Proposition of donation to support maternity and social projects

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Presentation of the National Vet School of Toulouse

The "Ecole Nationale Vétérinaire de Toulouse" (ENVT) is a public administrative establishment operating under the supervision of the Ministry of Agriculture and Food. As an agricultural higher education institution, its main missions are education and research. The school offers an exceptional living space of 54 hectares planted in trees and located only a few kilometres away from the city centre; it is situated on an urban area that has become heavily densified in its periphery. ENVT's ambition is to develop an attractive and effective clinical service in terms of training by investing in a state-of-the-art human and technical environment that is innovative and shared between clinical sectors. The clinical training mainly relies on the Veterinary Teaching Hospital (VTH).

Its missions are closely linked to :
- services to animal owners and veterinarians (in terms of diagnosis and clinical case management);
- the training (transfer of knowledge, skills and attitudes) of veterinary students in practical situations from the 3rd year onward;
- clinical research.

The compagnion animal hospital is a reference structure, led by veterinary surgeons and specialists. It operates thanks to a team of 80 people on a surface area of about 4000 m². It is organized around andro-gynaecology, anesthesia-analgesia, surgery, behavior, dentistry, dermatology, internal medicine, feline medicine, nutrition, neurology, oncology, ophthalmology, orthopaedics, preventive medicine, emergency and intensive care services. The consultations which are offered cover all disciplines, whether first line consultations or specialized consultations.

Sum up of Maternity project

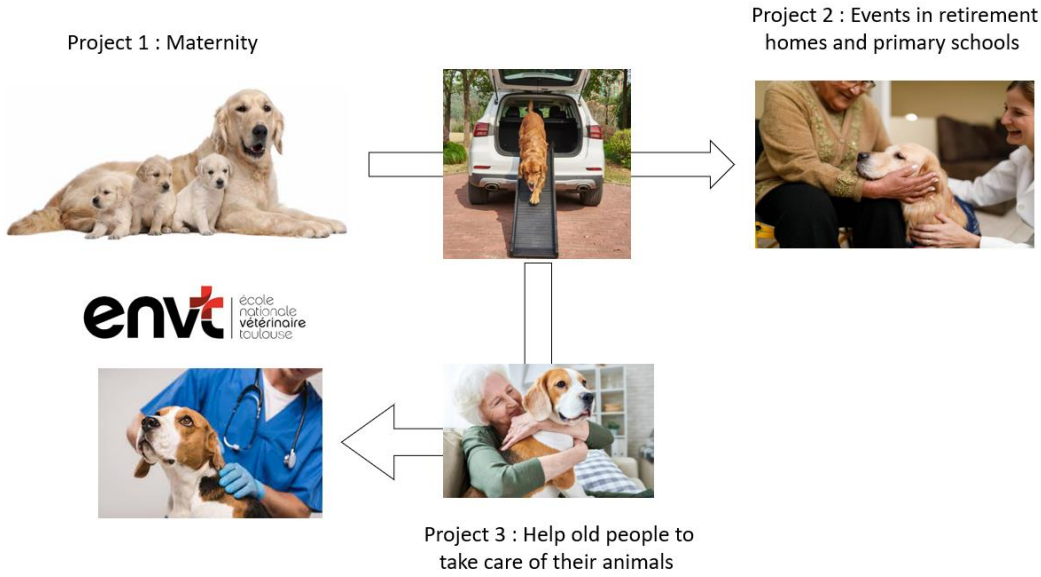
In the 1980s the concept of fetal programming was developed in human medicine: events taking place during the development of the fetus, or even the embryo, cause physiological variations to allow the survival of the fetus, which persist throughout the life of the fetus and which may have consequences for their postnatal development and long-term health and wellbeing. The here proposed project aimed thus to characterize which factors influence fetal growth (with birth weight as its final outcome) and what are the consequences of the low birth weight on health, wellbeing, and cognitive capacity at the end of the growth period. This study will particularly focus on the relationship between the maternal and neonatal microbiota and metabolism, the risk of low birth weight, and long-term health. This study would be conducted on the canine model.

For this reason, **a canine cohort of 100 growing dogs would be created at the Veterinary School of Toulouse**. Between birth and 2 months of life, dogs will be housed and followed at the maternity of the teaching hospital. Afterward, they will be adopted by the foster families (veterinary students) and they will continue to be followed until 18 months of life. This ethical study design permits the included animals to be fully socialized and to live as companion animals. Thanks to a close localization with clinics and the important involvement of the veterinary student, this project will allow developing an educational program on canine reproduction, neonatology, and preventive medicine but also will contribute to developing a general scientific literacy of the students. Finally, our project is also of societal importance, as after an intensive educational program, 18-month old dogs will be further trained to become assistant dogs.

Thanks to these futur assistant dogs, it will be possible to **create events in retirement homes and primary schools** (project 2). The goal in retirement home will be to bring well-being and stimulation of old people in this retirements homes. In primary school the goal will be to bring knowledge to young children on how to behave with a dog and a cat and basis on dog and cat wellbeing. For this project student volunteers will be mobilised.

