

【Grant-in-Aid for Scientific Research (S)】
Biological Sciences (Agricultural Sciences)



Title of Project : Identification and Application of the Bull Pheromone

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Research Project Number : 26221203 Researcher Number : 40157871

Research Area : Agricultural sciences

Keyword : Pheromone, Bioactive molecules, Cattle, Veterinary science, Theriogenology

【Purpose and Background of the Research】

Improving the conception rate of dairy cows is one of the most important as well as urgent problems to be solved in the field of livestock industry. Annual cost related to the dairy reproduction problem is estimated to reach 100 billion yen in Japan.

This study is planned to contribute to overcome this problem by developing a new method, namely utilization of pheromones. In goats and sheep, small ruminant species closely related to cattle, the “male effect” has been studied and the mechanism underlying this powerful progonadal effect is now being elucidated. In contrast, little is known about cattle pheromone.

The present study, therefore, aims at identification of bull pheromone for innovating novel methods of treating as well as preventing reproductive problems in dairy cows.

In other words, the first object of the research is to isolate and identify the bull pheromone, which stimulates genital function of cows.

The second object is to design and create synthetic pheromones based on the information of chemical structure of natural pheromone and also to develop a wearable device system for exposing a cow to the pheromone on demand.

【Research Methods】

Core members of our research team have been collaborating over decades in the study of “male effect” in small ruminants. Along with past collaboration we will maintain similar research strategy and tactics. In addition, at the final stage of this study, a fairly large scale field study is going to be conducted (Figure 1).

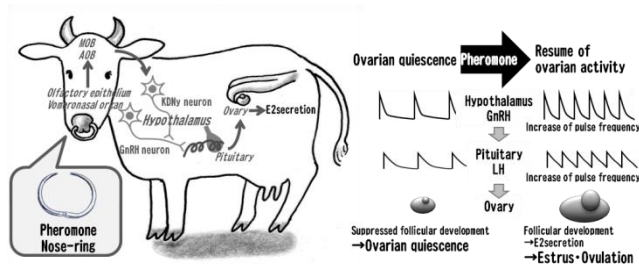


Figure 1 Conceptual illustration of the bull-pheromone usage for gonadal activation in cows

【Expected Research Achievements and Scientific Significance】

From basic scientific viewpoints including reproductive biology and neuroscience the information regarding the molecular structure of pheromone ligands and their receptors will provide insights into the evolution of chemical communication in mammals by comparing with those in other related species.

Moreover, tremendous benefit can be expected, once the pheromone is clinically applied to reproductive problems in cows such as follicular and/or luteal cysts, silent heat and delayed resumption of ovarian function postpartum. Now the conception rate at the first artificial insemination is below 50% in dairy cows, and this is a barrier against healthy management of dairy industry.

Our goal is to identify and utilize the bull-pheromone for solving these reproductive problems. As the pheromone is produced by a bull and has no worry about serious pollution or side effects, the research outcome will also be noticed internationally from the standpoint of environmental preservation as well as animal welfare.

【Publications Relevant to the Project】

Murata K., Tamogami S., Itou M., Ohkubo Y., Wakabayashi Y., Watanabe H., Okamura H., Takeuchi Y., Mori Y. (2014) Identification of an olfactory signal molecule that activates the central regulator of reproduction in goats. *Current Biology* 24: 681-686.

【Term of Project】 FY2014-2018

【Budget Allocation】 149,500 Thousand Yen

【Homepage Address and Other Contact Information】

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