



World Organisation
for Animal Health
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中华人民共和国农业农村部
Ministry of Agriculture and Rural Affairs of the People's Republic of China

A new scenario of zoonotic tuberculosis in South Asia

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- 4) German Nepal Tuberculosis Project, Nepal Anti-tuberculosis Association, Nepal**
- 5) International Centre for Diarrhoeal Disease Research, Bangladesh**

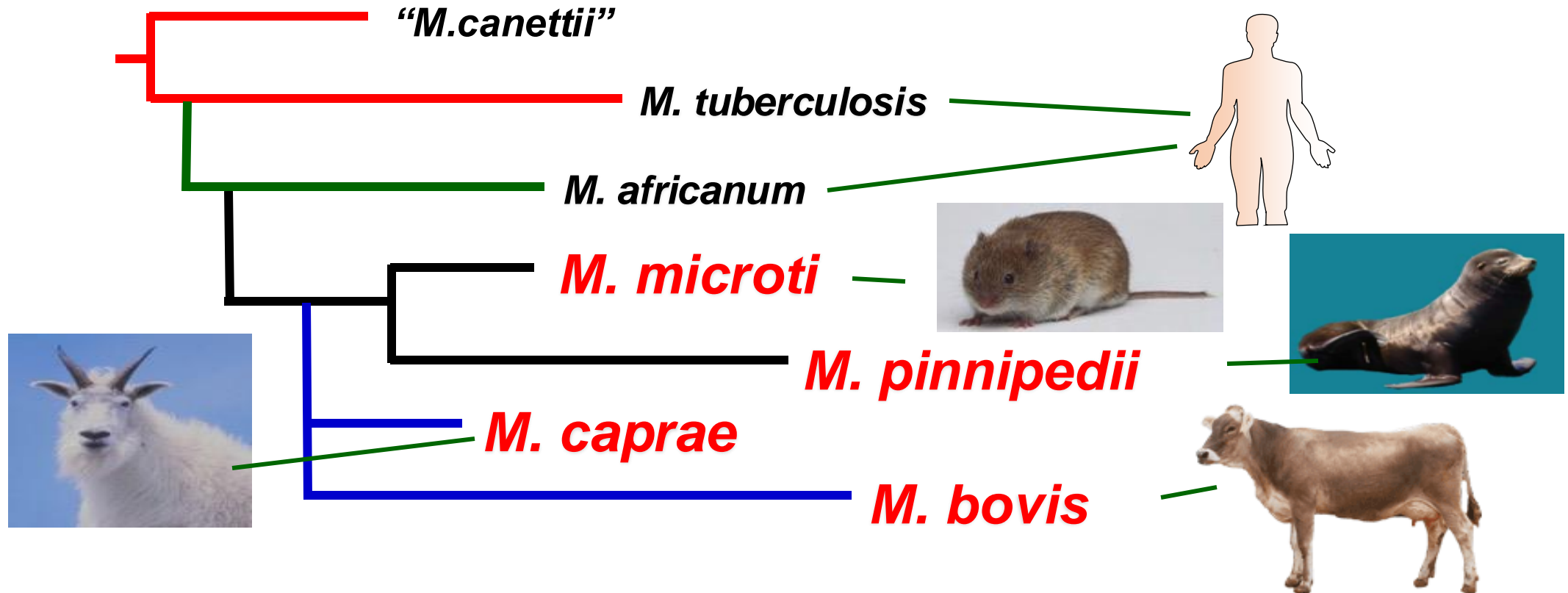




Mycobacterium tuberculosis complex (MTBC)

2

- Closely related species
 - House keeping genes: almost identical
- Causative agents of tuberculosis in mammals



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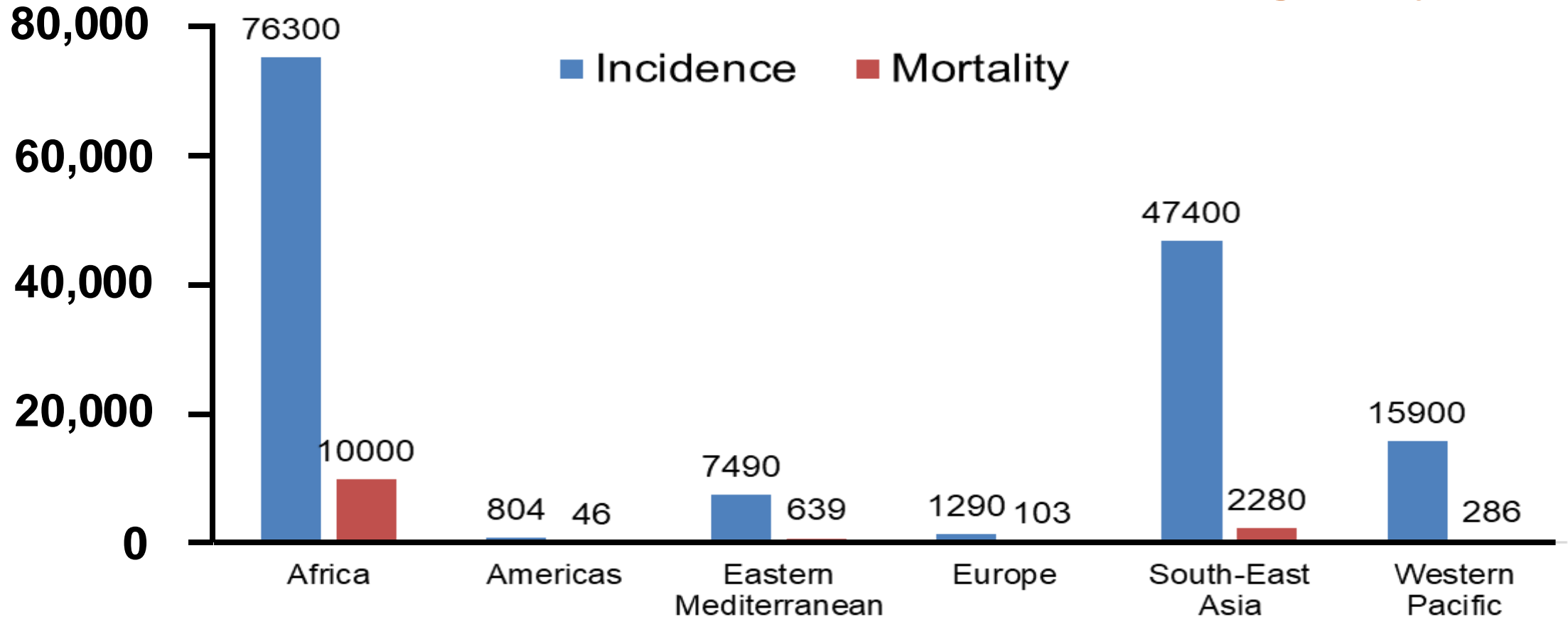