To go in retirement homes and in primary school a « social car » will be bought. This car could also be used for a second societal project (project 3) consisting in **helping old persons still living in their own homes.** Indeed, today, some old people have difficulties or fears about going out and bringing their pets to the veterinarian. Therefore this car could allow dependent old personne to have access to quality care for their animals. The old personne will be picked up at home by a nurse and transported to the school by car. Animal will be seen in consultation by vets before to go back home with the petowner

Figure 1 : Sum up of connections between projects



Scientific program

Title: Maternal programming: does digestive microbiota in the newborn dog shape its health until adulthood?

Rationale: Maternal microbiota and the microbiota of the newborn have been recently demonstrated to play a role on short- and long-term health outcomes in different species. Various factors can influence this gut microbial implementation, such as the level of maturity at birth (low birth weight), the type of diet (breastfeeding or artificial feeding) or any illnesses experienced during gestation or early life (with antibiotic treatments in particular). As demonstrated in mice, digestive microbiota, altered since birth in low-birth-weight individuals, may play a role in the development of the obesity (complex metabolic disease) at the adulthood. Such concept of maternal programming via microbiota has never been studied on a canine cohort, although numerous frequent health issues exist all along the dog's life.

Hypothesis/Objectives: We hypothesized that dysbiosis of the digestive microbiota in early life may have a short- but also long-term impact on health in the dog. The objective of our study, is thus to evaluate the relationship between digestive microbiota in low and in normal birth weight puppies and their health status until the adulthood, and particularly the risk of weaning diarrhea and obesity.

Experimental Design and Methods: All animals included in the study will be destined to become guide dogs. A total of 16 healthy Golden Retriever breeding bitches will be included

to the study, with 8 of them naturally overweight and 8 with an optimal body condition score. Bitches will be bred and their puppies will be followed since birth until 18 months of life. All along this period, rectal swabs will be performed on dams and puppies to analyze digestive microbiota (16S rRNA). Weight, body condition score, behavior, body temperature, level of activity and data on morbidity will be registered systematically during this period in order to evaluate continually health status of the dogs.

Preliminary Data: A very recent study, conducted by our team, demonstrated an increased risk of overweight at adulthood effect in puppies with a low birth weight. This suggests, alike in other species, an effect of the first days of life on health in adulthood.

Expected Results: We expect that puppies with low-birth-weight, with digestive troubles at weaning and with obesity at the adult age present altered digestive microbiota since the very first days of life. Such a dysbiosis could that be a predictive marker of short- but also long-term health of the dog.

Principal investigators

Principal Investigator (Hanna Mila, DVM, PhD)
Dr Hanna Mila, with over 9 years' experience in the field of canine neonatology, has the capacity to coordinate, supervise and participate in here propose project. She a veterinarian, with her PhD degree completed in the context of epidemiological studies on newborn dog. She has publications related to issues of the neonatal period (mortality, diarrhea, passive immune transfer via colostrum) and the microbiota. She will be responsible for study design and coordination, coordination of the post-doctoral fellow and the PhD student (to be recruited), interpretation of the obtained results, as well as writing and editing of peer-review publications. Her salary is provided by the ENVT. No salary or benefits are thus requested.

Co-investigator (Annabelle MEYNADIER, DVM, Prof, HDR, PhD)
Prof. Annabelle Meynadier, being a diplomated animal nutritionist has not only working in the field of gut microbiota, but also has experience in coordination of PhD students. Therefore, she will participate in study design, statistical analysis of microbiota and interpretation of the obtained results, as well as writing and editing of peer-review publications. She will co-coordinate the work of the PhD student. Her salary is provided by the ENVT. No salary or benefits are thus requested.

Co-investigator (Aurelien GRELLET, DVM, PhD)
Dr. Aurelien Grellet, performed his PhD thesis on the epidemiological aspects of weaning diarrhea. He will participate in study design, statistical analysis of epidemiological data and interpretation of the obtained results, as well as writing and editing of peer-review publications. His salary is provided by the ENVT. No salary or benefits are thus requested.

How the donation could help the project ?

The donation could help support in several different ways:

- allow us to give assistance to some fragile persons
- promote education of veterinarians, veterinary students and young children
- subsidize clinical research in order to advance our knowledge and better serve our future patients.

Project costs and needs

A sum up of the global cost for the project is indicated in table 1.

A financial support for this project is provided by the French Foundation for the Blind (VISIO, https://www.fondation-visio.org/fr). The grant provided by the VISIO Foundation will allow to cover the cost of animals' handling, sampling and samples analysis and digital tools used to follow animals' health.

The region Occitania also help by providing a grant in order to found a PhD student that will be able to study the relationship between microbiota in the newborn and health issues (low birth weight and weaning diarrhea) until and around weaning.

Financial support obtained from the donation will allow :

- to found another PhD student that will be able to study the relationship between microbiota in the newborn and health issues (low birth weight and weaning diarrhea) until adulte age.
- to finance a data scientist in order to treat the data during two years
- to buy a car in order to transport animals not only for this study but also for the two other projects
- to support a part of cohort animal care
- to pay a vet nurse to organise visit in retirements homes, schools and to recover the elderly in their homes as part of project 3