

Intellectual Property Aspects of Sexed Semen

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Introduction

Over the decades there have been hundreds of patents issued concerning sexed semen, most of which can be ignored because they do not involve sperm sexing procedures currently in commercial use, and furthermore have no utility because the procedures don't work. However, hundreds of patents also have been issued relating to currently used, efficacious procedures. Some of these have expired, some have contributed to improving sperm sexing procedures, and others probably could be challenged on the basis of utility, or concern patenting things that are obvious or not at all new.

Background

The most important patent concerning currently used sperm sexing procedures was filed in 1991 by the United States Department of Agriculture with Lawrence Johnson as the inventor. The procedure patented was the first (and broadly speaking still the only) procedure that results in efficacious separating of X-and Y-sperm that subsequently can be used for fertilization of oocytes. Since for practical purposes patents expire after 20 years, that technology is no longer patented. However, there have been many changes to improve sperm sexing procedures since 1991, and most of those changes are subjects of newer patents that have not expired. It is a bit tricky to determine exactly what is and what is not patented, and to determine the validity of some of the patents, because some of the claims seem obvious (to some people) and therefore are not patentable. All of this has resulted in a number of lawsuits.

These lawsuits are extremely expensive, usually costing millions of dollars, but that is the way that most disagreements over patents get resolved. Once a patent is issued, it is relatively rare for the U.S. Patent Office to resolve disputes or invalidate patents.

Why are there so many patent issues with sexed semen? At one time, most agricultural research was funded by federal and state governments by grants and other support to experiment stations, universities, and government laboratories. These non-profit entities did not patent research findings, so anyone could use the results of experiments. Over the past 50 years this type of research funding for agriculture decreased greatly, with the idea that private industry would step in. This is exactly what happened with developing sexed semen for commercial use. The original patent for sexed semen was licensed by USDA to 3 private companies: Mastercalf in the United Kingdom for in vitro fertilization of cattle oocytes with sexed semen, Genetics and IVF in Virginia for human applications, and XY, Inc. in Colorado for applications not involving human sperm.

XY, Inc. ended up buying Mastercalf, and so controlled the licenses for all non-human applications. Originally, the Colorado State University Research Foundation owned a percentage of XY, Inc., but decided that it was inappropriate to own such a business, so divested the interest to private investors. XY, Inc. was eventually sold to Sexing Technologies in

Navasota, Texas, who currently hold hundreds of patents related to current procedures for sexing non-human sperm. Many tens of millions of dollars were invested by the investors who owned XY, Inc. and subsequently, Sexing Technologies, and they have benefitted from the huge investment and continue to do so.

Before being sold to Sexing Technologies, XY, Inc. sublicensed this technology to companies in various countries including the United Kingdom, Argentina, Canada, and the United States. Most of these sublicenses still remain in effect. After purchasing XY, Inc., Sexing technologies developed a different business model, and contracts were developed to sex semen with various companies in a number of countries including the major bull studs in the United States. The exact structure of those contracts is proprietary and likely varies from company to company. However, in most cases, it is known that Sexing Technologies sets up laboratories close to sites of semen collection, and the semen is sexed by Sexing Technologies employees using their equipment. The bull studs collect and partially process semen before delivering it to the Sexing Technologies facilities, where the semen is sexed and returned to the bull studs for final processing including freezing in most cases. Sexing Technologies also collects, sexes and freezes semen at their Texas facilities.

Current situation

For practical purposes, Sexing Technologies controls all commercial sexing of non-human semen via licenses or contracts. They also own or control the companies who manufacture nearly all of the equipment used for sexing sperm.

The above situation has many characteristics of a monopoly, and there has been at least one court case based on monopoly issues. Various potential modifications of how sperm are sexed are being developed by companies, probably including Sexing Technologies; and some of these may end up as commercially viable alternatives to the methods currently in use. However, there likely will continue to be legal battles on top of the technical issues involved with commercialization.

Current situation for farmers and ranchers

In the United States and many other countries, sexed bovine semen can be purchased from a number of sources and semen can be shipped overnight for sexing and freezing by Sexing Technologies at reasonable cost. Sexed semen can be used to inseminate cattle with no limitations on the resulting calves. According to some interpretations, sexed semen cannot be used for superovulation or in vitro fertilization unless it is specifically processed for those purposes (e.g. more sperm than normal, per insemination dose); or where there is permission from Sexing Technologies for such use, possibly involving extra payments. These restrictions may not apply for sexed semen purchased from companies licensed by XY, Inc before it was purchased by Sexing Technologies.

Future

As best as I can determine, the above represents the current situation for using sexed semen. These issues may or may not change in the near future. The current technology for sexing sperm has one huge limitation in that sperm are individually sexed one at a time. Although the equipment used is remarkably rapid, methods likely will eventually be developed so that

thousands or even millions of sperm can be sexed simultaneously, rather than one at a time. It is likely that several companies are working on such approaches, which likely will involve a whole new set of intellectual property issues.