

BLUETONGUE VACCINATION

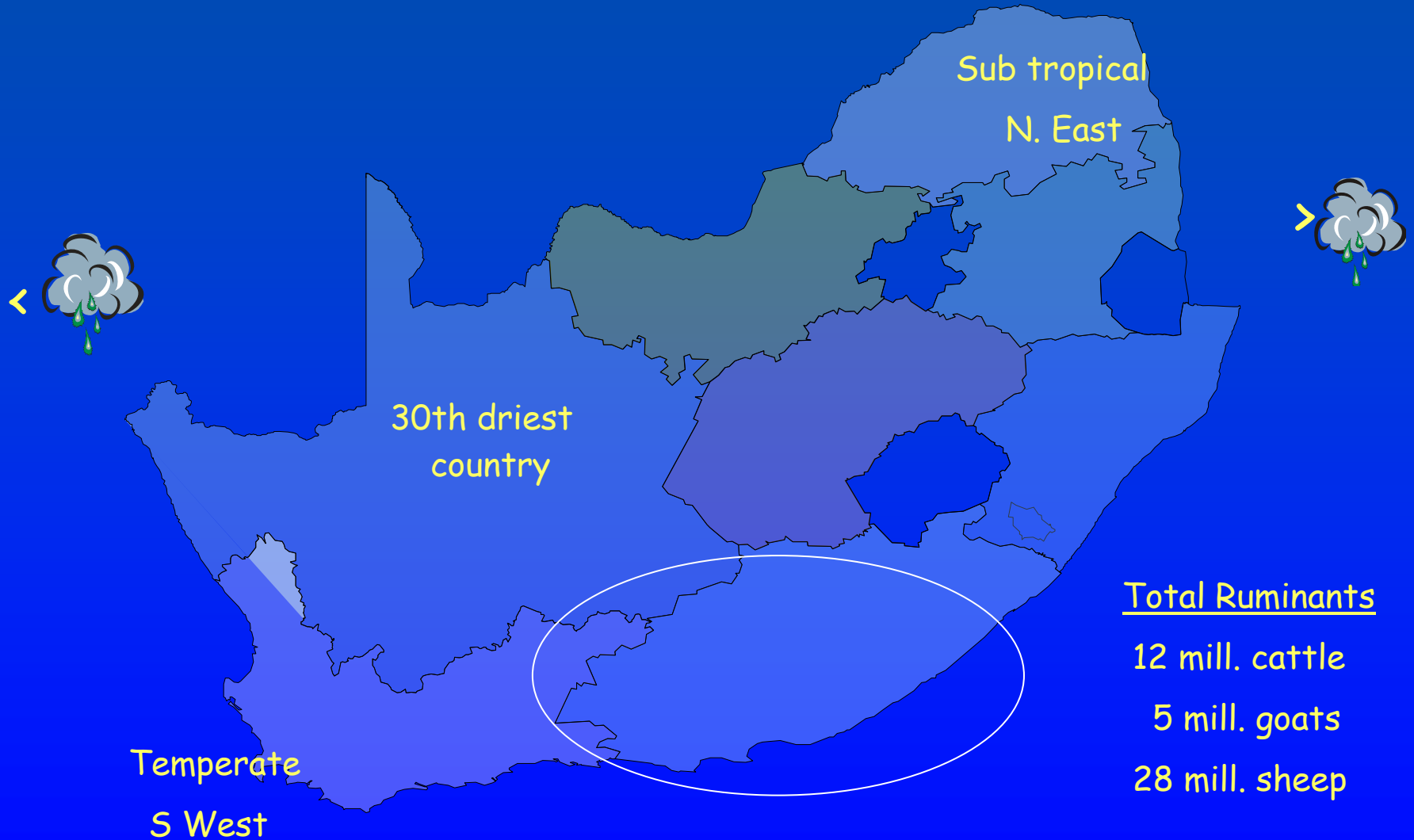
IN

SOUTH AFRICA



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LABORATORY STAFF
ONDERSTEPSPOORT

SOUTH AFRICA



THE VIRUS -background

Entire southern Africa endemic (Sahara)

- present since antiquity
- introduction merino sheep late 18th C
- 1943 *C. imicola* vector
- 1948 plurality of serotypes
 - pre 1960 - 12 serotypes
 - 1960 - 1970 - 4 serotypes
 - post 1970 - 8 serotypes

