The Roslin Institute (1993-) [1]

By: Bartlett, Zane Keywords: Dolly the sheep [2] Polly the sheep [3] Human Factor IX [4]

The Roslin Institute was established in 1993 in the village of Roslin, Scotland, as an independent research center by the Biotechnology and Biological Sciences Research Council (BBSRC), and as of 2014 is part of the University of Edinburgh [5] in Edinburgh, Scotland. Researchers at the Roslin Institute cloned the Dolly the sheep [6] in 1996. According to the Roslin Institute, Dolly was the first mammal [7] to develop into an adult from the transfer of thenucleus [8] of an adult sheep [6] cell into an ovum [9] with the nucleus [8] removed. The Roslin Institute performs genetic and medical based animal studies to help investigate human physiology and medicine and to improve agricultural research. The Roslin Institute studies embryology [10], cloning [11], hormones [12], and genetic alterations in animals and techniques such assomatic cell nuclear transfer [13].

Prior to the establishment and naming of the Roslin Institute in 1993, theUniversity of Edinburgh [5] created the Institute of Animal Genetics [14] in 1919, the precursor to the Roslin Institute. In 1947 the Agricultural Research Council, later called the Agriculture and Food Research Council (AFRC), created the Poultry Research Centre (PRC) and the Animal Breeding Research Organisation (ABRO) as part of the Institute of Animal Genetics [14] to help farmers find efficient ways to produce more food and livestock. The AFRC changed the name of the Institute of Animal Genetics [14] to the Unit of Animal Genetics (UAG) and the University of Edinburgh [5] maintained its presence at the UAG. In 1985, the AFRC reviewed greater than thirty Institutes and Units, among them were the UAG, PRC, and ARBO. The review contributed to the closure of the UAG in the same year and the combining of PRC and ABRO with the Institute of Animal Physiology, located at the Babraham Institute in Cambridge, United Kingdom. The name of the new institute was the Institute of Animal Physiology and Genetics Research. In 1985, the staff relocated from ABRO to the PRC site located in Roslin, Scotland, and they formed the Edinburgh Research Station of the Institute of Animal Physiology and Genetics Research.

In 1992, the AFRC planned to separate the Roslin and Babraham Institutes. The AFRC provided each institute with unique objectives. The objective for the Roslin Institute was to focus on livestock improvements. On 1 April 1993, the officially named Roslin Institute formed as an independent institution owned by the BBSRC. In 1995, the Institute became a company limited by guarantee, which meant that it was a non-profit organization [15]. The Institute was sponsored by a Scottish Charity and funded by the BBSRC. In 2008, the Roslin Institute became part of the College of Medicine and Veterinary Medicine of the University of Edinburgh [5], and the old legal entity continued as the Roslin Foundation. In 2011, the main research center for the Roslin Institute moved from Roslin to a new building located in Easter Bush, Scotland, on the University of Edinburgh [5] Veterinary campus. As of 2014, the Roslin Institute remained affiliated with the University of Edinburgh [5] and received funds from the BBSRC and the Roslin Foundation.

Various committees and groups run the Roslin Institute. All of the committees report to the Roslin Institute Executive Committee. The committees include the Science Management Group, which leads research and sets scientific goals, and the Business Finance Group, which handles everything else relating to business and finances of the institute. A director or chairperson leads the institute´s executive committee and the director reports to the University of Edinburgh [5]. The director of the Roslin Institute in 2014 is David Hume.

The Roslin Institute was founded on six principles with the collaboration of the BBSRC. The first principle was to enhance animal health and welfare through knowledge of genetic factors affecting resistance to disease. The second principle was to enhance sustainability and productivity of livestock systems and food supply chains through understanding of reproductive and developmental biology. The third principle was to enhance food safety by understanding interactions between disease-causing organisms and animals. The fourth principle was to enhance human health through an understanding of basic mechanisms of health and disease and comparative biology of animal species. The fifth was to identify new and emerging process of infectious disease transmission between species, called zoonoses, and to understand how pathogens might cross from animals to humans [16]. The sixth principle was to enhance the quality of life for animals by studying the mechanisms and behaviors associated with optimizing their environment and life experiences. As of 2014, these goals organized the Roslin Institute.

