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Welfare quality of sows kept in different production systems in the Red River Delta of Vietnam

Vu Dinh Ton, Nguyen Thi Phuong Giang, Han Quang Hanh and Vu Tien Viet Dung
Vietnam National University of Agriculture, Vietnam

Vietnam is one of the largest pork producers in the world, leading to the significance of pig welfare issues. This study was conducted at pig farms in the Red River Delta where there is about 27% of pig population of Vietnam raised in order to assess welfare quality of sows kept in three production systems using the Welfare Quality (2009) protocol. Sows in the semi-intensive production system were kept with a small herd size in individual stalls (51.22% of sows) or small pens (48.78% of sows) in an open housing type and fed with on-farm mixed feeding regime. By contrast, in the intensive and highly intensive production systems, 100% of observed sows were confined entirely in stalls without any bedding in the closed housing condition. Sow welfare quality was influenced by both production systems and seasonal factors. The main welfare issues of sows in the semi-intensive production system were strongly related to housing conditions (such as panting and insufficient water supply with long trough drinker). In the intensive and highly intensive production systems, sows had some problems with shoulder injuries, wound on body and bursitis but at a low prevalence. Sows in three production systems presented a high prevalence of stereotypical behaviors such as bar biting and sham chewing. Season was also a factor influencing on several welfare indicators of sows. There was a trend for increased panting sows in summer and increased proportion of sows showing bar biting and sham chewing behaviors in winter. The improvement of sow welfare quality can be achieved by mainly focusing on environmental ventilation enhancement of sow housing.

vdton@vnua.edu.vn

4,4'-diaponeurosporene, a C₃₀ carotenoid, effectively activates dendritic cells via CD36 and NF- κ B signaling in a ROS independent manner

Yang Qian
Nanjing Agricultural University, China

Carotenoids, an important nutrient, include two categories, C₃₀ carotenoids and C₄₀ carotenoids. Lots of experiments were performed to evaluate the immune functions of C₄₀ carotenoids, while those of C₃₀ carotenoids still remain unclear. In this study, the immune functions of 4,4'-diaponeurosporene (Dia), a C₃₀ carotenoid, were identified on DCs for the first time. To accurately evaluate the immune functions of Dia, firstly, recombinant *Bacillus subtilis*, which could synthesis Dia, was constructed by genetical modification, then Dia was extracted and identified. Dia-treated DCs showed morphologic and phenotypic characteristics of mature state and had an increased production of cytokines, while β -carotene had a suppressive effect on DCs maturation. Furthermore, Dia promoted antigen uptake of DCs *in vitro* and increased the quantity of antigen loaded DCs in MLN. Dia-treated DCs also had an enhanced ability to stimulate T-cell proliferation and Th1 polarization. Further researches showed that Dia activated DCs via CD36 as well as ERK, JNK and NF- κ B signals in a ROS independent manner. Our results underpinned the different roles of C₃₀ and C₄₀ carotenoids on DCs maturation. Moreover, the Dia derived from *Bacillus subtilis*, a probiotic, may have a high value of practical application in immune-compromised individuals.

zxbyq@njau.edu.cn