BioS Reports

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

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ANIMALS AND MONEY

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

Donkey Skins for Eternal Youth

Cosima Sagurna

More and more donkeys are killed across the globe to meet China's demand for their skins in the production of Ejiao. Ejiao is a hard gel used in Traditional Chinese Medicine. The trade is profitable to the people producing Ejiao but detrimental to donkey populations and their owners. The animals are needed to support rural communities. Especially in African countries the loss of equine populations could lead to economic ruin for rural communities.

Traditional Chinese medicine and its use of animal derivates dates back over 5000 years[1, 2]. One such animal derivative to produce Ejiao is donkey skins. Ejiao is a Gelatine substance used in various health and beauty products for its medicinal and rejuvenating benefits[3]. Over the last decades, the demand for Ejiao has increased exponentially, possibly because people are getting older and have more money to spend due to economic growth[3]. The increasing demand makes donkeys very valuable, however, the donkey skin trade poses economic and social problems.

From 2013 to 2016, Ejiao production in China has increased by 20%, from 3200 tonnes to 5600 tonnes annually[4]. To keep up with this demand, roughly 4,480,000 donkeys had to be killed every year, since one donkey hide can produce about 1.25kg of Ejiao[5]. Up to 20% of donkeys die before they even reach the slaughterhouse, as they are transported under precarious conditions[4]. Therefore, the real number of demanded donkeys is likely even higher than 4.48 million. Only 1.8 million of those donkeys are domestically sourced in China itself. The rising demand of this scale puts China's and consecutively the world's donkey population at risk[4, 6, 7].

The calculations show that around 2.5 million donkeys must be imported from somewhere else. This creates a lucrative market. Sub-Saharan Africa exports about 1.8 million donkey hides to China annually[8]. In many African countries like Kenya, Chinese-operated slaughterhouses kill hundreds of donkeys daily[2, 4]. However, killing all these donkeys poses several problems for the local people. In many low- and middle-income countries, donkeys are relied upon by the rural population for agriculture, transport and construction[10, 6, 11]. In Ghana, owning a donkey is estimated to save an adult about 5 hours of labour a week, children 10 hours[12]. The livelihood of approximately 158 Million people in Africa alone depend on them.

The high demand for donkeys has opened up the market for middlemen. Middlemen have connections to the Chinese trade and can sell the donkeys to Chinese operated slaughterhouses. Selling a donkey to a middleman gives the individual a momentary money flush, but in the long run it could mean financial ruin. If farmers are unwilling to sell, donkeys are often even stolen from them[4]. Smallholder farmers lose an average of $109.73 per month for every donkey they lose through sale or theft[13]. The income generated by the help of the donkeys enables owners to invest in savings schemes and contributing to building stronger economies within their communities[4]. Without them, more hands are needed to make up for the loss. This often means that children are unable to attend school, continuing the cycle of poverty. The result is that millions of dollars are potentially being taken each year from the communities that can least afford to lose them[4]. Because of the negative impact on their citizens, many African countries have banned the trade; Botswana, Uganda, Tanzania, Niger, Ghana, Gambia, Ethiopia, Burkina Faso, Mali, and Senegal all made the export of donkey hides illegal[14]. The trade doesn't only negatively affect individuals dependent on equine support: the demand for donkey hide is driving donkeys to extinction.

Intensive farming of donkeys is also difficult as the species is not well-suited for it. Donkeys have complex nutritional needs, a long gestation period and specific social needs[16, 17]. It could take around 15-20 year to create a sustainable Chinese farming system able to meet their demand for hides without relying on other countries[3]. In those years, the damage to the world's donkey population and those that rely on the animals will already be irreparable. The shrinking donkey population is even affecting the end of the supply chain. Ejiao companies, have reported dropping revenues since 2018, due to shortage of donkey skins. They also predict their profits to decrease further in the future[4].

This essay shows that while killing donkeys to make Ejiao of their skin is profitable at first, it is unsustainable and damaging in the long run. The problem presented in this essay is not an easy one to fix. „While demand exists, so will the route to fuel it"[15]. Closing down slaughterhouses and legislating the trade of donkey hides to China has shown limited success. Efforts to control the resulting illegal market are needed.