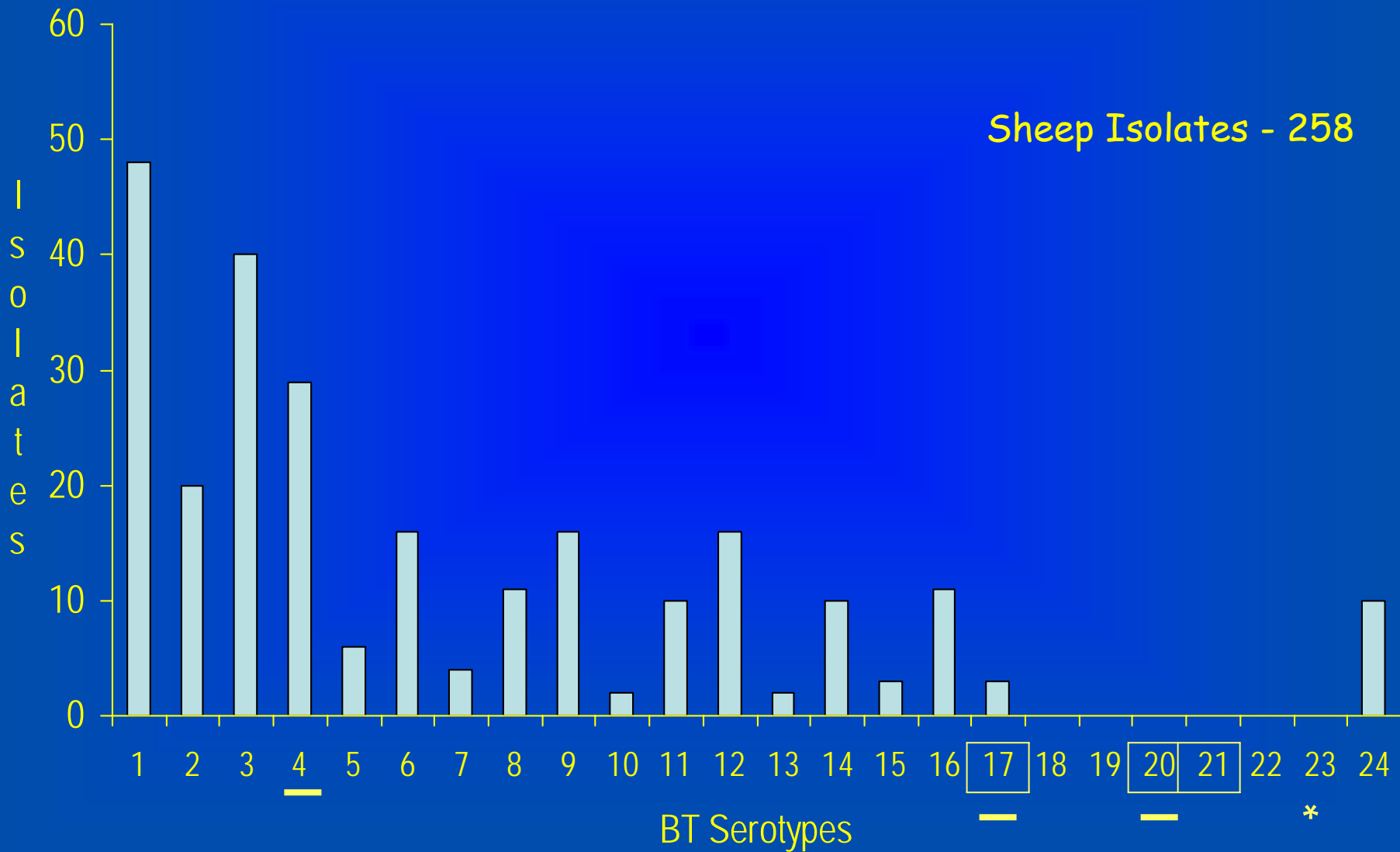
(cont.)

- two large merino introductions
late 1600 and late 1700
- BT recognized in early 1800
- 1876 outbreak serious febrile disease
- SNTs developed → typing (first 12 then 16 serotypes)
- Theiler 1900 Cape Province BTV 4 oldest



