Evaluation of two different additional water sources regarding health and welfare aspects of Pekin ducks under commercial conditions

Lea Klambeck[1], Falko Kaufmann[1], José Daniel Kämmerling[1], Nicole Kemper[2], Robby Andersson[1]

[1]Department of Animal Husbandry and Poultry Sciences, University of Applied Sciences Osnabrück, Germany

[2]Institute for Animal Hygiene, Animal Welfare and Farm Animal Behaviour, University of Veterinary Medicine Hanover, Foundation, Germany

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Background

Pekin duck meat production in Europe

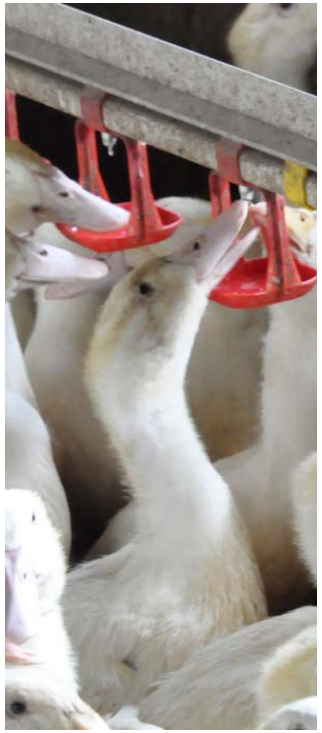
- Meat production in Europe (2015): 523,000 t (MEG 2016)
- Housing conditions: stables, straw/ slatted floor, nipple drinkers (Rodenburg et al. 2005)
- No specific legislation for Pekin ducks
- Legal binding: EC-Recommendations (1999)
- `Animal Protection Strategy of Lower Saxony (2011-2018)

Biological requirements

Water associated behaviour (examples; Reiter 1997)

- → Drinking
- → Straining
- → Bathing, preening
- → Cleaning of beak and nostrils

Nipple drinkers



Standard commercial production systems

Nipple drinkers are beneficial regarding:

→ Hygiene

→ Water losses

→ Quality of litter

Nipple drinkers → Contrary to the water associated behavioural needs of ducks (EC-Recommendations, Knierim et al. 2004)

EC- Recommendations

"Recommendations of the Standing Committee of the European convention for the Protection of Animals kept for farming purpose"

– Recommendations concerning domestic ducks (1999)

(Article 11, number 2)

<u>Access to bathing water</u>

→Fulfilment of the biological requirements of ducks

EC- Recommendations

Pekin ducks without access to bathing water:

Presence of water resources sufficient in number and designed to allow

1. to cover the head with water
2. to take in water by the beak
3. to shake water over the bodies without difficulty
4. to dip their heads under water

Aim of the study

- Effect of two different water sources on health and welfare parameters in Pekin ducks under commercial field conditions

Materials and methods

Animals, management and experimental design

- 2 commercial farms in the North-West of Germany
- One-day-old Cherry Valley Pekin ducklings
- Commercial diet and water *ad libitum*
- From day 16 (œ2) posthatch: 4 groups with different water sources and flooring systems
  - 2 water sources additional to nipple drinkers
- Stocking density < 20kg/m^2
- Average group size: n = 4,545 (œ232) ducks
- Slaughtering day 41 (œ1)
- 4 repetitions

Additional water sources

Water funnel: Outer circumference

at the base: 63 cm where the ducks gain access to the water

at the tip: 10 cm

1 water funnel per 100 ducks

Additional water sources

Troughs

Length: 200 cm

Height: 8 cm

Width: 330 cm

cleaned and refilled once a day

Group characteristics regarding water supply (from day 16 ± 2 posthatch)

Group	Water supply
N_{PF}	Nipple drinkers (N) located above plastic slats, House floor: straw-bedded (75%) and perforated floor (PF; 25%)
NWF_{PF}	Nipple drinkers (N) and prototypes of the water funnel (WF), House floor: straw-bedded (75%) and perforated floor (PF; 25%)
NWF_{CF}	Nipple drinkers (N) and prototypes of the water funnel (WF), both above a concrete floor with straw bedding
NWFT	Nipple drinkers (N), prototypes of the water funnel (WF) above a concrete floor with straw bedding; and troughs (T) located in two opposing corners of a fattening stable above plastic slats