Zoonotic Tuberculosis

3

TB in people by *M. bovis* and other animal adapted MTBC, WHO 2015

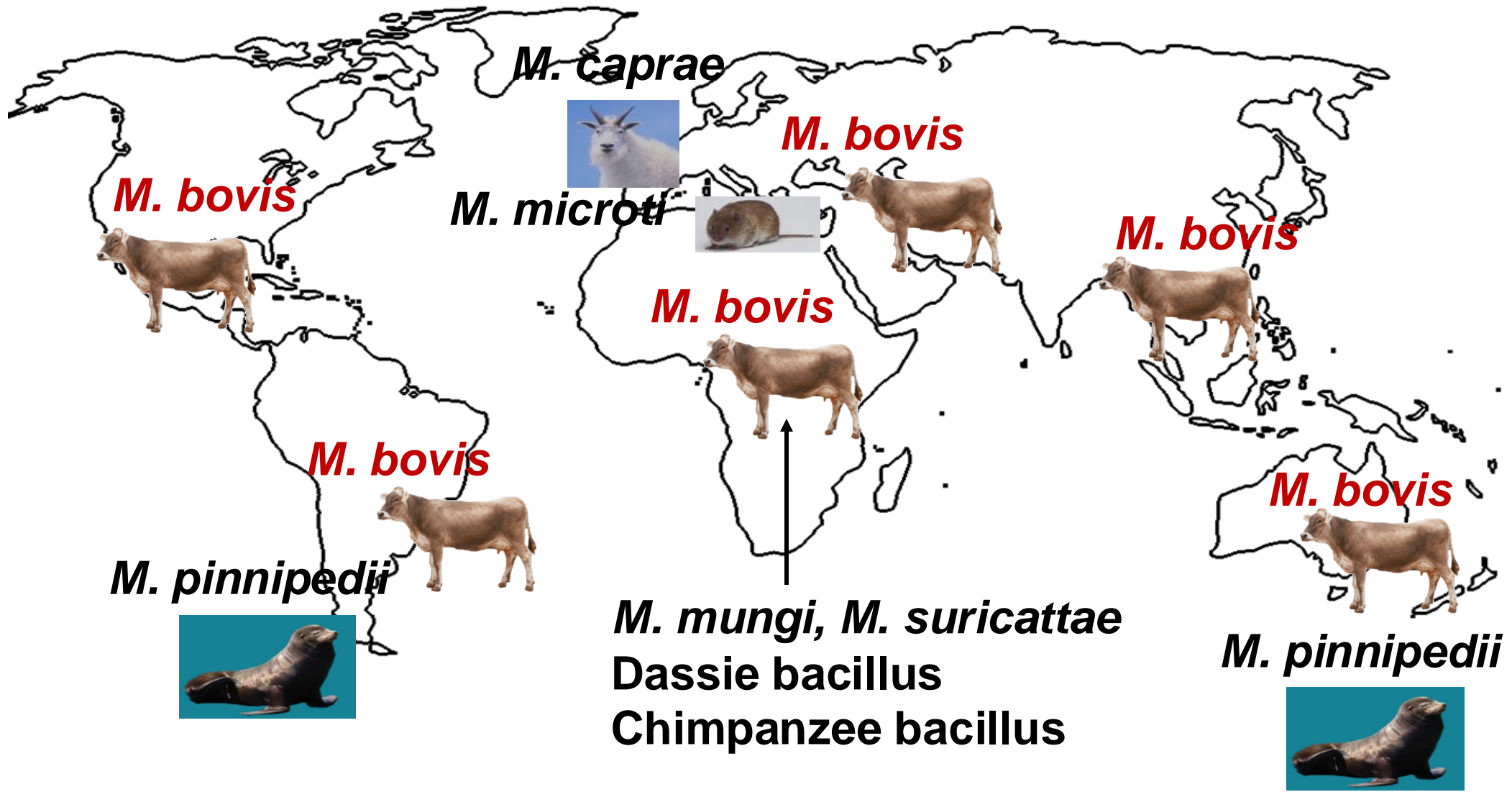
estimated 149,000 incidence and 13,400 deaths globally



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Causative agents of animal tuberculosis

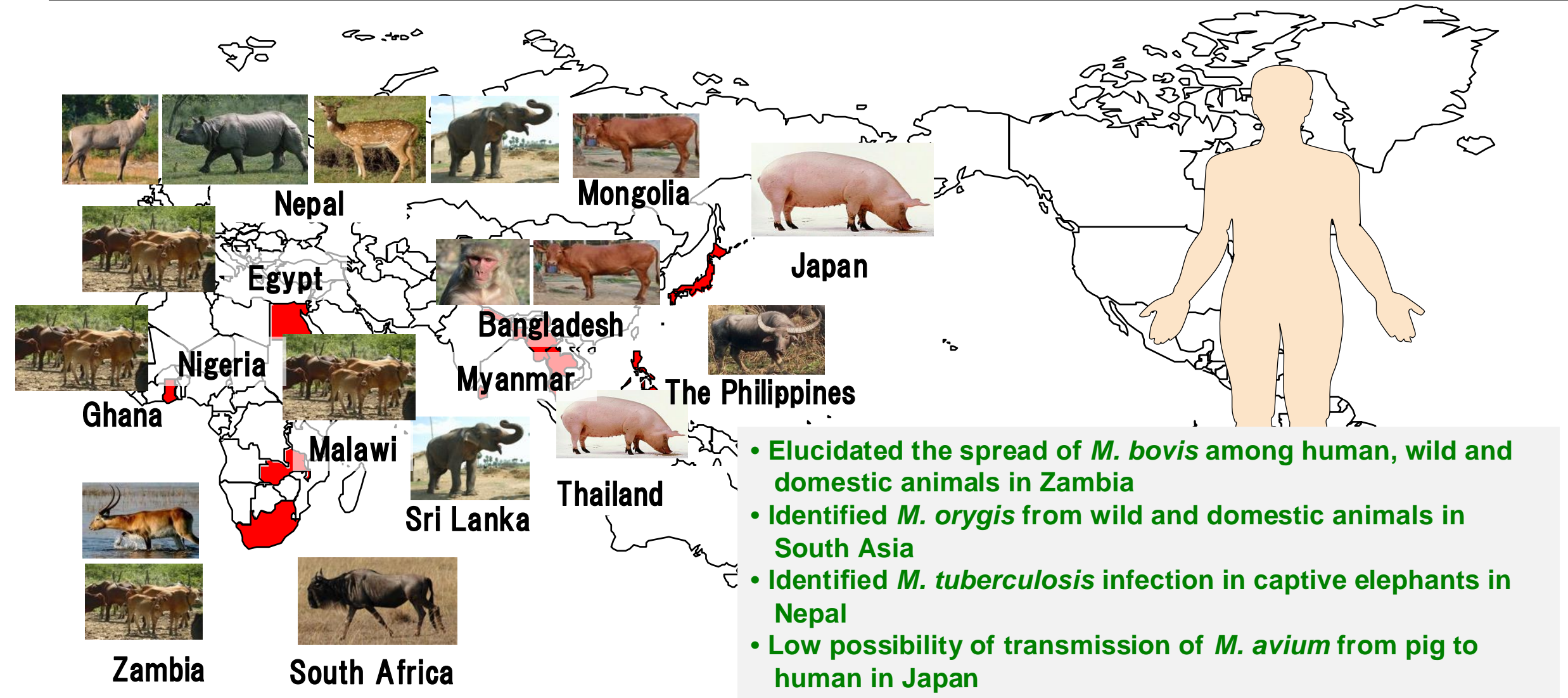


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International collaboration on mycobacterial diseases

