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Influence of genetic background to the bovine milk microRNA composition

Le Guillou S.¹, Laubier J.¹, Leduc A.¹ Launay F.², Barbey S.², Lefebvre R.¹, Rossignol M-N.¹, Marthey S.¹, Laloë D.¹, Le Provost F.¹

¹UMR1313 Génétique Animale et Biologie Intégrative, INRA Jouy-en-Josas, France

²UE326, Experimental farm Le Pin au Haras, INRA, Exmes, France

The concept of milk as a healthy food has opened the way of studies on milk components, including macro- and micronutrients, as well as a novel class of molecules with broad regulatory properties, the microRNAs. Their presence in large quantities in milk has led to focus attention on their potential role on health. Some studies suggested that microRNAs present in milk could i) affect functions such as immunity, growth, development, cell proliferation, and apoptosis, ii) be transmitted from mother to infant, iii) have a potential action across species and iv) influence milk effects on consumer health. Intrinsic and stable components of milk, their comprehensive identification and characterization have been performed in several species, such as human and bovine species (?), and depends on the stages of lactation.

In that context, we have studied milk microRNA composition (miRNome) variations according to genetic variables. Thus we have compared milk miRNomes of Holstein and Normande dairy cows, two breeds with contrasted lactation performances. We have performed high throughput small (?) RNA sequencing on the milk samples from 10 mid-lactation primiparous cows for each breed. microRNAs contributing more than 1% of the milk miRNomes are the same in the two breeds. However, our study reveals the presence of 182 microRNAs with a significantly differential level between breeds.

We previously showed a direct relation between microRNAs expression in the mammary gland and their level in milk. The milk miRNomes obtained here have been compared to mammary miRNomes already performed on dairy (Holstein, Montbéliarde) and beef (Limousine) cattle breeds. Variations according to breed in milk were also observed in mammary gland for five microRNAs.

For the first time, this study allowed to evaluate genetic variations of the bovine milk miRNomes according to the breeds. These variations may have several impacts on offspring and consumers and thus requires particular attention. The presence of microRNAs in milk opens a line of investigation to use them as biomarkers for downstream consequences of health, physiological or metabolic status, in animals and humans.