Hipra Mantova 2010

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Curriculum Vitae.

- Born: 1945 Grouw, the Netherlands
- Education:
- 1961- 1964; Ing. degree in Agriculture.
- 1964- 1971; Utrecht Vet. Med,
- 1971- 1974; Practitioner (ambulant)
- 1975- 1980; Centr. Vet. Inst. (Rotterdam/ Lelystad)
- 1981- 2007; A.H.S. GD- Deventer.
- 2005- 2007; guest prof. Vetmed Vienna.
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Progressive and non-progressive Atrophic Rhinitis and swine production in the future

Dr M.F. de Jong DVM, PhD.

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Content

- History
- Clinical and pathological lesions indicative for AR
- Pathogenicity test with Pm and Bb strains
- Diagnostic improvements
- Serology
- Reduction of profit by AR
- AR schematized
- Treatment and Prevention
- The role of vaccination in PAR eradication
- Future perspectives to reduce losses by AR pathogenic Bb and Pm

History

Franque, 1829 (Germany) (oldest publication AR)

- The disease develops not at once but gradually and is in the early stages difficult to recognize.
- It starts in the nose with an inflammation of the nasal mucosa and when the disease is prolonging, the mucosa is thickening, the turbinates, the ethmoidal bones and other nose bones degenerate, resulting in malformation of the total nose with thick wrinkles upon or at the sides of the nose resulting in a banding of the snout.
- The breathing is enforced during the disease with the sounds of snuffle and snorting specially heard when drinking. This is the reason such pigs are called ,,Schnuffelnasen,,
- When the disease develops further on, also nose bleeding from both nostrils is noticed even in well nourished pigs. Sometimes breathing is going easier for a while, but sometimes the bleeding is so strong that they die.
- After nose bleeding the pigs are weakened and at this stage of the disease they become thin even with the best food and need to be slaughtered

Schneider 1878
Germany, Nassau

- ,,Schnüffelkrankheit,,(AR) is a disease in pigs characterized by:
- a chronic, incurable, purulent hemorrhagic nasal catarrh with an accumulation of purulent material, blood, mucosal debris in the nasal cavities which makes breathing difficult, after which the animals become cachectic, dispneumatic and may die.

Schneider 1878 (Germany)[2]

- After a post mortem of two pigs which died from RA the following symptoms where noticed:
- The upper jaw is remarkable shortened and thickening, =**Brachygnatia superior**
- A chronic purulent hemorrhagic rhinitis,
- Conchae and ethmoid bones are strongly reduced or rudimentary**.**
  = Conchae or Turbinate Atrophy
- A catarrh of conjunctiva and sinuses

Poels 1904; (The Netherlands founder of the Dutch C.V.I.)

- ,,Schnüffelkrankheit,, is a collective name for different local (nasal) diseases in pigs which have snuffle or snorting in common.
  E.g. rhinitis can be caused by: CSV, laryngitis, tonsillitis, tuberculosis, actinomycosis.
- Osteomalacia and skull deformities can rarely be the cause of the snuffle sounds in pigs.
- Its better to forget the name ,,Schnüffelkrankheit,, but relate the chronical disease symptoms to one of the different disease agents.

Poels 1904

- Piglets examined (10 – 15 days and 3-4month of age) pigs with morfological changes of the turbinates showing chronic rhinitis.

- Reports bacteriological investigations
- In case of chronic rhinitis; Streptococcals were oft isolated from ethmoids and meningitis
- In case of croupeous diphteric rhinitis, Poels isolated bacteria of group septicaemia haemorrhagica.
- Bacterial identification; Gram negative, oval form, non motile, no gas forming from sugars or milk, no liquifaction of gelatin, indol positve.
- Letality in mice within 24 hours
  (=P.mult.)
- In a rabbit ear-test pathogenic differences were observed.

  - Strong ear swelling with a hemorrhagic necrosis followed by mortality in about 5 days (Pasteurella multocida **DNTpos=PAR)**

Rabbit ear test; strong swelling and Dermal necrotic demarcation

Oldest described names of Atrophic Rhinitis

- 1829 Franque (Germany). Schnüffelkrankheit and **Nose bleeders**
- 1878 Schneider (Germany), Rhinitis pigs
- 1890 (Imminger), Rhininits infectiosa
- 1904 Poels, (the Netherlands), Rhinitis (acute, diphteric, croupeutic, chronic
- 1925 name Rhinitis chronica and osteodystrophy deformans
- 1958 name Atrophic Rhinits Infectiosa, Hutyra, Marek; Rhinitis infectiosa suum

AR Eradication

- Until the discussion started about B.bronch. in 1956, in most West and East European countries herds suffering from AR were eradicated by slaughtering .
- This was based on the experiences, ,,a farm which once becomes infected stays infected,,

Bordetella bronchiseptica

- Since 1956 Switzer stated that Bordetella bronchiseptica plays an important part in the etiology of AR
- Since 1962 R.F. Ross eo ; B.bronch. induced Porcine Atrophic Rhinitis
- Based on severe turbinate/ concheal atrophy after nasal B. bronch. infection in gnotobiotic **colostrum deprived 3 day old SPF piglets**

Struggling with the cause of AR

- **P.multocida**
- 1904 Poels
- 1938 Ratke
- 1953 Gwatkin
- 1956 Brand and Flatla
- 1972 Dirks
- **1975 Il´ina and Zasukhin**
- **1975 deJong,Akkermans,Bercovich**
- 1981 Pedersen and Barfod
- 1982 Pedersen
- 1982 Martineau ao
- 1982 Rutter ao

- **B.bronchiseptica**
- 1956 Switzer
- 1963 Switzer (sulfa,s)
- 1962 Cross and Claflin
- 1974 Farrington.
- 1975 Pedersen
- 1976 Tornoe and Nielsen
- 1976 Nielsen N.C.
- 1976 Brassine a.o
- 1979 Nakase a.o.
- 1980 Keller and Lorentz
- 1982 Krüger and Horsch

Combating AR

- Since the introduction of B. bronch. as the cause of AR in 1956, different strategies appeared in European countries eg.
- Partly stamping out: slaughtering all pregnant sows 2 weeks before farrowing, making the farm free of piglets, and pigs till 9 month old.
- Medication.
  Since chemotherapeutics (sulfa's) and antibiotics (tetracycline) came available also these products were used for treatment.
- Vaccination and serum application. Bb and Pm (autovaccine)
- Improving housing, climate and management
- Combinations.

Results of different treatments on

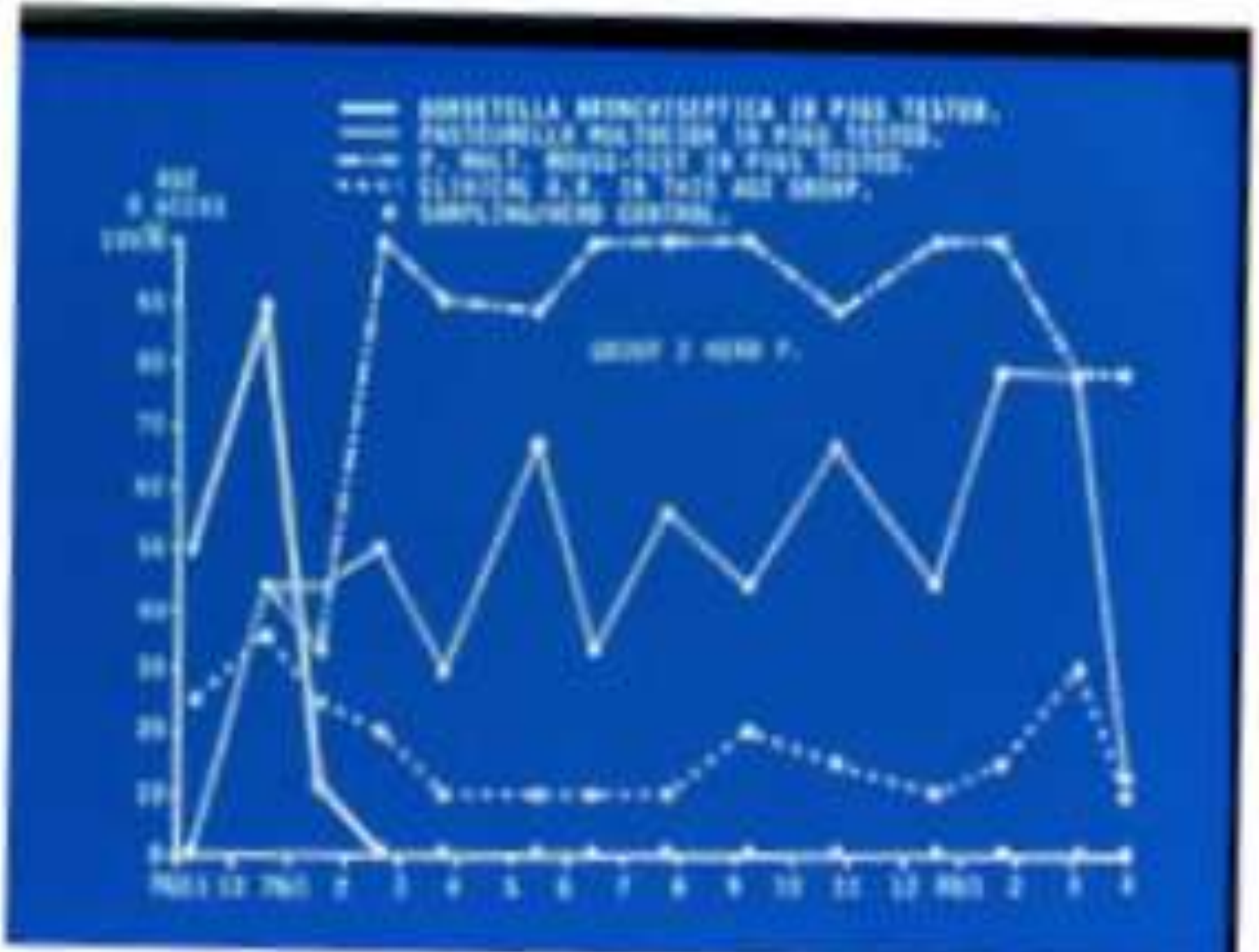
Tabel 1. Het gemiddelde percentage biggen van ± 6 weken dat bij het bacteriologisch onderzoek van de neusflora vóór en 6 (resp. 14) weken na een ingestelde behandeling besmet was met Bordetella bronchiseptica (B.B.) resp. Pasteurella multocida (P.M.)

