

ROSLIN TECHNOLOGIES: ACCELERATING IMPACT

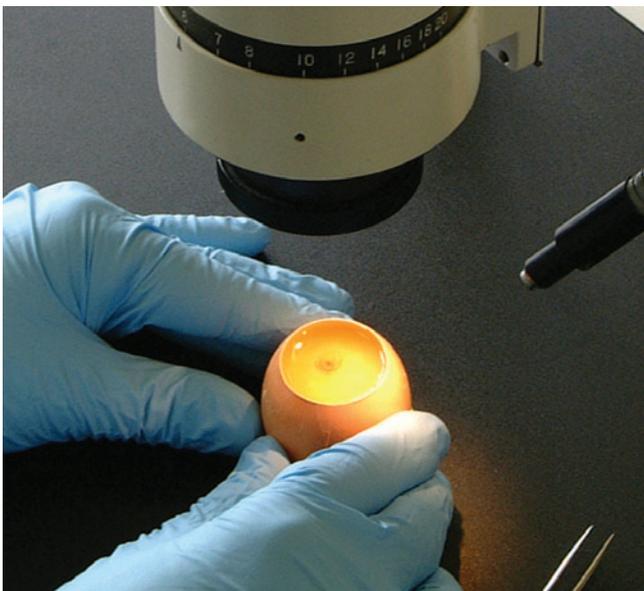
The new commercial arm of The Roslin Institute is open for business, and promises a step-change in delivering impact from cutting-edge animal agritech research

There is little doubt that innovation in agritech research can play a vital role in meeting a number of the grand challenges being faced globally, and the universities and research institutes in Europe are well placed to lead the way. However, although the research being conducted is frequently excellent, the traditional process of delivering industry impact from that research has often been highly cumbersome and inefficient. As a sector we need to do better.

March 2017 saw the establishment of a new commercialisation model that is expected to deliver a step change in the efficiency with which research excellence in animal biotechnology can be commercialised.

Roslin Technologies was formed as a joint venture between the University of Edinburgh and two external investors and commercialisation partners with strong global industry networks and a track record of successful commercialisation in animal agriculture. The goal was to create an agriculture biotechnology company that focused on pioneering new technologies for enhancing the sustainability and productivity of livestock production on a global scale. The starting point for this goal was the knowledge and expertise held within the world-renowned Roslin Institute and Royal 'Dick' School of Veterinary Studies.

Roslin Technologies is based at Easter Bush near Edinburgh, the Scottish capital, which is a science zone that is thought to host the largest concentration of animal science expertise in Europe. It has also received €12m of seed funding from investors to kick off its activity – so it's a great start given the goal.



Extraction of early-stage chicken cells for biobanking

With funding now in place, Roslin Technologies is developing new services and products across a range of areas of relevance to animal breeding and both animal and human health, which are developed around existing capabilities and expertise at The Roslin Institute and adjacent veterinary school. Examples include genome sequencing and genotyping, bioinformatics and the application of advanced genomic approaches, veterinary diagnostics and vaccine production. The company will also form three product platforms which will be used as a starting point for the development of a range of new services, which are avian biobanking, chicken biopharming and a new Porcine Genetics Research Centre.

The 'Frozen Aviary'

For many animal species long-term storage has been possible for decades through freezing semen, ova or embryos, but until recently it has been a bigger scientific challenge for poultry. A new service from Roslin Technologies focuses on cryopreserving cells from early stage embryos, called primordial germ cells, which have been extracted from fresh fertilised eggs using an approach developed at The Roslin Institute. The technology can be used to preserve a variety of poultry breeds and genetic lines, from rare and endangered species through to valuable commercial lines, which can then be reconstituted when required. It will be particularly useful for commercial breeders or organisations that may wish to develop ways of safeguarding against future disease challenges or potential losses in genetic diversity or breeds, in a practical and cost-effective manner. Dubbed the 'Frozen Aviary', Roslin Technologies is also seeking strategic partners in government and philanthropy for extending the project internationally to deliver a model akin the Svalbard Global Seed Vault as a failsafe cryopreservation service designed to preserve avian diversity in the event of natural or man-made disasters.