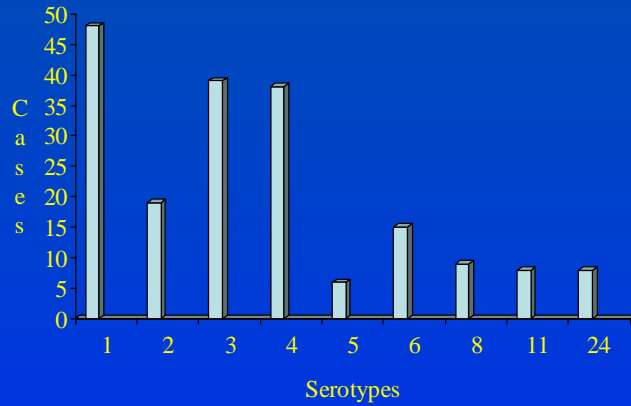
BTV SEROTYPES

1983 - 2003

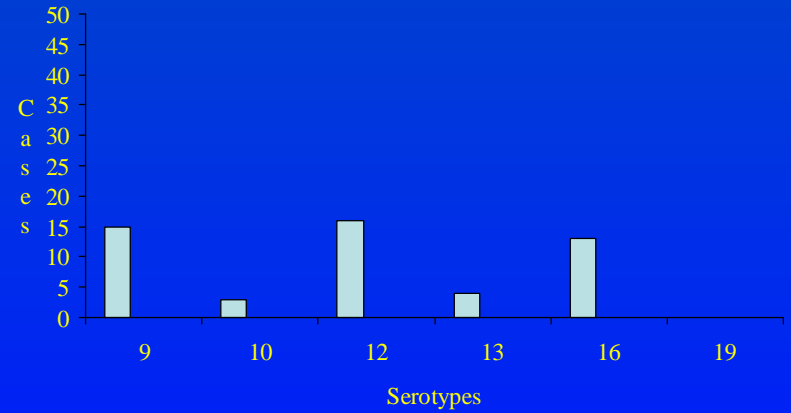


1983 - 2003

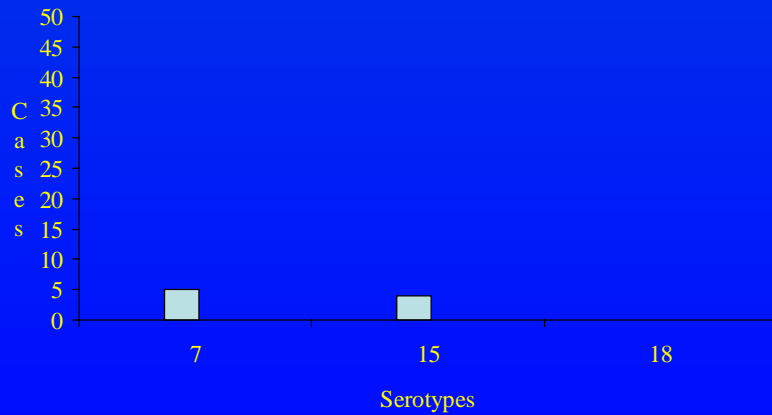
HIGH EPIDEMIC POTENTIAL



EVERY SEASON LOWER LEVELS

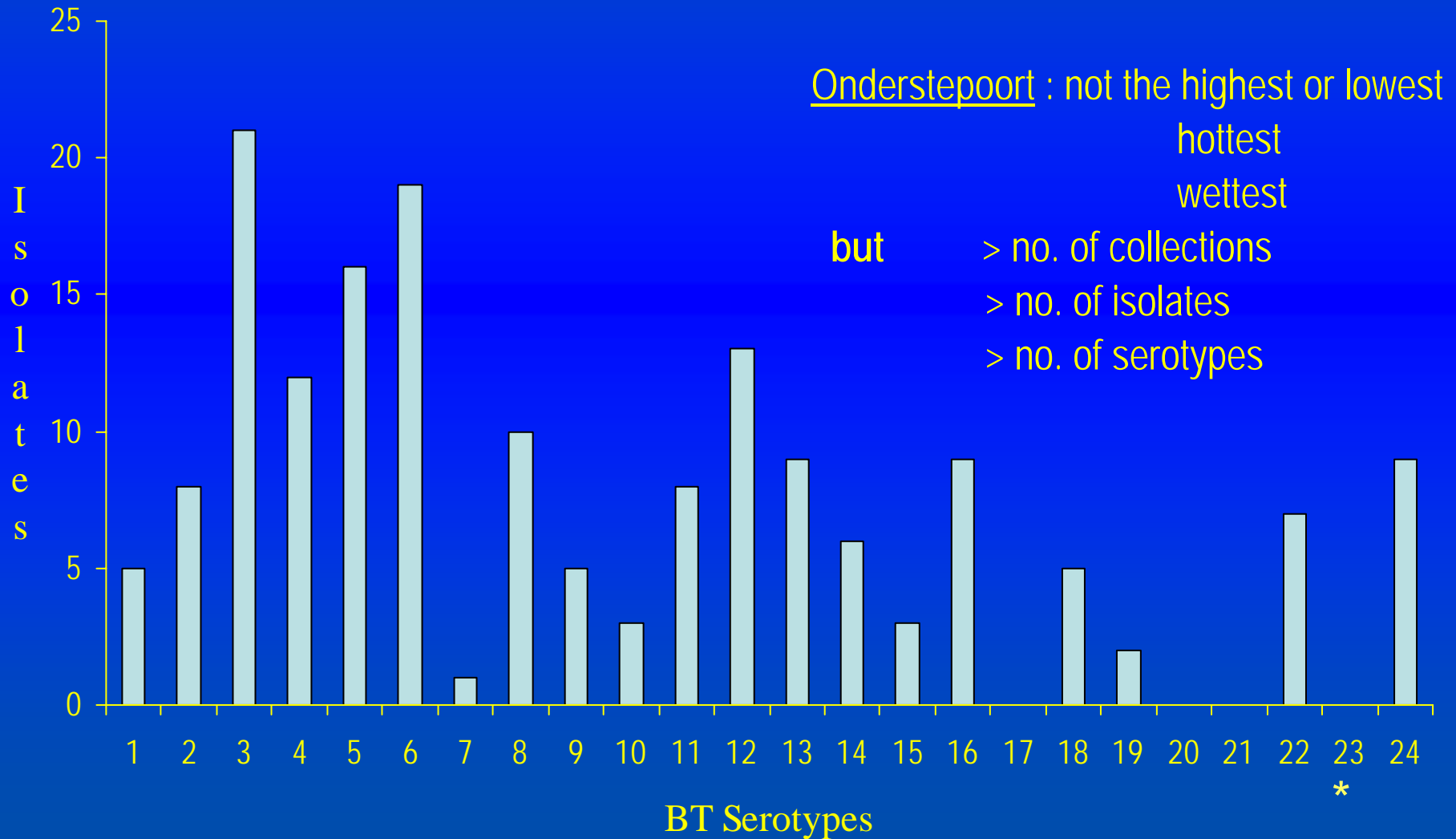


