



# Corporate Control

## in Animal Science Research

## About Food & Water Watch

**Food & Water Watch** champions healthy food and clean water for all. We stand up to corporations that put profits before people, and advocate for a democracy that improves people's lives and protects our environment.

Food & Water Watch has state and regional offices across the country to help engage concerned citizens on the issues they care about. For the most up-to-date contact information for our field offices, visit [foodandwaterwatch.org](http://foodandwaterwatch.org).

### Los Angeles, California

3000 S. Robertson Boulevard  
Suite 255  
Los Angeles, CA 90034  
(323) 843-8450

### Oakland, California

1814 Franklin Street  
Suite 1100  
Oakland, CA 94612  
(510) 922-0720

### Colorado

1740 High Street  
Denver, CO 80218  
(720) 449-7505

### Florida

1044 NE 15<sup>th</sup> Avenue  
Fort Lauderdale, FL 33304  
(954) 372-1881

### Illinois

811 W. Evergreen Avenue  
Suite 401  
Chicago, IL 60642  
(773) 796-6088

### Iowa

505 Fifth Avenue  
Suite 818  
Des Moines, IA 50309  
(515) 344-4834

### Maine

533 Congress Street  
Portland, ME 04101  
(207) 619-5845

### Maryland

3121 St. Paul Street  
Suite 28  
Baltimore, MD 21218  
(410) 394-7650

### Michigan

2727 Second Avenue  
Suite 136  
Detroit, MI 48201-2654  
(313) 486-1356

### New Jersey

100 Bayard Street  
Suite 202  
New Brunswick, NJ 08901  
(732) 839-0860

### New Mexico

7804 Pan American  
East Freeway NE #2  
Albuquerque, NM 87109  
(505) 633-7366

### New York

68 Jay Street  
Suite 713  
Brooklyn, NY 11201  
(718) 943-9085

### North Carolina

801 Gilbert Street  
Suite 204  
Durham, NC 27701  
(919) 794-6380

### Ohio

103 William H. Taft Road  
Cincinnati, OH 45219  
(513) 394-6257

### Oregon

917 SW Oak Street  
Suite 404  
Portland, OR 97205  
(971) 266-4528

### Pennsylvania

232 S. 4<sup>th</sup> Street  
Suite 1F  
Philadelphia, PA 19106  
(267) 428-1903

### National Office

1616 P Street, NW  
Suite 300  
Washington, DC 20036  
(202) 683-2500



# Corporate Control

## in Animal Science Research

### TABLE OF CONTENTS

Executive Summary . . . . . 2

Introduction . . . . . 3

Growth-Promoting Drug Zilmax . . . . . 4

Artificial Growth Hormones for Dairy Cows . . . . . 8

Arsenic in Chicken Feed . . . . . 9

The Federation of Animal Science Societies . . . . . 10

Conclusion. . . . . 11

Methodology . . . . . 13

Appendix. . . . . 14

Endnotes. . . . . 20

## Executive Summary

Corporate agribusinesses depend on favorable science to gain regulatory approval or market acceptance of products such as new animal drugs, and they depend on academic journals to deliver this science. To secure favorable scientific reviews, industry groups play an enormous role in the production of scientific literature, authoring journal articles, funding academic research and also serving as editors, sponsors or directors of scientific journals where much of their research is published.

Deep-pocketed corporations often have no counterpoint in the scientific literature. No group of scientists or science funders is, for example, aggressively investigating the safety or efficacy of new animal drugs, or examining alternatives. The influence that industry now wields over every aspect of the scientific discourse has allowed companies to commercialize potentially unsafe animal drugs with virtually no independent scrutiny.



PHOTO CC-BY-SA © VLADIMIR MENKOV / COMMONS.WIKIMEDIA.ORG

## Key Findings

An analysis by Food & Water Watch of several controversial drugs used in food animal production reveals:

- When the growth-promoter Zilmax was removed from the marketplace in 2013 due to animal safety concerns, there had been virtually no independent, peer-reviewed studies into the safety of the drug for cattle. Most of the available research examined commercial dimensions of Zilmax, such as the drug's impact on beef quality, and more than three-quarters of the studies were authored and/or funded by industry groups, almost all of which were published in scientific journals sponsored and edited by industry groups.
- A top destination for peer-reviewed studies authored and funded by animal science companies are the high-profile journals published by the Federation of Animal Science Societies, where corporate agribusinesses act as sponsors, directors, editors and frequent authors.
- Many academic journals have failed to establish or enforce rules requiring scientists to publicly disclose financial conflicts of interest, which has allowed deeply conflicted research to distort the scientific discourse.

