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Impact of some environmental pollutants on the livestock products in Kazakhstan

Ecological situation is stay with important environmental pollution. Reglementations of live-stock in the polluted area is not clear. Some studies were achieved to measure impact of heavy met-als, organic polutants on different farm animals. Globally information about impact of heavy metals and/or organic pollutants on livestock products is not enough. Especially recent data is very few and inludes not all livestock products. The available data shown in the present paper, cannot explaining of the mechanisms of exposure and of detoxification. The assessment of contamination risk is not yet known in the situation of Kazakhstan.
Keywords: animal products, heavy metal, organic pollutant, livestock

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Қазақстандағы кейбір қоршаған орта ластағыштарының мал шаруашылығы өнімдеріне әсері

Қазақстан Республикасының жағдайындағы үй жануарларға (ірі қара мал, жылқылар, түйелер, қойлар, ешкілер және т.б.) ауыр металдардың және органикалық ластағыш заттардың әсерін зерттеуге арналған ізденістерге шолу жасалды. Жинақталған мәліметтер жануар ағзасына және азық-түлік өнімдеріне ластаушылардың әсер ету механизімін және детоксикациясын көрсетпейді. Ластанған аймақтардағы малдың жайылуы жайында нормативті құжаттар әлі айқын еместігі анықталды.
Түйін сөздер: мал өнімдері, ауыр металдар, органикалық ластағыштар, мал шаруашылығы

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Воздействие некоторых загрязнителей окружающей среды на продукты животноводства в Республике Казахстан

Приведен обзор исследований по влиянию тяжелых металлов, органических загрязнителей на животных (крупный рогатый скот, лошади, верблюды, овцы, козы и т.д.) в условиях нашей республики. Имеющиеся данные не могут объяснить механизмов воздействия и детоксикации загрязнителей на организм животных и на продукты питания (мясо, молочные продукты). Также установлено, что нормативные документы по регламентированию выпаса сельскохозяйственных животных в загрязненных территориях Казахстана практически не разработаны.
Ключевые слова: продукты животноводства, тяжелые металлы, органические загрязнители, животноводство.

Introduction

As known, Kazakhstan has rich mineral resources and well developed mining and production industries and the exploration of the natural resources is a key-point in the economical development of the Republic. Indeed, this emerging country disposes large availabilities of petrol, gas, uranium, coal, iron and phosphorus. Moreover, an intensive

industrial base valorizes these resources. Thus their exploration is participating highly to the Kazakh economy and the development of this coun-try. But the extraction and use of these resources cause numerous ecological problems. The ecologi-cally threatened Aral and Caspian seas in southwest, the former nuclear testing site of Semey in the north east, several metallurgical, chemical and petrochemical plants, huge cotton plantation areas, as well as mining industries and uncontrolled waste burning and disposal are example of ruthless exploitation of natural resources and make Kazakhstan of real concern in terms of pollution.

In Kazakhastan ecological situation is still stay with high environmental pollution. Reglemen-tations of livestock in the polluted area is not clear. Some studies were achieved to measure impact of pollution on farm animals. What is the good practice to apply in such kind area are needed. In all cases, scientists should know what is the intensity of risk, time of exposure and mechanisms of tox-icity and decontamination are neceessary. This review is focused to collect bibliographic data around impact of environmental pollutants, as heavy metals and organic pollutant on livestock of Kazakhstan.

Livestock of Kazakhstan. Nowadays, livestock in Kazakstan mainly includes cattle, sheep and goat, horse and camel. The population use horse and camel breeds in addition to cows for dairy production [1] and all types of these animals for meat. The main livestock regions for sheep (more than 2 000 ths) are South-Kazakhstan, Almaty, Zhambul and East-Kazakhstan. Cattle (more than 500 ths) and horse (more than 200 ths) livestock are Almaty, South and East-Kazakhstan. Camel breeding are mainly used in southern-west part of Kazakhstan (Fig 1) [2].

Heavy metals. It is known that human activities, increasing urbanization notably industrial and mining processes, have been responsible for the wider diffusion of heavy metals. Consistently, in Kazakhstan, still they are present in all types of environment and they are interrelated. [3]. The most toxic heavy metals, lead, mercury, cadmium and zinc can be easily accumulated in soil, plants, wa-ter. Heavy metals situation depends of the quantity of factories, mainly industrial emissions and waste. During the twenty years of independence, the country has improved exploration of huge mineral richness and also, consequently wider wastes. The presence of heavy metals in the envi-ronment: air, water, soil, plantsare a main indicator of the contamination of areas. Also, we can not exclude the transition contaminants to food producing animals and consumers. According of evalu-ated study in Eastern Kazakhstan regarding toxic metal residues (Cd, Pb and As) in cattle in an in-dustrialized area (78 calves) and from a rural area (92 calves) cadmium and lead contents in the liver and kidney were moderately and significantly higher in calves from the industrialized area (Cd: liver 29.6, kidney 161; Pb: liver 38.1, kidney 38.3 μg/kg wet weight) than in calves from the rural area (Cd: liver 22.9,

