infected human handlers. In these circumstances, depending on housing and management arrangement (for example, contact of different age groups) and biosecurity (APHA collated data), there may be sufficient transmission and naïve populations to allow for the possibility of strains circulating in the ferrets to adapt functional mutations. Thus, it is this group who would be regarded as the highest-risk group for contact with ferret- adapted strains of SARS-CoV-2.

It is important to note that exposure will not always lead to infection from infected *Mustelinae* to human contacts.

7. Are humans highly susceptible?	**Yes**	**Good**

Naïve humans are highly susceptible to SARS-CoV-2 infection, with clinical presentations ranging from asymptomatic or mild to severe and fatal infections, depending on age, sex and underlying health conditions. Latest estimates according to SAGE, is a population level hospital case fatality rate of 15% (where only 5% of all those testing positive enter hospital) (39). Research is ongoing to determine the susceptibility of individuals to repeat infections with SARS-CoV-2. To date, a relatively small number of re-infections have been reported in the scientific literature (40).

Evidence from Denmark suggests that humans are susceptible to mink variants of SARS-CoV-2. In total, 214 human infections with mink variants have been reported out of 5,102 isolates sequenced since mink farm infections have been reported in Denmark. These infections have been reported in individuals with direct and indirect contact with mink, as well as in individuals with no contact with mink (24).

For the cluster 5 mink variant to date only 12 people are known to have been infected with this variant. In this group, 8 had a link to the mink farming industry and 4 cases are from the local community with no known contact with mink at this stage (24).

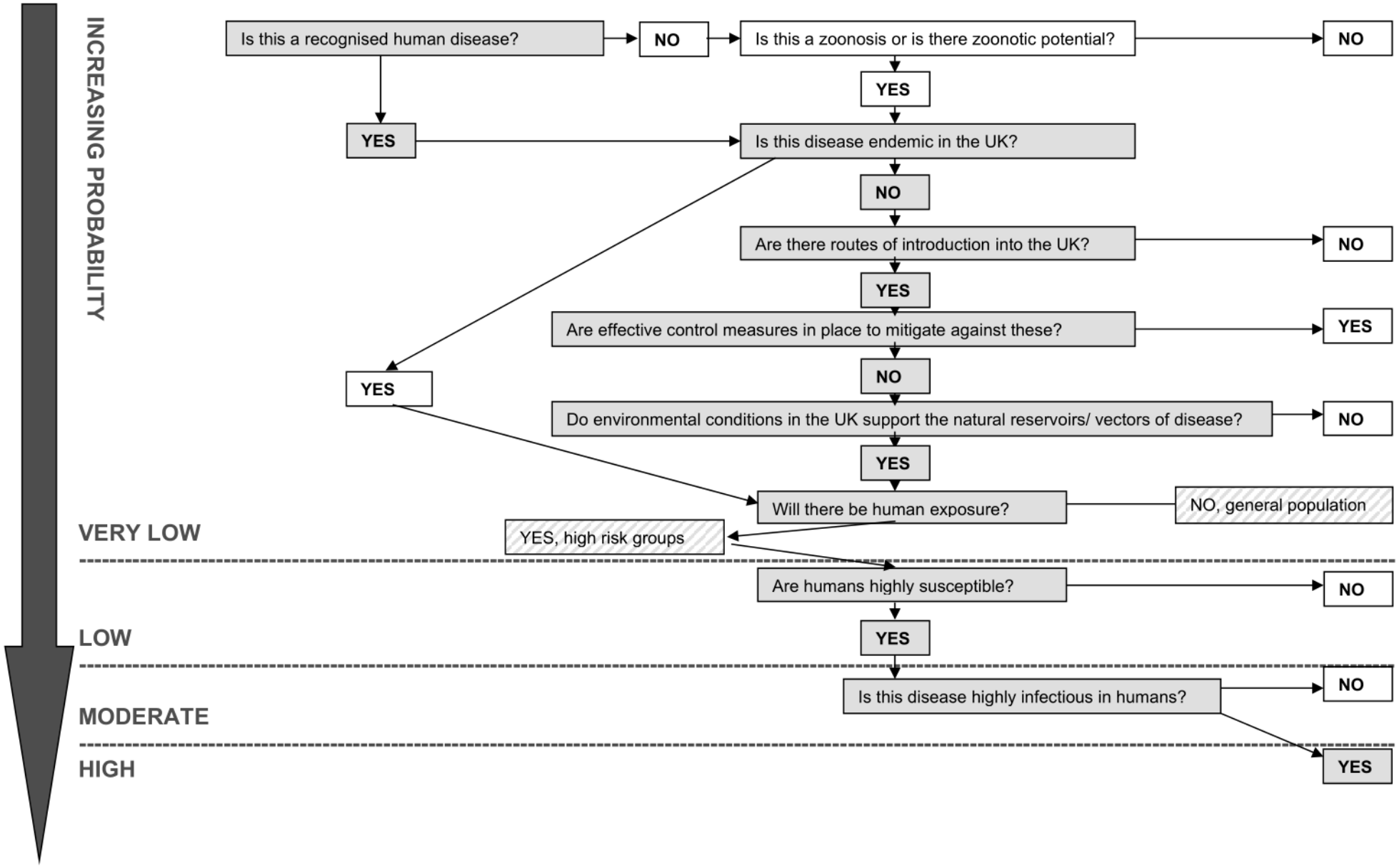
Based on investigations to date there is no evidence to suggest increased transmissibility or pathogenicity in humans from these Danish mink variants (Personal Communications, Statens Serum Institut, Denmark). Testing is still ongoing on antibody neutralisation studies. However, according to the most recent information, rabbit antisera will neutralise the mink variant (Personal Communications, Statens Serum Institut, Denmark). Although further research is required, these initial studies suggest that naïve humans infected with this mink variant will mount an antibody response to this variant but limited immunological protection may be provided by previous infections with other SARS-CoV-2 variants.		
8. Is this disease highly infectious in humans?	**Yes**	**Good**
The basic reproduction number (R_0) for SARS-CoV-2 has been estimated to be between 2 and 6 depending on the setting under investigation (41). Based on currently available information it is not thought that there is any significant variation in R_0 or R_t between different SARS-CoV-2 strains circulating in the human population. Information from Danish authorities indicates that mink variants are understood to have the same transmissibility and pathogenicity as other strains circulating in the human population. Although further investigations are ongoing, initial research has indicated the possibility that limited immunological protection may be provided by previous SARS-CoV-2 infections against the Danish cluster 5 mink variant. The potential implications of this finding in terms of transmission dynamics, including the R_0/R_t in human populations are still being evaluated.		