## Recommendations

To address the outsized corporate influence over animal science research, Food & Water Watch recommends:

- Congress should instruct the Food and Drug Administration (FDA) to dramatically revamp its animal drug approval process to be based primarily on independent science, instead of depending entirely on research furnished by drug sponsors.
- Congress should also instruct the FDA to issue a ban on the use of all beta-agonists, including Zilmax, given the evidence of animal welfare issues.
- Every agricultural journal should require authors to publicly disclose all of their research funding sources and all financial ties that authors have to industry.
- Every agricultural journal should publish the full names and affiliations of all editors and advisors that it utilizes.



## Introduction

Scientists, policy makers and the public have long looked to academic journals as the gold standard of scientific research — as an open marketplace of ideas and a place to describe, debate and debunk scientific findings. Academic publishers employ a gauntlet of peer reviews and editorial measures designed to ensure that only the best and most relevant studies enter the scientific discourse and that these studies are free of bias and errors.

However, just as agricultural research at universities is now heavily influenced by industry sources,<sup>1</sup> so, too, are some of the journals in which research is published, which creates another opportunity for bias. (See sidebar below.) Deep-pocketed corporations financially support academic journals where they publish their research, or they support the academic societies that oversee these journals. Industry representatives also claim positions on editorial boards of some prominent journals, potentially giving them influence over what kinds of studies are and are not published.

Corporate agribusinesses also author, fund and likely ghostwrite an enormous number of peer-reviewed studies, overwhelming the literature in some places with favorable

research about their products and practices. On research topics related to animal drugs such as Zilmax, a growth-promoter for cattle, very little independent research exists, and the available scientific literature amounts to little more than an echo chamber of industry-authored and industry-funded studies, published largely in industry-aligned journals such as those overseen by the Federation of Animal Science Societies (FASS). FASS, its member societies and several prominent animal science journals that it publishes count corporate agribusinesses as sponsors, directors and editors.

When science is authored, funded or otherwise influenced by a party that has a financial interest in the outcome of the study, it creates a clear opportunity for bias. A substantial body of research shows that industry-funded studies routinely produce results favorable to industry, and that they are far more likely to do so than research that is completely independent of industry influence.<sup>6</sup> This potential for bias looms large throughout the agricultural sciences because industry is a very large research sponsor, including funding university research, as Food & Water Watch documented in the 2012 report *Public Research, Private Gain*.

### Back Doors Into Academic Publications and Presentations

Weak oversight from academic journals has allowed a variety of avenues for industry to exercise undisclosed — and difficult-to-monitor — influence:

- **Companies understand that the studies they fund and author have less credibility than those produced independently, so they will sometimes recruit academic authors to publish corporate science under their own names.** This practice, called “ghostwriting,” can be commonplace in some fields, accounting for as many as 1 in 10 articles published in some prominent medical journals, for example.<sup>2</sup> Researchers say that other fields where profit motives are high, including biotechnology and agricultural research, are also likely to attract ghostwriting.<sup>3</sup>
- **Industry authors can publish and present their research using an academic “affiliation” given to them by a university.** For example, although animal scientist Jude Capper left academia to become an industry consultant, she has continued to present and publish her corporate-friendly animal research under one of two academic affiliations she holds, even listing her contact information with an academic e-mail address.<sup>4</sup> This highly misleading practice allows an author to present him or herself as an independent academic author when he or she is not. In 2014, Montana State University asked Capper to stop using her affiliation with the school to present research unrelated to the university.<sup>5</sup> It is unknown how common this practice is.
- **Academic articles will never reach publication if they do not successfully pass the peer-review process, in which scientists, often anonymously, review articles and look for problems and errors.** Given industry’s substantial role in every other aspect of publishing, it seems likely that industry scientists also serve as anonymous peer-reviewers, potentially easing the pathway to publication of industry-friendly studies or creating roadblocks for unfavorable studies.

