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Animal health in naturally-ventilated kennel housing for feeding pigs

In order to investigate the health status in two naturally-ventilated houses with kennels and a conventional insulated house, the nasal flora of feeding pigs was investigated for four pathogenic organisms. Pasteurella multocida and Bordetella bronchiseptica could be isolated from animals in any housing compartment. The proportion of pathogen carriers developed inconsistently in the different systems and mostly without significant differences. There was no clear difference in integument damage in the different types of housing. Pigs in all three systems showed very little lameness and this verified the fault-free housing design.

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Whereas livestock outdoors are exposed to the direct influences of weather and climate, a combination of factors is created indoors and especially in naturally ventilated buildings, these are closely related to the outside climate but are also affected by interior design, stocking rate, livestock behaviour and management [1].

In conventional insulated housing the interior climate is mostly regulated temperature-dependently via forced ventilation. Most common design features are uniformly structured slatted floor compartments. The naturally-ventilated kennel building is characterised by free, mainly draught-influenced, ventilation, zoned pens and insulated resting kennels. Interior climate effects on animal health in conventional housing have been often described [2, 3, 4, 5].

Conclusions as to the interior climate of individual housing systems can be made from the results of lung inspections on the slaughterline [6, 7, 8].

In the investigation here described the aim is to prove whether the change between different temperature zones (outdoor climate stimulation in the building, constant warm temperatures in the resting kennels) exert influence on the health and, in this case, especially the respiratory system.

Materials and method

Directly compared on a commercial farm were three separate units (conventional insulated housing with slatted flooring (kW), naturally ventilated housing with resting kennels and part-slatted flooring(AKt), naturally ventilated building with resting kennels and littered dunging area (Ake)) each with 64 animals in four pens [9]. The only differences between systems featured the buildings (naturally-ventilated, insulated), ventilation (free, forced) and interior climate zones (two or one) as well as the usual heterogeneity occurring where 600 growers are simultaneously housed. Alongside the control of climate, feed/feeding and medicament administering, the system-imposed disease pressure through already present respiratory disease pathogens in the snout cavities and changes at the integument (bursae auxiliares at leg joints) and the legs themselves were also investigated.

In three feeding cycles (all-in, all-out) every animal had a probe taken from the first eight cm of the nasal cavity with a sterile one-time swab at the beginning, middle and end of each cycle. The subsequent microbiological test using selective and non-selective nutrient media permitted qualitative identification of specific disease pathogens in the nasal cavity. The presence of *Pasteurella multocida, Pasteurella hämolytica, Bordetella bronchiseptica* and *Actinobacillus pleuropneumoniae* was investigated. *Pasteurella multocida* often colonises the mucous membrane of the respiratory tract and pharynx/tonsils of healthy pigs. In synergy with other germs they can create a pathogenic influence. *B. bronchiseptica* appears often as a secondary infection following virus and mixed infections. Above all, the organism causes disease where large numbers of animals are densely stocked. With pigs it is, along with *P. multocida*, causative organism for the “atrophic rhinitis” syndrome.

The pigs were individually visually inspected by a vet for dyspnoea, diarrhoea, lameness, pathological changes in trotters, arthritis, pathological changes in the hide and visible exterior injuries.

The replicated probes in the four identical pens per building permitted a dual factorial variance analysis for triple classification according to the factors housing, feeding phase and their interactions.

Results

The variance analytical evaluation of the results concerning *P. multocida* and *B. bronchiseptica* infections demonstrated, on the whole, no systematic difference between the housing systems, the feeding periods and the interactions of those two factors (*table 1*).

With *P. multocida*, only the feeding phases in cycle 3 showed very significant deviation from one another. The same applied to the interactions between housing system and feeding phase. In cycles 4 (initially not sampled) and 5, on average the proportion of traceable pathogens were substantially lower than in the previous cycle.

Also noted was a high heterogeneity regarding the proportion of traceable nasal *B. bronchisepta* which cannot be explained by the factors investigated. The pathogen could not be identified at the beginning of cycle 3 (late analysis with pronounced secondary flora). Tendentially, a somewhat higher degree of infection could be observed in the naturally ventilated housing, although this could only be proved for cycle 3. Differences in the feeding phases were identified only in cycle 4.