5



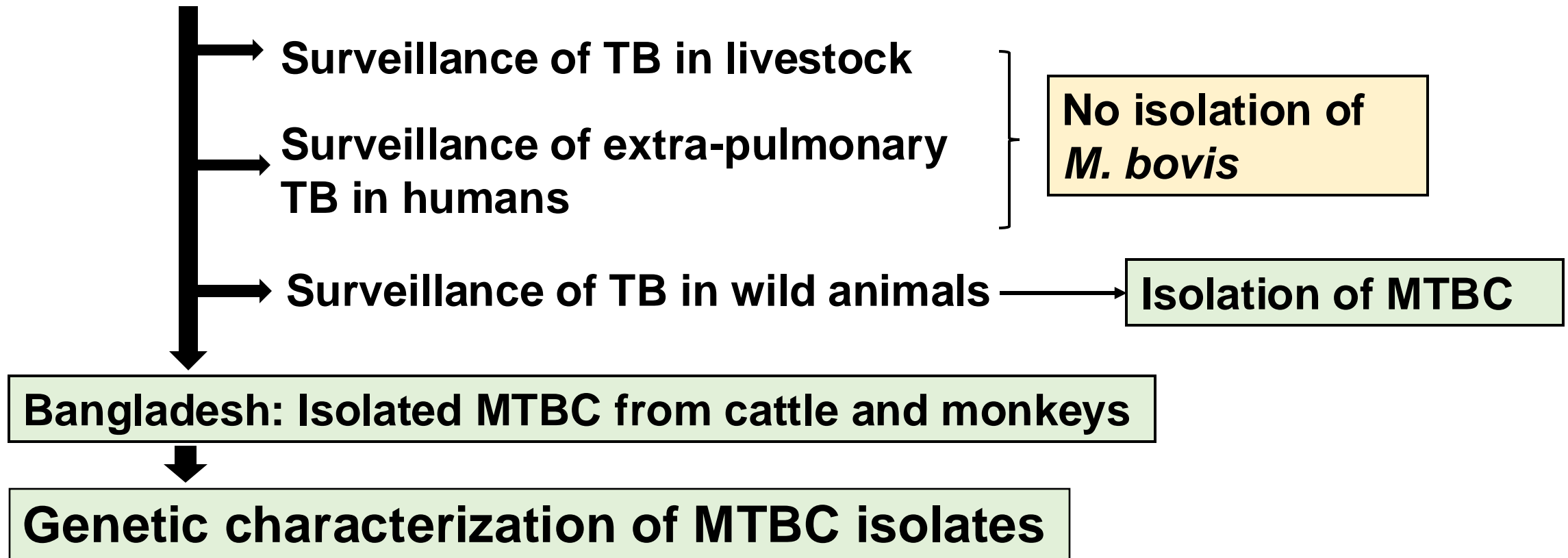
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Background studies

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To understand zoonotic TB in livestock/human/wildlife interface in Nepal



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TB among captive and wild animals in Nepal

7

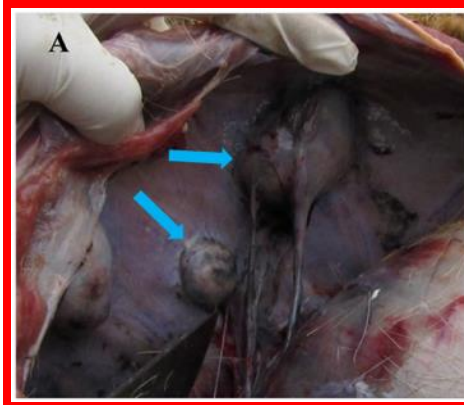
Captive facility in Kathmandu



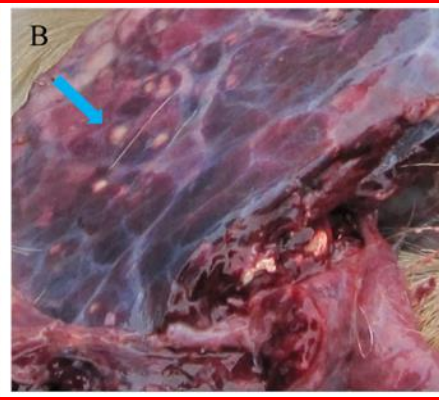
Blue bull (n = 1)



Deer (n = 1)



Extrapulmonary
TB lesions

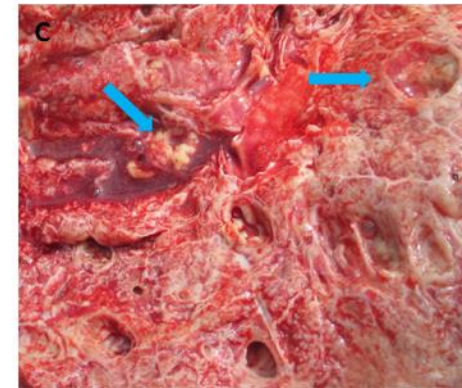


Lungs
TB lesions

Chitwan National Park (CNP)



Rhinoceros (n = 1)



Lungs
TB lesions

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Colony morphology of isolated strains

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Cultured in in-house prepared Löwenstein–Jensen media at different times showed smooth colonies