The **PROBABILITY** of human infection with SARS-CoV-2 from *Mustelinae* in the UK:

General population: very low

High-risk population: high

Flowchart showing the 'probability of infection in the UK population' algorithm (for an accessible text version see page 27)



Step 2: Assessment of the impact on human health of high-risk groups

The scale of harm caused by the infectious threat in terms of morbidity and mortality: this depends on spread, severity, availability of interventions and context. Please read in conjunction with the Impact Algorithm following the boxes shaded green. Where the evidence may be insufficient to give a definitive answer to a question the alternative is also considered with the most likely outcome shown in solid colour and the alternative outcome in hatching. The text alternative to the impact algorithm can be found in Annex A.

Question	Outcome	Quality of evidence
1. Is there human-to-human spread?	**Yes**	**Good**
The basic reproduction number (R_0) for SARS-CoV-2 widely circulating in human populations has been estimated to be between 2 and 6 depending on the setting under investigation (41). To date, there has only been limited community transmission of the mink variants (214 of 5102, 4.2% of sequenced strains since significant mink outbreaks started to occur in Denmark) (23). Based on currently available evidence, there is no reason to think this would not be capable of transmitting easily between humans, similar to the human variants. Other variants with mutations in the S protein (for example, D614G) have spread very quickly and regionally between humans (42).		
2. Is the population susceptible?	**Yes**	**Good or satisfactory**
Naïve humans are highly susceptible to SARS-CoV-2 infection. Investigations are ongoing to determine the susceptibility of individuals to repeat infections with SARS-CoV-2. To date, a relatively small number of re-infections have been reported in the scientific literature (40), thus re-infections are possible, but the degree to which they occur, and the impact of different variants, is yet to be determined. Information from Denmark suggests that humans are susceptible to mink variants of SARS-CoV-2 and are understood to have the same transmissibility and pathogenicity as other strains circulating in the human population. The Danish cluster 5 mink variant virus was tested *in vitro* against antibodies from people who had been infected with SARS-CoV-2 viruses commonly circulating in humans and there was a variable but reduced neutralising affect (23, 24). However, recent Danish experiments with rabbit antisera show good neutralising activity (Personal Communications, Statens Serum Institut, Denmark), suggesting naïve humans could possibly have a normal immune response to this particular variant if these in vitro outputs can be replicated with natural infection. The impact of this on the efficacy of candidate vaccines has yet to be determine but Danish authorities are believed to be working with the World Health Organization and vaccine producers to investigate.		

3. Does it cause severe disease in humans?	**Yes**	**Satisfactory**
Clinical presentations of human infections with SARS-CoV-2 range from asymptomatic or mild to severe and fatal infections, depending on age, sex and underlying health conditions. Latest estimates according to SAGE is a population level hospital case fatality rate of 15% (where only 5% of all those testing positive enter hospital) (39). The long-term impacts of COVID-19 on human health are not yet fully appreciated, but as many as 1 in 20 people can suffer symptoms for more than 8 weeks post infection (43). Current information provided by Danish authorities suggests that mink variants observed in human populations display no discernible differences in terms of ability to cause severe disease compared to SARS-CoV-2 viruses that commonly infect humans.		
4. Would a significant number of people be affected?	**No**	**Good**
It is anticipated that direct *Mustelinae*-to-human transmission would occur in very low numbers. In domestic and low/medium density ferret settings, care of animals is generally restricted to a small number of individuals or occurs within a household. Due to COVID-19 non-pharmaceutical interventions across the UK, situations where more individuals could interact with infected ferrets (for example, petting farms) are under restrictions limiting visitor, and thus, exposure numbers. In higher density ferret settings, that is, populations where specific variants are deemed most likely to occur, care of animals is undertaken by a restricted number of people. Although there will be some seasonal variability in ferret numbers coinciding with breeding seasons, the animal densities in these facilities in the UK are much lower than what is described in mink farming in Denmark and other countries with commercial farming of mink for fur. Thus in the UK, seasonal workers are unlikely to be widely employed, and the workforce would be a more static, low number. Outside the scope of this risk assessment is the risk of indirect transmission of mink SARS-CoV-2 variants if human-to-human transmission were to occur. Uncontrolled spread in this circumstance could result in a significant number of people being affected, as seen with other SARS-CoV-2 viruses. Surveillance should be enhanced to ensure early detection of such an event. Any isolates from *Mustelinae* species or known handlers of *Mustelinae* species should be reported promptly to the relevant incident control team, whole genome sequenced, and information shared with relevant animal health and human health counterparts across the UK.		