Bedrijfsgroep no.	Aantal bedrijven	Gem. aantal zeugen per bedrijf	Toegepaste behandeling	Gem. perc. besmette biggen voor de behandeling		Gem. perc. besmette biggen ± 6 (resp. 14*) weken na het begin van de behandeling	
				B.B.	P.M.	B.B.	P.M.
1	4	54	"all in - all out" in totaal gescheiden kraamafdelingen	0	34	0	4,4
2a	5	54	penicilline/ streptomycine combinatie	5	34,8	1,4	7,6
2b	1	100	chlooramfenicol	0	76	0	32
2c	5	84	oxytetracycline-HCl	7,5	47,8	1	11,4
2d	5	60	"sulfa"preparaten	33	4,8	4,4	2,8
3a	1	120	serum	25	42	0	10
3b	3	100	vaccinatie	24,2	25,1	3,3	3,4

Bordetella Anti Serum Therapy

Injection at day 3 and 10 with 3 ml sc

Treatment Serum	Serum titer	Number of piglets	Perc. Piglets of 8 weeks with BS		
			grad 0+1	grad 2	grad 3+4
lot A	1: 25	126	52,4	16,6	31,0
lot B	1: 100	137	63,5	22,6	13,9
lot C	1: 500	122	90,1	7,5	2,4
No treatment	--	182	28,5	25,7	45,8



•Influence of changing AR combating strategy from a total stamping out into partial eradication (in combination with medications)

1958--1962 total stamping out.
1963- 1970 Some provinces starting partial stamping out + sulfa medication some continued total stamping out.
1970- 1980 partial stamping out + medication
1981-1990 AHS program to select and treat farms based on AR toxigenic P.mult. by vaccination and medication and selecting and slaughtering severe AR weaners from participating farms
1985 Breeding herds certified free of ARtox.P.m . no AR vaccination allowed

Year	Number of Herds
1958	325
1959	152
1960	176
1961	52
1962	6
1963 ←	26
1964	16
1965	33
1966	47
1967	40
1968	88
1969	74
1970	87

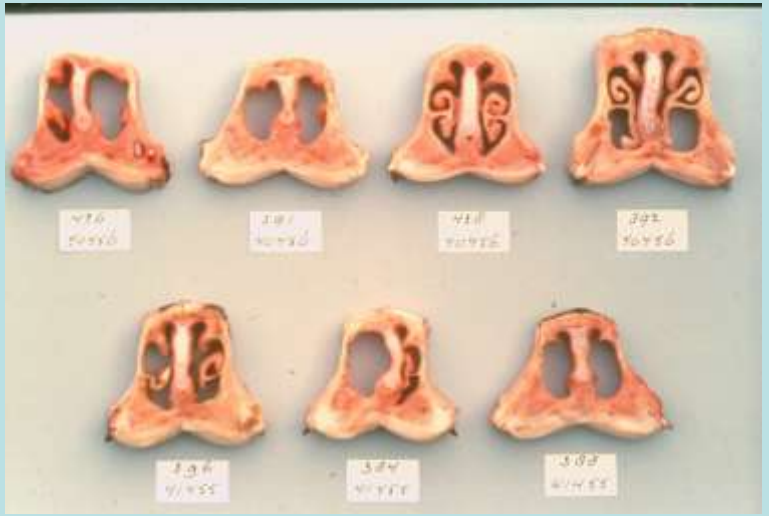
Year	Number of Herds
1971	221
1972	229
1973	154
1974	224
1975 ←	344
1976	301
1977	433
1978	550
1979	555
1980	486
1981	690
1982	556
1983	535
1984	442

Clinical and pathological lesions indicative for AR

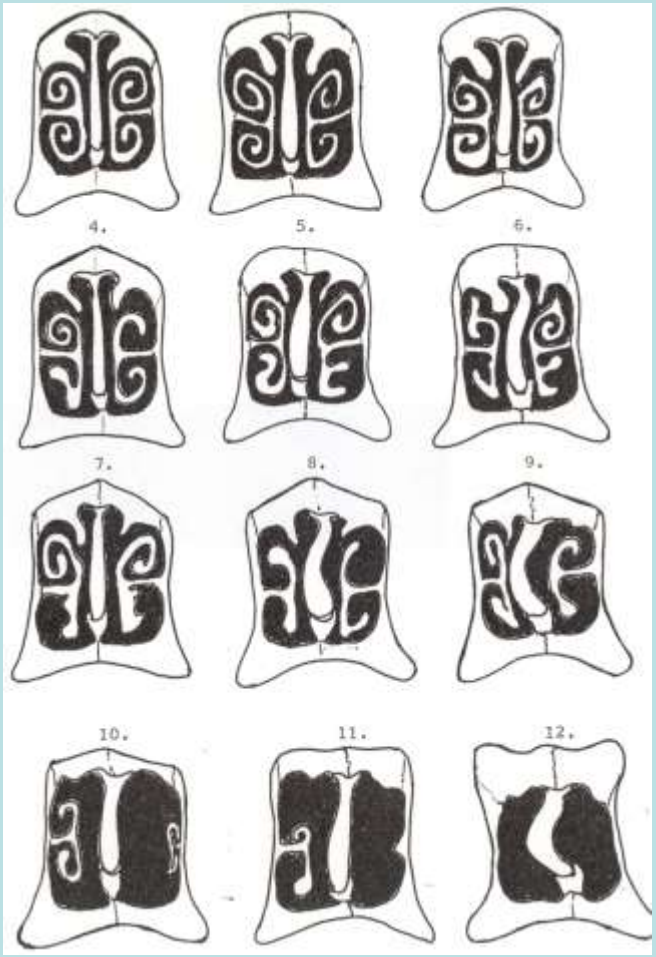
- Sneezing, sharp till snorting
- Lacrimation
- Brachygnatia superior
- Snout deformations, torsion, twisting, bending, wrinkling
- (Endoscopy)
- (Radiography/ tomography)

Some clinical and pathological features suspicious for (P)AR

- First SPF pigs showing AR after intra nasal Pm infection with a Pm strain from severe AR diseased pigs
- Different macroscopical features e.g. ventral and dorsal turbinate atrophy, septum deviation, malformation of nasal bones.



Snout scouring method



AR beoordelingsschema transversale neusdoorsnede (praemolare 1 à 2).

AR snoutgrading cross-sections (praemolar 1 or 2)

neus[1] door- snede No.	vorm[2] Os nasale	septum[3] deviatie	AVC[4]	ADC[5]	HVC[6]	HDC[6]
1	convex	0	0 - 0	0 - 0	0 - 0	0 - 0
2	convex	0	0 - 0	0 - 0	0 - 0	0 - 0
3	convex	+	0 - 0	0 - 0	3 - 1	1 - 0
4	dakvormig	0	1 - 1[a]	1 - 0	1 - 0	0 - 0
5	asymmetrisch	+	1 - 1	1 - 2	2 - 1	1 - 0
6	asymmetrisch	++	2[b]- 1	0 - 2	1 - 1	3 - 1
7	dakvormig	0	2 - 2	0 - 2	1 - 3	0 - 0
8	dakvormig	++	3 - 3[c]	1 - 2	2 - 0	1 - 1
9	dakvormig	+++	2 - 3	2 - 2	1 - 1	1 - 2
10	dakvormig/ plat	+	3 - 4[d]	3 - 3	1 - .	1 - 0
11	plat	++	3 - 4	3 - 3	1 - .	1 - 2
12	concave	+++	4 - 4	3 - 3	. - .	3 - 3

Legenda:

1. neus doorsnede No.
2. vormveranderingen Os nasale
   normaal = convex, onregelmatig, dakvormig, dakvormig tot plat, plat, concave.
3. septum deviatie schaal: 0 = recht, + = gering (mediaan 1 loopt nog door septum), ++ = duidelijk (mediaan valt net buiten septum), +++ = ernstig.
4. AVC: Atrofie Ventrale Conchae
   gradatie 0 = geen afwijking
   gradatie 1 = ventrale of dorsale winding gering afwijkend
   gradatie 2 = ventrale en dorsale winding beide gering afwijkend of ventrale of dorsale winding duidelijk aangetast (steeltje)
   gradatie 3 = beide windingen aangetast; ventrale of dorsale winding duidelijk tot ernstig
   gradatie 4 = Ventrale concha verdwenen of slechts vormsel aanwezig zonder (kraak) benige structuur.
5. ADC : Atrofie Dorsale Conchae
   gradatie 0 = geen afwijking;
   gradatie 1 = gering afwijkend;
   gradatie 2 = duidelijk afwijkend;
   gradatie 3 = totale atrofie.

