

University of Agricultural Sciences and Veterinary Medicine Cluj Napoca

Doctoral School: Plant and Animal Resources Engineering

ABSTRACT

Habilitation: **Microbial biotechnologies: Applications to life sciences**

Domain: **Biotechnology**

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The habilitation thesis is a synthesis of the relevant personal achievements, following the support of the doctorate, in 2007 based on the theme of isolation, purification and characterization of polyclonal antibodies from eggs of hen, quail and duck. The results were materialized in scientific papers published in specialized journals indexed in international databases but also in research contracts, carried out during that period.

The requirements for the preparation of the habilitation thesis, according to the recommendations of the doctoral school of the University of Agricultural Sciences and Veterinary Medicine of Cluj Napoca, suggest its structuring in three parts:

The first part of the habilitation thesis, contains the presentation of the chosen research field for the development of the experiments needed to complete the doctoral thesis, in the period 2001-2007. Immediately after choosing the PhD theme, I benefited from a funding source for research. Thus, in the period 2002-2003, I benefited as project manager of a CNCSIS Grant type At (code 421) with the theme: ***“Production, isolation and purification of polyclonal antibodies from hen eggs, quail and duck”***.

The research carried out, which was completed by the doctoral thesis, held in 2007, had as main objective the isolation, purification and characterization of polyclonal antibodies from eggs of hen, quail and duck. The use of monoclonal and / or polyclonal antibodies has wide applicability in many fields. The use of vitelline immunoglobulin concentrates for the prevention and control of bacterial and viral diseases has been reported mainly for enteric zoonotic diseases with mono- or even polyfactorial etiology. In this context we can mention numerous studies that indicate the administration either in purified form (IgY extracted and lyophilized) or even in native form (egg yolk) of anti-fimbriary antibodies (F4, F5, F6) against ETEC in pigs and cattle.

The purpose of the research and the originality of the thesis were, first and foremost, to observe whether, even in the case of Salmonella-like bacteria, it is possible to produce, isolate and use specific vitelline antibodies. For this purpose, we analyzed the isolation protocols described in the literature for choosing the most appropriate method of isolation of the vitelline antibodies and will be used throughout the research. This step was performed using eggs from unimmunized birds from three species of birds: chickens, quails and ducks, choosing at the same time the species most suitable for further experiments.

The antibodies obtained from the isolation protocols were characterized morphologically by the electro-microscopic study aspect of originality regarding the vitelline antibodies.

An important objective of the research was the induction and characterization of the humoral immune response given by Salmonella gallinarum for this, it was necessary to make experimental batches of birds that were subjected to a hyperimmunization protocol to determine the total and specific antibody titer of both the serum of birds and from the calf of the eggs produced by them.

The obtaining of the vitelline antibodies was followed by the characterization step by the electron-microscopic examination and the specific anti-Salmonella antibodies were used in immunodiagnostic reactions as well as in the prophylaxis and therapy of salmonellosis.

Another important goal I wanted to achieve was the demonstration that vitelline antibodies can be produced against other categories of antigens than microbial ones, trying to produce vitelline antibodies against toxins such as viper venom, as well as testing their activity by performing the immunoprotection assay on laboratory mice. Thus the antibodies obtained can be successfully used in immunodiagnosis, immunoprophylaxis and immunoprotection.

During and after the completion of the PhD period, I published numerous articles in the thesis and a monograph on this topic.

The second part of the qualification thesis supposes a synthesis of the main researches carried out over time in the professional career, after the support of the doctorate.

This period captures both the development of research topics related to the field of microbiology and immunology with emphasis on the use of biotechnologies in the two fields, but also in the field of environmental biotechnologies.

Part of the research was part of the field of Biotechnology in immunology, this includes a significant part of my research because the doctoral thesis was in this area it was normal to continue the research in this field, or to return here when needed. The first project to which I had the status of project director was part of this field of biotechnologies in immunology: CNCSIS project type At code 421

/ 2002-2003: "**Production, isolation and purification of polyclonal antibodies from eggs of hen, quail and duck**", but because there is an interrelation between these 3 areas of the research we have carried out, we will return again to applications of antibody uses, this time in environmental biotechnologies.

In this chapter of **Biotechnologies in immunology** we have addressed topics related to the peculiarities of the immune system in birds, the characterization of IgY avian antibodies with their techniques for obtaining and isolating them, but especially with their applications.

Another part of my research was in the field of **Microbial Biotechnologies**, which includes all the uses of microorganisms, from antibiotic, probiotic and sometimes pathogenic activity. In this area of research there are some of the papers I have published, but more importantly most of the diploma projects and dissertation papers I have led.

Here we have tackled various topics, starting from the antimicrobial activity of some vegetable oils or extracts, or of the bee products, to the use of microorganisms as probiotics with their characterization, studying the survival capacity in the digestive tract or the action of antibiotics.

A third direction of research of a table for the environment: **Environmental biotechnologies**, which can be created in collaboration with the private environment in this field. Then continued through the project PN II Partnerships in priority areas "**Innovative technology of ex-situ bioremediation of hydrocarbon-polluted soils (BIORESOL)**" in the care I had the responsibility of USAMV Cluj.

Also from previous experience in 2012 we proposed a research topic accepted as internal and financial awarding of USAMV Cluj "**Production and in vitro testing of IgY antibodies against metanobrevibacter ruminantium and metanobrevibacter gottschalki, microorganisms involved in methanogenesis in ruminants**".

Each project is a completion with the publication of the ISI article as well as certain BDI articles.

The third part of the qualification thesis is a synthesis of the activities and research directions that I propose to carry out as my PhD supervisor, from the point of view of biotechnological applications in microbiology and immunology. Given the potential of these fields for research and development, the involvement in many fields of biological sciences, I consider that I have maximum responsibility for research in the field of biotechnologies.

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