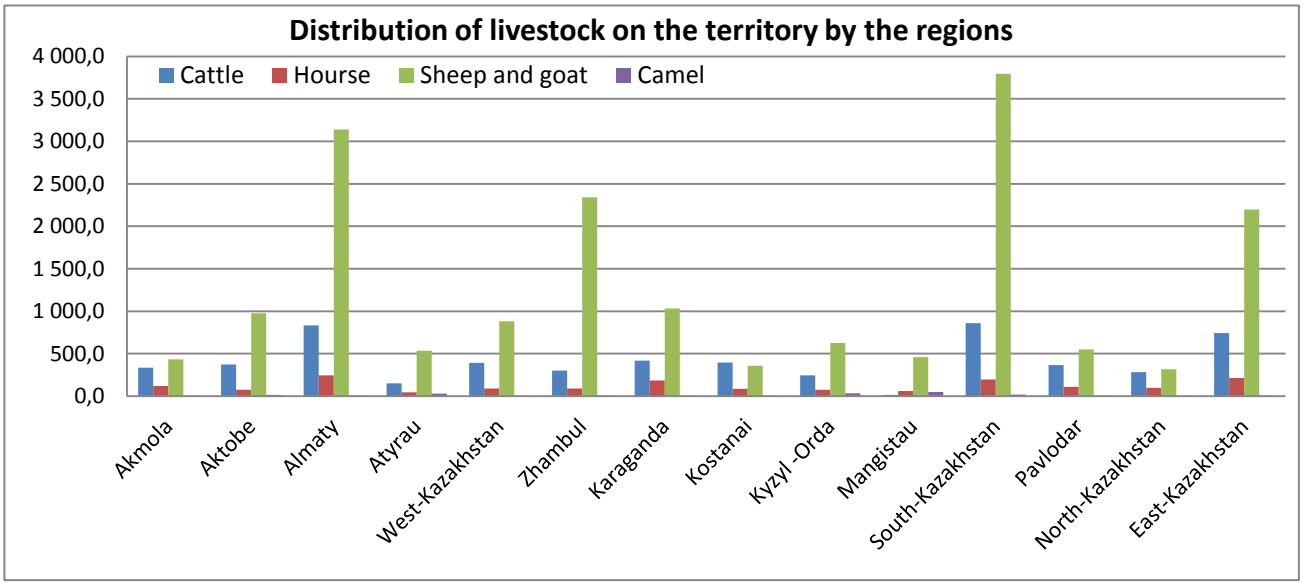

Figure 1 – Distribution of livestock on the territory by the regions of Kazakhstan

kidney 96.4; Pb: liver 20.7, kidney 15.9 μg/kg kg wet weight) [4].

In Kazakhastan, actually all domestic animals graze everywhere in the steppe, especially in areas without reglementations for environmentally polluted zones (behind emission sources: plants, wastage and other sources of contamination) [5]. In the East-Kazakhstan region, famous for metallurgical industry, the animal feed and meat (cattle, horse and sheep) products contain cadmium, lead and zinc in high concentrations. The mean cadmium concentrations in horse kidneys were found 128 mg/kg and lead concentrations for liver 2.2 mg/kg [6]. The main sources of pollution of Oskemen was due to the activities of non-ferrous, rare metal industry, power engineering, machine building and instrument-housing and communal services [7]. In the South of Kazakhstan oblast where are developed cotton industry, uranium mining, phosphorus plants and agricultural habitants, camels milk analyzed for copper, iron, manganese, zinc, arsenic and lead mean content was respectively of 0.07 ± 0.04, 1.48 ± 0.53, 0.08 ± 0.03, 5.16 ± 2.17, <0.1, and 0.025 ± 0.02 ppm. In shubat (fer-mented Camel milk) mean contents were 0.163 ± 0.164, 1.57 ± 0.46, 0.088 ± 0.02, 7.217 ± 2.55, and 0.007 ppm respectively [8, 9].

