BioS Reports

glimpse into the activities of the Master's course „Biology in Society"

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EXCURSIONS AND OTHER NEWS

Small insights in students' or professors' points of view, field trips, and other stuff we do.

Life as a Scientist – Interview With Prof. Zierau

Hello Prof. Zierau, please introduce yourself and tell us about your research topic.
My Name is Oliver Zierau I studied veterinarian science but I have been working in biology for more than 20 years. My research topic is animal physiology, more specifically endocrinology in mammals and physiology of ingestion. Some of my research is also focused on animal welfare aspects.

What is one important thing you have discovered during your career as a scientist?
If I am honest, I would have to say that science nowadays is almost always teamwork, that means for example that I think they shouldn't give Nobel prizes anymore to single persons but only to the team/group. But I guess that wasn't your question. I am pretty happy about a study I was involved in, where we found, that the estrogen receptor-ß activation stimulates skeletal muscle growth and regeneration, which was very surprising at that time. We expected if at all rather activation of the estrogen receptor α would have that effect. Hormones like estrogen have multiple functions in the body. This finding brought us one step further to understand which effects can be triggered by estrogen and how exactly the information is processed by the cell. Or a study that is not published yet where we showed that apes unlike humans really like the taste of tannins. Therefore, I presume gorillas would order barrique wines in a restaurant.

What do you like most or least about your job?
I like to quote Isaac Asimov for this who once said: "The most exciting phrase to hear in science, the one that heralds new discoveries, is not 'Eureka! ' but 'That's funny…'"
I like the fun and thrill to research new things, find out new things and the possibility to so. I also like teaching and discussing with students.

Is there anything you dislike about academia/science?
This is easy, all the administrative burden which grows every year and gives you less and less time for research.

You were recently awarded the position of Professor Extraordinary at the department for biochemistry of Stellenbosch University in South Africa. Why did you receive it and what tasks does it entail?
I have been cooperating with a group from Stellenbosch for almost 15 years. Through this connection it happened that I was asked if I would like to teach students and mentor a younger South African researcher. Because I know her very well and I think she has quite some potential, I was happy to take this challenge. This on the other hand resulted in me being granted this position, but it is a pure honorary passion.

If you could not be a professor, what job would you like to do (outside from science)
Where do I start, as I said I studied veterinarian medicine, and my plan was to become a wildlife vet. However, as a child I always wanted to become an artist, a painter to be more precise. This would still be something I would love to be able to do.

What is your favourite book?
Fictional, still "Lord of the Rings" which I read first 40 years ago. Non-fictional "The selfish gene" by Richard Dawkins or "The third Chimpanzee" by Jared Diamond.

Which book would you recommend anyone to read?
Beside the ones above, I would say "Full House: The Spread of Excellence from Plato to Darwin" by biologist Stephen Jay Gould.

What new thing would you like to learn?
Sailing, maybe I will find time in the future to do so.

ANIMALS AND MONEY

This part of BioSReports unravels interesting relations between animals and the economy.

How Alpacas Act as Life Savers in Cancer Immunotherapy

by Charlice Hill

Cancer is one of the most widespread diseases worldwide and new tumor types evolve over time, creating a global health care challenge[1]. Several treatment approaches, such as surgery, drug treatment, external radiation therapy and immunotherapy are available. Cancer shows an increasingly diverse disease pattern. Today`s challenge is offering individualized treatment setups for patients. Modern approaches, such as immunotherapy are integrated into traditional cancer treatments.

Immunotherapeutic agents for cancer support the body´s immune system, to fight against cancer cells. Full-size antibodies are proteins produced by the immune system to fight off foreign substances like viruses or bacteria. Therapeutic antibodies can be used in immunotherapy to treat solid tumors[2]. Those antibodies can identify tumor cells and induce cell death or deliver chemotherapeutic agents directly to the cancer cells. Despite the wide use of antibodies in oncology, some antibody-related obstacles remain. Due to their large size, it takes long for them to travel through the blood and through tissues and there is a high chance that they randomly bind to other cells instead of arriving at the targeted cancer cell[3,4]. A promising alternative to solve these size related issues are small antibody fragments called nanobodies. The size of nanobodies is approximately 10 % of a conventional antibody, which makes them travel faster through blood and tissues and bind more specifically to the targeted cancer cells[3]. They can either function as regular antibodies and directly detect tumor cells, or bind to full-size antibodies, which can be used to track the distribution of antibodies in the body and make sure they arrive where they are needed.

Nanobodies are produced in and isolated from the blood of Camelids, such as alpacas[5]. Originating in South America, Alpacas (*Lama pacos*) are traditionally used for their wool, as pets or as pack animals[6]. To produce nanobodies in alpacas, so called antigens are introduced into the animal, thereby stimulating its immune system to produce antibodies that can bind to these antigens and fight them off. This process is comparable to the functioning of vaccinations[5]. Blood samples are purified and alpaca DNA as well as antibodies are isolated. Isolated antibody DNA is introduced to artificial cellular systems, called cell culture. Those cultured cells are used to categorize and analyze the antibodies that were produced by the alpaca. With that information antibodies can be modified to create nanobodies to fit specific therapeutic needs[5].

Their high chemical and thermal stability enable their broader application and simplify production and shipment procedures. Nanobody DNA can be brought into microorganisms such as yeasts or *E.coli*, which then produce the antibodies. This makes the production of nanobodies comparably fast and cost efficient and transferrable to an industrial scale. In consequence, costs for immunotherapies which are currently highly expensive can be reduced.

The use of nanobodies could have an extensive influence on animal experiments. Full-size antibodies for therapeutical treatments are mainly produced by donkeys, goats and sheep [7,8]. To produce these antibodies, animals are treated with antigens and euthanized after the trials are finished. The production of conventional antibodies is an elaborate and agonizing process which requires many animals. To produce nanobodies however, alpacas are treated with antigens only once. After blood sampling no further trials are necessary and the animals go back to farmers. The established use of nanobodies over full-size antibodies could greatly reduce animal suffering. Nanobodies have shown promising results in diagnostics as well as in therapeutical methods. Therefore, nanobodies could generate a new theranostic frame for cancer management with improved and personalized medicine opportunities. Moreover, this technology can be seen as a bridge solution on the way to animal-free nanobody production.

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Healthy Cabbages – Lab Rotation

by Nele Kheim

I did my lab rotation at the Chair of Plant Physiology supervised by Dr. Susann Auer, initially thinking I would perform research on plants. However, I did not.

The Chair of Plant Physiology of Prof. in Ludwig-Müller does lots of research related to the topic of clubroot disease. Clubroot is a common plant pest caused by a unicellular protist that affects the harvest of many cabbage plants. To fight plant pests, natural antagonist organisms called biocontrol agents are being researched, which are less damaging and environmentally pollutive than common pesticides.

Acremonium alternatum, a fungus, was proven to protect cabbage plants against clubroot disease. Therefore, it acts as a promising biocontrol agent and could potentially be applied in agriculture. That is where my lab rotation begins. I investigated if sour or alkaline conditions influence the growth of the fungus. This could be important for the industrial production of the fungus. To assess the growth, I measured diameters of *A. alternatum* growing in different pH conditions. I compared how the respective condition influenced the growth and found that fungal colonies grew bigger, when pH was more alkaline. With my labrotation I hope to have contributed to supplying the world with healthy cabbages.

Figure: That is what the fungus looked like growing at pH 8 for approximately 3 weeks.

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