5. Are effective interventions (preventative or therapeutic) available?	**Yes**	**Satisfactory**

The employment and correct use of appropriate PPE when handling ferrets and other *Mustelinae*, as well as preventing SARS-CoV-2 infected individuals contacting these species, could prevent infection occurring in these populations.

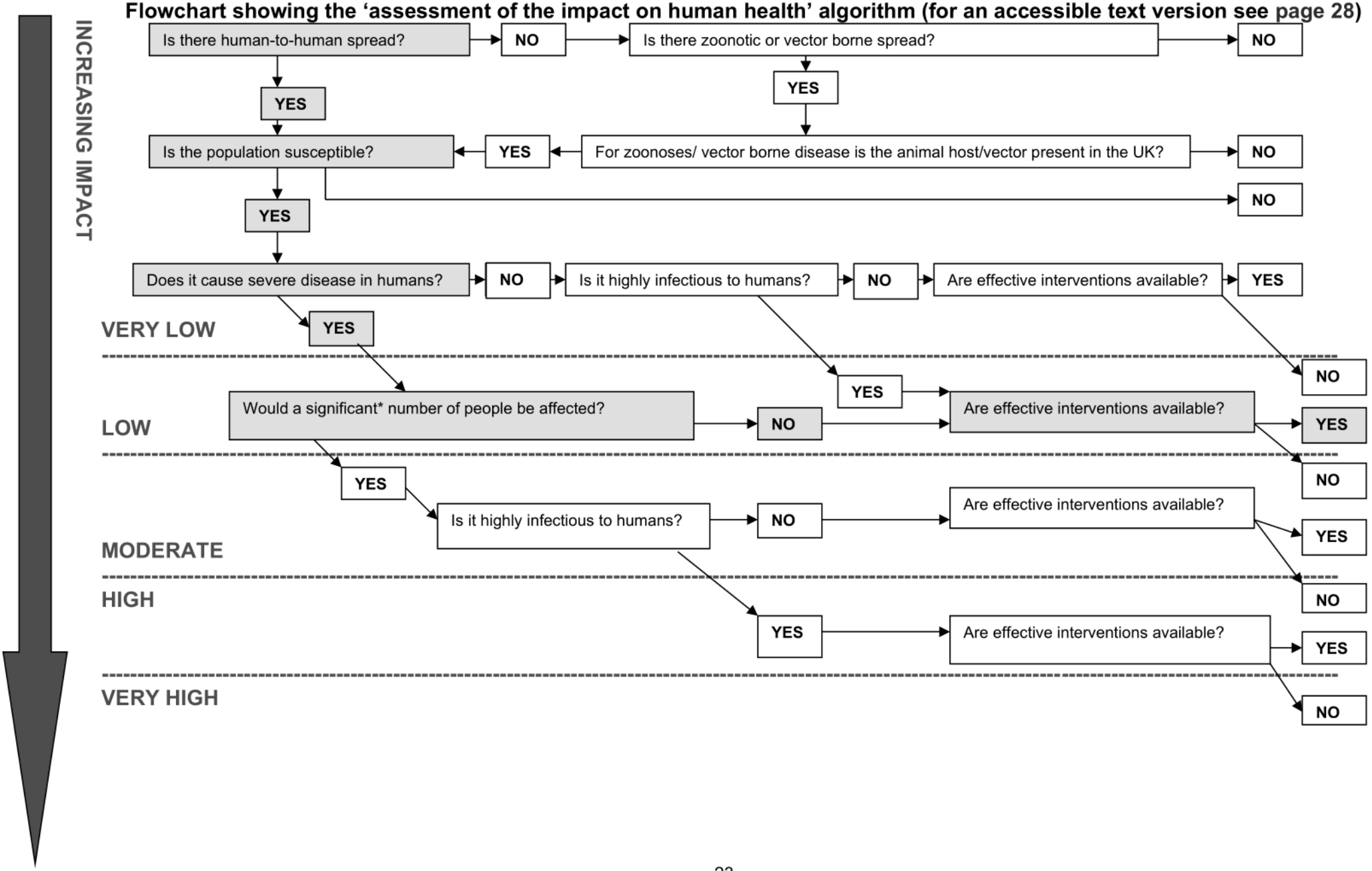
The OIE recognises the importance of human-to-animal transmission and has produced guidelines on working with free-ranging wildlife (38). The guidance is to avoid handling mammals as much as possible and collect environmental samples instead (reduce, replace and refine), so that if an individual has been exposed or is infected with SARS-CoV-2 she/he should postpone handling animals and, finally, that individuals should adopt practices to reduce exposure – face coverings, gloves and disinfection procedures.

It is recognised that, in the household setting, the application of PPE for handling ferrets where they are likely to share living space with owners is not always feasible, but good hand hygiene and the use of face coverings should be encouraged. In these circumstances, if owners become unwell with COVID-19 symptoms, they are advised to not be involved in the care of their ferrets if possible. They should self-isolate from their pets, avoid kissing and cuddling them, and avoid sharing food or other items with them. If a ferret does develop clinical signs suggestive of SARS-CoV-2 infection, owners are advised to contact their vet who will provide guidance on testing and care of the animal.