Deer



Blue bull

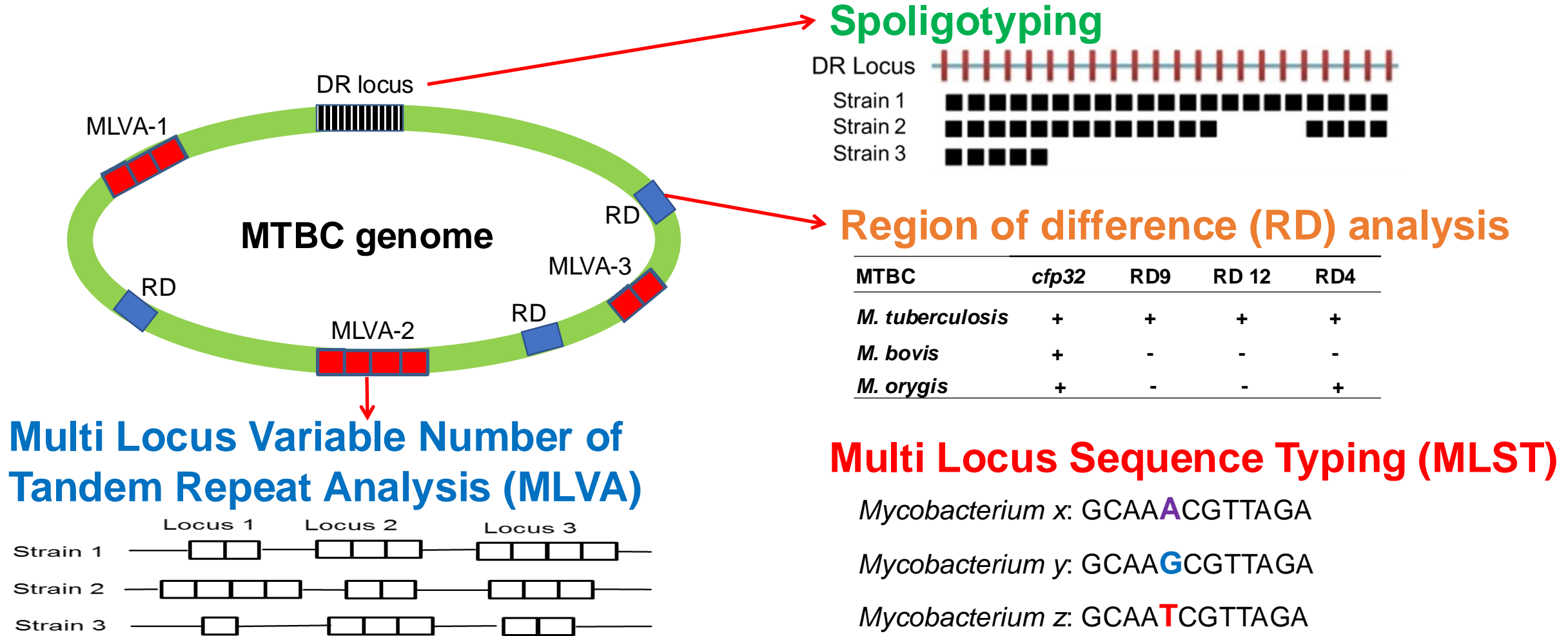


Rhinoceros



M. tuberculosis

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Spoligotyping

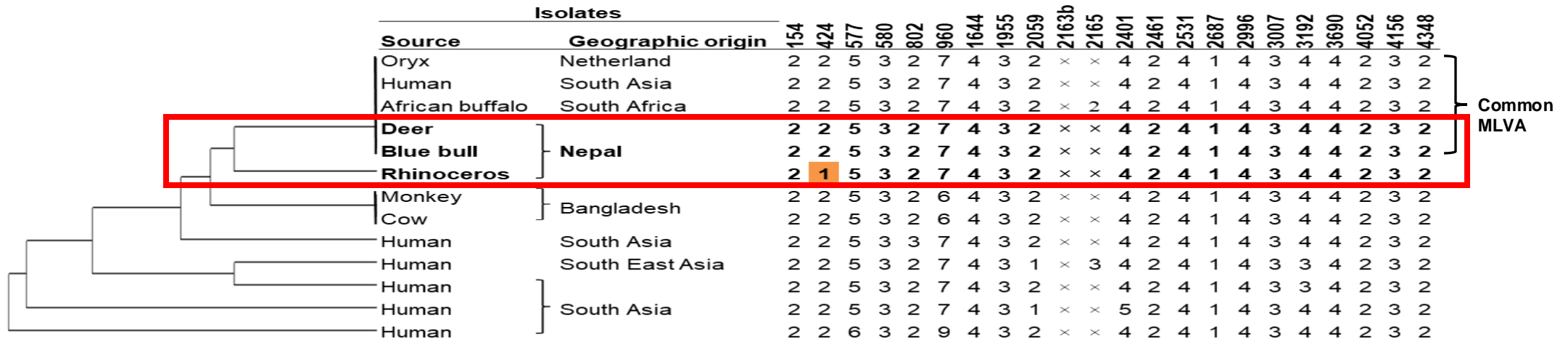
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RD analysis and MLST

MTC	<i>cfp32</i> gene and RD analysis P=positive, N=negative (Huard <i>et al</i> , 2006; Nakajima <i>et al</i> , 2010)					SNPs in following genes for MTBC species differentiation								
						Huard <i>et al</i> , 2006								Rv2042c (van Ingen <i>et al</i> , 2012)
						<i>gyrB</i>		<i>mmpL6</i>		TbD1	<i>PPE55</i>			
	<i>cfp32</i>	RD9	RD12	RD1	RD4	756	1113	1410	1450	551	171	2162	2163	38
<i>M. tuberculosis</i> H37Rv	P	P	P	P	P	G	G	C	G	C	C	T	C	T
<i>M. bovis</i>	P	N	N	P	N	A	G	T	T	G	C	T	C	T
<i>M. bovis</i> BCG	P	N	N	N	N	A	G	T	T	G	C	T	C	T
<i>M. africanum</i>	P	N	P	P	P	G	G	C	T	C	C	T	C	T
<i>M. orygis</i>	P	N	N	P	P	G	A	C	T	G	G	G	T	G
Deer isolate	P	N	N	P	P	G	A	C	T	G	G	G	T	G
Blue bull isolate	P	N	N	P	P	G	A	C	T	G	G	G	T	G
Rhinoceros isolate	P	N	N	P	P	G	A	C	T	G	G	G	T	G



M. orygis with similar genotypes is spreading across animals



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M. orygis, a conservation challenge in Nepal

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- **CNP, a UNESCO world heritage site.**
- **One-horned rhinoceros: a globally protected species and total population as of 2015 is 3,555 individuals.**
- **In Nepal: 605 of total 645 rhinoceros live in CNP**



Chitwan National Park



Source: CNP

एकसिंगेलाई क्षयरोग

■ पवन यादव

भरतपुर- चितवन निकुञ्जका गैडामा क्षयरोग देखा परेको छ। यसअघि निकुञ्जकै हात्तीमा उक्त रोग देखिएको थियो। अधिकांश हात्तीमा रोग निको भइसकेको छ। त्यसको तुलनामा गैडाको समस्या पार लगाउन असहज भएको संरक्षणकर्मीको भनाइ छ।

निकुञ्जको पश्चिम सेक्टरमा मृत भेटिएको गैडाको फोक्सो परीक्षण गर्दा क्षयरोग फेला परेको हो। उक्त गैडा ०५ फागुन ५ मा मृत भेटिएको थियो। परीक्षण क्रममा फोक्सोमा संक्रमणको शंका भएपछि काठमाडौँस्थित जर्मन-नेपाल क्षयरोग केन्द्रमा नमूना पठाइएको थियो। कल्चर (कीटाणु वृद्धि प्रविधि) वाट आठ साता नमूना

राख्दा क्षयरोगका कीटाणु भेटिए। निकुञ्जका वरिष्ठ पशु चिकित्सक डा. कमल गैरेका अनुसार तिनको प्रजाति पत्ता लगाउन जापानको होक्काइडो युनिभर्सिटीको प्रयोगशालामा पठाइएको थियो।