LOW EPIDEMIC POTENTIAL



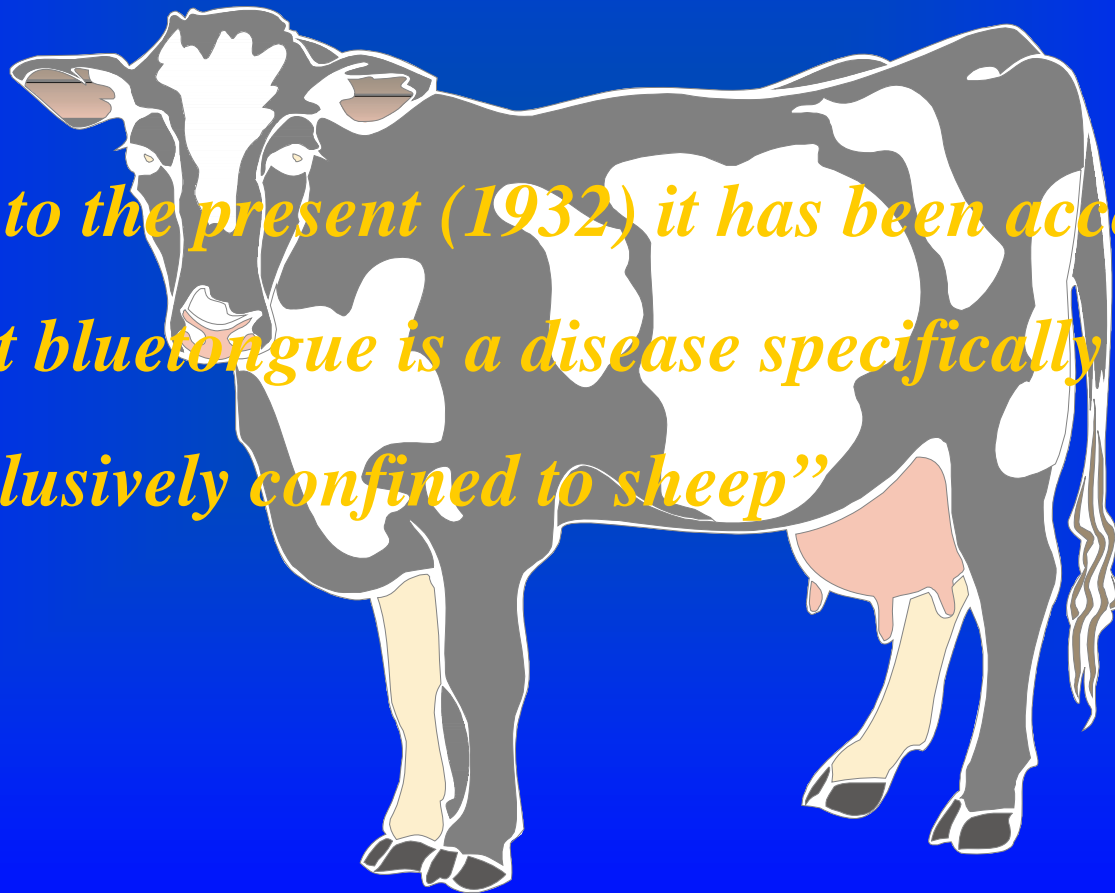
CULICOIDES SURVEY

1978 - 1985



BLUETONGUE IN CATTLE

“Up to the present (1932) it has been accepted that bluetongue is a disease specifically and exclusively confined to sheep”