Avian biopharming

In the second product platform, Roslin Technologies is commercialising a new approach that will allow substantial steps to be made in reducing the cost of producing therapeutic proteins such as biologics for use in maintaining animal and human health. The platform is based on producing the proteins in eggs that have been laid by transgenic hens, and is built around proprietary knowhow and expertise that exists at The Roslin Institute. Biologics are very large, complex molecules that are currently manufactured in living systems such as micro-organisms, plants or animal cells, in relatively small quantities. As a result, the successful commercialisation of anything other than the most profitable medicines is difficult. Due to the larger volume of protein that could be produced using the new platform, it could offer the means of not only reducing the cost of existing drugs production, but also the cost-effective production for a host of new targets of relevance to both human and veterinary medicine.

The first target protein in the product pipeline is CSF1-Fc, a cytokine that is a new potential therapeutic drug that has been shown to enhance liver regeneration following disease, poisoning or partial liver transplant in humans, in companion animals following acute liver failure, and as an immunomodulator in pigs. The platform also lends itself to producing other types of proteins, including biosimilars and biobetters, and is also offered as a contract manufacturing service for pharmaceutical companies. The project is boosted by the expertise of the world renowned Roslin team, and also through strong collaborations with the National Avian Research Facility (NARF), a state-of-the-art research facility with a strong focus on using advanced technologies in chicken, which is also located on the campus.

Porcine Genetic Research Centre

Building upon the strength of porcine genetic research at the Roslin Institute, Roslin Technologies is planning the construction of a new state-of-the-art production unit to drive the revolution in porcine genetics. The centre will be a state-of-the-art high biosecurity facility for developing next-generation commercial breeding pigs and large animal biomedical models for research. As well as advanced imaging and monitoring capabilities, the centre will add value to existing breeding approaches by harnessing the world-renowned expertise at Roslin in using new breeding technologies.

Glen Illing, CEO of Roslin Technologies, said: "There will be room for 500 breeding sows in the facility, producing 12,500 to 15,000 piglets a year with whole genome sequencing being applied to every generation. There are not many places in the world where you can do that at present."

The unit will have world class phenotyping capabilities and will allow rapid scaling-up to commercial production of any successful model. Step changes in genetic improvements in the resistance and resilience of livestock to diseases are desperately needed in agriculture as antimicrobial resistance and vaccine failures are expected to propagate greater disease pressures in livestock populations in the future. Other areas of interest are key economic traits such as food conversion rates, growth rates and prolificacy.

The Roslin Institute has had recent success with using advanced genetic techniques to produce pigs that are resistant to Porcine Reproductive and Respiratory Syndrome (PRRS), and has an African Swine Fever (ASF) resilience model at an advanced stage. PRRS and ASF pose major animal welfare challenges and cost the global pig industry billions of euros each year, through mortalities and substantial reductions in feed use efficiency. Other control strategies, such as vaccines, have only have limited success to date. Such diseases can be especially disastrous for developing pig-producing economies where biosecurity standards are poorer and access to veterinary services constrained.

Large animal models of human diseases for the biomedical industry could help dramatically increase the success rates in late stage clinical trials for new drugs and therapeutics aimed at improving human health. Models under development include ones for neurodegenerative, cardiovascular, metabolic and respiratory diseases. Roslin Technologies already has proprietary gene-edited animals in commercialisation on the back of strong commercial interest from pharmaceutical companies in the US and Europe. Aside from direct sales of the animals to clients in academic research and industry sectors, an array of services will include model customisation



"Pig 26" - bred at Roslin to resist African Swine Fever (ASF) infection

and development, off-site housing and husbandry facilities for developed animal models, as well as facilities and support for regulatory compliance to conduct trials using the models.

Delivering impact

The application of new tools in genomics, gene-sequencing and phenotyping offer real opportunities to boost food production and security by decreasing production losses and waste for animal production, as well as improving the welfare of the animals being produced. Animal models also offer real opportunities to improve human health through the low-cost production of therapeutic proteins and models to help elevate the impact of disease. The establishment of Roslin Technologies will help deliver real industry impact from such advances, and offer a step-change in the efficiency of commercialisation from world class research conducted in Europe.



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