Brachygnatia superior; a simple clinical feature for AR scoring

Pathogenicity tests for Bb and Pm

- The Dutch results obtained with fighting Bb alone to control AR were disappointing
- P.multocida appeared every time in such AR herds when Bb was under control
- **Question:** are there Pm strains with different AR pathogenicity?
- 1975 Investigations started to test different Pm and Bb strains for AR pathogenicity in gnotobiontic colostrum derived SPF piglets

Pathogenicity tests with Bb and Pm strains

SPF piglets kept in isolators

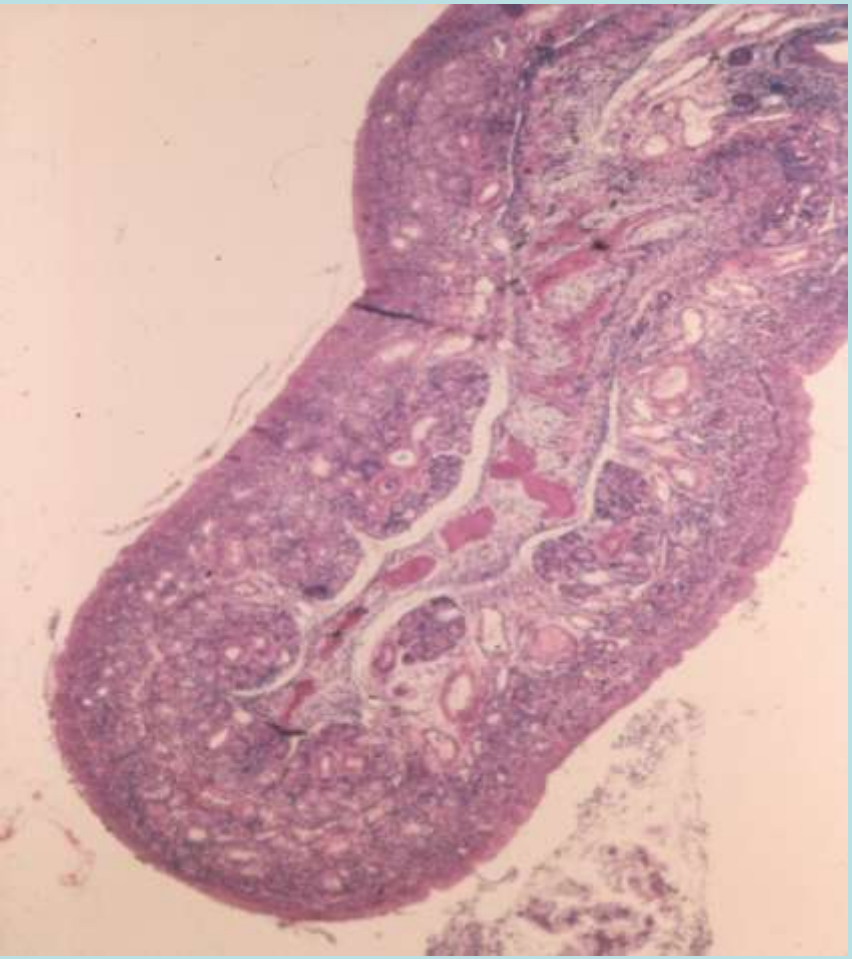
Turbinate atrophy in CD-SPF pigs with an AR pathogenic Bb strain

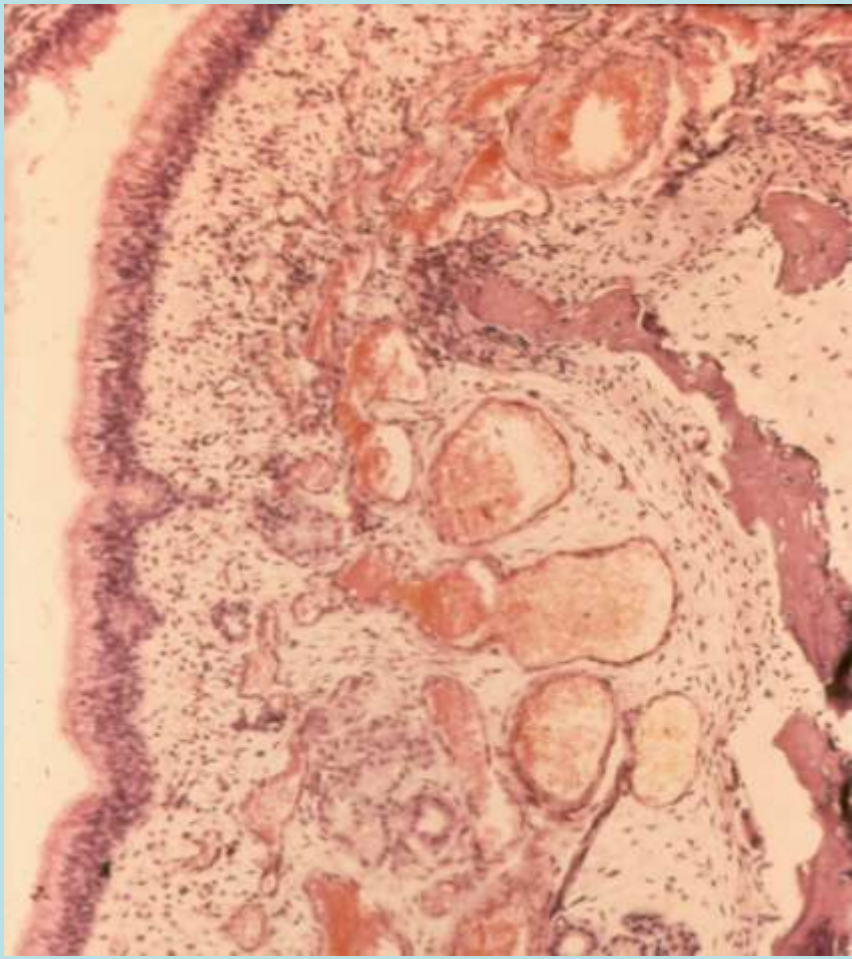
- In the 3 week old SPF pigs the nasally infected and the contact pigs both showed severe turbinate lesions 4 weeks later
- Bb is motile, has filli and adhere to the nasal mucosa

Turbinate atrophy in CD-SPF pigs with an AR pathogenic Pm strain

- The both intra nasal infected SPF piglets show strong turbinate lesion and bending of the septum.
- The contact pig had slight turbinate lesion but still bending of the septum.
- First time shown that Pm alone can cause AR and could be repeated.
- Pm is non motile and for that reason needs support after transmission

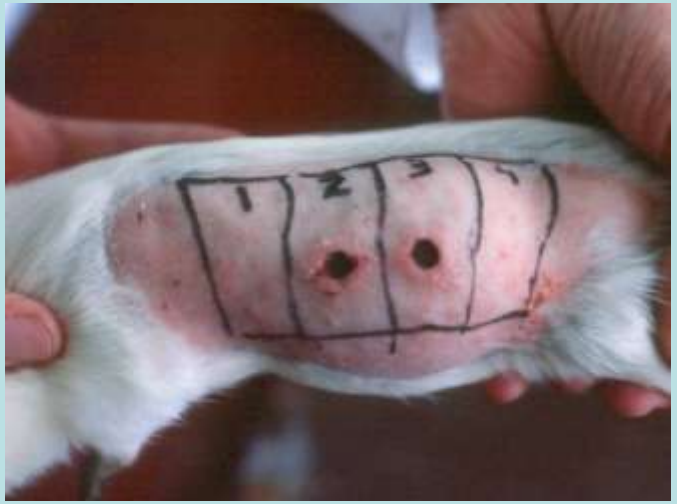
Differences in histopathology between an AR tox+ Bb and a AR tox+Pm strain

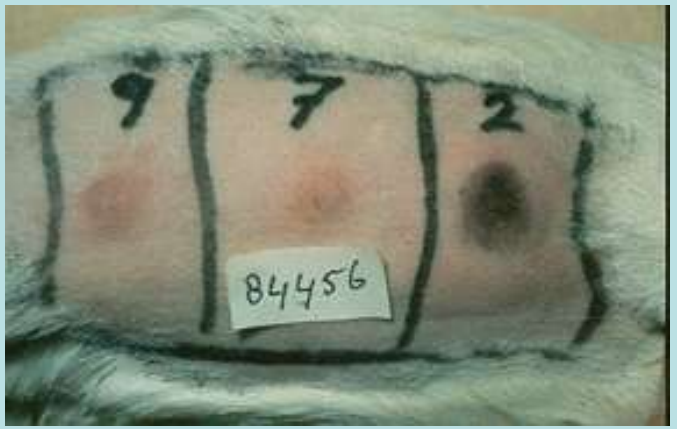




The guinea pig skin test; a simple test to select AR toxigenic Bb and Pm strains

- B.bronch. 2 of 4 strains with pos. Dermonecrotic Toxin Skin Reaction (no 2 and 3)
- P. mult. guinea pig skin test with 1 pos. DNT reaction (no 2)
- Toxins of Bb and Pm are different. No cross neutralization





Relation between guinea pig skin test and SPF piglet test

Table 3: The results from 18 Pasteurella multocida strains tested in the guinea-pig skintest and in 3-week-old SPF piglets, compared with capsule (c) and somatic (o) serotype.