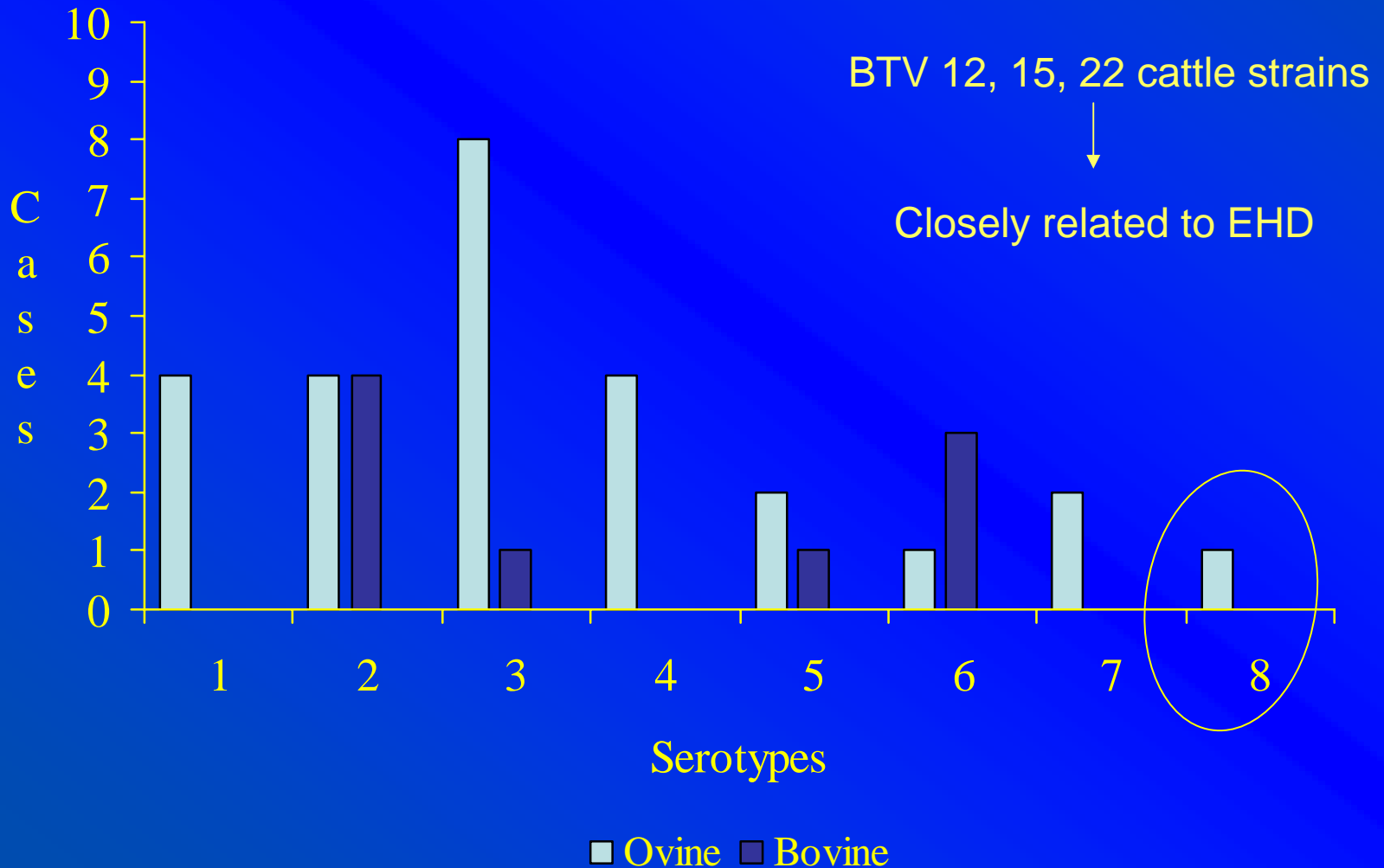


BLUETONGUE TRIAL

SYMPTOMS	FIELD CATTLE	EXPERIMENTAL CATTLE	EXPERIMENTAL SHEEP
Eye discharge	+	+	+
Nose discharge	+	+	+
Salivation	++	slight	Frothing
Swollen tongue	+	-	+
Stomatitis	++	+	++
Torticollis	-	-	+ (late)
Skin lesions	+	-	+
Stiffness	+	-	-
S/c oedema	-	-	+
Coronitis	+	-	++

DISEASE IN CATTLE

1996



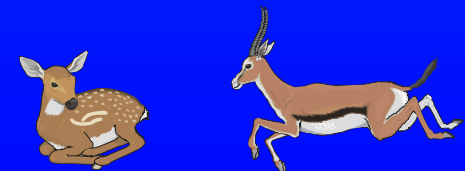
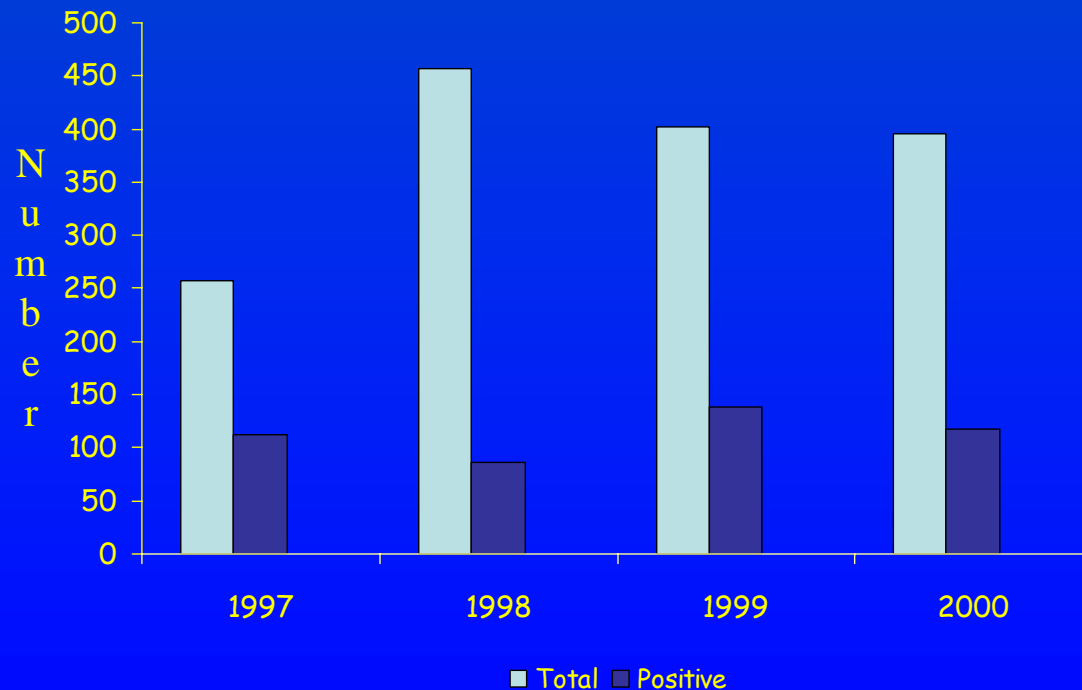
BLUETONGUE IN GAME

Dec. < role as maintenance/amplifying host
(23 official protected areas)

A - Export data

B - Survey data

A: In 4 yrs exported - 1,511 game 30% BT Pos.