In higher density ferret facilities and holdings, appropriate PPE should be worn by all handlers, and any staff members with symptoms suggestive of COVID-19 should not be permitted to handle ferrets as recommended by the OIE guidance on working with farmed animals of species susceptible to infection with SARS-CoV-2 and WHO (24, 33).

The **IMPACT** of SARS-CoV-2 infection in UK *Mustelinae* on human health in the UK: **Low**

Flowchart showing the 'assessment of the impact on human health' algorithm (for an accessible text version see page 28)



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Effort was made to include mainly peer-reviewed articles related to SARS-CoV-2. However, due to the rapidly changing situation when important novel or unique information has been made available online through rapid pre-print releases, government reports or official press releases, these have been included, despite not being peer-reviewed.

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Annex A

Accessible text version of the assessment of the probability of infection in the UK population algorithm.

Outcomes are specified by a ✓ beside the appropriate answer. Where the evidence may be insufficient to give a definitive answer to a question, the alternative is also considered with the most likely outcome shown with ✓✓ and/or the alternative outcome(s) with a ✓

Question 1: Is this a recognised human disease?

- Yes: go to question 3 ✓
- No: go to question 4

Question 2: Is this a zoonosis or is there zoonotic potential

- Yes: go to question 3
- No: probability of infection in UK population is very low

Question 3: Is this disease endemic in the UK?

- Yes: go to question 7
- No: go to question 4 ✓

Question 4: Are there routes of introduction into the UK?

- Yes: go to question 5 ✓
- No: probability of infection in UK population is very low

Question 5: Are effective control measures in place to mitigate against these?

- Yes: probability of infection in UK population is very low
- No: go to question 6 ✓

Question 6: Do environmental conditions in the UK support the natural reservoirs/vectors of disease?

- Yes: go to question 7 ✓
- No: probability of infection in UK population is very low

Question 7: Will there be human exposure

- Yes – high-risk groups: Go to question 8 ✓
- No – general population probability of infection in UK population is very low ✓

Question 8: Are humans highly susceptible?

- Yes: go to question 9 ✓
- No: probability of infection in UK population is low

Question 9: Is this disease highly infectious in humans?

- Yes: probability of infection in UK population is high ✓
- No: probability of infection in UK population is moderate

Accessible text version of the assessment of the impact on human health algorithm

Outcomes are specified by a ✓ beside the appropriate answer. Where the evidence may be insufficient to give a definitive answer to a question, the alternative is also considered with the most likely outcome shown with ✓✓ and/or the alternative outcome(s) with a ✓

Question 1: Is there human-to-human spread?
- Yes: go to question 4 ✓
- No: go to question 2

Question 2: Is there zoonotic or vector-borne spread?
- Yes: go to question 3
- No: impact on human health in the UK is very low

Question 3: Is the animal host or reservoir present in the UK?
- Yes: go to question 4
- No: impact on human health in the UK is very low

Question 4: Is the population susceptible?
- Yes: go to question 5 ✓
- No: impact on human health in the UK is very low

Question 5: Does it cause severe human disease?
- Yes: go to question 8 ✓
- No: go to question 6

Question 6: Is it highly infectious to humans?
- Yes: go to question 9
- No: go to question 7

Question 7: Are effective interventions available?
- Yes: impact on human health in the UK is very low
- No: impact on human health in the UK is low

Question 8: Would a significant number of people be affected?
- Yes: go to question 10
- No: go to question 9 ✓

Question 9: Are effective interventions available?
- Yes: impact on human health in the UK is low ✓
- No: impact on human health in the UK is moderate

Question 10: is it highly infectious to humans?
- Yes: go to question 12
- No: go to question 11

Question 11: Are effective interventions available?
- Yes: impact on human health in the UK is moderate
- No: impact on human health in the UK is high

Question 12: Are effective interventions available?
- Yes: impact on human health in the UK is high
- No: impact on human health in the UK is very high

Risk Assessment of Mink farms with COVID-19 outbreak

Background

With mink herds in two farms having been infected with SARS-CoV-2 in BC, it is important to assess the risk of a mutation of significance arising, and the risk of onward transmission in different scenarios. The risk assessment can inform recommendation about mitigation strategies. This is important to protect the health of the population in BC, but also to protect the workers on mink farms and their contacts.

Rationale

The risk that mink farms with COVID-19 outbreaks poses to workers and the general population ~~depends on a number of factors~~which can be divided into two main categories or risk each with its own set of mitigation strategies.

1)~~.~~ The risk ~~arises if~~ of a mutation of significance arising ~~occurs~~ in the minks ~~and~~

2) The risk of transmission from mink to humans and onward ~~is then transmitted back to humans and spreading to the general population.~~

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1. Risk of a mutation of significance arising in affected farms in BC

The risk of mutation arising is increased with increased viral replication. Viral replication increases with larger herd, as well as with longer time of virus circulation in the herd. Continued transmission of SARS-CoV-2 in mink farms may eventually give rise to other variants of concern. (ECDC 2020)

1.1 International variants of concern linked to mink farming

Of all mink-related variants analyzed so far, in the millions of infected minks that have been the object of intense monitoring in Denmark and the Netherland as well as some monitoring in the United States and other countries with infected mink farm, only the Cluster 5 variant has raised specific concern due to its effect on antigenicity (ECDC 2020). Cluster 5 (a cluster of 4 cumulative mutations in the spike protein) with decreased antigenicity occurred only in Denmark, with small spread to about 12 people, and this was controlled (ECDC 2020). Cluster 5 variants was found to have a lower susceptibility to neutralizing antibodies (Lassaunière 2020), which might lower the level of vaccine effectiveness (ECDC 2020). The strain is no longer considered to be circulating (ECDC 2020).