When the relative proportion of infected animals were compared with one another for both pathogen groups it was clear that, between the cycles and within the systems, substantial differences in levels of infection existed. This indicated that, along with the housing system, further factors (health status at initial housing, genetic influence) strongly influenced infection.

In the cycles 3 and 4 no difference in bursa occurrence on front and hind legs caused by hard flooring could be identified. In cycle 5, the housing system, the feeding phases, and their interactions showed very significant differences in this case. Among other factors, high temperatures and different animal behaviour could supply some of the reasons. In natural ventilation housing the lying area extended, with the increasing weight of pigs, from the solid floored kennel lying area onto the slatted (Akt), or solid floored and littered, dunging area. In the conventional insulated housing a higher proportion of bursa was diagnosed as early as shortly after the pigs were introduced.

Leg damage was recorded when the animals were seen to be limping. In cycles 3 and 4 significant differences in this were apparent between feeding phases and also housing forms. In the third cycle there was a 3 to 5% increase in the proportion of lame animals at end of feeding period in all systems. However the differences between the systems were able to be explained by the respective standards of the pigs to begin with. At the middle of the feeding period in the fourth cycle, however, and applying to the AKe system only, there appeared to be a reduction in leg movements affecting 8% of the animals. However by the end of the mast there was no lameness to be seen in any of the systems. This also backs-up the clear difference between the feeding phases and also the interaction between housing system and feeding phase. Up to 7% of the pigs were affected by lameness in the AKt and kW systems without any significant relationship.

	Cycle	3				4				5			
	System	**A**	**M**	**E**	**G**	**A**	**M**	**E**	**G**	**A**	**M**	**E**	**G**
No. of pigs	AKT	64	62	52	178		63	60	123	64	62	57	183
	Ake	64	64	49	177		63	60	123	64	63	58	185
	kW	26	25	21	72		34	36	70	36	35	35	106
	G	154	149	122	425		160	156	316	164	160	150	474
P. multocida %	AKT	11	34	21	22		8	20	14	1	12	24	12
	Ake	6	57	7	23		12	12	12	12	18	14	14
	kW	12	24	33	23		25	23	24	4	2	13	6
	G	10	391	20	23		15	18	17	6	11	17	11
	System				n.s.				n.s.				n.s.
	Phase				***				n.s.				n.s.
	Interaction				***				n.s.				n.s.
B. bronchisept. %	AKT		47	51	49		73	63	68	30	30	59	40
	Ake		52	52	52		66	44	55	19	51	45	38
	kW		28	14	21		86	44	65	17	33	31	27
	G		42	39	41		75	50	63	22	38	45	35
	System				**				n.s.				n.s.
	Phase				n.s.				***				n.s.
	Interaction				n.s.				n.s.				n.s.
Bursa Auxiliares %	AKT	3		0	2		3	0	2	0		23	12
	Ake	2		2	2		5	0	2	0		11	5
	kW	0		0	0		6	0	3	25		21	23
	G	2		1	1		5	0	2	8		18	13
	System				n.s.				n.s.				***
	Phase				n.s.				**				***
	Interaction				n.s.				n.s.				***
Lameness %	AKT	0		4	2		0	0	0	1		7	4
	Ake	3		6	5		8	0	4	0		0	0
	kW	0		5	3		0	0	0	0		2	1
	G	1		5	3		3	0	2	8		3	1
	System				**				n.s.				n.s.
	Phase				***				***				n.s.
	Interaktion				n.s.				***				n.s.

Dual-factorial variance analysis, four sampling repeats (four pens per system)
Phase A. beginning, M: middle, E: end, G: total; Akt: natural ventilation part-slatted flooring; Ake natural ventilation littered dunging area; kW conventional insulated housing; G total.

Table 1: % of fattening pigs with nasally detectable pasteurella multocida, bortedella bronchiseptica, visual detectable bursae auxiliaries and lameness depending on housing and fattening period

Discussion and conclusion

Infection diagnoses with a comparable range of spot tests are not given in the literature. A classification of the results is therefore not possible. The fact that between all three systems hardly any significant differences were able to be demonstrated indicates that the hypothesis "good through-ventilation leads to a reduced infection pressure" is not accurate and that other factors (higher pathogen concentration in the kennel atmosphere, immune status of piglets at housing) are just as influential as infection factors.

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