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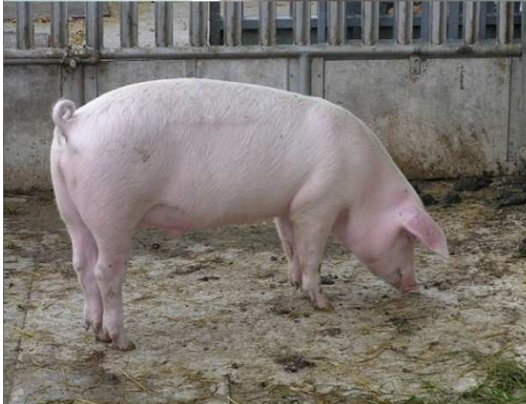
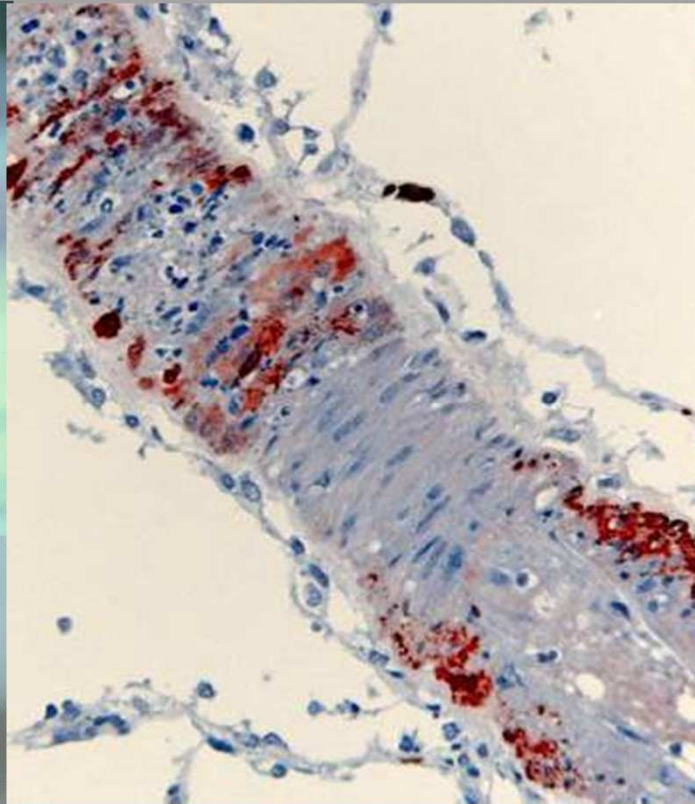
## Emerging virus infections of bats: old relationships, new paradigms?



Deborah Middleton



# Spillover hosts and surrogate humans

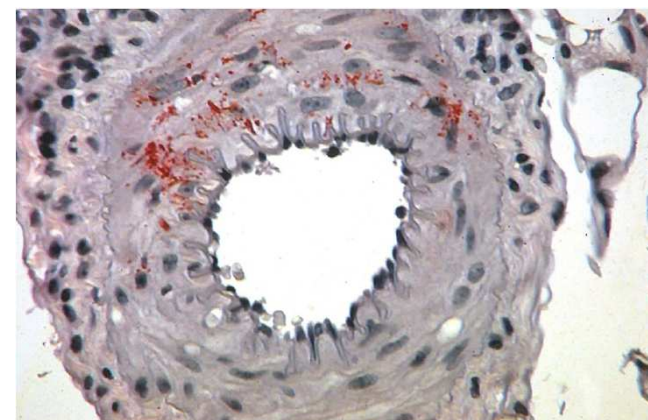
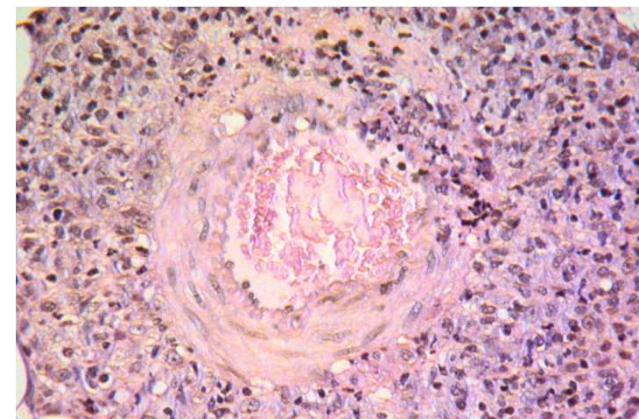