PM strain	guinea-pig skintest in mm	SPF pigtest average grade of AVC[3]	qualification[5] of AR pathogenicity	c-serotypes	o-serotypes	
				Carter[6]	Namioka	Heddleston
4/47459	20(48h)[2]	3.75	+	D	1	10
5/04041	25(")	3.50	+	A	5,11,14	Nt
4/40456	20(")	3.25	+	D	13	2+4+(7)+12
4/70596	18(")	3.00	+	D	15	Nt
Pepping	20(")	2.83	+	D	Nt[4]	2+3+11+12
5/09391[1]	20(")	2.75	+	D	4	2+4+ 7+12
4/93698	18(")	2.50	+	D	15	2+4+(7)+12
4/72510	8(72h)[2]	1.50	±	D	1	11
4/76628	10(")	0.50	±	D	15	2+4+7+12
5/12453	0(")	0.85	-	D	11,13,15	(11)+(15)
4/75510	0(")	0.50	-	D	13	2+3+11+12
Pepping	0(")	0.50	-	D	5,14,15	2+4+ 7+12
4/43954	0(")	0.25	-	A	Nt	3+4+12
4/44758	0(")	0.25	-	A	1	3+4(6+12)
4/76593	0(")	0.00	-	A	11	3+4
4/70373	0(")	0.00	-	A	1	Nt
4/99924	0(")	0.00	-	D	1	2+4+7+12
4/99011	0(")	0.00	-	D	12	2+4+12

1. =turkey strain from herd with AR diseased swine
2. 48h =diameter of haemorrhagic necrotic center measured after 48 hours
   72h =diameter of haemorrhagic necrotic center measured after 72 hours
3. AVC =Atrophy Ventral Conchae of 3-week-old actively infected colostrum deprived Specific Pathogen Free pigs
4. Nt =not to typify
5. =AR pathogenicity expressed by:
   - = negative
   ± = doubtful
   + = positive
6. =haemagglutination test
   ( )+ weak precipitation lines

Guinea pigs skin tests to select ARtox.positive and negative B.bronch. and P.mult. strains.

Year 1975-79	Strains tested	Guinea pig skin test (DNT)
	B.bronch 157	➢10 mm Ø = ➢152 (97%)
	P. mult. 776	➢10 mm Ø =396(51%) ➢<10mm Ø =36 (5%)

Age related sensitivity for a Bb infection in SPF piglets

Table 4: The induction of clinical and pathologic-anatomical lesions of AR after experimental infection with an AR pathogenic B.bronchiseptica strain in SPF * piglets at different ages.

pigs infected age in weeks	number of pigs infected actively or by contact	number of pigs with a positive BS "	average atrophy ventral conchae	number of pigs with septum deviation	number of pigs with clinical AR
3	2 inf.'	1	3	2	1
3	1 cont.	0	3	1	0
6	2 inf.	1	1.25	2	0
6	2 cont.	0	0.5	0	0
9	2 inf.	0	0.75	2	0
9	1 cont.	0	0.25	1	0
12	2 inf.	0	0.5	2	0
12	1 cont.	0	0	0	0
16	2 inf.	0	0.25	2	0
16	2 cont.	0	0.25	1	0

') inf. = infected actively; cont. = infected by contact
") BS = Brachygnathia superior
*) SPF = Specific Pathogen Free, colostrum deprived

Age related sensitivity for a Pm (tox+) infection in SPF piglets

Table 5: The induction of clinical and pathologic anatomical lesions of AR after experimental infection with an AR pathogenic P.multocida strain in SPF* piglets at different ages.

pigs infected age in weeks	number of pigs infected actively or by contact	number of pigs with a positive BS"	average atrophy ventral conchae	number of pigs with septum deviation	number of pigs with clinical AR
3 3	2 inf.' 1 cont.	1 0	3.3 1	2 1	1 0
6 6	2 inf. 2 cont.	1 1	3.3 1.3	2 1	2 1
9 9	2 inf. 2 cont.	0 0	1.8 0.5	1 2	0 0
12 12	2 inf. 2 cont.	0 0	2.0 0.3	1 1	0 0
16 16	2 inf. 1 cont.	0 0	1.3 0	2 0	0 0

') inf. = infected actively; cont. = infected by contact
") BS = Brachygnathia superior
*) SPF = Specific Pathogen Free, colostrum deprived

Pedersen K.B. and Barfod K.
Nord. Vet. Med. 1982-34-293-302.

Mean daily weight gain (g) in relation to the degree of turbinate atrophy.

(Med)	Turbinate Atrophy	challenged with B.bronch. and P. mult. tox. -	B.bronch. and P. mult. tox. +	Index
0	0	633.7	633.5 a	100
1	?	623.8	636.9 a	101
2	+	662.7	617.6 a	98
3	++	647.5	568.4 b	90
4	+++	--	540.0 c	85

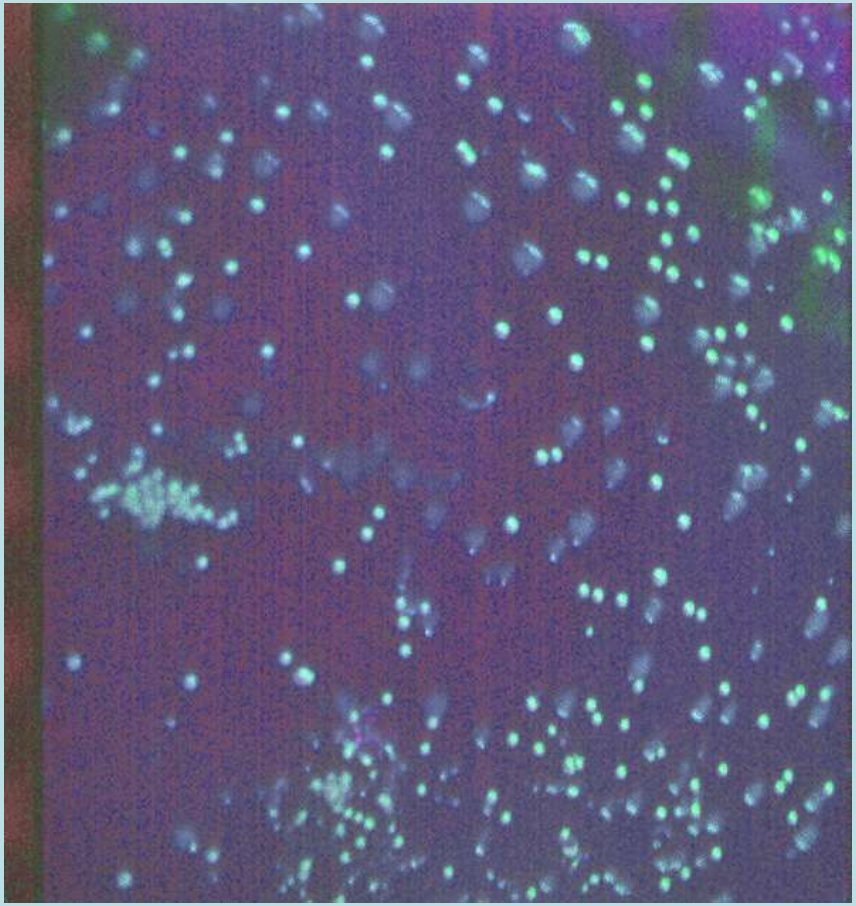
no significant difference (analysis of variance)

means with diff. superscripts differ significantly P 0.05, t - test

Diagnostic Improvements

Selective CVGA culture plate with mucoid Pm and whitish B.bronch.

- Culture plate with a mixture of different antibiotics suppresses the commingling flora and favours Pm and Bb after 48-72 h.
- Clindamycine 0,75mg/l
- Vancomycine 4mg/l
- Gentamycine 0,75mg/l
- Amphotericine 5mg/l
- Replacement for Pm preselection in mice



Sampling of Pigs: collection of nasal and tonsil- samples

Comparison of the detection of the AR tox Pm with Elisa or PCR

Table 2

herds	N T	herds ELISA	pos. PCR	number of swab	tot. % PM	% ELISA pos.	% PCR pos.
5 clinical AR	N	5	5	75	67	27	63
	T	1	2	35	66	9	60
8 vaccin. AR history	N	3	3	276	45	3	7
	T	6	8	299	59	6	11
5 vaccin. no AR history	N	0	0	379	56	0	0
	T	0	0	364	66	0	0

Comparison of Elisa and PCR test (replacement of the guinea pig skin test)

- Conclusion;
- There is no complete agreement between both tests
- In cases of test and removal and or certifying herds free of ARtox Pm, this has to be taken in account.

