



Towards a threshold for the ammonia concentration in pig barns

Marc B.M. Bracke

Wageningen Livestock Research, Wageningen, The Netherlands. Marc.Bracke@wur.nl. +31-317-480558.

Background

Council Directive 98/58/EC (art. 10 of the Annex) prescribes that (pollutant) gas concentrations should be kept within limits which are not harmful to the pigs.

A desk study was conducted to (try to) close the open norm (principle-based standard) for ammonia (NH₃) in pig barns, where esp. in winter-time fairly high concentrations (above 20 ppm) may be recorded.

Objective & Method

An inventory was made of publications reporting **effects of air quality on pig health and welfare using the semantic-modelling methodology to assess the harmful effects of increased NH₃ concentrations in pigs**, based primarily on a weighted count of the significant effects and trends reported in the publications (and mostly taking for granted the effects that were not significant). The effects on human health were also included, based on the reciprocity of the view that pigs have been used as a model for human health on this issue too.

Results

In total **158 publications** were found to report relevant effects. Below 5 ppm human COPD patients may experience **dyspnoea** and **headaches**, and (well) below 15 ppm various effects have been reported in pigs including a **reduced growth** rate (e.g. at 5 ppm), increased **tail biting**, **turbinate atrophy**, **aversion** (e.g. at 10 ppm) and **altered immune function and cell mobility** (see Figure 1).

In fact, **the adverse effects of increased NH₃ concentration seemed to increase almost linearly from very low concentrations as of 0 ppm up to at least 40 ppm.**

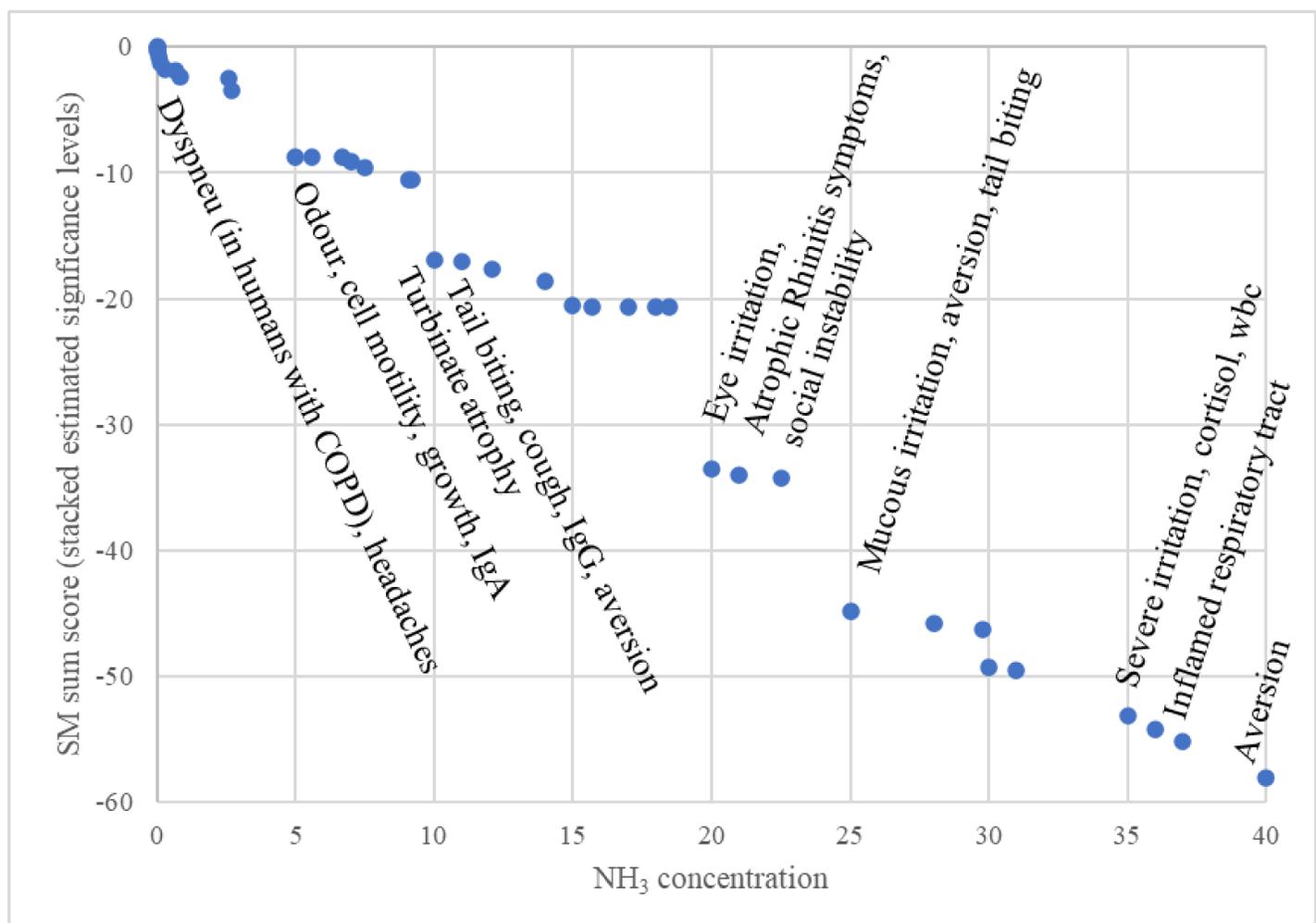
Conclusions

Harmful effects are already quite likely well below the conventional norm of 20 ppm (i.e. even at 5 ppm).

Given this finding and given the current formulation of the law, it seems necessary to reduce the level of NH₃ in modern pig production to well below 20 ppm if all harmful effects of NH₃ on pigs must be eliminated. Perhaps, higher NH₃ levels (up to 20 ppm) can be accepted in exceptional cases, e.g. in high-health (SPF) herds, using no/very little antibiotics, with intact tails (with hair plume), no tail biting, a good production performance, very low lung-lesion scores, no pen soiling, no tear staining, no conjunctivitis, etc..

In conclusion, **the conventional norm of 20 ppm NH₃ seems outdated and may have to be replaced by a (considerably) lower threshold if the open norm in the law, which says that gas concentrations should not be harmful to the animals, were to be closed, i.e. if the law were to be implemented.**

Figure 1. Cumulative score (SM sum: Semantic modelling sum) for the extent to which scientific support (significant effects) were found for damage to the pigs' health and welfare in relation to the NH₃ concentration, and some main findings. COPD: Chronic obstructive pulmonary disease; IgA and IgG are types (A and B) of immune globulins (Ig); wbc: white blood cells.



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