परीक्षण क्रममा 'माइक्रो ब्याक्टेरिया ओरी जिस' रहेको पत्ता लागेको छ। यसको जानकारी दिए। भएर त्यसको रिपोर्ट आएको हो।

क्षयरोग सरुवा हो, अरू गैडामा सरे/नसरेको पत्ता लागेको छैन। 'यसबारे अहिलेसम्म वन्यजन्तुमा अनुसन्धान गरिएको छैन,' डा. गैरेले भने। क्षयरोगको कीटाणु पनि हालसम्म पत्ता लागेको भन्दा नयाँ रहेको उनले बताए।

यसबारे बृहत् अनुसन्धान हुनु जरुरी रहेको उनले बताए। श्वासप्रश्वासबाट सरे रोग भएकाले उच्च सतर्कता अपनाउन जरुरी

First TB death of CNP rhino stokes fear of outbreak

PAWAN YADAV
BHARATPUR, APRIL 14

Laboratory test has recently confirmed that a rhino found dead inside Chitwan National Park (CNP) last year had died of tuberculosis (TB), causing conservationists to worry that other animals could also be carrying TB bacteria.

Samples extracted from the dead rhino were sent to the Kathmandu-based German-Nepal TB Test Centre. After the centre traced TB bacteria in the samples, they were sent to Hokkaido University in Japan to find out the bacteria's strain.

Chief Conservation Officer at the CNP

Hokkaido University in Japan to find out the bacteria's strain.

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MTBC isolation in Bangladesh

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Feb.2008



Rhesus monkey (n = 1), from a captive facility in Dhaka

July 2008



Rhesus monkey (n = 1), from the same facility

2009 - 11



**21 cattle diagnosed as TB at a slaughter house in Dhaka
18 isolates suggested as MTBC**

20 MTBC isolates



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<i>M. bovis</i> BCG	P	N	N	N	N	A	G	T	T	G	C	T	C	T
<i>M. africanum</i>	P	N	P	P	P	G	G	C	T	C	C	T	C	T
<i>M. orygis</i>	P	N	N	P	P	G	A	C	T	G	G	G	T	G
2 monkey isolates	P	N	N	P	P	G	A	C	T	G	G	G	T	G
18 cattle isolates	P	N	N	P	P	G	A	C	T	G	G	G	T	G



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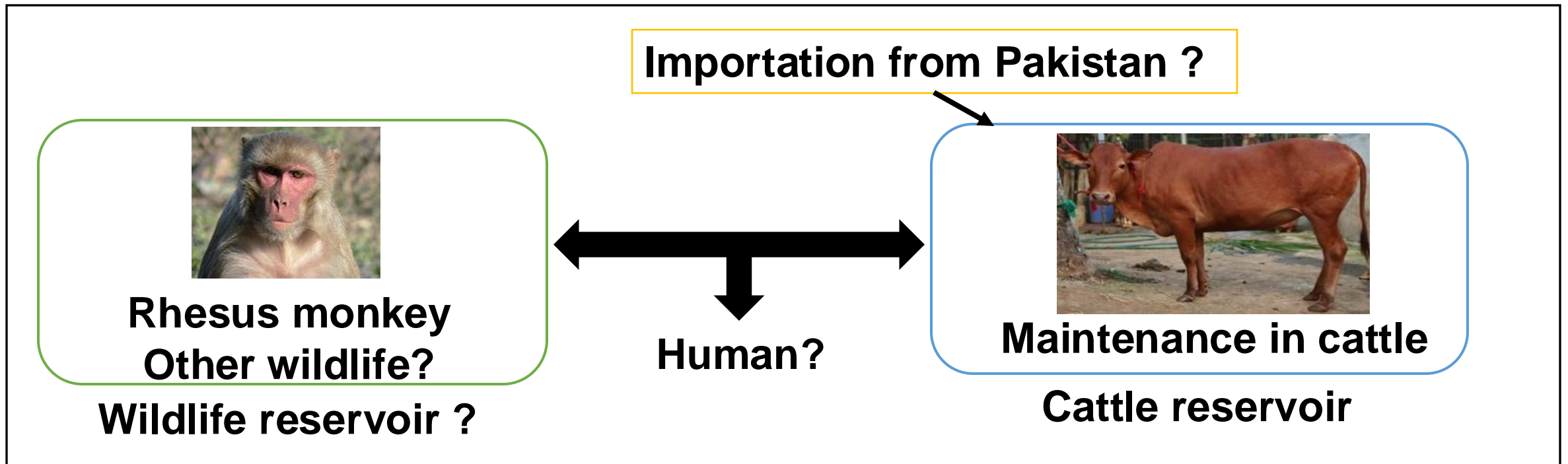
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M. orygis is spreading among animals in Bangladesh

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- *M. orygis* was the causative agent of TB in animals in Bangladesh
- Wide distribution of *M. orygis*
- Airborne might be the mode of transmission





