GENETIC FACTORS INFLUENCING ATROPHIC RHINITIS IN THE PIG.

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As possible causes of Atrophic Rhinitis (A.R.) are mentioned infectious, feeding and also genetic factors. Most of the investigators now find the different infectious agents the most important, however there are also regularly publications, who pay attention to the genetic influence (Clausen e.a., 1966; Schönmuth, e.a., 1970; Backström e.a., 1976; Lundeheim e.a., 1979 and Kennedy e.a. 1980). The results of these investigations in relation to the heritability (h^2) strongly differ from eachother, and it seems to be, that the method of examination is of an important influence.

Table 1. Heritability of Atrophic Rhinitis

Investigator(s)	Method	h^2
Clausen e.a. (D), 1966	Rö	0.28
Schönmuth e.a. (DDR), 1970	Rö	0.45-0.62
Backström e.a. (Sw), 1976	C.a.	0.13-0.14
Lundeheim e.a. (Sw), 1979	C.a.	0.16
Kennedy e.a. (Can), 1980	C.a.	0.03-0.12

Dando e.a. (1973) found a low correlation (0.70-0.77) between the X-ray-method and the necropsic examination of the conchae. The latter one seems to be the most reliable. The h^2 found on this way is very low. This can be consequence of the breeds, who are used, the infection and farm conditions.
Therefore we have examined under Dutch circumstances if genetic factors influence the Atrophic Rhinitis.

In this investigation 13 Herdbook-breeding farms are involved with clinical signs of A.R.
From these farms all pigs of 3 weeks to 1 year old are examined on the incidence and the degree of degeneration of the conchae (C.A.-score).
The degree of degeneration of the conchae ranged from 0 to 4. Score 0 = no atrophy, Score 1+2 atrophy of the ventral conchae, Score 3+4 atrophy of the ventral and dorsal conchae.
The results, ranged at the degree of atrophy (= C.A.-score) are given in table 2.

Table 2. The degree of atrophy of the nasal turbinates pro farm.

Farm	Number of animals	CA-score	% CA = 0	% CA = 3+4 piglets 0-3 month	% CA = 3+4 pigs 3-12 month	% with septum-deviation
7	35	2,94	5,7	77,1	-	14,3
5	93	2,70	8,6	64,8	76,2	6,5
12	90	2,52	3,3	-	12,0	25,6
9	295	2,38	1,7	37,4	46,3	19,3
10	124	2,23	5,6	-	41,1	38,7
13	91	2,07	34,1	50,0	25,0	24,2
3	161	1,92	10,6	61,5	19,7	23,0
2	279	1,89	3,6	31,4	18,9	22,2
8	113	1,78	18,6	35,2	22,3	6,2
4	76	1,78	23,7	55,2	23,7	25,0
1	327	1,37	23,2	17,8	11,0	4,0
6	112	1,32	25,9	13,6	13,0	10,7
	1796	1,96	11,5	37,0	26,7	17,3

As showed in this table 2 there are big differences in the CA-score. Also the % piglets without CA has a big variation. A statistical analyse, where is corrigated for the effects of age, breed, boar and saison, showed that these differences are significant ($f=8,93$, $p<0,001$)

- Breeding differences.
  In this investigation the pure breeds Dutch Landrace (NL) and the Large White (GY) and their crosses were used. The breeding differences are given in table 3.

Table 3. Differences in CA-score and septum-deviation between the breeds.

	NL	GY	F1
Number of pigs	1023	298	376
% CA = 0	13,6	4,7	8,0
% CA = 3+4	26,9	43,3	29,3
Average CA-score	1,85	2,26	1,98
After correction for age- and farmeffects	1,91	1,51	1,70

After correction for age and farmeffects there are no significant differences between the breeds and their crosses.

- Differences in boars.
  The 1729 pigs in this investigation, from which all data are known, are of 151 boars. Some of these boars are only used on one farm, others are used for A.I. To eliminate farmeffects, only those A.I.-boars are used from which at least data of 20 pigs are known. (see table 4).

Table 4. Differences between A.I.-boars in CA-score and septum-deviation (only boars with more than 20 descendants).

Nr. of boar	Number of descendants	Average CA-score	% CA=0	% CA=3+4	% septum-deviation
NL 01	22	3,14	4,5	72,7	18,2
NL 02	27	2,66	0,0	55,5	29,6
GY 03	26	2,31	3,9	42,3	7,7
GY 04	24	2,29	4,2	41,7	25,0
NL 05	20	2,25	0,0	40,0	0,0
NL 04	31	2,13	19,4	45,2	12,9
GY 05	26	2,04	3,8	30,8	34,6
GY 12	21	1,95	0,0	4,8	14,3
NL 10	23	1,91	8,7	26,1	26,1
GY 07	20	1,90	20,0	30,0	15,0
GY 08	26	1,89	3,8	23,1	11,5
NL 09	23	1,83	8,7	30,4	0,0
GY 06	23	1,78	13,0	30,4	26,1
NL 14	41	1,73	9,8	12,2	12,2
NL 11	92	1,64	19,6	22,8	8,7
NL 12	36	1,56	22,2	19,4	2,8
NL 15	56	1,48	14,3	10,7	14,3
NL 16	21	1,48	23,8	9,5	9,5
NL 17	36	1,47	16,7	8,3	19,4
NL 13	53	1,19	34,0	17,0	17,0
	647	1,83	13,8	26,0	14,5

These data are not corrigated for the effects of farm and age. To estimate the significance of the differences between boars, the data of 55 boars with more than 10 descendants are used. In totally the data of 1317 descendants are used.

A statistical analyse proved, that after correction for the effects of farm and age the differences between boars in CA-score were still significant ($f=2,87$, $p<0,001$).
With the method of least-squares analysis of data of inequal subclass numbers, using the LSMLMM programm of Harvey (Harvey, 1972), the heritability is estimated. Age and farm are the "fixed" effects and the boar is the random effect.
This analyse showed, that the heritability for CA-score was: $h^2 = 0.35 \pm 0.09$

Literature.

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