In Kyzylorda oblast no convenient data about contamination of food producing animals are available. But, the level of lead in the hair of children of Aral Sea regions was 30 times higher than the upper limit in the hair from children in West Germany. In erythrocytes, the lead was approximately 5 times higher than in children from Sweden. Cadmium was 2.5 times higher. In such condi-tions, the contamination of animals cannot be excluded [10]. Also, the presence of "Baikonur" cos-modrome in this region where in 2012 only 21 boosters were started [11] is also a source of heavy metals exposure. Some authors noted also that the contaminants come along the upper parts of the Syrdarya river, from the zinc melting industry in Uzbekistan /11/. In Western part (mainly petrol and gaz production region) the pollutants content of cobalt in the organs of small cattle (liver, kid-neys,heart, and lungs) was 2.5 times higher than authorized level and five times higher than normal – in milk [12]. Pourjafar et al (2008) found that cows located close to oil industry (Isfahan city, Iran) had higher blood and hair lead content [13]. Total mercury concentrations in the topsoils of the floodplain of river Nura (Karaganda oblast) ranged from near background levels to over 100 mg/kg. The contamination is serious and relatively localized, with >70% of the total amount of mercury in topsoils and >90% of mercury in river bank deposits located within 25 km from the source [14]. As lactating ruminant may ingest daily from 1% to 10% soil when grazing [15], the contamination by soil ingestion could strongly affect the herbivorous. Elsewhere, people in Central Kazakhstan were exposed to high levels of Hg due to the frequent consumption of fish from Nura river or the neighbouring lakes. Among 289 hair samples of local people near to Nura river Hg concentrations ranged from 0.009 to 5.184 μg/g with mean is 0.577 μg/g [16].

Organic pollutants. One of the main sectors of Kazakhstan's economy is Oil industry. The results of transportation, processing, consumption of oil and petroleum products, energy production, chemical and petrochemical industry, transport and the generation of construction materials are the major potential sources of organic pollution. Today, proven reserves of oil Kazakhstan is among the top 15 countries in the world, having 3% of the world's oil reserves. Oil and gas areas cover 62% of the country, and 172 oil fields. The deposits are located in six of the fourteen regions of Kazakhstan: Aktobe, Atyrau, West Kazakhstan, Karaganda, Kyzylorda and Mangystau regions. In this case, approximately 70% of hydrocarbon reserves are concentrated in the West of Kazakhstan [17].

PCBs were produced in the USSR from 1934 to 1995 and mainly used as dielectric fluids in transformers, capacitors by name Sovol, Sovtol and there mixtures Trichlordifenil (85% Sovol), Gexol (25% Sovol). It was also produced, as a plasticizer in the manufacture of varnishes and polierny materials, lubricants and fungicides to protect the hardwood. The major producer of PCBs were companies like “Orgsteklo” (Derjinsk city, Russia), ‘Orgsintez’ (Novomoscovsk, Russia), VNITIG (ВНИТИГ) (Ufa). The filling capacitors were implemented in next cities Serpuhov (Russia), Ust-Kamenogorsk (Kazakhstan), Leninakan (Armenia), Chirchik (Uzbekstan). And nowadays in Russia, above 200 000 transformers and capacitors with 18 000 tons of PCBs are still present /18/. However, one of the problems to study the effects of this PCBs on human health, to-day, is that there is not enough information

about basic composition of Sovol or Sovtol. But, we have information that the composition of Sovol is similar to Aroclor 1254 [18].

In Kazakhstan according to data of Agency "Greenwomen" (2006) and analyzed production and industrial potential of the country based on these data, areas being "hot spots" of contamination with PCBs could be exactly located: Semey nuclear test site 14,865 capacitors; Pavlodar Chemical Plant - 31,244 capacitors; East-Kazakhstan oblast - 1 transformer, 1977 pieces of capacitors and capacitor installations 34; Karaganda oblast, Zhangiztobe polygon region - 105 transformers, capacitors 1262 and 6 capacitor installations; Aktobe oblast - 520 capacitors; West-Kazakhstan oblast - 351 capacitors and 2 capacitor installations; Mangistau region - 323 capacitors; Zhambyl oblast - 290 capacitors [19].

PCB contamination of food producing animals in Kazakhstan is very few. In a comparative study of the contamination of camel milk in Atyrau, Kyzylorda, Zhambul and South Kazakhstan oblasts, only samples from Kyzylorda oblast have high level (0,95 ng/g), and mainly PCBs 52 and 138 [20]. In human breast milk from Almaty, Shymkent and two cotton growing area of South Kazakhstan Oblast (Djetisay and Kyrov), the cities nearest of the Aral Sea (Aralsk and KyzylOrda), and a site of petrochemical exploration on the Caspian Sea (Atyrau), the mean concentration of total PCBs was 410 ng/g fat. Concentrations of six PCB congeners (28, 52, 101, 138, 153, 180) were between 100 and 350 ng/g fat [21]. In Aral sea region, it was revealed that the PCBs was 1900 μg/kg in lipid of plasma of children, which was higher than in Europe [10]. PCDD/Fs in camel milk from Almaty, Atyrau, Aralsk, Shymkent were investigated. The concentration of PCDD/Fs were higher in the Atyrau oblast. This result could be linked with oil extraction in this region [1].

Globally information about impact of heavy metals and/or organic pollutants on livestock products is not enough. Especially recent data is very few and inludes not all livestock products. The available data shown in the present paper, cannot support the understanding of the mechanisms of exposure and of detoxification. The assessment of contamination risk is not yet known in the situation of Kazakhstan. There is urgent need to achiv such studies for a convenient evaluation of the polluting impact for the human and animal population of the country.

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