Collected data

- 3 sampling dates
  - Start (date 1, days 18–23 posthatch)
  - Middle (date 2, days 25–30 posthatch)
  - End of fattening (date 3)
- Scoring of eyes, nostrils, food pads and plumage condition
  - n= 100 randomly selected birds per group and sampling date
- Body weight
  - n= 100 randomly selected birds per group and sampling date
- Mortality rate (%)
  - Recorded consecutively by farmers
- Microbiological examinations of water sources
  - Total aerobic count (Annex 1 Nr. 5 TrinkV a. F.)
  - Count of *E. coli* (ISO 9308-1)

Scoring scheme of foot pads

Modified according to Hocking *et al*. (2008) in accordance with S. Kudinov (2013)

Body region	Score	Attribute of scores
Foot pad condition	0	No alterations
	1	Slight hyperkeratosis on either < 50% of the foot pad *or* toe pads
	2	Severe hyperkeratosis/ parakeratosis on either > 50% of foot pad *or* > 50% of the toe pads
	3	Superficial pododermatitis on > 50% of the foot pad and the whole toe pads
	4	Severe ulcerative pododermatitis on the whole foot and toe pads

Scoring scheme of plumage conditions

Body region	Score	Attribute of scores
Plumage condition of head, breast, back, belly and tail	0	Clean plumage
	1	Moderate soiling of plumage
	2	Severe soiling of plumage

Scoring scheme of eyes

Adapted to Küster (2007)

Body region	Score	Attribute of scores
Eye condition	0	Both eyes clean
	1	Redness of conjunctiva of one eye
	2	Redness of conjunctiva of both eyes
	3	Redness, swelling and adhesions of one eye
	4	Redness of conjunctiva of one eye, swelling and adhesions on the other eye
	5	Redness, swelling and adhesions of both eyes

Scoring scheme of nostrils

Adapted to Küster (2007)

Body region	Score	Attribute of scores
Nostril condition	0	Both nostrils clean
	1	One nostril: slightly clogged
	2	Both nostrils: slightly clogged
	3	One nostril: > 50% clogged
	4	One nostril: > 50% clogged Second nostril: slightly clogged
	5	Both nostrils: > 50% clogged

Statistical analysis

Animal related parameters: Log-transformation [log(x)=Log(x+1)]

Analysis of variance, effects of water sources regarding conditions of birds,

MIXED procedure; tukey post-hoc-test

Fixed effect: groups

Random effect: fattening periods (cycles/batches)

Relative frequency of occurrence of alterations per group, parameter and sampling date; FREQ procedure

Scoring data: classified as binomial data

Probability of occurrence of alterations compared to reference group; Odds ratios; GENMOD procedure with a logit link function

Statistical analysis

Microbiological examinations:

Descriptive analysis (mean value, standard deviation, median)

- Total aerobic counts
- *E. coli*

Results

Animal related parameters

Body weight

Weight gain of all flocks was in accordance with the management guide.

Mortality

Ø Mortality rates during fattening over all batches differed between 2.5% (SD 0.91) in NWFT group and 3.6% (SD 0.87) in N_{PF} group.

Animal related parameters

Water source affected conditions of food pads

Group N_{PF}: Highest food pad scores at the end of the fattening periods *(P d 0.0001)*

Group NWFT: Lowest food pad scores (*P d 0.0001)*

Effect of different water sources on the occurrence of foot pad dermatitis represented as LSMeans and standard errors (SE)

