Data driven decision making

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Abstract

When I began my veterinary career in the late 1990s there was a lot of talk about production medicine in food animal medicine. And while the profession has been evolving since it began, I think at that time there was a real struggle to establish just what production medicine was. As many veterinarians described what they did as herd advisors or consultants, it was common to declare our role was to assist with establishing herd health protocols, such as vaccination or treatment protocols, and then help analyze whether those protocols were effective or not. The only problem was our evidence of whether something was working on-farm was slim to non-existent. Or, our evidence was either statistically irrelevant or incorrectly interpreted.

In the early 2000s several production medicine-oriented veterinarians began working towards improving the data we had available to evaluate herd performance and improving our ability to make good management recommendations. This started with improving our farm records systems and then developing additional analytical programs to improve the efficiency of analyzing farm records. The final step to using data to make decisions is to improve our knowledge of statistics and our ability to accurately interpreting farm data.

Key words: dairy, production medicine, data, management, decisions

Introduction

The first step in "fixing" any problem is defining the problem. For many veterinarians attempting to advise their clients the first challenge is having data to analyze. This is a multi-factorial issue, including the farm doesn't record any events; the records are in an antiquated system or not even recorded in a computer; the herd management software doesn't do a good job of capturing the event data; or the veterinarian doesn't have the skills to summarize the farm data.

One problem with getting data to analyze is related to herd size. NAHMS 2014 [5] identified the percentage of dairy herds under 100 cows using a computer record system was less than 33%, while 68% of herds of 100 to 500 cows and 98% of herds over 500 cows used computer records. Historically this certainly presented a challenge for many veterinarians in regions with smaller herds; however, the trend is clearly towards increasing herd size which will lead to more herd data available to analyze. The cow-calf sector is also challenged by a lack of computer records; however, these operations are also continuing to grow, and more and more use a computer system each year.

Good Health Records

The second problem facing food animal veterinarians attempting to analyze herd data is having computer systems which do a good job of capturing individual animal data. Most herd records systems were developed as a replacement for a written notecard record system. They were meant to record the life cycle of the cow which revolves around reproductive records. When did she calve, get bred, pregnancy diagnosed, dried off and repeat? Some people might have gone the extra step of recording a treatment for something like mastitis, but it was rare. But the area farm records analyze the best is reproduction. And many programs do a pretty extensive job of analyzing reproduction. They can dissect the outcomes of breedings, pregnant or open, by technician, heat cycle, breeding number, breeding code, calendar month, etc. But the ability to evaluate the outcome of health events didn't exist, which led Dr. John Wenz and Dr. Sarah Giebel at Washington State University to secure USDA funds for a project titled "Good Health Records".[4]

The Good Health Records study focused on a couple of key areas. Due to the lack of structure in commercial farm records programs it became apparent that a very consistent data entry protocol was required to get the records into a standardized format, which then allows for analysis in Excel pivot tables or a secondary analytics program. Secondly, the study identified that recording data in a consistent, "good" manner didn't take the dairy personnel any longer than it took to record data poorly. And while recording no data does take less time, it really isn't acceptable for milk and meat quality assurance and residue avoidance. As outlined in the American Association of Bovine Practitioners Drug Use Guidelines for Bovine Practitioners and Establishing and Maintaining the Vet-Client-Patient-Relationship in Bovine Practice,[1] it is the farm's responsibility to record treatments or "health" events and it is the farm veterinarian's responsibility to review those records and verify the farm is following their prescribed treatment protocols.

The Wenz-Giebel Good Health Records Project really focused on a core problem with herd management programs. When one mingles in the world of data warehousing professionals and statisticians, there is a process for how data should be stored in order to allow a person to analyze such data. This is called the standardized methods of data storage. What it means is, the records are parsed out in a standardized

approach so that each column is a different piece of data such as treatment date, animal ID, disease, and treatment protocol. Unfortunately, many of the on-farm programs dominating farm records systems today are still fraught with breaches to this standardized approach, leading to a very tedious and time-consuming cleanup process in order to evaluate the data. Some of the program developers simply wanted to "allow flexibility" in how a farm records their treatment remarks, while others fail to maintain the discipline to keep data types separated in a consistent manner and allow deviations such as a treatment to be recorded under a disease category or vice versa.

Data Analysis

The next hurdle to analyzing herd data is efficiently analyzing the data. Farm records systems do very limited amounts of health data analysis, including a count of events by month or maybe a disease incidence by month. But for many veterinarians who want to evaluate if a program is working, we would like to evaluate a specific disease during a specific period, for a specific group of animals, and commonly be able to separate performance by other variables such as calf sex, technician, or treatment protocol. Additionally, we'd like to know what the outcome of a specific protocol is. These outcomes would include retreatment rates, recurrence rates, culling rates within a period post treatment, and case fatality rate.