M. orygis isolates analyzed

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Nepal



Blue bull: 1



Deer: 1



Rhinoceros: 1

Bangladesh



Cattle: 18



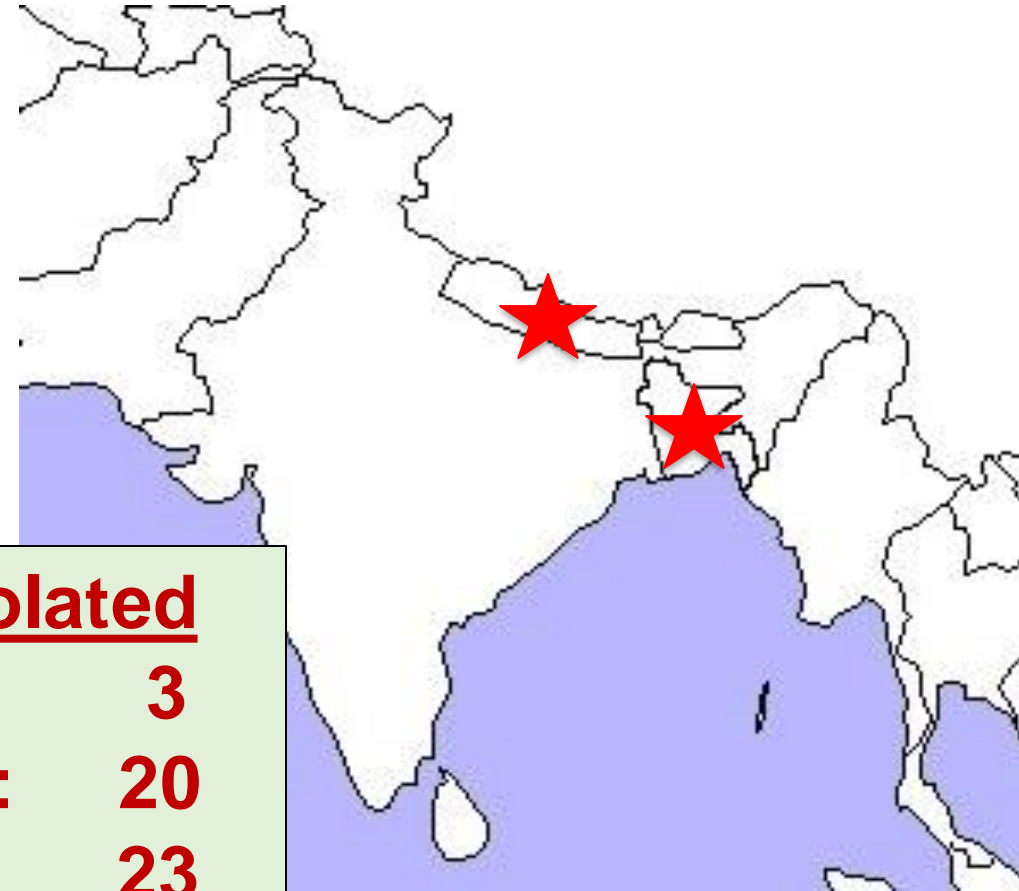
Monkey: 2

M. orygis isolated

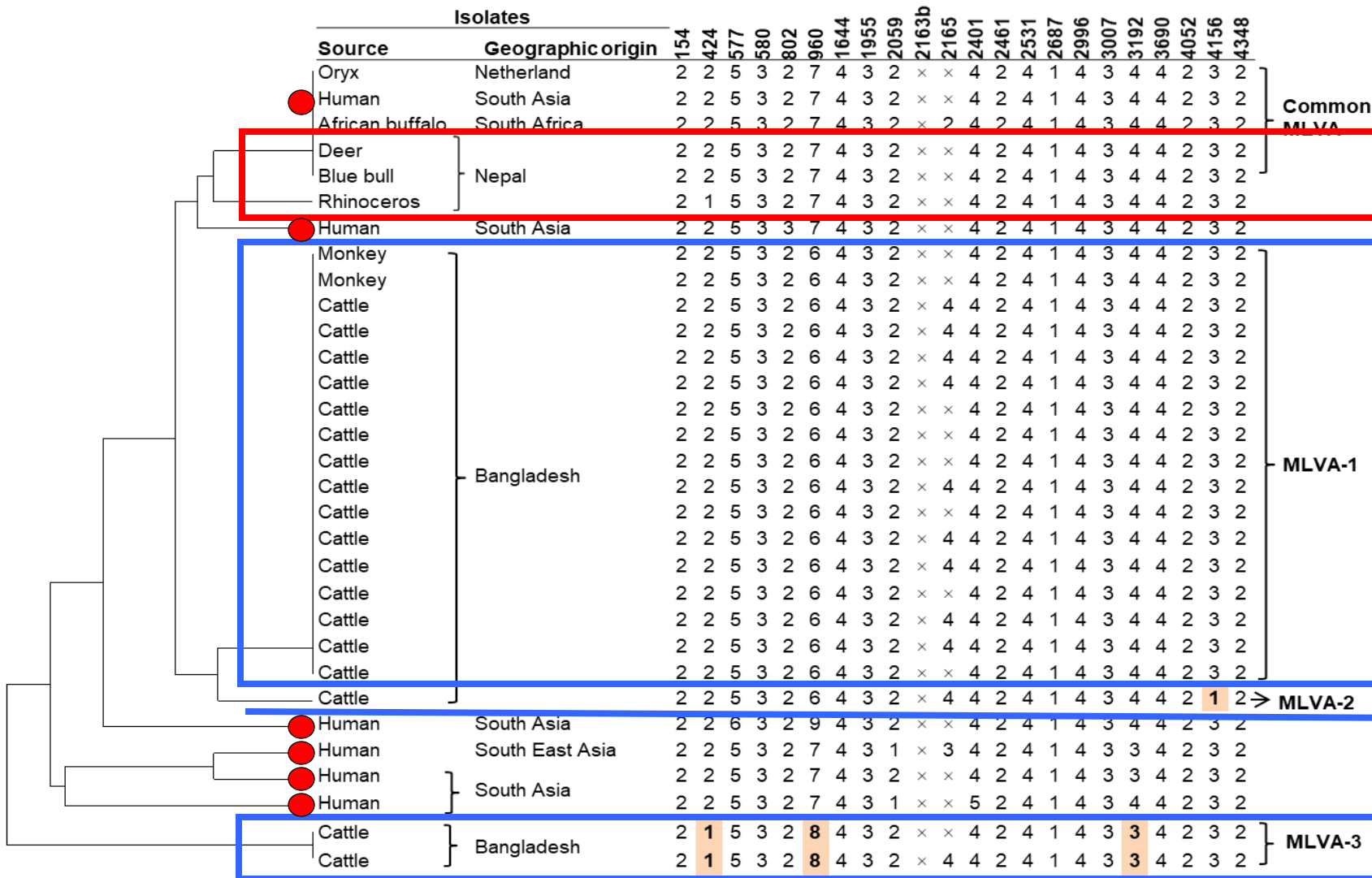
Nepal: 3

Bangladesh: 20

Total: 23



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- **Human infection from publication by other research group**



Key findings on *M. orygis*

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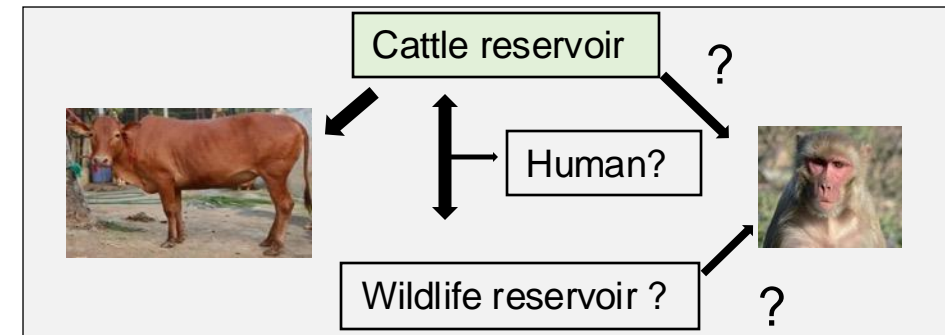
Nepal

- *M. orygis* is a conservation challenge of wildlife
- Needs of surveillance of human, wildlife and livestock in and around national parks



