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Oral

Poster

**«Sequestration methods for environmental contaminants in order to reduce the exposure for food producing animals in Kazakhstan»**

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Résumé (1 page max)

Food security should give an access to sufficient, safe and nutritious food (Food and Agriculture Organization, 2003). Nevertheless, some economic activities enhance risks for Food safety via environmental pollution. In Kazakhstan, industry represents one of the most important factors of the economic development with 34,4% of Growth Domestic Product (GDP, IndexMundi, 2019) followed by mining industries (10,4% of GDP, Agency of Statistics of the Republic of Kazakhstan, 2019). Both activities are reputed to be responsible of large emissions of environmental contaminants. The majority of food producing animals lives in extensive conditions in close connection to the local environment and therefore exposed to the deposited contaminants. As Kazakh population consumes large proportions of Food from animal origin (for ex. One of the highest consumption of dairy products in Asia with 237,7 kg of milk and dairy products, Committee on statistics of the Republic of Kazakhstan, 2018), the question of Food safety in animal products has to be asked. Therefore, the pollution with heavy metals (HMs), especially near large cities and industrial plants, is one of the environmental problems for Kazakhstan. Moreover, these economic activities emit Persistent Organic Pollutants (POPs) too. Therefore, the POPs are also present in the environment of Kazakhstan (Sailaukhanuly et al., 2016) and can be then transferred to Food produced by outside raised animals. Thus, the presence of both types of contaminants in the environment needs management methods to avoid or at least reduce their income in the Food chain, for example reducing their bioavailability.

The aim of our study is therefore to reduce the bioavailability of HMs in environmental matrices ingested by animals (i.e. feed, soil, water) to reduce or avoid their transfer into Food. Indeed, some chelation techniques are described to bind strongly metals to protein hydrolysates and peptides. The latest are derived from proteins of sunflower (Megías et al., 2004), cow milk (Suetsuna et al., 2000) and goat milk (De Gobba et al, 2014), soy bean (Gibbs et al., 2004) and egg albumin (Miguel et al., 2005) but also Pacific hake (Cinq-Mars et al., 2008). The local context opens possibilities for other binding agents as peptides from locally produced Camel or Mare milk but their technological properties are insufficiently explored. It is necessary to determine the strength of bonds between these peptides and HM-ions but also to investigate the reasonable selectivity to minimize the depletion of minerals (Ca, P, Mg). Therefore, caseins and whey proteins of Camel or Mare milk have been isolated and peptides from them have been liberated. The ability to create solid complexes by chelation are studied by measuring the resistance of links between them and some HMs (Ni, Zn, Cu, Cd, Pb, As) by Isothermal



Titration Calorimetry (Plateforme ASIA, University of Lorraine). If strong complex links are revealed between these peptides and the studied contaminants, then it should be checked that nutrients will not be complexed in the same time. Indeed, a reduced availability of nutritive minerals as calcium or phosphorous would limit the interest of this chelation agents.

In a second time, the eventual charge of POPs in the Food chain will be studied by a different approach. These contaminants will be recovered mainly in the fat fraction of Food, especially in milk. Therefore, it seems interesting to reduce their concentrations in milk and dairy products by skimming fully or partially the contaminated raw milk. Even if fat free milk has a reduced nutritive value, the so modified milk will allow consuming self-produced Food even in lightly contaminated areas as for ex. Mangystau desert where Food from animal origin is the only local Food source for the people. The study of reducing the amount of POPs in Mare or Camel milk regarding the degree of skimming will allow developing a method to obtain dairy products, which ensure food safety.

The two different approaches in this PhD work aims to improve the respect of Food safety in Kazakhstan in the context of maintaining local Food production within an environment, which can be affected by contaminants.

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