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CURRENT SITUATION IN THE GENE BANK OF ANIMAL GENETIC RESOURCES IN SLOVAKIA: A REVIEW

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ABSTRACT

In the last fifty years, there was a significant decrease in the number of animals in the Slovak Republic, and in some species an original, (native) autochthonous breeds completely disappeared. From the last update (at the end of 2011) statuses of animal breeds in the Slovak Republic, it is obvious that three breeds of cattle and two breeds of pig are subjected to extinction. The situation with animal genetic resources in the Slovak Republic is not satisfactory due to the fact that semen doses, stored in the gene bank, are originated only from several, but not from all Slovak breeds. In particular, from the cattle breeds there are Slovak Pinzgau and Slovak Spotted, from rabbit breeds – Nitra rabbit, Zobor rabbit and Holic rabbit and from chicken breed – Oravka. In the near future we plan to store embryos from Slovak cattle, sheep and rabbit breeds. Stem cells appear to be a perspective tool for preservation of endangered species (breeds). Moreover, we also collect for storage stem cells from various sources (bone marrow, amniotic fluid, blood and fat tissues) of different Slovak animal breeds. For this reason animal genetic resource *ex situ* (gene bank) is important for solution of problems of animal genetic resource in Slovakia.

Key words: gene bank; animal genetic resources; Slovak animal; cryopreservation

INTRODUCTION

Every week the world loses two breeds of its valuable domestic animal diversity, according to estimates just published in the 3rd edition of the World Watch List for Domestic Animal Diversity. Despite enormous potential contribution to sustainable development and to reducing hunger and poverty, animal genetic resources for food and agriculture are underutilized and underconserved. In the past 100 years, we have already lost about 1 000 breeds. New findings show that domestic animal breeds continue to be in danger: one third are currently at risk of extinction (FAO, 1993).

Throughout 2014, the international conservation community celebrated the 50th anniversary of the International Union for Conservation of Nature (IUCN) Red List of Threatened Species and its significant contribution to guiding global preservation action. Currently there are more than 79,800 species on the IUCN Red List, and more than 23,000 are threatened with extinction, including 41 % of amphibians, 34 % of conifers, 33 % of reef building corals, 25 % of mammals and 13 % of birds. The statistics shows that in 2016, around 67,050 species of vertebrates in the world were known and 7,967 were endangered to be extinct.

For conservation of Animal Genetic Resources (AnGR) various methods can be used and conservation activities can be categorized according to whether they involve the maintenance of genetic material *in vivo* or *in vitro*. *In vivo* conservation can, in turn, be classified according to whether it takes place *in situ* or *ex situ*.

In situ conditions were defined in the Convention on Biological Diversity as "conditions and natural habitats, and, in the case of domesticated or cultivated species, in the surroundings where they have developed their Distinctive properties" (CBD, 1992).

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Table 1: Current activities for *ex situ* conservation of AnGR in the European countries

Country	Institutions	Starting date of genebank „*In vivo*"	Starting date of sample collection „*In vitro*"
Albania	Ministry of Agriculture	2008	
Austria	Institute of Organic Farming and Biodiversity of Animals	1997	1997
Belgium	Université catholique de Louvain	2010	2010
Bulgaria	Executive Agency on Selection and Reproduction in Animal Breeding (EASRAB)	1969	
Croatia	Croatian Agricultural Agency	2012	
Czech Republic	Institute of Animal Science	2006	2006
Denmark	Ministry of Agriculture	1987	1987
Finland	MTT Agrifood Research	1984	
France	Group Council (12 institutions)	1999	
Germany	Several institutions	planned 2013	
Hungary	Centre for Farm Animal Gene Conservation	2009	2010
Italy	Several institutions	1980	1980
Latvia	Latvia University of Agriculture	2007	2007
Lithuania	Institute of Animal Science	1998	
Netherlands	Center for Genetic Resources, Wageningen	2000	
Norway	Breeding Association	1960	
Poland	National Research Institute of Animal Production, Krakow	1968	1990
Portugal	Ministry of Agriculture and Sea	2004	
Serbia	Livestock Veterinary Centar for Reproduction and Arteficial Insemination Velika Plana	2003	
Slovakia	Ministry of Agriculture, NPPC, Research Institute for Animal Production, Nitra	planned 2013	2015
Slovenia	University of Ljubljana	2010	
Spain	Ministry of Agriculture, Food and Environment	1998	1999
Sweden	Swedish University of Agriculture	1990	1990
Switzerland	Several institutions	2009	2009
Ukraine	Institute of Animal Breeding and Genetics	2002	
United Kindom	Rare Breeds Survival Trust		