Unfortunately, the animal sciences community has done very little to contain or correct the obvious impacts that industry influence is having over the production of peer-reviewed science. Scientific fields such as pharmaceutical research for human drugs have begun to initiate reforms to control the destructive effects that too much industry influence can have on science — a reaction to repeated examples of bias and fraud, at times perpetrated with the collaboration of powerful, for-profit academic publishers, such as Elsevier.<sup>7</sup> (See sidebar at right.) Although animal science research is heavily influenced by some of the same pharmaceutical companies, like Merck, which have the same interest in securing favorable scientific reviews, some animal science journals have failed to enforce even the most basic and obvious measures of transparency, such as requiring journal authors to publicly disclose their sources of research funding and whether or not they have financial conflicts of interest.

At its worst, this broken system of science is supporting the commercialization of drugs like Merck's Zilmax, which was found to have serious impacts on animal health only after it reached the market. In this way, the outsized influence that animal drug companies hold over the science surrounding their products can have a harmful impact not just on the scientific literature, but also on the safety, sustainability and resilience of our food system.

## Growth-Promoting Drug Zilmax

In August 2013, the nation's largest meatpackers abruptly announced that they would no longer accept cattle that had been treated with the growth-promoter Zilmax because of significant animal health problems, including dead cattle or animals arriving at slaughterhouses with missing hooves.<sup>13</sup> The announcement shocked beef markets and eventually pressured Merck to voluntarily withdraw its blockbuster drug from the market, costing the company as much as \$160 million a year in revenues.<sup>14</sup>

Zilmax's sudden fall from grace drew attention to the weak regulatory process at the U.S. Food and Drug Administration (FDA), which had approved Zilmax as safe for cattle in 2006 based on industry science — and on only one animal safety study.<sup>15</sup> But, just as importantly, Zilmax's obvious animal welfare issues should also draw attention to animal scientists and animal science journals, which published virtually no safety research leading up to Merck's decision to withdraw Zilmax from the market.

There have long been indications of safety issues associated with Zilmax. As many as 160 foreign countries, including all of Europe, had long banned the entire class of beta-agonist animal drugs, to which Zilmax belongs.<sup>16</sup> Although these

## Perverse Incentives in Academic Publishing

Numerous acquisitions and mergers in the academic publishing world have helped concentrate the market in the hands of a few firms that enjoy immense profit margins.<sup>8</sup> Large publishing companies like Elsevier, Springer, Informa (Taylor and Francis) and John Wiley and Sons publish thousands of journals and play a crucial role in the distribution of scientific research.<sup>9</sup>

Academics and academic institutions complain that this level of market power is leading to abuses, for example in the increasing costs of journal subscriptions that limit access and dissemination of research. Such complaints have prompted thousands of researchers to boycott publishing their research to journals controlled by Elsevier, the largest journal publisher in the world.<sup>10</sup>

The treatment of science as a highly profitable commodity has, predictably, crossed ethical lines at times. Elsevier worked with one company, Merck, to publish what looked like independent, peer-reviewed publications that were actually veiled efforts by Merck to promote its products, notably the human drug Vioxx that was later removed from the market due to safety concerns.<sup>11</sup> Merck also produces Zilmax. Although Elsevier has acknowledged and terminated these journals, it did so only after the deception was independently exposed as part of a legal proceeding.<sup>12</sup> It is unknown how pervasive such practices are or to what extent they exist in the animal sciences.







bans are based primarily on human safety concerns associated with eating beef from Zilmax-treated cattle,<sup>17</sup> there also have been animal safety concerns associated with Zilmax, including nearly 300 reports submitted to the FDA documenting cattle that died or had to be destroyed after receiving the drug.<sup>18</sup> Temple Grandin, a prominent animal health expert at Colorado State University, also noted potential animal welfare issues prior to Zilmax’s removal from the market.<sup>19</sup>

Despite these indications, the impact of Zilmax on cattle welfare remained almost completely unaddressed in academic journals. One likely reason for this has been the outsized role that the makers of Zilmax — Merck and Intervet — played in the scientific research.