Table 1a

		ELISA		
		+	-	
PCR	+	42	54	96
	-	2	791	793
		44	845	889

Table 1b

		ELISA		
		+	-	
PCR	+	42	79	121
	-	6	1466	1472
		48	1545	1593

Comparison of Elisa and PCR-test in 374 pigs of PAR herds

- Total examined pigs 374
- Pos. after subculture + Elisa 32
- Pos. after Plate Washing.+Elsa 27
- Total pos. with Elisa 44
- Total pos. with PCR 96
- Total AR-Tox.Pm pos 98

Development of methods to detect Pmtox+ in Pm and Bb in the fight against AR

- Detection of Tox. P.Mult. Replacement of Lab. animals;
  -Mice to isolate Pm, Replaced by Selektivmedium (CVGA) for Pm/Bb
  -Guineapig skintest;
  -EBL/Vero tissue culture;
  -Elisa in * P.mult. Pure cultures;
  * Plate washing suspension of primary and secundary culture plates
- Detection of Tox. Pm by PCR;
  - different primers (sensitivity / specificity ?)
  – different pretreatments of the samples
  - detection directly in direct sample or after enrichment stap
- Detection of antibodies against AR-Tox. antigen;
  -Serumneutralisationtest in;
  -Guineapigskintest,
  -Mouse letalitytest,
  -Tissuecultures
  -Elisa’s

Serology

Bb antibodies: Comparison of RPA and CBR

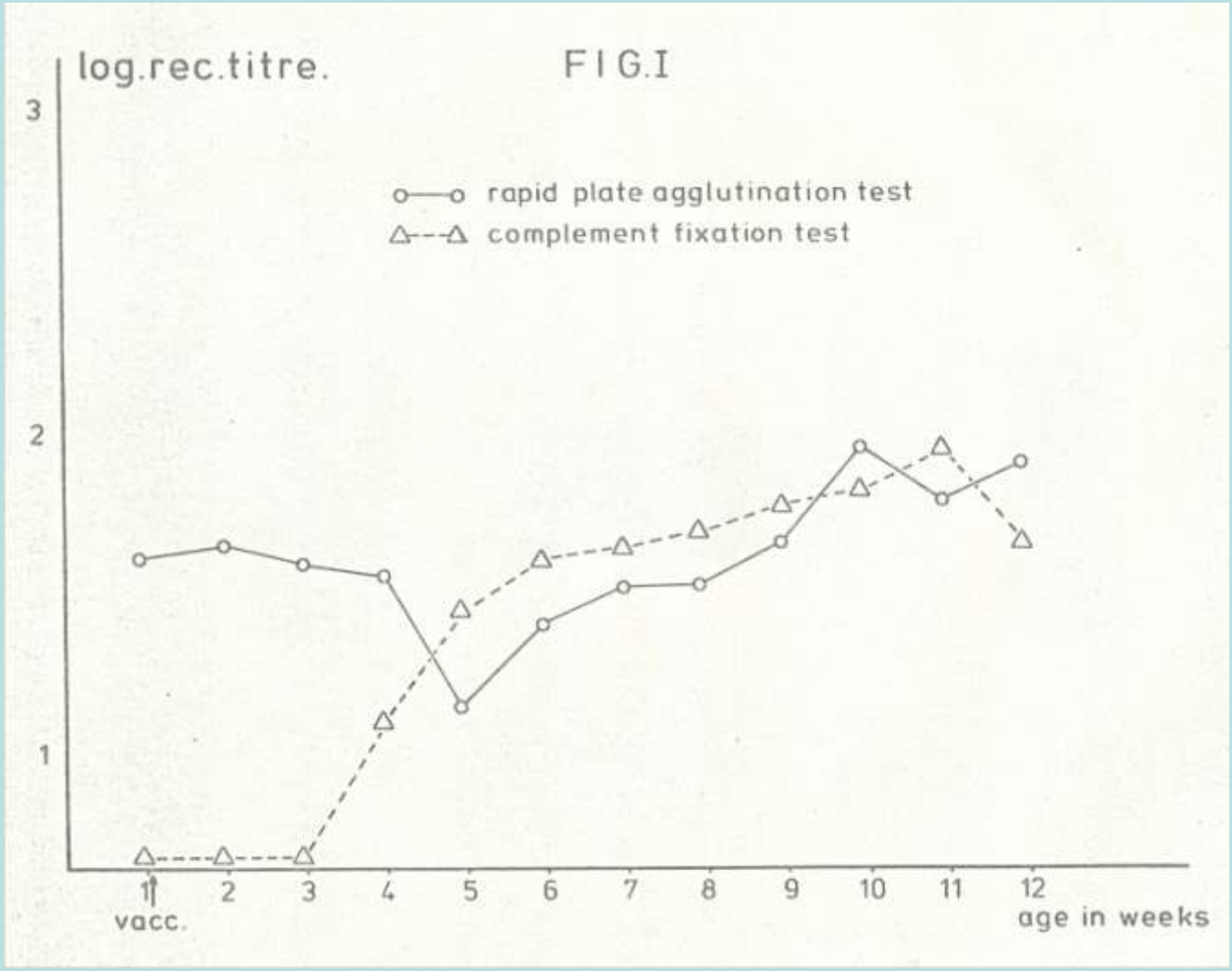


Table I. The serum reciprocal antibody titre of the vaccinated sows of group A before and after vaccination

Sow No	titre before vaccination 60th day of gestation	titre on the 100th day of gestation	titre 5th day after partus
61	neg	500	500
82	50	100	500
140	50	100	500
143	50	1.000	500
66	25	500	1.000
100	50	500	1.000
138	50	500	1.000
67	50	1.000	1.000
52	neg	500	1.000
89	neg	500	1.000
136	25	50	100

titres higher then 1 : 1.000 were not further tested.

P.Mult toxin neutralization

Table 8: The neutralization and crossprotection of two PM-AR toxins with anti-toxin containing rabbit sera in the mouse lethality- and the guinea-pig skintests.

PM-strain		proportion	mouse lethality test '	guinea-pig skin-test "
toxin	anti-toxin	toxin/antitoxin		
40456	40456	4 : 1	0/3	-
		9 : 1	0/3	-
		99 : 1	0/3	-
47459	47459	4 : 1	0/3	-
		9 : 1	3/3	±
		99 : 1	3/3	+
40456	47459	4 : 1	0/3	-
		9 : 1	3/3	-
		99 : 1	3/3	+
47459	40456	4 : 1	0/3	-
		9 : 1	0/3	-
		99 : 1	3/3	+

') mouse lethality test: number of mice dying after 5 days per number of mice injected

") guinea-pig skintest : + = haemorrhagic necrotic center of a diameter of ⩾15 mm after 48 hours

± = diameter of the haemorrhagic necrotic center of 10 to 14 mm after 72 hours

- = no haemorrhagic necrotic skin-reaction after 72 hours.

Anti – AR toxin of P.mult. in 8 week old pigs born from AR vaccinated sows

Number of herds	Examined serum samples pro farm	Antibody- titer profile			Clinical AR
		< 2 %	2-32 %	≥64 %	BS %
7	14	5	23	72	0
3	12	11	19	70	<1
6	15	27	24	49	<5
7	12	55	35	10	≥5

PM – TOXIN NEUTRALIZING ANTIBODIES IN SOW AND THEIR OFFSPRING

SOW NO.	TITRE SOW	PIG NO.	AGE 3 DAYS	3 WEEKS	6 WEEKS
1	<2	1	<2	<2	<2
		2	<2	<2	<2
		3	<2	<2	<2
2	5,6	1	16	2,8	2
		2	11	2,8	<2
3	45	1	45	8	<2
		2	128	22	11
4	>128	1	>128	>128	64
		2	128	22	8
		3	<2	<2	<2
5	>128	1	11	2,8	2,8
		2	128	32	22
		3	128	45	16

Pm- toxin neutralizing antibodies in sows.

Group	herd no.	number of sows	Titers <2	<2 <8	>8 <32	>32 <64	>64 <128	>128
A	1	11	11					
	2	15	15					
B	3	9	9					
	4	15	15					
C	5	10	10					
	6	15	15					
D	7	20	15	3	1	0	0	1
	8	25	7	1	4	2	4	7
	9	18	1	4	0	0	4	9

Legends:

Group A: herds free of AR and free of toxinogenic Pm
B: herds with AR and with toxinogenic Pm
C: herds as cat. B: sows vaccinated with a Pm vaccin without toxinogenic factor.
D: herds as cat. B: sows vaccinated with a Pm vaccin with the toxinogenic factor.

Elisa tests to detect ART antibodies

- The trials in mice and guinea pigs could be replaced by tissue cultures eg EBL or Vero cells
- These test are replaced by Elisa based tests today
- Remind discrepancies between the tests.
- Antibodies after a natural ARtox.Pm infection are difficult to detect
- Vaccination titers from potent ART vaccines can be shown much easier.
- For Tox.Pm eradication there are indications that we do need high ART antibodies, higher than needed for clinical AR herd improvements

Reduction of profit by PAR

Pedersen K.B. and Barfod K.
Nord. Vet. Med. 1982-34-293-302.