Other SARS-CoV-2 variants were also found in relation to mink farming~~but need to be investigated if they affect antigenicity or not~~ (Rambaut 2020, Van Dorp 2020). One mutation Y453F in the spike protein was found in 214 mink related cases in Denmark, and also independently found in minks in Netherlands (ECDC 2020). Variants with Y453F, unrelated to the Danish and Dutch variants, have also been reported from other countries (The Russian Federation, South Africa, Switzerland, and the United States) in the

GIS EpiCoV sequence database (GISAID 2020). About half of the mink-related strains reported by Denmark additionally carry a deletion of two amino acids (69-70) in the S protein. This mutation is not present in any of the mink strains from the Netherlands but has been widely reported in unrelated human cases in the GISAID EpiCoV database (from Australia, Canada, Côte d'Ivoire, France, Germany, Malaysia, New Zealand, Norway, Sweden, and the United Kingdom) (ECDC 2020). Importantly, ~~T~~the ECDC states that there was no change in transmissibility ~~reporte~~ with the delation of 69-70 ~~n~~or with the change to Y453F (ECDC b, 2020)~~-~~.

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1.2 Comparison to mink farm outbreaks in BC to other countries

The herds in BC are relatively small compared to the herds in the Netherlands and Denmark (Table 1), and the virus has been circulating for a shorter period. In Netherlands, the first SARS-CoV-2 infection in a mink and subsequently in a mink farm worker occurred in April 2020 (ECDC 2020), and on 3 June 2020, the government ordered a cull of all infected minks (Guardian 2020). In Denmark, the virus circulated for about 6~~5~~ months prior to ~~all~~ minks in the affected zones being culled. Denmark authorities found extensive spread of SARS-CoV-2 on mink farms in June 2020, and detected cluster 5 mutations in Aug 2020 (WHO 2020). On 4 November 2020, Denmark decided to cull all farmed mink in Denmark and by 25 November, mink on all 289 affected mink farms, and farms within an assigned zone, were culled. (WHO 2020)

In the USA, mink herd infected with SARS-CoV-2 have been reported in 4 states, in farms ~~the smallest farm was~~from about 3000 ~~mink and the largest was about~~ to 30,000 minks, with average size around 10,000-15,000 minks (Taylor, 2020). The first case was confirmed on Aug 17, 2020 in Utah where to date in Dec 2020, they are still detecting virus on these farms (Taylor, 2020). Although genomic data suggest that there was a reintroduction of SARS-CoV-2 in the infected herd, explaining the finding of a large proportion of the herd infected in October, which decreased to about 5% in December. USA has not culled their infected mink but have quarantined infected farms. To date none of the USA farms have been cleared from quarantine. (Taylor, 2020) In Utah, infected farms have been allowed to pelt. One farm was allowed to move its pelts to a pelt processing facilities outside of the infected farm. Involved workers were instructed to use appropriate PPE, and there was a special zone designated to carry the work, with enhanced disinfection afterward. This was not associated with known spread of SARS-CoV-2. The Utah veterinarian assess that the full processing of pelt to a finish product would destroy all live viruses and would be comfortable with the movement of those fully processed pelts without restrictions. The Utah veterinarian are planning to allow pelts from other infected farms to be processed the same way. The pelts apparently need to be ready by mid-January to be auctioned in March.

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Table 1. ~~Human and~~ Size of the mink industry in various locations~~Mink Demographics~~ (Radke, 2020)

Region	Annual pelt production (millions)
Denmark	14
Netherlands	4
Canada	.9
BC	.25
Fraser Health	.25

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1.3 Risk a~~A~~ssessment of a mutation of significance arising ~~for British Columbia~~ in BC's~~A~~ affected m~~M~~ink Farms ~~A~~

Currently, we estimate the risk of a mutation of significance arising at affected mink farm A as low, and very ~~to~~ very low on farm B. For both, it is due to the relatively small number of mutation of significance that have arisen in other countries with much larger mink farming industry and viruses circulating for longer. The remaining herd in the first farm has about 5000 animals. PCR results ~~,~~are pending on more samples from the original increased in mortality the first week of the outbreak on farm 1. Whole genome sequencing (WGS) will be performed on a number of samples if they are PCR positive to assess for mutation that might have aroused at the beginning, and ongoing viral sampling will be performed to assess for further mutation arising, and ongoing infection or not in the herd. This is contingent on obtaining sufficient samples in the infected farm, and have a sufficient number for the lab to be confident to find a cluster of mutation of significance. At this time, the BC CDC lab estimates that to follow the evolution of the virus, they would need periodic submission of a minimum of 5 viral samples of sufficient quality and quantity for WGS. This could potentially be done weekly, especially if samples on live mink can be collected, which is done currently successfully in Utah.