Food & Water Watch consulted three academic databases in early 2014 and found 78 published journal articles examining the effects of Zilmax on cattle.<sup>20</sup> (See Appendix.) In total, more than three-quarters of the Zilmax studies that Food & Water Watch analyzed (60 out of 78) had identifiable authors and/or funders from industry groups or corporate agribusiness, most of them from the drug makers of Zilmax — Merck or Intervet.<sup>21</sup> (See Table 1.) More than half of the studies did not disclose (or, in a few cases, did not fully disclose) funding sources, so the actual influence that companies like Merck exercised may be even higher.

**TABLE 1 • Peer-Reviewed Studies on Zilmax**

<b>Total # of Peer-Reviewed Zilmax Studies</b>	<b>78</b>	
Studies with industry authors/funding	60	<b>77%</b>
Studies with industry authors/funding from Merck/Intervet	48	<b>62%</b>
Studies published in FASS journals	56	<b>72%</b>

For additional detail, see Methodology on page 13.

Almost all of this scientific literature focuses on purely commercial dimensions of Zilmax, such as beef quality attributes like tenderness, texture, palatability, cooking loss, color and “cutability.”<sup>22</sup> Other studies looked at non-safety aspects of feedlot performance, such as beef yield from Zilmax-treated cattle. Food & Water Watch’s review did not find a single independent, peer-reviewed study designed to examine animal health prior to the removal of Zilmax from the commercial marketplace in 2013.

Even passing references to animal health issues were scarce. Few studies, for example, mentioned whether animals died or were removed due to poor health during the course of the study — even in trials where thousands of cattle were enrolled.<sup>23</sup> One study that did report deaths found that cattle treated with Zilmax died at a much higher rate than untreated cattle.<sup>24</sup> Authored by the makers of Zilmax and published in FASS’s industry-aligned *Journal of Animal Science*, the study declared the deaths to be “normal.”<sup>25</sup>

Merck and Intervet authored and funded two studies published in an FASS journal claiming to address animal health, which recorded deaths.<sup>26</sup> However, both of these studies only reported deaths of cattle treated with Zilmax or another beta-agonist drug; because there was no experimental control group, it is impossible to know if Zilmax-treated cattle were dying at a higher rate than untreated cattle.<sup>27</sup> And because the studies were conducted by scientists working for a company with a financial interest in the outcome of the study, the results cannot be seen as independent.<sup>28</sup> In public relations materials, Merck cites scientific studies that it claims demonstrate the safety of Zilmax for cattle, but not a single one of these is an independent, peer-reviewed journal article.<sup>29</sup>