Global awareness is therefore of the greatest importance. Partnership across NGOs, agencies and government remains essential not only in the countries currently negatively affected by the trade, but in western countries as well, since the diminishing donkey population is a growing problem. Further research also needs to be conducted to find sustainable alternatives to Ejiao. A promising lead is the Chinese cellular agriculture industry; advances are being made in the production of artificially grown, donkey-derived collagen [4]. This could mean a more sustainable, controllable source of Ejiao.

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EXCURSIONS AND OTHER NEWS

Small insights in student's or professor's points of view, field trips, and other stuff we do.

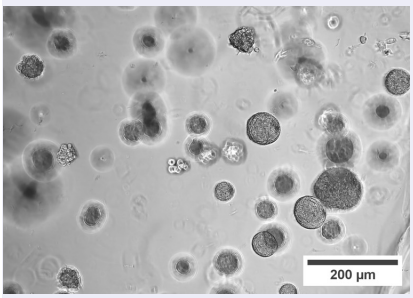
Cancer in a Gel – Lab Rotation

Emily Fichter

Cancer is one of the leading causes of death worldwide and accounted for nearly 10 million deaths in 2020 alone[1]. It is therefore an important topic of current research, with different approaches being considered to further optimise therapies and to achieve the best possible treatment outcome.

To get an insight into such research aspects, I completed my lab rotation at the Biotechnology Center (BIOTEC) in Dresden in the research group of Dr. Anna Taubenberger. They investigate how the stiffness of cancer cells and their surrounding tissue changes as they interact with each other, and how this stiffening or softening affects the metastatic potential and drug resistance of cancer cells. To study these effects, special 3D models are needed that can be applied in the laboratory and mimic the natural environment and growth conditions of cancer cells as accurately as possible. 3D models for cancer research are an important alternative to animal experiments. For establishing such models, it is important to test whether the cells can live in these environments or whether the artificial conditions need to be optimised for the cells.

In this lab rotation, I therefore constructed and tested such a 3D model in the form of a gelatine-based hydrogel. This represents an approximately 0.5 cm small, stable networked gel for cell cultivation. In prepared gels, I separately cultured prostate cancer cell lines together with fibroblasts. Fibroblasts are cells that are part of the tissue surrounding cancer cells. During cultivation, I investigated the cells' growth, division, and fusion into three-dimensional spherical structures (spheroids), to test their viability. It became apparent that although the prostate cancer cells divided and formed spheroids, the fibroblasts grew only poorly and died, showing that the culture conditions are not fit yet for all of the cells to survive. Even if further intensive research is needed, I hope to have made a first contribution in developing such 3D models to advance cancer research in the future.



Cancer cells in a 3D gel, fused into spheric structures.

EXCURSIONS AND OTHER NEWS

Is Chicken Döner Really Made of Chicken?

Layanne Abu-Bader

As part of our second semester studies, BioS students could choose to take part in the practical course "genetic forensics", led by Dr. Heiko Stuckas. In this course, we learned a special technique to identify the species from which a DNA sample has come from. This technique is called DNA barcoding, and it uses genes found in the mitochondria that are so highly conserved that all animal species have them. Every species will have a slightly different DNA sequence for these genes, which is how we can use them as a sort of DNA "barcode." In the case of this course, the two genes we used were the mitochondrial CO1 and 16S genes. Each student worked with various food samples to determine which species the food contained. My sample was a chicken doner. I bought the sandwich from a nearby restaurant and carefully picked a tiny sample to take back to the lab, while I saved the rest for my lunch, of course.

In the lab, I extracted the DNA from the sample and amplified the two barcoding genes by polymerase chain reaction (PCR). Those two amplified barcoding genes were then sent to the Senckenberg Institute here in Dresden to determine the exact DNA sequence of the sample overnight. With an online tool, we compared our DNA sequences against sequences from a variety of databases on the next day. Both of my sequences brought up the same result when I entered them into the online tool: *Gallus gallus* 99% match. So my chicken doner was, without a doubt, made of chicken!

However, the same can't be said for my classmate, Sebastian, who sampled beef doner and received a less promising result. His doner definitely contained cow DNA, but also turkey DNA and traces of some other surprising species. Whether this is a result of cross contamination, scientific error or something else, we don't know for sure. Hopefully, the new BioS students will test some doner again next year, so that we have an answer once and for all!