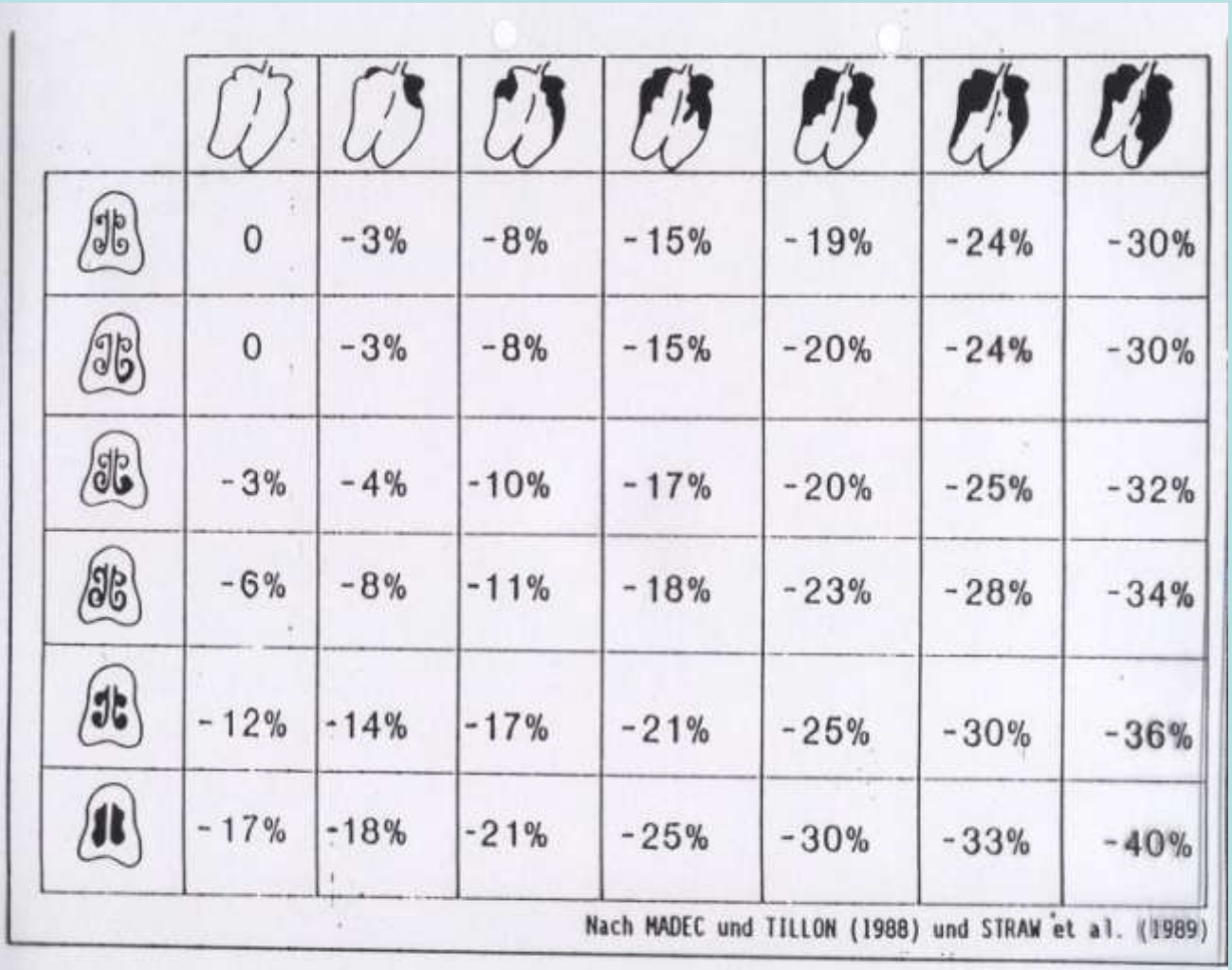
Mean daily weight gain (g) in relation to the degree of turbinate atrophy.

(Med)	Turbinate Atrophy	challenged with B.bronch. and P. mult. tox. -	B.bronch. and P. mult. tox. +	Index
0	0	633.7	633.5 a	100
1	?	623.8	636.9 a	101
2	+	662.7	617.6 a	98
3	++	647.5	568.4 b	90
4	+++	--	540.0 c	85

no significant difference (analysis of variance)

means with diff. superscripts differ significantly P 0.05, t - test

Profit reduction due to respiratory diseases (Blaha)



	0	-3%	-8%	-15%	-19%	-24%	-30%
	0	-3%	-8%	-15%	-20%	-24%	-30%
	-3%	-4%	-10%	-17%	-20%	-25%	-32%
	-6%	-8%	-11%	-18%	-23%	-28%	-34%
	-12%	-14%	-17%	-21%	-25%	-30%	-36%
	-17%	-18%	-21%	-25%	-30%	-33%	-40%

Nach MADEC und TILLON (1988) und STRAW et al. (1989)

Abb. 6: Reduzierung des ökonomischen Ertrages durch respiratorische Erkrankungen
Fig. 6: Profit reduction due to respiratory diseases T. Blaha

Growth reduction related with Brachygnatia superior(at start of the fattening) and av.turbinate atrophy at slaughter

Tabel 3: Gemiddelde dagelijkse groei vergeleken met BS (Done) en ventrale conchae atrofie (AVC) bij 341 varkens van AR-bedrijven.

Table 3: Mean daily weight gain compared with BS (Done) and turbinate atrophy (AVC) in 341 pigs of AR diseased herds.

	startgewicht 1) 20-25 kg		
BS 2) in mm geschat	aantal 3) varkens	groei/ 4) dag in gr.	gem. 5) AVC
-2/3	21	590	1,02
-1	47	560	1,70
0	46	591	1,81
+1	63	567	2,34
+2	31	565	2,98
+3	31	537	3,28
+4	24	501	3,81
+5/6	38	512	3,63
+7/10	22	484	4
> 10	18	472	3,94
	341		

1) startweight
2) estimated BS in mm
3) number of pigs
4) growth/day (gm)
5) mean AVC

PAR schematized

Bordetella bronchiseptica

Pathogenesis

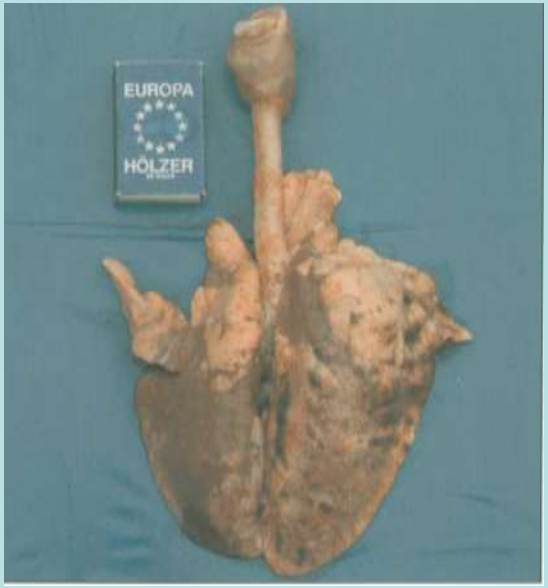
Lung ← Respiratory-epithelium ← aerogenic uptake