The risk at farm 2 is extremely low because the herd has been euthanized entirely and early in the outbreak. WGS results on the minks that died at the beginning of the outbreak and detection of SARS-CoV-2 in mink euthanized subsequently are pending, if any are positive with a low enough CT value to perform WGS, they will be sequenced.

Therefore even if mutation was to occur, the risk is further mitigated by our ~~We assess we have a good~~ ability to identify ~~capture~~ mutations that might cause concerns. Mutation arising can be compared to others, ~~,~~ based on location of the mutation(s) and number of mutation(s). s.13

s.13 -This is contingent on obtaining sufficient samples in the infected farm, and have a sufficient number for the lab to be confident to find a cluster of mutation of significance. At this time, the BC CDC lab has asked for periodic submission of a minimum of 5 other viral samples ~~per week~~ of sufficient quality and quantity for WGS.

2. Risk of transmission from mink to workers and onward

The risk of onward transmission from minks to workers to the general population, of any mutation, depends on several factors s.13

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In general, ~~A~~accordingto the risk assessment by ECDC, "based on the information currently available on transmissibility, severity, immunity and cross-border spread, the overall level of risk to human health posed by SARS-CoV-2 mink-related variants can be determined as:

- low for the general population and moderate for medically-vulnerable individuals, which is no different to other SARS-CoV-2 strains (not related to mink);
- low for the general population in areas with a high concentration of mink farms and moderate-to-high for medically-vulnerable individuals living in the same areas;
- moderate for non-medically vulnerable individuals with occupational exposure and very high for medically-vulnerable individuals with occupational exposure." (ECDC 2020)

This is a risk assessment based on the strains found in Europe, which included cluster 5 and demonstrated mink to human transmission, and have been more concerning than the mutations found in BC. Therefore the risk of transmission of a mutation of concern to human in BC is likely lower, and can be further mitigated. F~~Those~~ factors that can mitigate the risk further include: ~~the consistency of the farm in following~~ COVID-19 prevention and management protocols with appropriate , type and consistent use ~~the type~~ of personal protective equipment (PPE), ~~worn, and the~~ immune status of the

workers relative to the circulating virus, ~~with mutation(s), . The risk can be further mitigated with further quarantine,~~ ongoing monitoring for COVID compatible symptoms, repeat ~~and/or~~ testing, quarantine, and vaccination. ~~;~~

2.1 Risk mitigation from prior infection

A prospective longitudinal cohort study from April to November 2020, including 12,541 UK health care workers found that those with evidence of prior antibody response to COVID-19 were at substantially lower risk of reinfection, over a period of at least 6 months. Among all healthcare workers, 11,364 had no evidence of COVID-19 antibody while 1265 had evidence of such antibodies. In those without antibodies, 223 tested positive at some point for SARS-CoV-2 via PCR, a positive test rate of1.09 per 10,000 days at risk. Whereas only 2 workers tested positive for SARS-CoV-2 via PCR among the 1265 with prior antibody detection, a rate of 0.13 per 10,000 days at risk (Lumley 2020). The presence of anti-spike or anti-nucleocapsid IgG antibodies was associated with a substantially reduced risk of SARS-CoV-2 reinfection in the ensuing 6 months (adjusted incidence rate ratio, 0.11; 95% CI 0.03 to 0.44; P=0.002) (Lumley 2020). Rate ratios were similar when the anti-nucleocapsid IgG assay was used alone or in combination with the anti-spike IgG assay to determine baseline status (Lumley 2020).

A mink worker who has had previous COVID infection is most likely to have some immunity and protection against reinfection. This is especially true if there is no mutation on key part of the virus linked to immune response. As the risk of a mutation arising and affecting the know part of the virus linked to immune response is low, and can be monitored with change in mitigation measures if needed, the risk of reinfection and transmission of a mutation of concerns is very low from those workers.

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2.2 Risk mitigation from COVID-19 safety plan and the use of appropriate PPE

2.3 Risk mitigation from ongoing testing

2.4 Risk mitigation from vaccination

2.5 Risk mitigation from quarantine

Conclusions and Recommendation

In summary, for the BC affected mink farm 1, the risk of a mutation of concern is currently low. As well, the workers on the farm have been trained with regards to use of personal protective equipment, which will also decrease their risk of transmission. In addition, the workers that are being asked to perform work involving the minks are those who have had COVID-19 infections and would have some immunity to the SARS-CoV-2 virus. Hence, we agree with other jurisdictional assessments that with workers using proper personal protective equipment, adhering to WorkSafe protocols for managing minks and with the affected farm using workers that have some COVID immunity, the risk of spread of a mutation of concern is very low.

The burden of quarantine on workers' mental health and wellbeing is also significant (Brooks 2020) and compliance may decrease with prolonged quarantine.

Taking all of those factors into account, we recommend considering the measures outline in Table 1, as likely adequate to sufficiently minimize the risk of onward transmission and spread of a significant mutation.

At this time, for workers without prior evidence of COVID-19 infection in the last 6 months, we would not recommend they be allowed to perform low, moderate or high risk activities, without additional risk mitigation measures. Additional risk mitigation measures could be an extended quarantine – for the duration of the exposure to risky activities, regular asymptomatic testing, or vaccination.

Ongoing quarantine would be the least preferred option considering the low risk of a mutation of concern arising, the low risk that such mutation would go undetected, the mitigation of the risk from COVID safety plans and PPE use, and the negative impact of quarantine on workers mental health and life in general.