# *Pt. poliocephalus* and HeV (Williamson PhD 1999)

## Serology (challenge dose 50000 TCID<sub>50</sub>)



	d0	d21
<b>s/c</b>	<5	80
	<5	40
	<5	<5
	<5	<5
<b>Oral</b>	<5	10
	<5	<5
	<5	<5
	<5	Toxic
<b>Contact</b>	<5	<5
	<5	<5
	<5	<5



No virus from urine or feces or PM tissues

No transmission to in-contact horses

# *Pt. poliocephalus* and HeV – late gestation

## SC exposure

SNT	d0	d10	d14	d21
SC	<5	10		
SC	<5	20		
SC	<5		40	80
SC	<5		40	160

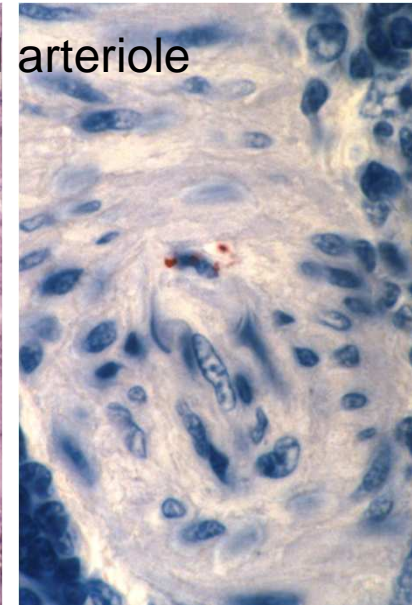
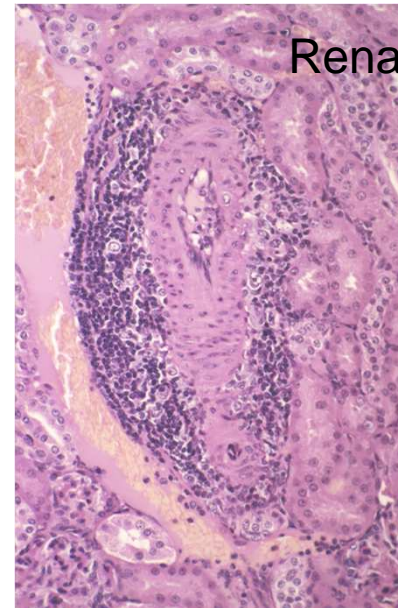
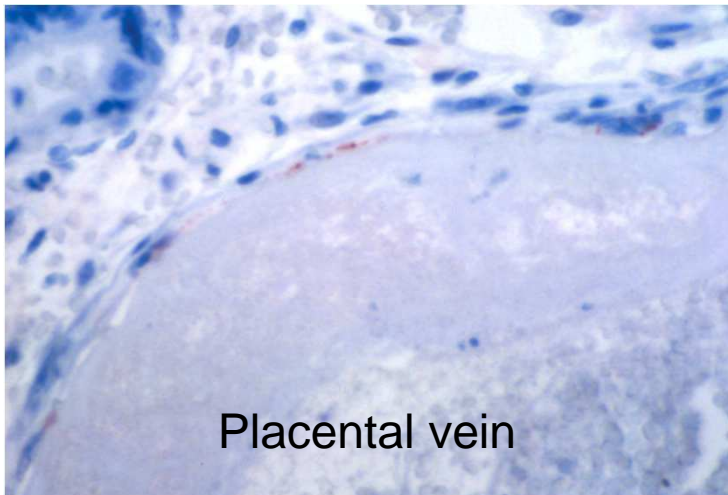
- ★ Heart and buffy coat
- ★ Spleen and kidney
- ★ Heart, kidney and spleen

### D 10 Vasculitis

(Ag+ placenta: fetuses -ve)

### D 21 Vasculitis

(Ag+ kidney: fetuses -ve)