Bangladesh

- *M. orygis* is endemic among cattle
- Cattle seemed to be a maintenance host



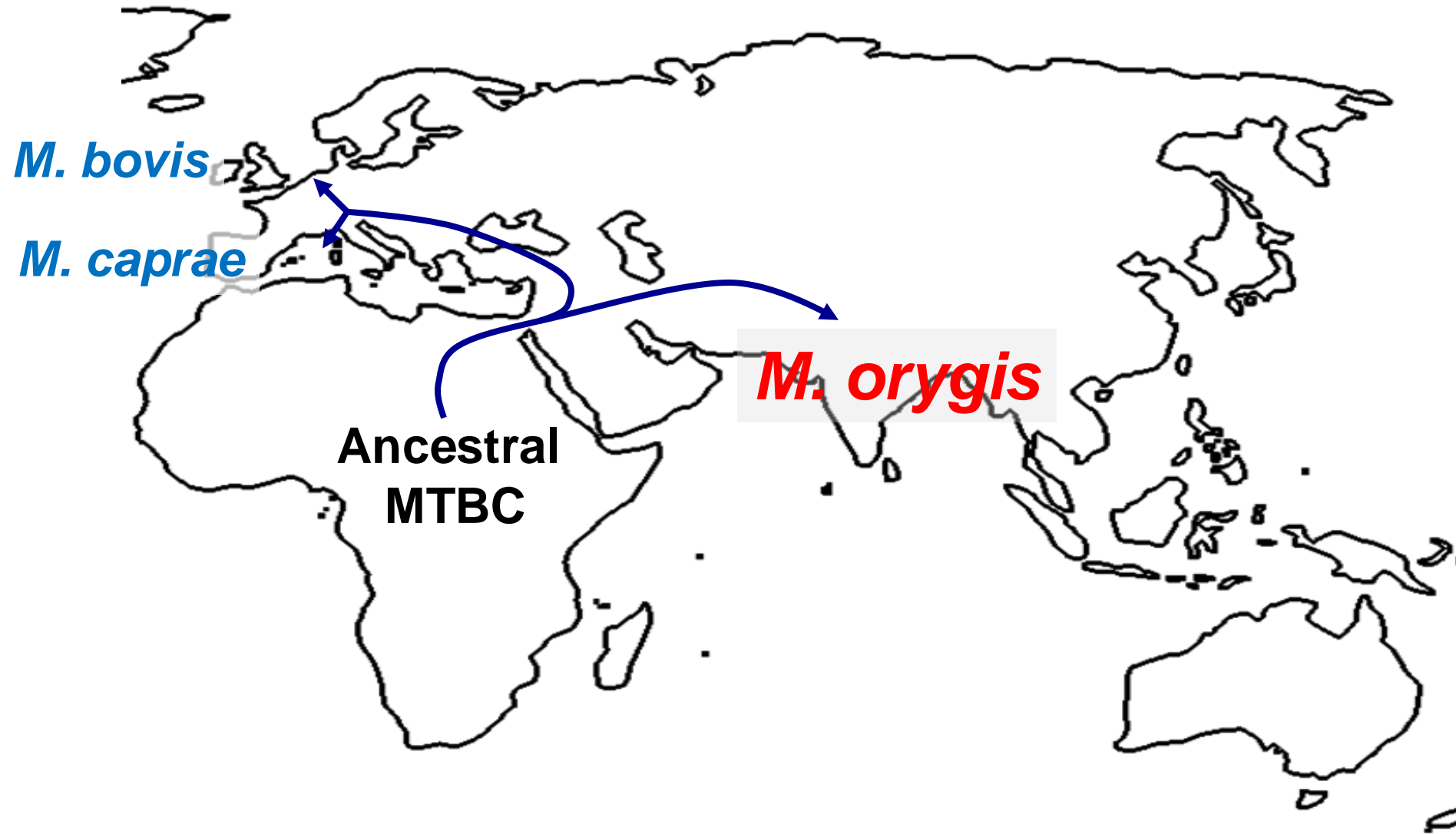
Overall summary

- Airborne transmission was suspected
- *M. orygis* has wide host range from human to wildlife
- *M. orygis* is endemic among animals in South Asia



The evolutionary history of *M. orygis*

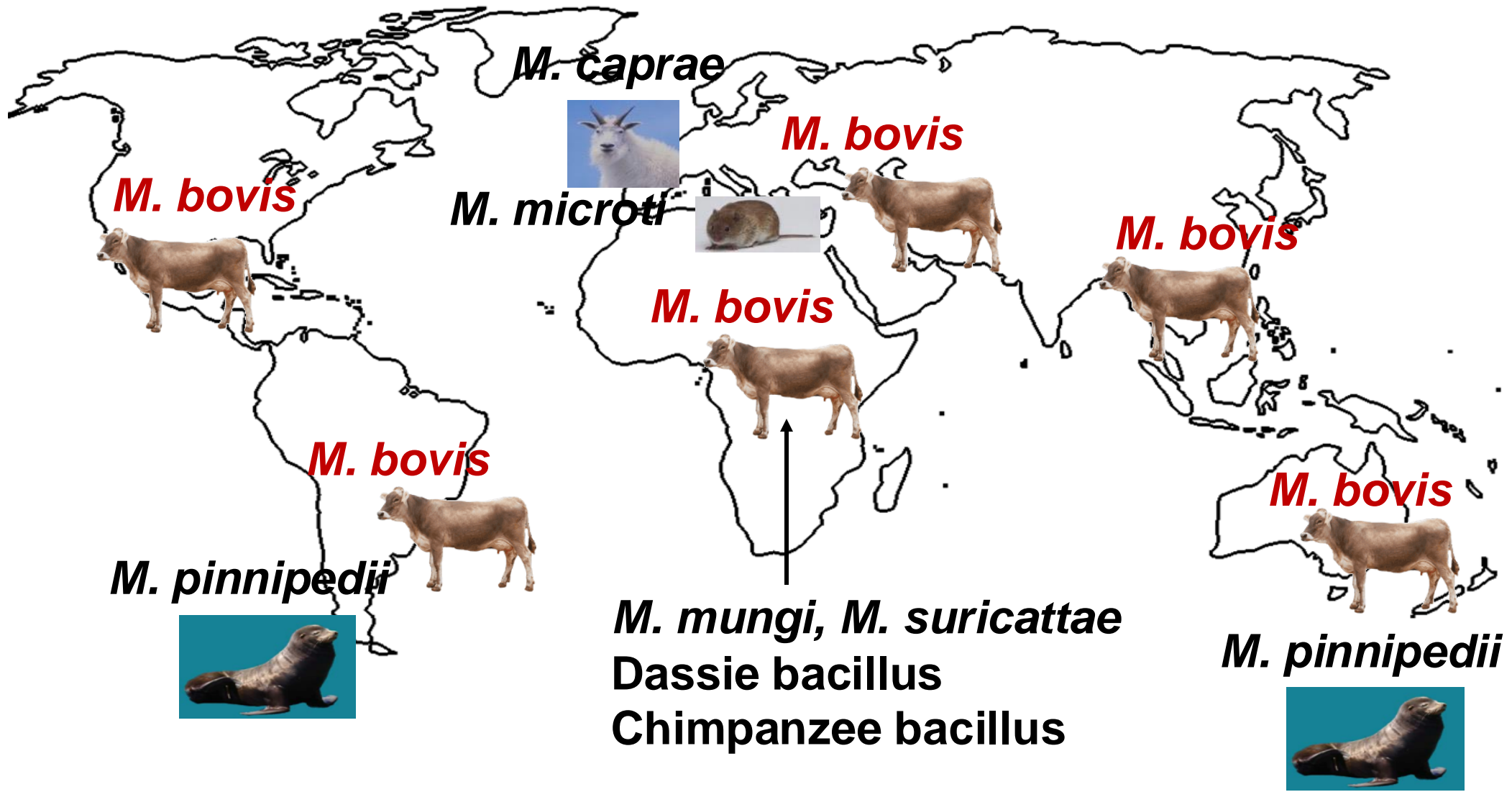
20



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Causative agents of animal tuberculosis