In situ conservation is undertaken in the traditional production system of the conserved AnGR. However, *in situ* conservation is not without risks. For example, a population maintained *in situ* may be struck by a disease outbreak or other disaster or may be affected by inbreeding, genetic drift or introgression from another breed.

Ex situ conservation (Table 1) decreases these risks by providing a backup that can be drawn upon if required. However, if the population is also maintained *in situ*, regularly collecting and conserving new samples *in vitro* can help to maintain the potential for future adaptation. As described above, *ex situ* conservation can be undertaken either *in vivo* or *in vitro*. While in many circumstances maintaining a live *ex situ* population adds little to the conservation strategy that already includes *in situ* and *in vitro* components, it can have some advantages.

The situation with animal genetic resources in the Slovak Republic is not satisfactory due to the fact that semen doses stored in the gene bank are originated only from several, but not from all Slovak breeds. In particular, from the cattle breeds there are Slovak Pinzgau cattle and Slovak Spotted cattle, from rabbit breeds

Table 2: Selected samples from animal genetic resources in the Slovak Republic in 2016

Breed	Animals (N)	Females in herd book (N)	DNA*	ID** (N)	Frozen embryos	Frozen stem cells	DNA samples
Pinzgauer cattle	9883	1583	yes	200	yes	no	no
Slovak spotted cattle	161 550	30 545	yes	250	no	no	no
Walachian sheep	2437	553	yes	no	no	no	120
Tsigaja	123 660	7066	no	no	no	no	no
Improved Valachian	131 573	7732	no	no	no	no	no
Nitra rabbit	1500	-	no	155	yes	yes	yes
Zobor rabbit	100-120	-	no	267	yes	yes	yes
Holic blue rabbit	260-390	-	no	154	no	no	yes
Slovak pastel Rex	80	-	no	42	no	no	yes
Slovak greyish blue Rex	700-900	-	no	17	no	no	yes
Oravka hen	1800	-	no	100	no	no	yes
White short-haired goat	8036	1062	no	no	no	no	no
Brown short-haired goat	1627	116	no	no	no	no	no
Slovak carniolan honeybee	262 000	-	yes	no	no	no	170

dad.fao.org * DNA microsatellites; **ID - Insemination doses

– Nitra rabbit, Zobor rabbit and Holic rabbit (Kuliková *et al*., 2015) and from chicken breed – Oravka. We have verified methods of embryo freezing and vitrification and in the near future we plan to store embryos from Slovak cattle, sheep and rabbit breeds (Kubovičová *et al.*, 1998, 1999; Popelkova *et al*., 2009). Stem cells appear to be a prospective tool for preservation of endangered species (breeds). Moreover, we also collect for storage stem cells from various sources (bone marrow, amniotic fluid, blood and fat tissues) of different Slovak animal breeds such as chicken blastodermal stem cells (Svoradova *et al*. 2016), which were derived from X stage embryos (blastoderm stage) of Oravka breed and rabbit amniotic fluid stem cells (Kováč *et al*., 2016). At present there are samples kept and registered at NPPC-RIAP Nitra and partner insemination center (Table 2).

CONCLUSION

Generally, Animal Gene Bank plays an important role in agricultural production globally for the present and the future, and in sustaining most production systems and community livelihoods. At national level, collaboration between institutions has to be improved for increasing the animal resource conservation efficacy and implementation. For the gene bank development, new tools related to genomic large-scale studies and reproductive technologies are required.

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