FOOD SECURITY AND ADAPTATION TO CLIMATE CHANGE - GENOTYPING FOR RESISTANCE OF DISEASE

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ABSTRACT
Adaptation to climate change is essential for any efforts to promote food security, poverty alleviation, or sustainable management and conservation of natural resources. Many countries are already dealing with climate change impacts. The dynamic of food's world population projection to 2050 year and consumption dynamic of cereals, animal products (meat, milk, eggs) in terms of respect international standards of food safety and security; the known european principles "from the farm to the fork" and "from the farm to the plate" which have restricted rules established by European Food Safety Authority, must be respected in agrifood products 2050 year perspective also. In this framework, the food safety and security must be correlated with the respect of known principles of Hazard Analysis and Critical Control Points, based on actual international standards from ISO 9001-9002 series (Quality Management System), ISO 14001: 2004 (Environment Management), ISO 22000 (Food Safety). The projections for the future socio-economic environment and the assessment of the situation and prospects of the natural resource base raise the question as to whether and under what conditions the estimated future food demand can be met and how food security can be achieved.

Keys Words: *food security, climate change, traceability*

INTRODUCTION

Long-term climatic models predict that the present breeds of low heat tolerance face serious risks for the stability of their production. Beside changes in management technologies the introduction (or selective breeding) of heat tolerant populations seems to be the most obvious step in adaptation to the new climatic conditions.Climatic changes indicate a scalable stressor for both farm animals and natural habitat. In farm animals the impacts can generally be alleviated by appropriately selected management technologies but in some cases these effects may even be amplified, as well. Changes in climatic environment for farm animals can be expressed not only in function of temperatures but temperatures, humidity and circadian temperature threshold values combined in the Temperature Humidity Index (THI). Values above show that 72 THI can be considered as stressors in cattle. Based on mean values heat stress monthly distribution is heterogeneous characteristic regarding the seasons, but based on the gloomiest scenarios almost 60% of the territory will be affected by this change. Heat stress impairs several physiological, production and reproduction functions in cattle.

The severity of the impacts caused by heat stress of equal magnitude depends primarily on the genotype. Cattle breeds in tropical regions (Bos taurus types including N'dama, Senepol, Romosinuano, Carora, Bos indicus types with zebu genetic background) possess traits which allow for the regulation of body temperature with the maintenance of production and reproduction during times of heat stress. At the same time, thermo tolerant cattle breeds were not subjected to milk and meat production traits selection at the same rate as the European and North American cattle breeds.

Currently, humanity is in a new phase of economic and social development at the beginning of the XXI century - the century and millennium III - century, with numerous and varied characteristics knowledge society based on science and education. At the same time manifests successive economic-financial crisis, this requires integrated prevention and control of risk management and crisis situations. Knowing the food problem in complex relationships with explanations of population dynamics (10.6 billion-2050) issued with maximum credibility of organizations such as: NATO, the World Bank, FAO, and recognized experts in scientific forecasts and projections of long-term main focus of the United Nations Summit, held between 20-22 September 2010. Eradicating poverty and hunger are clear targets of global strategies. Globalization of the food chain causes constant new challenges and risks to health and consumer interests. The main objective of EU food safety policy is to achieve the highest possible degree of protection of human health and consumer interests in relation to food. In this regard, the EU strives to ensure food safety and proper labeling, given the diversity of products, including traditional ones by specific certification bodies (EFSA).

The EU has developed a comprehensive body of legislation on food safety, which is continually monitored and adapted as new developments. Thus, traceability is managed by European legislation and the regulations nr.178/2002 1642/2003 on food safety and the local law no. 150/2004 on food safety and feed quality and standards, such as: 22005:2007, ISO 22000:2005 and ISO / TS 22004:2006 for traceability in the food chain. The

EU actively promotes high standards of consumer safety and consumer support organizations to strengthen their role in decision making. Biotechnology researches and development related to food (including genetically modified organisms) is a way to eradicate hunger, which takes into account the basic principle of EU food safety policy by applying an integrated approach, such as "farm to fork" covering all sectors of the food chain, including feed production.