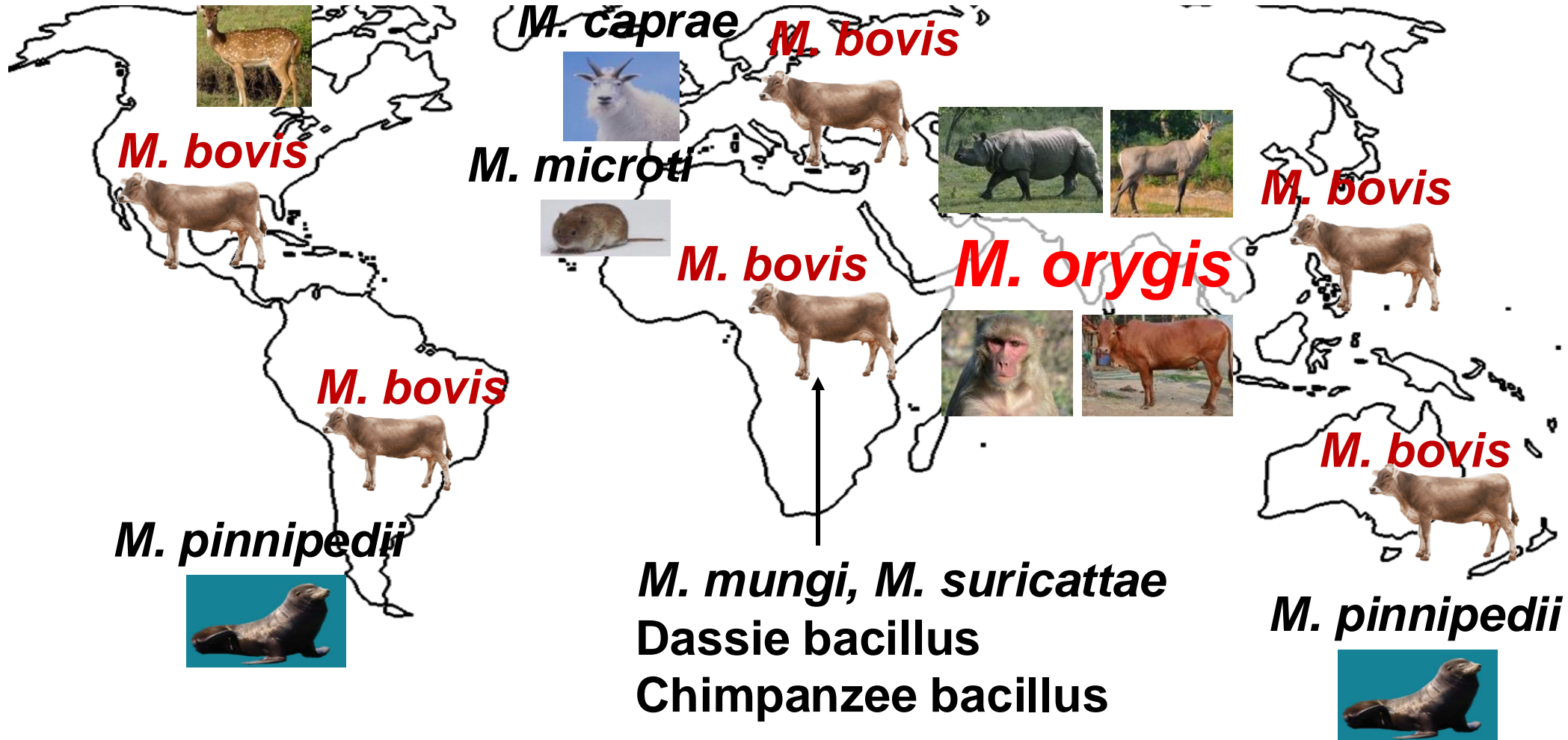
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A new scenario of zoonotic tuberculosis in South Asia

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Results provided a new scenario of zoonotic TB in South Asia



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Acknowledgements

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Hokkaido University International Institute for Zoonosis Control, Japan

Hokkaido University Institute for Vaccine Research and Development, Japan

Department of National Park and Wildlife Conservation, Chitwan National Park

National Trust for Nature Conservation, Nepal

NATA-German Nepal Tuberculosis Project

Tuberculosis Laboratory, ICDDR, Bangladesh



国立研究開発法人 日本医療研究開発機構
Japan Agency for Medical Research and Development



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Thank you!

谢谢!

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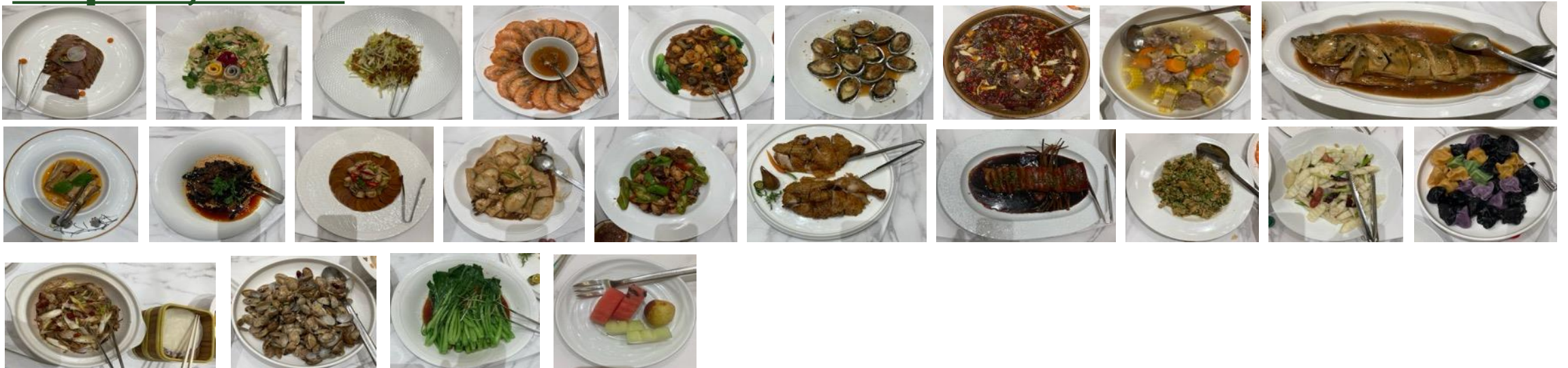
多谢!

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Sep24, 2024



Sep25, 2024



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