Respiratory-epithelium → by Toxin forming

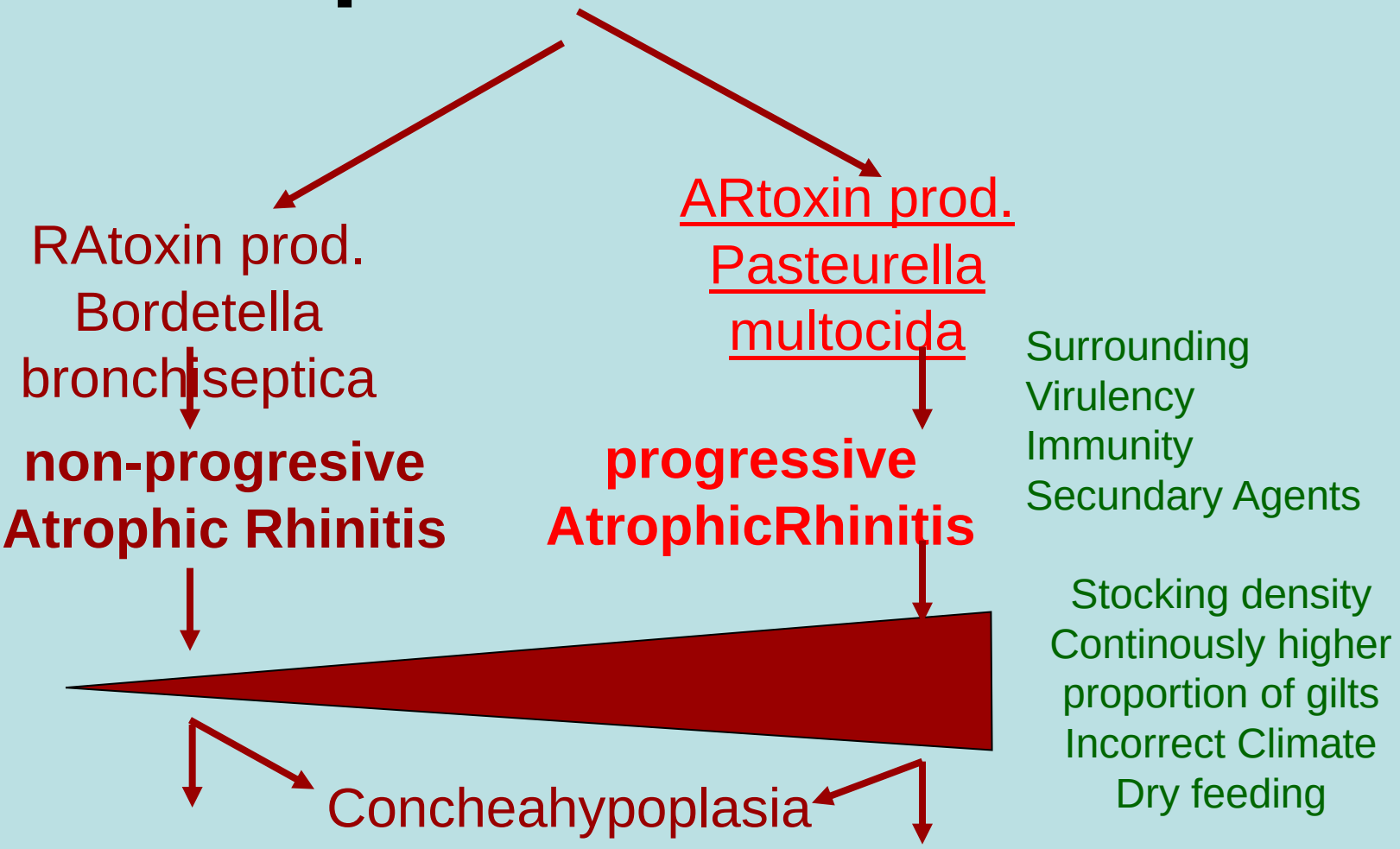
Lung → Broncho-pneumonia

by Toxin forming → Conchea → non progressive Atrophic Rhinitis

non progressive Atrophic Rhinitis → Predisposition for toxin producing Pasteurella??



Atrophic Rhinitis=?



Progressive Atrophic Rhinitis

Pathogenesis Destruction mucosa

Mucus accumulation

Infectious causes

non infectious causes

toxinbildende Pasteurellen

catarrhalic-purulent Rhinitis

Osteoblast reduction

-dry air
-toxic gasses
-dust

Virrisses
-IBR(Cytomegalo)
-Influenza
-PRRS
-Aujeszky
-Circo2

Bacteria
-Mycoplasmata
-Streptococces
-Bordetella

Conchae hypoplasia

-colt air,draft
-chancegings in temperatur

Treatment and Vaccination

Therapy for Piglet producers

Sow herd treatment 14d

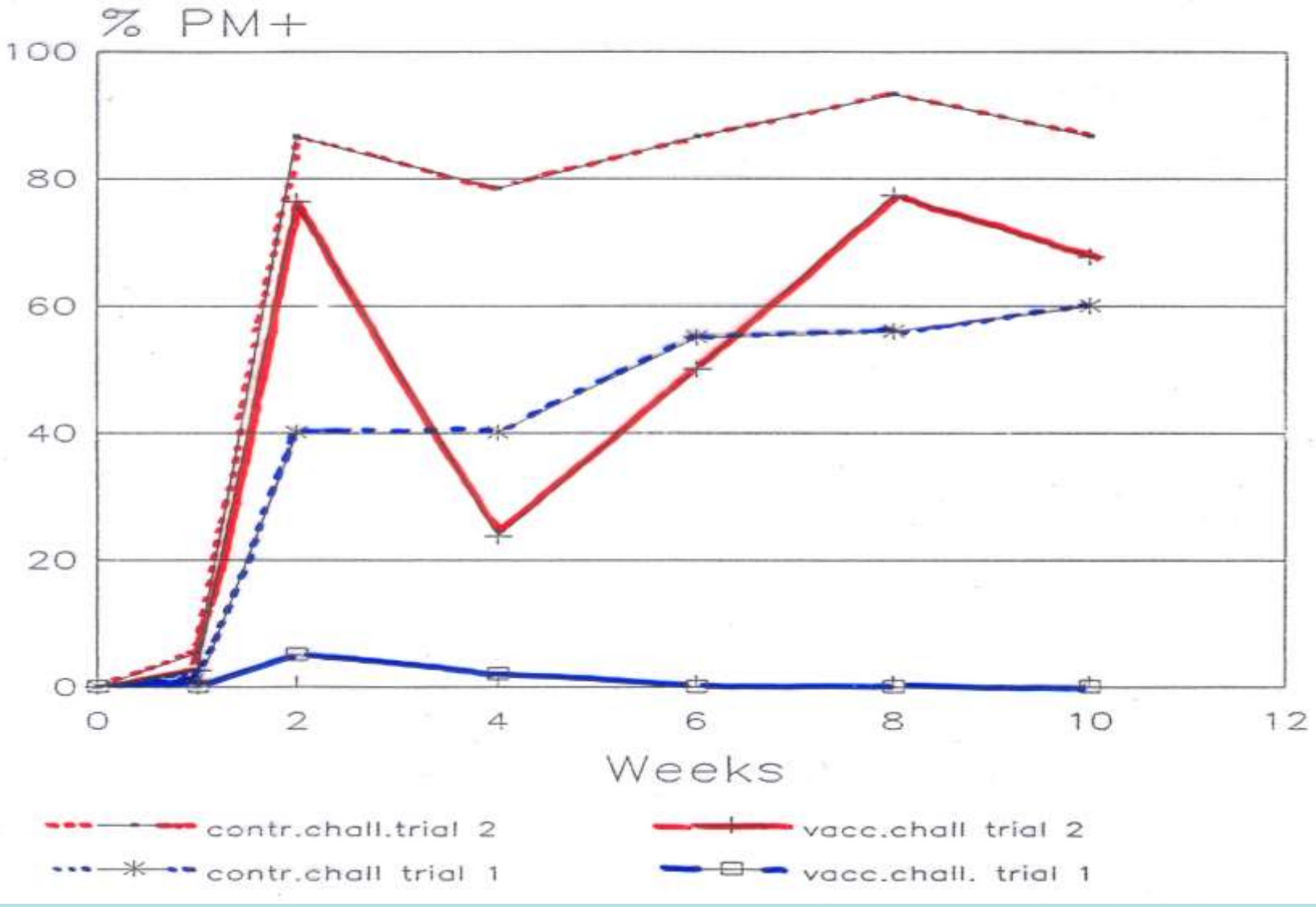
Individuel animal:, Enrofloxacin, Oxytetracyclin,Penstrep
oral: 500 - 1000 ppm Trim.Sulf. oder Tetracycline
400 ppm Tilmicosin

Injection of all farrowing piglets: OTC;PenStrep
d3,d6,d9,d12,d15,d18,d21,d24
Doxy. or Draxxin 1x p.W? Longacting-AB;
Naxel
till weaning;

Feedmedikation of all weaners till 25-30 kg (s.o.)

Sowherd vaccination after AR outbreak
(high potent Antibodies against ARToxin)

The % of PM+ isolates in challenged piglets in trial 1 and 2



Elimination of ARtox.Pm from sow herds with help of ART vaccin

Proceedings of the 14th IPVS Congress, Bologna, Italy, 7-10 July

ELIMINATION OF AR TOXINOGENIC *PASTEURELLA* FROM INFECTED SOW HERDS BY A COMBINATION OF ART VACCINATION AND TESTING SOWS WITH A PCR AND ELISA TEST

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Tonsil scratching: boar

Eradication of ARtox.Pm in PAR herds by help of ART vaccination and management factors

Table 3

farm size	period ARTP vaccin	ARTP free gilts	sows tested nose/ tonsil	tot. with PM	ELISA ARTP cult.	ELISA ARTP mix	PCR ARTP	ARTP tot. pos. sows (PCR+ ELISA pos.)
I(300)	5	+	N110	62	0	0	0	
			T110	47	0	0	0	
II(450)	4	+	N 99	60	0	0	0	
			T 99	67	0	0	0	
III(200)	4	+	N 40	31	0	0	0	
			T 40	28	0	0	0	
IV(150)	5	+	N 22	18	0	0	0	
			T 22	21	0	0	0	
V(200)	7	-	N183	107	0	0	0	
			T183	135	0	0	0	
VI(150)	7	+	N 36	31	0	0	0	
			T 36	33	0	0	0	
VII(1000)	10	-	N 50	8	1	1	NT	2
			T 50	27	1	1d	NT	(NT)
VIII(450)	6	-	N100	45	5	32.8d	NT	39
			T100	61	5	13.13d	NT	(NT)
IX(450)	7	-	N 50	5	0	0	4	9
			T 50	16	2	1	6	(2)
X(250)	4	-	N 50	11	1	1	1	6
			T 50	15	3	2d	4	(3)
XI(200)	6	-	N 50	35	7	4	12	26
			T 50	28	8	1	19	(13)
XII(120)	6	+	N 50	31	0	0	0	2
			T 50	46	1	0	2	(1)
XIII(450)	7	-	N 50	25	0	0	0	1
			T 50	33	1	1		(1)

Table 1c.

Results of screening ART vaccinating breeding farms with a PAR history using the PCR-test and the effect of a test and removal programme.