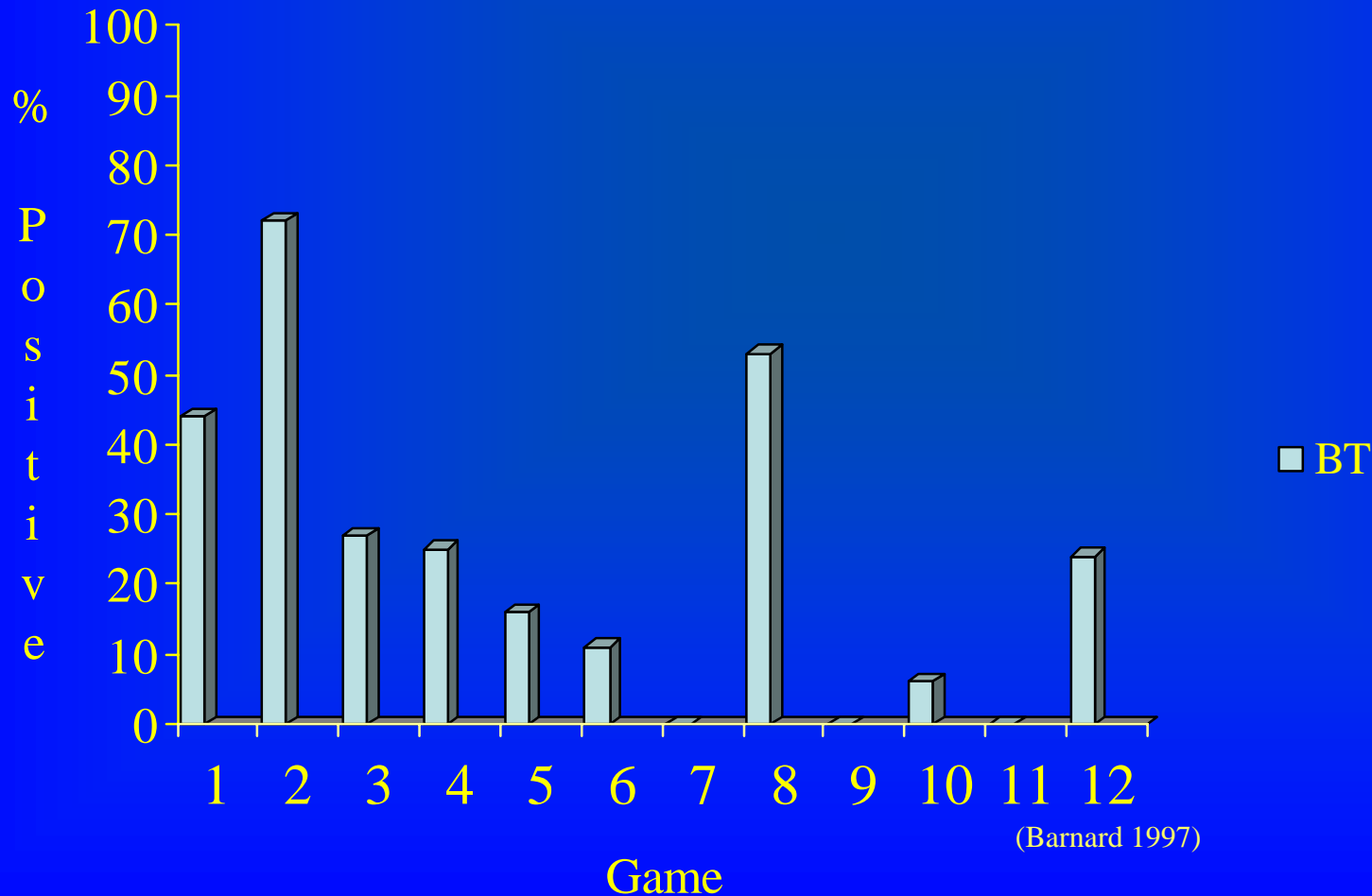


B: Single survey 1997

- 4 vegetation types

- rainfall 280mm . 900mm

1. Blk w/beest
2. Bl w/beest
3. Red h/beest
4. Bl/buck
5. S/buck
6. Impala
7. G/buck
8. Buffalo
9. Kudu
10. Eland
11. B/buck
12. Giraffe



VACCINE - background

- 1° - Theiler Sheep blood vaccine BTV 4
- used at # 11, 33, 54

alternative host system



egg

- progressive serial # in eggs (temp)
- 2° - pre 1959 used polyvalent egg attenuated
(BTV 3, 4, 11, 12)

ATTENUATION

- Absence of clinical Sx ? Attenuation
- Index of infection = solid homologous immunity after challenge
- attenuation
 - decrease severity fever
 - absence mouth and foot lesions
 - shortened febrile reaction

(cont.)

BTV 9 & 10 most pronounced clinical Sx
prolonged viraemia

Higher egg # foot lesions disappeared

Low virus yield in some egg strains

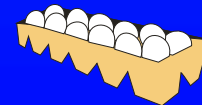


go to TC

Pathogenicity of original virus reduced by serial #

Febrile reaction \pm 1 day

Egg/TC better than Egg only



(cont.)