Researchers have pursued those goals through experiments at the Roslin Institute. These include experiments performed on cow [17] embryos in 1993 by Ian Wilmut [18], William Ritchie, and Keith Campbell. These preliminary experiments led researchers to clone sheep [6] from differentiated cells in the experiment entitled "Sheep Cloned by Nuclear Transfer from a Cultured Cell Line" by Campbell, Wilmut, Ritchie, and Jim McWhir in 1996. The scientists developed the techniques used in this sheep [6] experiment that researchers applied to many future Roslin Institute experiments, including the cloning [11] of Dolly the sheep [6]. Campbell also formulated the plan to place cells in the resting state, called quiescence, or induced cellular stasis, necessary for transfer and cloning [11] of adult cells during the sheep [6] experiments. According to Wilmut, placing cells in quiescence was an important insight needed to understand the mechanics of cloning [11] and the cell cycle that are universal in mammals, including

humans [16].

Experiments conducted by the organization [15] included the "Viable Offspring Derived from Fetal and Adult Mammalian Cells" experiments in 1996. These experiments cloned sheep [6] from adult sheep [6] body or somatic cells. The scientists named the cloned sheep [6] Dolly. She was the first mammal [7] cloned from an adult differentiated cell. Dolly became famous internationally and the Roslin Institute received much recognition from the scientific community. The director of the institute at the time of the experiment was Graham Bulfield. Among the scientists in the experiment were Wilmut, McWhir, and Campbell, who had also contributed to previous sheep [6] and cow [17] embryo experiments at the Roslin Institute.

The work performed at the Roslin Institute spurred debates on the issue of cloning [11] human beings. Some people argued against the practice of cloning [11] animals because they said it would lead to cloning [11] humans [16]. Others claimed that cloning [11] would bring great advances. Many of the scientists who worked at the Roslin Institute in 1996 received phone calls requesting clones of deceased loved ones.

After the Dolly experiment, the Roslin Institute continued to clone animals. The Institute aimed to engineer animals to produce proteins that could act as medicines in large quantities. The animals could produce cheaper, purer, and non-contaminated pharmaceuticals. In 1997, the Roslin Institute developed a sheep [6] that produced a human protein in its milk in the experiment titled "Human Factor IX Transgenic Sheep Produced by Transfer of Nuclei from Transfected Fetal Fibroblasts." The Roslin Institute worked to transfer human genes [19] into animal cells (transgenic animals). For example, in 2000, Roslin researchers modified pigs to reduce the potential rejection rate of transplanted organs from other animal species (xenotransplanted) into humans [16]. However, a few scientists argued that altering and researching human embryos as opposed to animals could make more progress.

In the year 2001, the Roslin Institute contacted the licensing agency for clinics and research involving human embryos in the UK, the Human Fertilisation and Embryology Authority (HFEA), to receive a license to work with cloning [11] human embryos. The license was delayed for a variety of reasons. According to Wilmut, these reasons involved heavy amounts of regulatory paperwork as well as meetings with many committees and ethical assessments involving the HFEA. Furthermore, controversies were also present over the request to the HFEA to work on human embryos. For example, anti-abortion [20] parties criticized the Roslin Institute in 2002 for requesting permission to experiment on human embryos. In 2004, a research group led by Woo-Suk Hwang in Seoul, South Korea, reported to have cloned human embryos using somatic cell nuclear transfer [13]. The Journal retracted the paper after learning that Hwang´s group falsified much of the data. The political reaction from the Hwang scandal further delayed the Roslin Institute´s HFEA license, which it received in February of 2005. The Institute studied motor neuron [21] disease in humans [16] and how early development can affect this disease, but the Institute used donated embryos as opposed to cloned embryos. By 2013, the Roslin Institute no longer cloned animals, Wilmut left in 2005 to become director of the Centre for Regenerative Medicine at the University of Edinburgh [5] and most of the group members had moved on to other organizations.

Roslin researchers have further experimented with transgenic animals and genetic manipulation in animals. An example involves a type of chicken [22] that the Institute calls a genetically modified chicken [22]. Scientists have genetically altered these chickens so they do not transmit avian bird flu. Roslin researchers have also investigated animal behavior, for example, scientists at the Institute have investigated the role of the hormone [23] vasopressin in animal behavior and mating. According to Wilmut, the Institute also frequently receives correspondence in regards to animal cruelty and testing.

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Subject

Cloning [32] Genetic engineering [33] Roslin Institute [34] Campbell, Keith, 1954-2012 [35] Wilmut, Ian [36] University of Edinburgh [37] Human cloning [38] Human Fertilisation and Embryology Authority [39]

Topic

Organizations [40]

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