The EU has a comprehensive strategy on food safety. It covers not only food safety but also health and welfare of animals and plants. The strategy provides the ability to track food from farm to consumer even if it is needed to move within the EU borders. EU food strategy is based on three main elements: legislation on food and feed safety, basic scientific advice necessary decisions in the field and implementing a policy and control. The law covers many areas, from food and feed, up to food hygiene, applying the same high standards throughout the Union. Community legal framework on food safety is common to all Member States, but adapted diversity. EU efforts significant because traditional foods are not removed from the market due to food safety standards and that innovation should not be discouraged and do not have the quality of the Romanian scientific.

The context of our paper approach: eco-and bio-economy (the socio-economic priorities and humanities), biodiversity as a resource of sustainable development, biotechnology, food safety including food chemistry, health (a consequence of ecosanogenesis) environmental and implicitly (through the environmental impact on human health aspects and animals). Each EU country is obliged to ensure that product safety was not compromised in its food chain, and this can be achieved through the implementation and certification of a Food Safety Management System. HACCP is a system of internationally recognized food safety, based on a systematic analysis and preventive production process, which shows that food safety risks are identified, assessed and controlled. HACCP involves risk identification, control and monitoring of critical points where the process could be compromised food quality. The system is based on the Food Code (Codex Alimentations) developed by the UN Food and Agriculture Organization and World Health Organization.The dynamic of food ‘s world population projection to 2050 year and consumption dynamic of cereals, animal products (meat, milk, eggs) in terms of respect international standards of food safety and security; the known european principles “from the farm to the fork” and “from the farm to the plate” which have restricted rules established by European Food Safety Authority, must be respected in agrifood products 2050 year perspective also.There is a big interest apart of breeders and veterinarians for a certain identity of animals and for their paternity. Current animal identification practice in the EU is based on administrative tracking of the animal ID by using visual animal ID devices (e.g. visual ear tags) and procedures (e.g. animal passport, abattoir batch no.). A major drawback of this approach is its susceptibility to fraud as reliable control instruments are missing. Today, molecular genetic technologies are available to provide such control instruments. These technologies ("DNA fingerprinting") not only provide the means to 100 % reliable traceability of livestock and livestock products, but also represent a powerful instrument to improve animal health and animal welfare.

MATERIAL AND METHODS

The research team used modern tools to identify the traceability the original materials (meet or milk) of different species from traditional products - molecular tests based on identification, amplification and characterization of nucleic acids for food traceability (PCR techniques). Many ways and methods were tested and applied. The best of them seems to be the DNA analysis as "Genetic Fingerprint", which is found in every cell of the body and the more recent method of microsatellites genetic markers. Using PCR techniques to multiply DNA segments it is possible to dispose of enough genetic material to compare DNA from different cells, let say from under skin tissue and from muscle fibers, and know if they have or don't have the same genotype origin. This scientifically paper presents results of research concerning recognition of genotypes by microsatellites genetic markers collecting and preserving the tissue samples by TypiFix method. Concerning traceability of animal products there are hopes as well. The method based on microsatellite markers gives concrete results and is a valuable tool for the specific meat of breed. The applicability of the methods is very important because give the transparency needs of the market in very short time. The analytical methods used for species identification and authenticity of foods rely mainly on protein and DNA analysis. The protein-based methods include immunological assays electrophoretical and chromatographic techniques. More recently, DNA molecules have been the target compounds for species identification due to the high stability compared with the proteins, and also to their presence in most biological tissues, making them the molecules of choice for differentiation and identification of components in foods, and a good alternative to protein analysis. Most DNA-based methods for species identification in foods consist on the highly specific amplification of one or more DNA fragments by means of polymerase chain reaction (PCR). DNA microsatellite markers are proposed for meat traceability.10 microsatellites were amplified in multiplex reactions and analyzed on ABI310 genetic analyzer. The probes it was works in Agrobiogen Laboratory at the Vienna.