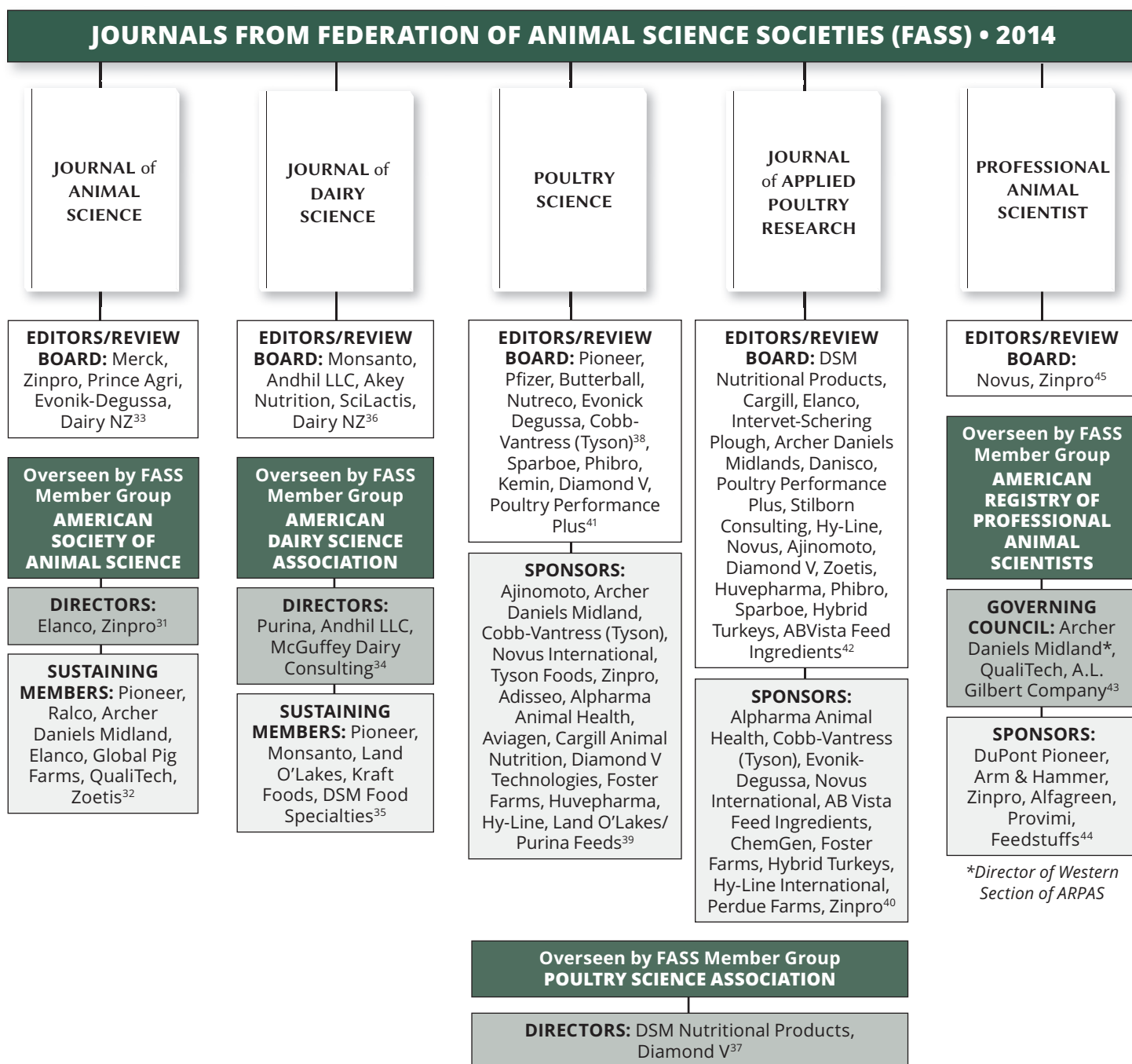
FASS journals, which are sponsored, directed and/or edited by corporate representatives (see FASS chart below), have played the dominant role publishing research on Zilmax, issuing more than 70 percent of the Zilmax studies (56 out of 78) that Food & Water Watch found. All but six of these FASS studies had industry authors and/or funders, mostly from Intervet and Merck; of the six studies that did not note the presence of industry authors or funders, only one fully disclosed its source of funding.<sup>30</sup>

Both Merck and Intervet have acted as financial sponsors of meetings held by FASS's American Society of Animal Science, which oversees the *Journal of Animal Science*.<sup>46</sup>

A Merck representative serves as an editor of the journal, as of this report's publication.<sup>47</sup>

The second most common destination for Zilmax research was the *Journal of Meat Science*, which is overseen by the American Meat Science Association (AMSA), whose many corporate sponsors include Merck.<sup>48</sup> The *Journal of Meat Science* published eight studies on Zilmax, four of which disclosed industry authors or sponsorship.

The most frequent authors of the Zilmax research on cattle include Intervet and Merck scientists like J.P. Hutcheson, who co-authored 38 of the studies that





Food & Water Watch analyzed, almost all of which were published in FASS journals. (See Table 2.) Other frequent authors include academics who collaborate or sometimes consult with industry. Texas Tech Professor Markus Miller’s university *curriculum vitae* reports his having received more than \$2 million in research funding from the makers of Zilmax.<sup>49</sup> He authored 17 of the Zilmax studies that Food & Water Watch analyzed; of these, all 17 were co-authored by Intervet scientists, and all but one was published in FASS’s *Journal of Animal Science*. Only eight of these studies disclose a source of funding (six were funded by Intervet).

West Texas A&M animal scientist Ty Lawrence authored 19 of the articles that Food & Water Watch analyzed, all of them with co-authors from Merck or Intervet, and all but two were published in FASS’s *Journal of Animal Science*. Only seven studies disclosed a source of funding (six were funded by Intervet or Merck).

