SCIENCE

Next great discovery could be on the farm

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MARCIO JOSE SANCHEZ/AP FILE PHOTO
Chickens are the only animals besides humans known to develop ovarian cancer.

Watch out, little white lab mouse. Barnyard animals might get your job.

A group of agricultural scientists says farm animals are underrated as an experimental resource for improving human health, and they're vying for some of the billions of dollars the government invests in biomedical research.

The human-sized hearts and blood vessels of pigs are well-suited for the study of cardiovascular disease, they say.

Cow embryos have the ability to start forming body structures in lab dishes, where they are easy to observe.

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"Farm animals are more closely related to humans genetically and physiologically," said Jim Ireland, a professor of animal science and physiology at Michigan State University, who adds that at least 17 Nobel Prize winners used barnyard species in their experiments. However, "most of the research dollars have been invested in using the mouse."

Mice, of course, have many advantages as research tools. Hundreds can be housed, fed and scrutinized for the same cost of studying a single pig or cow. Research labs are organized around mice, and an entire industry has sprung up to supply the critters in endless genetic variety and all the materials needed to study them.

At the University of California, Los Angeles, mice are central to about 1,000 of the 1,200 research projects involving live animals, and many of the rest use rats, said radiation biologist William McBride, chairman of UCLA's animal research committee. The small rodents are more practical. "We don't have green fields," McBride said.

Livestock can be useful in other ways, agricultural researchers say. They can be studied for months or years, with their barnyard lives interrupted for blood tests and other medical exams. Some farm animals live in state-of-the-art facilities that meet National Institutes of Health guidelines. When the research is over, many return to herds.

Dozens of land-grant universities raise farm animals for agricultural research, and some of the studies have become so sophisticated that it's almost impossible to ignore their implications for human health.

Notably, artificial insemination and in-vitro fertilization techniques used in people were developed by ag scientists to help cattle breeders improve the quality of their herds.

Biologist Russ Hovey's interest in dairy production led him to study mammary gland development in cows and sheep. As he was pursuing a doctorate, he realized the genes and hormones he was focusing on could help explain human breast cancer development.

As part of the animal science department at the University of California, Davis, Hovey is using pigs to find the hormones and genes that trigger changes in breast development and hoping to learn what goes wrong in human breast cancer. "We know the human is different from the mouse," he said. "We really should be asking what other species might look more like a human."

For Animesh Barua, who investigates reproductive immunology at Rush University Medical Center in Chicago, the answer is white leghorn hens.

About half the hens develop ovarian cancer by age 2 or 3. That makes it possible for Barua and collaborators at two University of Illinois campuses to track the chickens from the moment they are hatched until they become ill.

Barua has found a protein that circulates in the blood when the hens are in the early stages of ovarian cancer. The team is studying more hens to see if the protein can be used in an early detection test for women analogous to the prostate-specific antigen test that can flag prostate cancer in men.

Barua is using hens to develop an ultrasound exam to pinpoint the blood vessel growth that precedes deadly tumors. Finding early signs of ovarian cancer is crucial, he said, since "this is one of the very difficult malignancies that you cannot detect" until it is too late.

There is an added benefit to applying biomedical studies to existing livestock research—a chance to tap into the NIH's multibillion-dollar research budget. Ag scientists have suffered a 44 percent cut in federal and state research funding over the last two decades, a recent report found. Animal science academic faculties at larger land-grant universities are half the size they were 30 years ago, and entire breeds of livestock are disappearing from campuses, the report says.

"The reality is, we need the money," said North Dakota State University animal physiologist Larry Reynolds.