No concept Master Seed Virus

Some egg # >100

3° 14 strains (TC adapted Egg attenuated) in 1 dose
failed to stimulate polyvalent immunity

- loss antigenicity
- role interferon
- competition between 2 Ag s
- rapid : slower growing strains

Viraemia essential for high a/b titers

EVOLUTION OF A NEW VACCINE

Effective & Practical control measure

Goals :

Inactivated - complete inactivation
- minimal loss antigenicity

Attenuated - adaptation to new host

or

prolonged # in TC

- genetically stable agent
- avirulent

Move away - highly attenuated egg#
- use of 14 strains in 1

Selection of strains

1 - 14 were not selected → used (old and widespread)

(3) 17, 20, 21 exotic

(6) 15, 16, 18, 22, 23, 24 low pathogenicity for sheep
low presence in *Culicoides*
all recent isolates

1976 floods - outbreak of two new viruses BTV 18 & 19

19 very pathogenic

Directly related to 7 (weak immunogen)

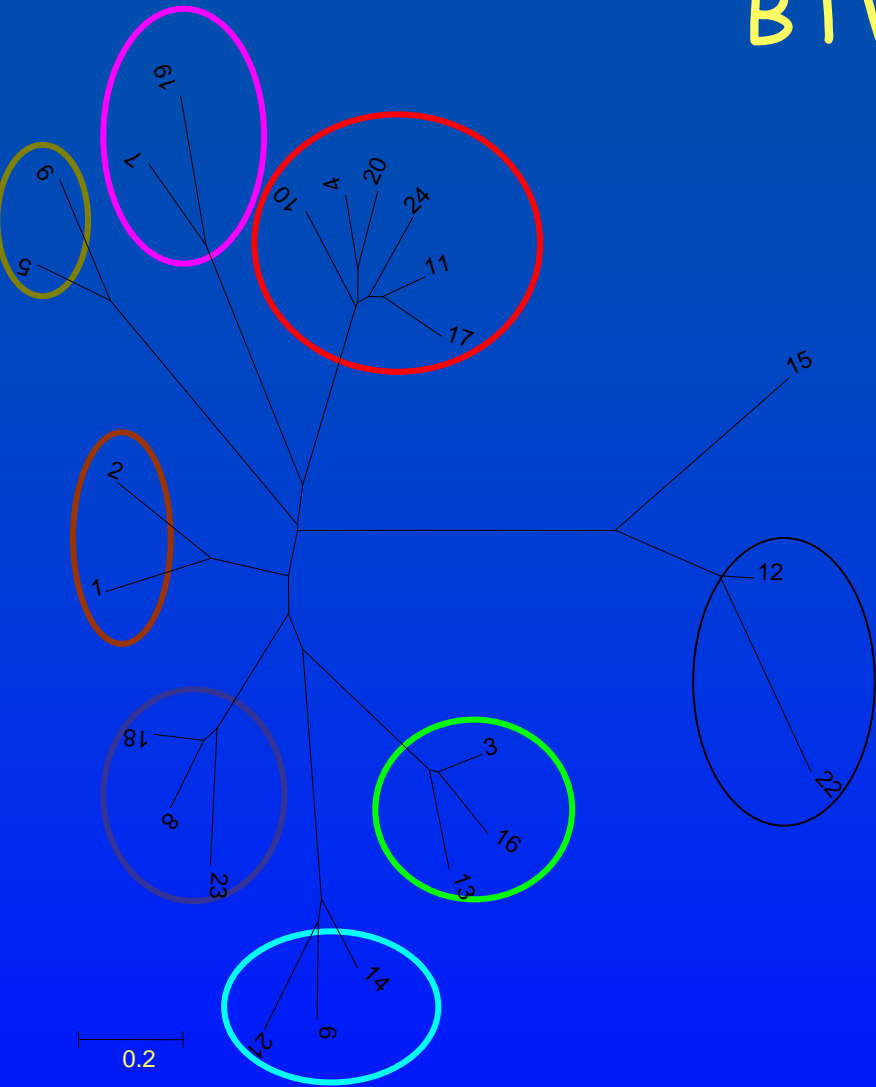
19 became the 15° strain of the 3 x pentavalent product