Tissue collection with TypiFixTM –System The TypiFix™ ear tag system is a combination of a conventional ear tag with a simultaneous tissue sampling technology. By ear tagging the farm animals, the tissue samples are automatically collected and sealed in the TypiFix™ sample containers, where the tissue samples are preserved at ambient temperature and can be used for protein or DNA based assays. The easy handling of the TypiFix™ ear tag system allows economic sampling of whole populations and is therefore an effective tool for analysis of genetic markers for paternity control, traceability and breeding traits. The Typi-Fix-System is a procedure for the collection of DNA containing tissue samples avoiding all these hurdles and problems. With the Typi-Fix-ear tags the animal is marked - in the usual convention - with a plastic ear tag. At the same time, however, a tissue sample is taken by the spike of the ear tag which immediately after the collection is packaged in a special plastic container (sample receiving container) labeled with the (bar coded) animals ear tag number.After collection the preservation and preparation of the DNA is initiated automatically by substances which are hold in stock in the sample receiving container. The identification number of the samples can be registered by a reading device (scanner). The sample container is connected to the ear tag by a plug and socket and is easily removed after the ear tag has been affixed and the tissue sample simultaneously collected. If desired, the sample container can also be used without the ear tag. After pigs tissue collection with ear tagging, we collected meat probes in abattoir. The porcine agreed microsatellite markers use for: Set I is: S0005 for chromosome 5 and range 205-248, S0090 for chromosome 12 and range 244-251, S0155 for chromosome 1 and range 150- 166, SW857 for chromosome 14 and range 144-160, SW240 for chromosome 2 and range 96-115; Set II is: SW24 for chromosome 17 and range 96-121, SW951 for chromosome 10 and range 125-133.

DNA purification with DNA FIX columns an extremely simplified and shortened one-step high-throughput separation procedure of genomic DNA from TypiFix samples. The sorbents retain protein and other contaminants, while the DNA passes the column in the exclusion volume. DNA isolation and purification can be automated through the use of a pipe ting robot and a special one-step procedure (Nexttec technology). PCR reactions with hese samples can also be prepared automatically. The results of the multiplex PCR 565 analyses are linked with the scanned identification number and saved in the animal data bank. *Gel electrophoresis of NCC purified DNA from 88 TypiFix eartag samples* : 5 µl (total elution volume: 240 µL) of each sample were loaded on a 1% agarose/ EtBr gel. The DNA concentration is about 10 ng/µl or greater = negative control.

In the future, many developed countries will see a continuing trend in which livestock breeding focuses on other attributes in addition to production and productivity, such as product quality, increasing animal welfare, disease resistance and reducing environmental impact. The tools of molecular genetics are likely to have considerable impact in the future. For example, DNA-based tests for genes or markers affecting traits that are difficult to measure currently, such as meat quality and disease resistance, will be particularly useful (Leakey et al. 2009). Another example is transgenic livestock for food production; these are technically feasible, although the technologies associated with livestock are at an earlier stage of development than the equivalent technologies in plants. In combination with new dissemination methods such as cloning, such techniques could dramatically change livestock production. Complete genome maps for poultry and cattle now exist, and these open up the way to possible advances in evolutionary biology, animal breeding and animal models for human diseases (Lewin 2009). Genomic selection should be able to at least double the rate of genetic gain in the dairy industry, as it enables selection decisions to be based on genomic breeding values, which can ultimately be calculated from genetic marker information alone, rather than from pedigree and phenotypic information. Genomic selection is not without its challenges, but it is likely to revolutionize animal breeding.

New tools of molecular genetics may have far-reaching impacts on livestock and livestock production in the coming decades. But ultimately, whether the tools used are novel or traditional, all depend on preserving access to animal genetic resources. In developing countries, if livestock are to continue to contribute to improving livelihoods and meeting market demands, the preservation of farm animal genetic resources will be critical in helping livestock adapt to climate change and the changes that may occur in these systems, such as shifts in disease prevalence and severity as the tools and techniques of breeding are changing.

CONCLUSION

Adaptation to climate change is essential for any efforts to promote food security, poverty alleviation, or sustainable management and conservation of natural resources.The future of agriculture and the ability of the world food system to ensure food security for a growing world population are closely tied to improved stewardship of natural resources. Major reforms and investments are needed in all regions to cope with rising scarcity and degradation of land, water and biodiversity and with the added pressures resulting from rising incomes, climate change and energy demands. Many ways and methods were tested and applied for identification traceability of animal products; the best of them seems to be the DNA analysis as “Genetic Fingerprint”, which is found in every cell of the body and the more recent method of microsatellites genetic markers. In order to apply DNA analysis using microsatellite test there are much hopes but it is necessary to know precisely how this trait, microsatellite presence in different chromosomes is inherited in the progeny.

The DNA-based methods, namely the PCR, proved to be reliable, fast, sensitive and extremely specific techniques for the detection of frauds.

The method based on microsatellite markers gives concrete results and is a valuable tool for the specific meat of breed . The applicability of the methods is very important because give the transparency needs of the market in very short time.

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