Farm	Test run	Number	ART-Pm PCR	
4	1	sows 124	19 (15%)	1-7-’98
	2	sows 102	4 (4%)	
	3	sows 111	6 (5%)	
	4	sows 116	4 (3%)	
	5	sows 126	2 (2%)	5-11-’98
	6	sows 91	0	10-12-98
	7	sows 98	0	7-1-’99
	8	sows 103	0	1-6-’99,stop vac.
	9	sows 102	0	5-1-2000
	10	sows 19	0	13-3-2000

Results of a test and removal in a 1000 sow farrow to finish breeding farm by PCR of nose+tonsil samples

- 1st inv Dec03/Jan.04 Sows/boars 540 Carriers = 5,6 %
- 1st 2ndFebr.04 Sows/boars 757 Carriers =2,9 %
- 2 nd inv.März/Mai04Sows/boars 610 Carriers =1,5.%
- 3 rd inv. Juli 04 Sows/boars1065 Carriers (16) =1,5 %
- 4 rd inv. Aug.04 Sows/boars1100 Carriers (4) =0,36%
- 5 rd inv.Sept.04 Sows/boars1022 Carriers (1) = 0,001%
- 6 th inv. Nov.04 Sows/boars 898 Carriers (0) = 0,%
- 7 th inv. Dez.04 Sows/boars1080 Carriers (2) = 0,002%
- 8 th inv. Jan.05 Sows/boars 989 Carriers(1?) = 0,0%
- 9 th inv. Feb.05 Sows/boars 1010 Carriers (0) = 0,0%
- 10th inv. May05 Sows/boars 1030 Carriers (0) = 0,0%

Results of a test and removal program in a 1000 sow farrow to finish breeding farm by PCR of nose+tonsil samples

- During the first year ARtox free gilts were bought and vaccinated 3x in the quarantine before introduction in the sow herd.
- After introduction of these vaccinated gilts these could be kept almost free of becoming a carrier (only 1 of 300 was tested pos. and slaughtered but examining nose and tonsils again were negativ).
- Of 16 tested farmworkers and staf 2 were ARtox. Pm. positiv
- After the finishing of the ART herd vaccination and also finishing the medication in the growing out and fatteners, we regularly tested groups of own bred replacement gilts, sows, weaners, growing outs and fatteners by PCR.
- These examinations were carried out in a herd monitor 3x a year according to Dutch PM+free certification regulation.
- During each monitoring 48 pigs were tested. During all these tests from 2005 till 2010 no ARtoxPm could be detected.
- (In case of a carrier, we had expected a relaps within 1 or 2 years after finishing medication and vaccination)
- For this reason we have declared this farm free of ARtox.Pm since 2007

Conclusions

- From this and earlier observations in PAR herds producing their own replacement gilts, it is difficult to eradicate the toxigenic P. multocida (less than 25% chance).
- With the test and removal programme we succeeded in eliminating the carriers after 5-7 investigations in a period of 5-12 months.

Pm+ free certified breeding farms

Jahr	**1982 1987**	**1988 1994**	**1990 1991**	**1992 1993**	**1994 1998**	**1999 2000**	**2001 2003**	**2004**	**2005 2006**	**2007 2010**	
Gw Pm+ inf	**213 66 31%**	**1398 13**	**1375 11**	**1115 8**	**1098 3**	**750 1**	**600 -**	**425 -**	**350 -**	220 -	
Pm+ Frei Zert	**72**	**440**	**493**	**596**	**876**	**750**	**600**	**425**	**350**	220	
Pm+ inf		**9**	**4**	**5**	**3**	**1**	**0**	**2**	**0**	0	

ARtox. P.mult. is isolated from different animal species and from human

- Isolations described from:
- Pigs
- Rabbits/hares
- Turkey / poultry / birds
- Sheep / goat
- Dogs
- Cats
- Rats / mice
- Human
- ARtox.Pm has to be considered as a zoonotic disease agent

Table 1. Source of isolation and toxigenic properties of 44 isolates of P. multocida ssp. multocida from humans

SOURCE	TOXIN PRODUCTION +	-
SPUTUM	6	8
SINUS	2	0
PLEURA	3	2
BITE	0	3
BLOOD	2	3
APPENDIX	0	2
OTHER	0	7
UNKNOWN	2	4
TOTAL	15	29

= 34 %

(Hospitalized

ATROPHIC RHINITIS IN PIGS CAUSED BY A HUMAN ISOLATE OF TOXIGENIC PASTEURELLA MULTOCIDA

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Future perspectives to reduce losses by ARtox Bb and ARtox Pm

Future perspectives concerning ARtox Bb and ARtox Pm

- Eradication of ARtox Pm by:
  Vaccination of infected sow herds with a high potent Bb+ART vaccine until the last carrier is moved out. This procedure can be speeded up with a test and removal program. Also introduction of vaccinated gilts/boars from a free source can be helpful. Use consequent Ai/Ao
- The quickest method to clean a farm from ARtox.Pm is de- and repopulate with certified free stock.
- Test the farm staff and laborers for ARtox Pm.
- Vaccination against ARtox.Pm can be finished when the herd is repeatedly tested free.
- By improvement of biosecurity standards herds can be kept free of ARtox.Pm
- Use semen or boars from certified Ai centers or breeders

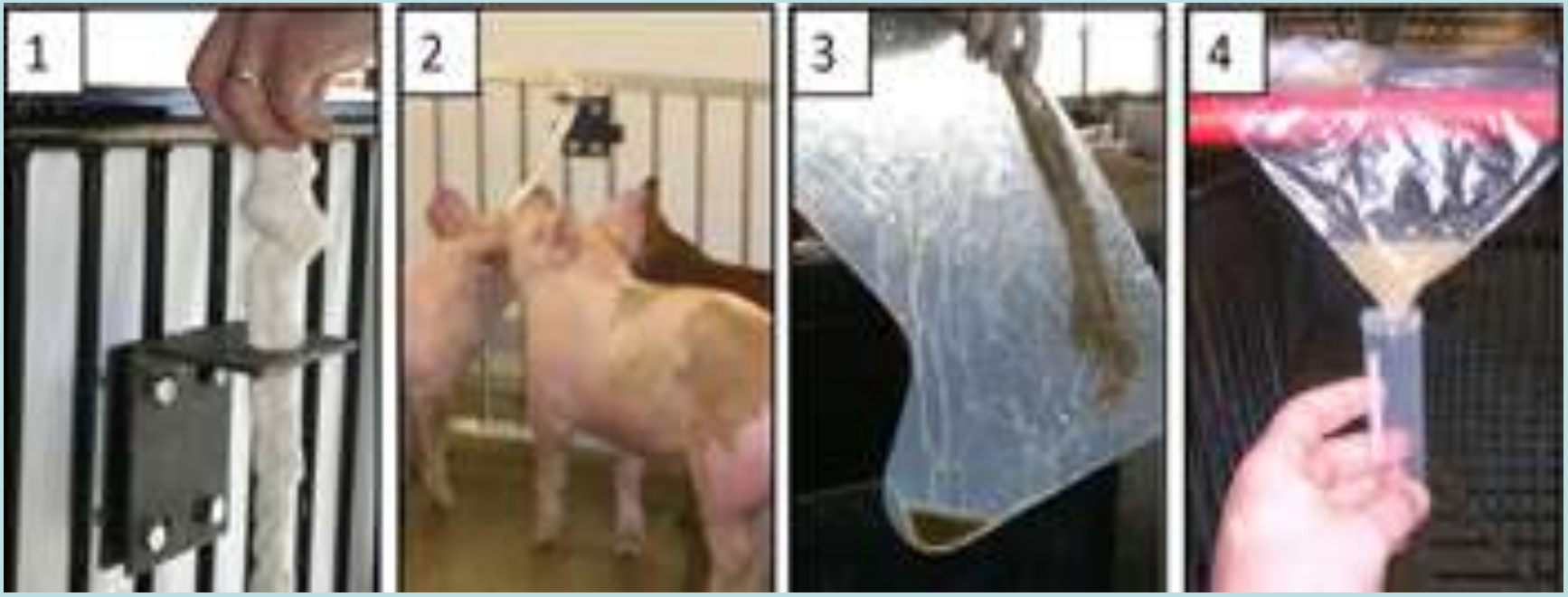
Future perspectives concerning ARtox Bb and ARtox Pm

- The influence of a Bb infection can be minimized by vaccinating replacement gilts and boars.
  The sow herd can be vaccinated when the Bb antibody profile is low or heterogenic.
- The piglets need to take sufficient colostrum to protect them for an Bb infection at a young age.
- Postpartum hypogalactiae and large litters are risk factors for insufficient colostrum uptake.
- Combination of Bb and other vaccines e.g. Erysipelotrix or Parvo has to be taken into consideration.
- New herd sampling methods have to be tested for the detection of ARtox Pm and Bb by PCR on herd level.
- Automatic application of vaccines with needle less injection technics

- Good lactating sow

- Bad lactating sow
- Check sows for udder and teat / nipple quality regular
- Examine sow condition and feed quality, amount of food, feeding schema and amount and quality of water
- Check transition from gestation to lactation feed

Collection of oral fluid:
New sampling method to detect DNT pos P.mult and Bb by PCR?



Thank you for your attention