A - B- C divide based on degree attenuation

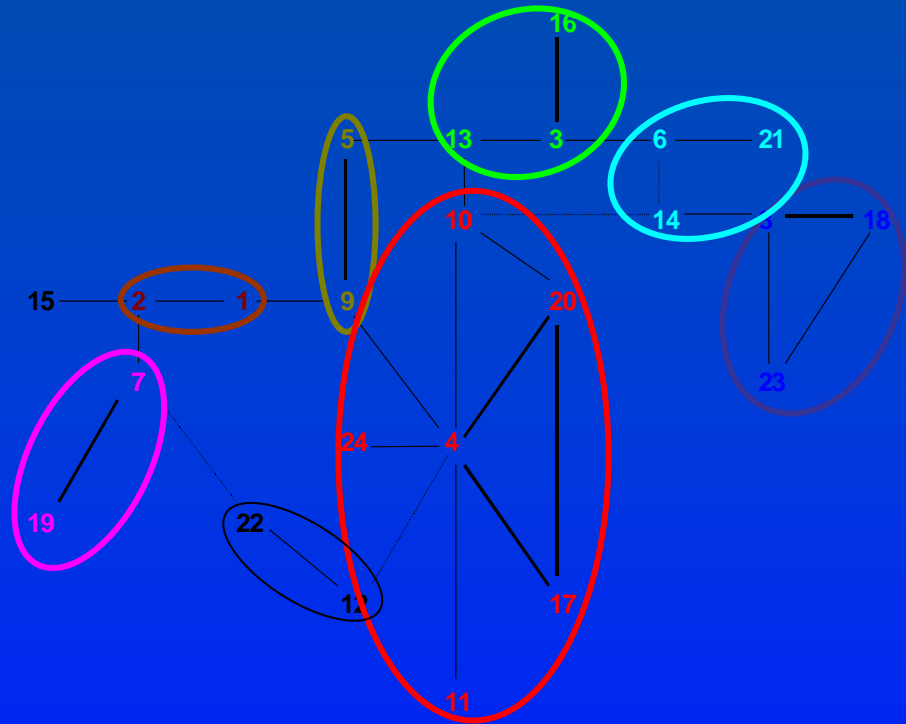
degree relatedness



BTV VP2



Phylogenetic relationship



Serological relationship

VACCINE STRAINS

HAD			HAVE		
1	53 E	4TC	50 E	3P	4BHK
2	80 E		50 E	3P	4BHK
3	60 E		45 E	2 BHK	3P 5BHK
4	80 E		60 E	3P	9BHK
5	63 E		50 E	2BHK	3P 6BHK
6	80 E		60E	3P	7BHK
7	80 E		60 E	3P	4BHK
8	80 E		50 E	3BHK	10P 7BHK
9	80 E		70 E	----	
10	80 E		E 82		
11	45 E		35 E	3P	5BHK
12	60 E		55 E	3P	4BHK
13	80 E		45 E	2BHK	3P 4BHK
14	80 E		60 E	3P	4BHK
19			29 E	3P	3BHK

BTV VACCINE STRAINS

Not all South African - exotics in vaccine

3 - Cyprus

10 - Portugal

16 - Pakistan

East : West

Italians have BTV 9 - E

Vaccine is BTV 9 - W



Effective (a/body)

Primary vacc. - Bottle A → a/bodies to 3



- Bottles A, B, C → protection against 9

Annual vacc. X 3 - full protection to 15

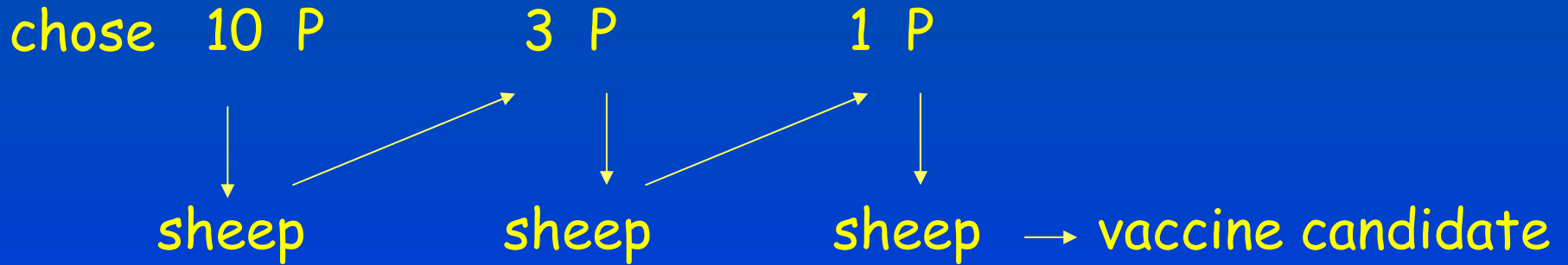
- chose the lowest available egg passage
- plaque purify on TC



Modified live - plaque selection avirulent/virulent ratio

(no genetic marker - choose large number)

(cont.)



Extensively tested - SA conditions
- SA merinos

In use 40 yrs 12 - 14 million doses

↓
8 million doses

CAUTION



- Live attenuated risks

- * not first ½ pregnancy
- * temporary infertility

- Objections

- * reversion to virulence
- * re assortment
- * vector spread (viraemia)
- * no DIVA test - trade difficulties

Teratogenicity - potent cause of early foetal death
- lesser extent foetal malformations

RE ASSORTMENT

EU PROJECT - VP2 sequences 130 strains

1982 - 2003

- 8 vaccine strains

BTV(2), 3, 5, 6, + 14



1982 death

- PAGE gel 7 vaccine segments +

- animal trial pending

MISCELLANEOUS

1. Game
 - springbok with mouth lesions/muscle necrosis
 - sable antelope with torticollis
2. Alpacca
 - two separate submissions with pneumonia
3. Goats
 - often with coronitis
 - Angoras with hyperaemia base horns
 - drop in milk production & torticollis (Saanen)

Abortion?

FOOT NOTE A

Vaccination History:-

- | | |
|-----------------|--------------|
| 1. Unvaccinated | 24 cases |
| | 13 serotypes |
| 2. Vaccinated | 16 cases |
| | 6 serotypes |
- multiple serotypes
 - majority were BTV 4, 3 and 12
 - only BTV 16 and 24 not in the vaccine

FOOT NOTE B

Serotype 16

- not South Africa
- not in the vaccine
- Eastern strain
- included in an Israeli product
- recent strain
- not tested in the field here



THANK YOU