Regular asymptomatic testing, every few days with antigen testing, or every 5 to 7 days with PCR testing, is likely to detect infections very early, as well as detecting asymptomatic infections. If infection is detected very early, and if asymptomatic infections are detected, isolation, WGS, contact tracing and quarantine, can then be implemented to mitigate the risk of onward transmission as well as to assess the risk of the infection arising from a variant of concern. This could be a reasonable option if feasible for the workers and the BC public health or private lab system.

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We recommend that workers without evidence of prior COVID-19 infection in the last 6 months, could be allowed to perform only very low risk activities, such as those that do not require interactions with animals.

We recommend that mink farm workers be prioritized for vaccination, and be offered the vaccine before the general population. Further discussion are needed on timing and sequencing relative to other priority groups. The rational is that they are potentially having increased risk of exposure, if the virus is circulating on an ongoing fashion in the infected herd, or in another herd not yet found to be infected, as well as to prevent introduction or re-introduction of the virus in the herds, if workers are infected or re-infected with COVID-19. This would mitigate the risk for future upcoming high risk activities, such as the introduction of new minks for breading, the movement of minks between cages for breathing, the welping and the care of the subsequently expended herd.

Further discussion and risk assessment are also needed regarding processing the pelts from infected premises.

Table 1: Risk Assessment of Various Activities on Mink Farms with COVID-19 Outbreak

Scenarios	Risk Assessment for transmission based on ECDC 2020 and group discussion	Recommendations
On farm activities with no interaction with animals	Very low risk	1) Limit number of people interacting with animals 2) Hand and respiratory hygiene, physical distancing, and face mask (ECDC 2020)

Feeding	Low risk	1) Ensure proper PPE use 2) Wash hands frequently and immediately before and after feeding and removing PPE (ECDC 2020)
Pelting /Culling	High risk (ECDC 2020)	1) Ensure proper PPE use which should include N95 mask and eye protection (ECDC 2020) 2) Appropriate biosafety protocols for handling infected animals. 3) Change clothes and footwear when entering and exiting animal areas (ECDC 2020) 4) Take a shower after work (ECDC 2020) 5) Wash work clothes at a minimum of 60°C and wash and disinfect footwear(ECDC 2020) 6) Separate storage of work and street clothing (ECDC 2020)
Disposal of Carcass	Moderate risk	

* Other elements of COVID-19 safety protocols should be in place as per WorkSafe BC including enhanced cleaning, facilities to clean and change on entering and exiting affected areas, log of personnel and daily worker self-monitoring for symptoms. (USDA 2020)

Biosafety Meeting Discussion on 16 Dec 2020

Topic	Discussion	Recommendation	Responsibility
Infection risk from animals to humans. Risk assessment Need for quarantine post pelting	Consensus on the risk of transmission from mink back to humans on infected premises. National risk assessment on mink and risk to back to human by CFIA's was qualitative for employees and contractors working with live mink or pelting (CFIA 2020): 1) Probability of human –mink-human transmission is most likely low. 2) Where mink have been infected, the probability of mink-human transmission is most likely moderate Summary of literature: 1. It is common for humans to transmit to mink (ECDC 2020, PHE 2020, USDA 2020) 2. Some mutations develop in affected mink farms. (ECDC 2020, PHE 2020, USDA 2020) 3. Higher level of mutations develop in larger populations of mink (PHE 2020) 4. No evidence that mutations detected for BC's affected mink farm to date affect immunity or transmissibility or present a significant risk to human health (PHE 2020) 5. Only 1 cluster (referred to as Cluster 5) identified (with 4 mutations) where there was some evidence (a small study) showed that there may be	The level of risk from infected mink back to farm workers is considered low when appropriate controls (including adequate PPE) are in place. With the existing evidence and context in BC, the risk to human health from potential mutations of the virus in mink is considered low. Do not recommend the application of an extended quarantine on mink workers beyond existing isolation measures to control human to human transmission as proper PPE and COVID safety plan in place. The risks of prolonged quarantine outweigh the benefits: compliance decreases and risks to producer economic/mental health are increased No movement of people, animals, animal products, or equipment between farms	Fraser Health on public health management and decision-making Min of Agriculture on farm quarantine, and animal surveillance.

	decreased immune response in people (WHO 2020) 6. This cluster has been controlled and is no longer circulating (PHE 2020) 7. Mutations of the virus are also detected in humans (ECDC 2020, PHE 2020) Risk analysis of BC's affected mink farm: 1. Genomic monitoring is available for people and minks. Changes will be evaluated and risk reassessed as new evidence becomes available 2. Workers on affected arm have been exposed and have recovered and presumably have a reasonable level of immunity 3. PPE recommendations are robust and inspections have been conducted of work site by WorkSafe and Fraser Health Federal guidance for workers on affected farms: • Mitigation measures primarily biosecurity, PPE, social distancing • No additional quarantine on individuals		

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Ryder, Shevaun HLTH:EX

From: Massey, Keren L HLTH:EX
Sent: December 5, 2020 12:01 PM
To: McGuire, Caitlin HLTH:EX
Subject: co-ordination call re: mink farm COVID outbreak

Hi, Caitlin

I got a call from Graham Know, director of emergency management at Ministry of Agriculture. He was calling to brief me on a COVID-19 outbreak discovered on a mink farm near Chilliwack.