In order to evaluate disease incidence, many of us initially turned to Excel and began charting our own disease incidence by month for each of our farms. Then to evaluate outcomes and get more indepth, we began learning how to use pivot tables. These are a very powerful tool which allow you to select which group of animals, diseases, treatments and related outcomes you want to look at to summarize the treatments and their outcomes. If you have not learned how to use pivot tables, which is common for the older half of our profession, you may want to learn more about how they work. The other possibility I would highly recommend is to find a technician who is good with Excel and let them learn how to run pivot tables for you. Our profession needs to do a better job of using non-DVM assistants to get more done at a better price for the customer and practice and doesn't tie up as much of the doctor's valuable time.

Databases

Some practices have gone so far as to develop their own databases to allow them to efficiently do indepth analysis for their clients. Databases allow us to look at how 1 disease or protocol impacts other performance such as milk production or reproduction, as well as the outcomes of those protocols. They are great at evaluating the differences in an on-farm trial in an efficient manner. On-farm trials can be difficult to accurately analyze and avoid all the statistics issues of bias,

power, and randomization, but will continue to be utilized and extremely valuable for making good decisions in tough economic times on increasingly larger farms. The downside to databases is it takes time, the technical expertise, and financial investment to get one developed. However, some of the most successful veterinary consulting practices have made this investment to the benefit of their clients and their practice.

For those consultants who don't have the people or resources to develop a database, there is one available for use by any veterinarian on a subscription basis. In 2015 a group of veterinarians frustrated with the lack of a health records analysis tool developed an analytical software as a service database affectionately called HEALTHSUM.[a] For those who are familiar with the DairyComp 305[c] BREDSUM command, which allows you to evaluate reproduction, the goal of HEALTHSUM was to allow evaluation of health events and the treatment protocols or other interventions which were recorded in the farm management program. Over the past several years they have continued to upgrade, modify, and expand the capabilities of the program, as well as a similar database called CALFSUM[b] for use on calf ranches.

Statistics

One feature available in the programs are performance charts with some statistic values to help guide you on how much of the differences seen are due to chance or due to a 65, 80, or 95% statistical significance. It is extremely important when we analyze herd data to keep variables in mind which may impact the likelihood that a difference is due to chance or not. This doesn't mean we need a 95% confidence in order to make a decision on-farm, but we probably would like it to be more than 70%. If it's a 50:50 chance there's a difference, then we should use caution in making a decision and the economic impact may dictate whether we continue such a protocol or not, or whether we gather more data to improve our power and predictability.

Type 1 vs Type 2 Errors

When making on-farm decisions we should keep in mind the impact of our decisions and this can go 2 ways, commonly known as a Type 1 or Type 2 error. A Type 1 error is when we make a change and it ends up being a mistake and therefore costs the farm money. A Type 2 error is when we decide not to make a change, but it turns out to be the wrong decision and costs the farm. One item to be aware of is that commonly a Type 2 error is more costly than a Type 1 error, but because we didn't make a change the losses are often hidden and not recognized. Dr. John Fetrow[3] has spent years trying to educate those of us in private practice on the effects of these 2 error types and their impact on farm profit or loss. The thing to recognize is that we often make Type 2 errors because we don't have the data or enough of it to show

the benefit of making a change and therefore, we don't make the change. Having data we can efficiently analyze is the best, or possibly the only, way we can avoid a Type 2 error other than making a lucky guess.

Conclusion

The economics of operating a dairy or ranch continue to be a challenge. According to a 2010 study by Dr. Kevin Dhuyvetter,[2] farm profitability was in the red 13 of the prior 22 years. However, there was a significant difference between high-profit herds and low-profit herds. Whenever low-profit farms run out of equity, off-farm income, or will power, the farm will be sold. In Washington State 80% of the dairy farms have shut down over the past 30 years.[6] While many factors contribute to the demise of farms or ranches, many of the factors can be summarized as poor business analysis and decision making, and more often than not these are due to a lack of good data to help the farm make sound decisions.

Dairies and ranches will continue to follow the trends of consolidation that our friends in the swine, poultry, and feedlot industries have taken. This means the operations will be larger and run more as a business, and therefore there should be a continued or increasing demand for data-driven decision making. Poor decisions will lead to larger errors and be more costly on a large farm, and managers should likewise be more interested in avoiding such mistakes.

Meanwhile, veterinarians continue to look for ways to be relevant and maintain a seat at the table of the farm management team. Traditional veterinary services continue to be reduced by good nutrition and management or replaced by non-veterinarians. If we don't develop new areas of value or expand our service offerings, we will not continue to make a living servicing dairies and ranches. Data analysis and subsequent advising is an area where we have the most expertise, know the statistical issues, help set up the protocols, and now have the data analysis tools available to be the best person for the job. The question is, will we take the steps necessary to gain the knowledge and technique and then market those skills to our clientele? Data-driven decision making is extremely important to the future of our farm and ranch client businesses. Position yourself and your practice to be the best resource available for making those data-driven decisions.

Endnotes

[a]HEALTHSUM. The HEALTHSUM Syndicate, LLC Sunnyside, WA
[b]CALFSUM. The HEALTHSUM Syndicate, LLC Sunnyside, WA
[c]DairyComp 305, VAS, Tulare, CA

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