# *Pt. poliocephalus* and NiV

50000 TCID<sub>50</sub> low passage virus from human CNS (SC exposure)



Bat	Day 11	Day 14	at PM
①	0	1/20	1/20 <small>Urine d 12, 16, 18</small>
2	0	1/10	1/80
③	0	1/20	0
4	0	1/20	1/40
⑤	1/20	>1/640	1/60
6	0	1/10	1/80

# Pt.alecto and HeV

50000 TCID<sub>50</sub> ON – bat isolate

N gene



Ct	d0	d2	d4	d6	d8	d10	d12	d14	d16	d18	d20
13 - rectal swab			33		*						
- urine						38	35	*			
- blood				*	*	34	36		*		Spleen
14											
15											
16 - rectal swab			*	31	*	*					Spleen
- urine			*	29	32	33	32	32	30	38	Liver
- blood			*	38	35	34	37	38		*	Kidney
17 - rectal swab		*		33				37			Spleen
- urine			*		*	36	37	33			Lung
- blood			31	36	33	33	37	38			Liver
18											
19 - rectal swab			*	34							
20 - blood						*	*		37	38	Spleen

Halpin *et al* (2011) Under review

# Pt.alecto and HeV

50000TCID<sub>50</sub> O/N – bat isolate

N gene

	d0	d21	Ct	d0	d2	d4	d6	d8	d10	d12	d14	d16	d18	d20
13	<5	20	13 - rectal swab			33		*						
			- urine						38	35	*			
			- blood				*	*	34	36		*		Spleen
14	<5	<5	14											
15	<5	<5	15											
16	<5	<5	16 - rectal swab			*	31	*	*					Spleen
			- urine			*	29	32	33	32	32	30	38	Liver
			- blood			*	38	35	34	37	38		*	Kidney
17	<5	40	17 - rectal swab		*		33				37			Spleen
			- urine			*		*	36	37	33			Lung
			- blood				31	36	33	33	37	38		Liver
18	<5	20	18											
19	<5	<5	19 - rectal swab			*	34							
20	<5	<5	20 - blood						*	*		37	38	Spleen

# Pt.alecto and HeV - pregnancy

	d0	d21
1	<5	10
2	<5	10
3	<5	<5
4	<5	20
5	<5	<5
6	<5	<5
7	<5	<5
8	<5	40
9	<5	10
10	<5	<5
11	<5	40
12	<5	<5

Ct	50000TCID <sub>50</sub> ON											
	d0	d2	d4	d6	d8	d10	d12	d14	d16	d18	d20	
1												
2												
3 - throat				35								Lung
4												
5 - throat			33	35								
6												
7 - throat		33										
8												
9 - throat		29		36								Spleen
- rectal		33	30		36							
- blood							*					
10 - throat		28										
- rectal		30	32	30								
- urine		33										
11												
12												

# Pt.vampyrus and NiV

50000 TCID50 O/N



Bat	Day 0	Day 14	Day 21	Day 28	Day 35	Day 42	Day 63+
1	0	0	0	1/10	1/20	1/20	1/40
2	0	0	1/5	1/10	1/10	1/80	1/80
3*	0	1/5	1/10	1/10	1/20	1/40	1/20
4	0	0	0	0	0	0	0
5	0	0	0	1/5	1/20	1/5	1/10
6	0	0	0	0	0	1/40	1/20
7	0	1/80	1/10	1/40	1/40	1/20	1/40
8	0	0	0	0	0	0	1/10

\*+ve genome: throat day 4; rectal day 8 but NO virus

# Questions

- How does virus perpetuate itself in bat populations?  
How do bats acquire an infectious dose?  
Is heterogeneity of individual responses critical?
- The nature of the innate and adaptive immune responses in bats  
Mechanism of resistance to infection and disease  
Mechanism of virus neutralisation in SNT
- For homologous host/virus systems, does cell culture adaptation confound infectivity studies?

# Why are these questions important?

- **Phylogeny of ecological associations**
  - Co-speciation (origins by descent)
  - Host-switching (origins by dispersal)

Flawed infection paradigms?

 **SURVEILLANCE & RISK**



# Acknowledgements