Variable	Date	N_{PF}	NWF_{PF}	NWF_{CF}	NWFT	SE
Right foot	1	1.20^{a}	0.57^{b}	1.44^{c}	1.45^{c}	0.116
	2	1.15^{a}	0.72^{b}	1.08^{a}	1.01^{a}	0.052
	3	2.10^{a}	1.49^{b}	1.22^{c}	1.02^{d}	0.149
Left foot	1	1.14^{a}	0.56^{b}	1.48^{c}	1.44^{c}	0.133
	2	1.23^{a}	0.79^{b}	1.09^{a}	1.02^{a}	0.060
	3	2.17^{a}	1.54^{b}	1.18^{c}	0.97^{d}	0.142

^{a,b,c,d}: Different letters in the same row indicate significant differences (*P d 0.0001*)

N_{PF}: Nipple drinkers, partly perforated floor; NWF_{PF}: Nipple drinkers, water funnels, partly perforated floor; NWF_{CF}: Nipple drinkers, water funnels, concrete floor; NWFT: Nipple drinkers, water funnels, troughs

Animal related parameters

Water source affected plumage conditions

Group N_{PF}: Cleaner plumage than all other groups (*P d 0.0001)*

Effect of different water sources on overall plumage condition (OPC) represented as LSMeans and standard errors (SE)

Variable	Dates	N_{PF}	NWF_{PF}	NWF_{CF}	NWFT	SE
	1	1.33^{a}	1.71^{b}	1.88^{c}	1.92^{c}	0.103
OPC	2	1.40^{a}	1.95^{b}	3.35^{c}	2.78^{d}	0.279
	3	2.17^{a}	2.57^{b}	3.86^{c}	3.31^{d}	0.340

^{a,b,c,d}: Different letters in the same row indicate significant differences (*P d 0.0001*)

N_{PF}: Nipple drinkers, partly perforated floor; NWF_{PF}: Nipple drinkers, water funnels, partly perforated floor; NWF_{CF}: Nipple drinkers, water funnels, concrete floor; NWFT: Nipple drinkers, water funnels, troughs

Animal related parameters

Water source did <u>not</u> affect conditions of eyes

Animal related parameters

Water source influenced condition of nostrils

Effect of group on clogged nostrils. The first row for each date indicates the frequencies (Freq.) of the selected event (clogged nostrils); the second row for each date indicates odds ratios as the probability that the selected event occurs (¨)

Date	Parameter	N_{PF}	NWF_{PF}	NWF_{CF}	NWFT	P d
1	Freq., %	12.8	4.6	2.8	4.0	0.0001
	¨	1	0.32*	0.19*	0.27*	
2	Freq., %	1.4	0.8	1.8	2.6	0.1438
	¨	1	0.57	1.29	1.88	
3	Freq., %	2.2	2.6	3.8	3.6	0.3775
	¨	1	1.19	1.76	1.66	

*: *p d 0.0001*

N_{PF}: Nipple drinkers, partly perforated floor; NWF_{PF}: Nipple drinkers, water funnels, partly perforated floor; NWF_{CF}: Nipple drinkers, water funnels, concrete floor; NWFT: Nipple drinkers, water funnels, troughs

Microbiological examinations

Total aerobic count at 36°C (CFU/ ml) and count of *E. coli* (CFU/ 100 ml) per water source for setting and fattening periods

Parameter		Nipple drinkers	Water funnels	Troughs
Total aerobic counts (36°C; CFU/ ml)	n	288	108	48
	Mean	2,122	$192.6 * 10^6$	$1,677 * 10^6$
	SD	$16.6 * 10^3$	$634 * 10^6$	$3,557 * 10^6$
	Median	126	$16.3 * 10^6$	$81.4 * 10^6$
E. coli (CFU/ 100 ml)	n	288	108	48
	Mean	11.14	6,295	$5.25 * 10^4$
	SD	46.3	8,150	$14.23 * 10^4$
	Median	0	3,669	$1.94 * 10^4$

Conclusions

Additional open water sources

- Did not impair ducks health as indicated by
  - Occurrence of foot pad dermatitis
  - Mortality rate
  - Condition of the integument
- Production systems with open water sources:
  - Intense management regarding hygiene and health aspects
- Further investigations: Hygienic and economical aspects, focus on specific risk factors

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