

<b>Sheet abstract of thesis</b>	<b>Disciplinary Fields Nutrition and Physiology</b>
Funding: <b>CIFRE (36 months)</b>	
Thesis Title : <b>Interactions between lipid matrix infant formulas and intestinal biology; impacts on later adult glucose metabolism</b>	
3 keywords : <b>Dairy fat / gut / microbiota</b>	<b>ACRONYME CLIMAPIG</b>
Unit/Team of supervising : <b>UR1341 ADNC (Rennes, France)</b>	
Name of the scientific director and co-director : <b>Isabelle Luron (scientific director) and Sophie Blat, Didier Dupont and Philippe Gérard (co-directors)</b>	
Contact : Isabelle <a href="mailto:Luron@rennes.inra.fr">Luron@rennes.inra.fr</a> , 02 23 48 53 62	
<i>Socio-economic and scientific context :</i> <b>Infant milk formulas are the only alternative to breastfeeding. Today there are more than 160 varieties of infant formulas on the French market, which differ in their technological processes and the nature of the used macronutrients. The lipid composition of the current formulas is essentially based on a mixture of vegetable oils, but some formulas use a mixture of vegetable oils and dairy fat. The incorporation of dairy fat can get closer to breast milk by acting on the ultrastructure of the lipid emulsion and the fatty acid composition of the formulas, with consequences for their biological properties. We have recently shown that incorporation of dairy fat in formulas changed the dynamics of protein digestion and the nature of the peptides released, with consequences on the immune and structural development of the infant gut and on its microbiota.</b>	
<i>Assumptions and questions:</i> <b>We hypothesize that the early changes in the intestinal microbiota and physiology induced in newborn by formula lipid composition and structure modulate its ability to adapt to adulthood deleterious nutritional environment, often encountered in Western societies (ie high fat high energy diet). In addition to its barrier and immune functions, gut has a major endocrine function that sets up at a young age and potentiates pancreatic endocrine function: it is the entero-endocrine axis. Its involvement in the long-term effect of the lipid composition of the formulas on glucose metabolism in adults in condition of deleterious nutritional challenge will be considered.</b>	
<i>The main steps of the thesis and demarche:</i> <b>In a first step, we will evaluate the long-term consequences of formulas enriched in dairy fat on glucose metabolism, inflammatory status and composition of the microbiota of the adult under a high fat diet. In a second step, we will determine the origin of the differential responses following the kinetics of the establishment of the intestine and pancreas endocrine function (phenotypic and functional data) and the bacterial colonization of the gut with the various tested infant milk. The breakdown of the food matrix will be followed throughout the digestive tract by an analysis of the structure and biochemical composition of digesta. In a last step, we will evaluate the effects of the incorporation of dairy fat in infant formulas on glucose and lipid posprandial profiles and on infant glucose tolerance. This last step will relate the biochemical composition of digesta and postprandial plasma profiles, and assess their impact on the maturation of the entero-insular axis.</b>	
<i>Methodological and technical approaches considered:</i> <b>The animal model used will be the piglet, whose digestive maturation profile is the closest to that of human newborn. The newborn piglets (1-2 d of age) will be fed artificially with milk distributors until 28 days of age. They will receive one of three tested infant formulas (adapted to piglets) containing dairy fat or not. They will be then fed a standard diet and eventually a high fat high energy diet in step 1, or slaughtered at 28 days of age in step 2. Step 3 will require the implementation of a jugular catheter at 21 days of age for achieving glucose tolerance tests (IVGTT, meal test).</b>	
<i>Scientific and technical skills required by the candidate:</i> <b>The candidate should have a strong background in nutrition, endocrinology and digestive physiology. He must enjoy working with the animals. Knowledge in food technology and microbiology will be an asset.</b> <i>How to apply (until the 15<sup>th</sup> of March 2014):</i> <b>Provide a curriculum vitae and a letter of motivation, as well as L3, M1 and M2 (when available) marks and rankings.</b>	