Dr. Ingrid Tyler briefed the Public Health Leadership Committee on this situation yesterday. The details as I currently have them are as follows:

- Majority of staff have tested positive (Dr. Tyler said nine staff, MoA said five, so not sure on the exact number).
- Testing done on the mink has resulted in a non-negative result, i.e. it can't be said with certainty whether or not they are infected. However, at present their behavior appears to be normal. Further testing will be done.
- The farm is now quarantined.
- The provincial Chief Veterinary Officer, Dr. Rayna Gunvaldsen, is working closely with Fraser Health.
- M of Ag is also working with Ministry of Environment re: advance planning in case the mink need to be culled.
- Ministry of Agriculture is offering to hold a cross-ministry coordination call today as EMBC, EVR and HLTH are also involved in responding to this event.

Action: determine whether we wish to participate in a coordination call. If yes, if Ian could advise on who from the MoH should participate that would be great. I am happy to, of course, and can send a call summary. Ministry of Ag wants to decide by 12:30 if a coord call will be going forward, so please let me know what our decision in re: participation.

Thanks,

Keren Massey
Provincial Health Duty Officer – Emergency Management Unit
BC Ministry of Health
Work: 1(250)952-1929 Cell: s.22

I respectfully acknowledge the unceded territories of the Songhees, Esquimalt and WSÁNEC peoples'.

Ryder, Shevaun HLTH:EX

From: Massey, Keren L HLTH:EX on behalf of HLTH MOC Duty Officer HLTH:EX
Sent: December 5, 2020 12:05 PM
To: 'christopher.reimer@phsa.ca'
Subject: FW: co-ordination call re: mink farm COVID outbreak

Hi, Chris

We were informed that you are the LM HEMBC on call today, but I have had trouble reaching you by phone. Hoping that this email finds you in a timely manner.

I got a call a few minutes ago from Graham Know, director of emergency management at Ministry of Agriculture. He was calling to brief me on a COVID-19 outbreak discovered on a mink farm near Chilliwack.

The details as I currently have them are as follows:

- Majority of staff have tested positive.
- Testing done on the mink has resulted in a non-negative result, i.e. it can't be said with certainty whether or not they are infected. However, at present their behavior appears to be normal. Further testing will be done.
- The farm is now quarantined.
- The provincial Chief Veterinary Officer, Dr. Rayna Gunvaldsen, is working closely with Fraser Health.
- M of Ag is also working with Ministry of Environment re: advance planning in case the mink need to be culled.
- Ministry of Agriculture is offering to hold a cross-ministry coordination call today as EMBC, EVR and HLTH are also involved in responding to this event.

I imagine that HEMBC is already aware of this situation given your close support of FHA. However, as per processes I am reaching out to ensure situational awareness across our health partners. If there is a coord call, can I assume that FHA/HEMBC will receive an invitation through our EOC structure or shall I forward it to you?

Thanks,

Keren Massey
Provincial Health Duty Officer – Emergency Management Unit
BC Ministry of Health
Work: 1(250)952-1929 Cell: s.22
If this is an emergency, please contact our 24/7 Duty Officer at 250-686-6061 or hlth.dutyofficer@gov.bc.ca

I respectfully acknowledge the unceded territories of the Songhees, Esquimalt and WSÁNEC peoples'.

Ryder, Shevaun HLTH:EX

From: Massey, Keren L HLTH:EX
Sent: December 8, 2020 10:08 AM
To: Hrycuik, Lorie HLTH:EX; Sterloff, Trish HLTH:EX
Cc: Galt, Jamie HLTH:EX; McGuire, Caitlin HLTH:EX
Subject: RE: N95's - Mink Farm Association request

Hi, Trish and Lorie

Trish, I would suggest that AG put their query to EMBC via the Provincial Emergency Coordination Centre. Their general intake email is pecc.ops1@gov.bc.ca.

I will give the PECC a heads up that AG may be in touch about this.

Let me know if you have any questions about this approach.

Thanks,

Keren Massey
Emergency Manager – Emergency Management Unit
BC Ministry of Health
Work: 1(250)952-1929 Cell: s.22

I respectfully acknowledge the unceded territories of the Songhees, Esquimalt and WSÁNEC peoples'.

From: Hrycuik, Lorie HLTH:EX
Sent: December 8, 2020 10:01 AM
To: Sterloff, Trish HLTH:EX
Cc: Massey, Keren L HLTH:EX
Subject: RE: N95's - Mink Farm Association request

Trish, I would suggest AGRI contact EMBC to see what access to supply them may have. Keren may have a contact for AGRI to follow up with.
Lorie

Lorie Hrycuik
Executive Lead, Population & Public Health Division
Ministry of Health
Phone: (778) 974-3766 | Lorie.Hrycuik@gov.bc.ca

From: Sterloff, Trish HLTH:EX <Trish.Sterloff@gov.bc.ca>
Sent: December 8, 2020 9:40 AM

To: Hrycuik, Lorie HLTH:EX <Lorie.Hrycuik@gov.bc.ca>
Subject: N95's - Mink Farm Association request

Hi Lorie,

Just on the call on Mink Farms, and Rayna (AGRI) has been asked by the Mink Farming Association(?) as to whether someone can help with procuring N95s; AGRI is working within to see what they can do. If they cannot procure them, is this something HLTH does, or RHA, or WorkSafe/other?

Thanks,

Trish

Trish Sterloff
A/Executive Director
Health Protection Branch
British Columbia Ministry of Health
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