Lawrence’s close ties to Zilmax were the subject of a 2012 investigative report by the *Chronicle of Higher Education*, which noted his routine failure to disclose in journal articles that he also was being paid as a private consultant and pitchman for Zilmax.<sup>57</sup> FASS’s *Journal of Animal Science*, when confronted about the lack of transparency about conflicts of interest, noted that the journal makes internal decisions about potential bias around conflicts of interest, apparently on a case-by-case basis, but it also stated that it would start requiring authors to disclose all of their industry ties on all journal articles.<sup>58</sup> Nevertheless, Lawrence has continued publishing Zilmax research in the *Journal of Animal Science* without disclosing any conflicts of interest.<sup>59</sup>

The American Society of Animal Science, which is part of the industry-aligned FASS and which oversees the *Journal of Animal Science*, eventually issued an official statement in response to the *Chronicle* article.<sup>60</sup> The press release included comments from one former board member who, acknowledging his own ties to industry, offered the tone-deaf comment: “If an animal scientist believes, on the basis of solid scientific evidence, that a particular technology can make important contributions... it would be unethical for him or her not to convey that message to the industry at every opportunity.”<sup>61</sup>

Lawrence and the American Society of Animal Science continue to highlight the “important contributions” of the drug. A 2014 conference by the group included a Merck-sponsored panel of new Zilmax research and 21 new studies that Merck trumpeted as being conducted

TABLE 2 • Top Authors of Zilmax Research		
Top Co-Authors of Zilmax Studies	No. of studies	Relationship to Intervet/Merck
Hutcheson, J.P.	38	employee <sup>50</sup>
Yates, D.	33	employee <sup>51</sup>
Streeter, M.N.	26	employee <sup>52</sup>
Lawrence, T.E.	19	Intervet consultant <sup>53</sup>
Miller, M.F.	17	received Intervet research funding <sup>54</sup>
Johnson, B.J.	17	Intervet consultant <sup>55</sup>
Allen, D.M.	16	private consultant <sup>56</sup>

NOTE: These authors’ relationships toward Intervet/Merck may have changed over the years or in recent months.

by “third parties” like Ty Lawrence.<sup>62</sup> The author of one headline-grabbing research project, funded in part by Merck, dismissed safety concerns with the drug, saying, “From the data we’ve got, it doesn’t look like Zilmax is the problem.”<sup>63</sup>

By contrast, a different safety study that emerged following Zilmax’s removal from the marketplace, published in a journal with no obvious industry ties, found Zilmax to be related to cattle deaths. Examining feedlot records on hundreds of thousands of cows, the study’s authors found that animals treated with beta-agonist drugs, either Zilmax or a competing drug called ractopamine (marketed under the name Optaflexx), had much higher mortality rates than untreated cows.<sup>64</sup> Cattle given Zilmax were more likely to experience disease than untreated cattle and to require treatment, possibly including antibiotics, which raises additional safety and public health questions.<sup>65</sup> The overuse of antibiotics in industrial animal agriculture has been linked to antibiotic-resistant bacteria, which cause hard-to-treat infections in humans.<sup>66</sup> Zilmax-treated cattle also had higher rates of what is called “dark cutter” beef, darkly colored meat of a lower quality, which can be an indication that the animal experienced chronic stress.<sup>67</sup>

The research was published in the journal *PLOS ONE*, which offered extensive conflict-of-interest and funding disclosures about the three academic authors, two of whom cited conflicts of interest (see endnote for details).<sup>68</sup> It is noteworthy that the study was based on dated feedlot data and presumably could have been conducted years ago, but it was not published until *after* Zilmax was removed from the market, which may have given

researchers the political cover they needed to pursue publication of critical research. Because the FDA has taken no regulatory action on Zilmax, Merck can bring the drug back to the market anytime it wishes, and it has said it plans to do so.<sup>69</sup> Optaflexx, the competitor beta-agonist drug, which also has been linked to animal welfare issues, has seen its sales surge since Zilmax was removed from the market.<sup>70</sup>

## Artificial Growth Hormones for Dairy Cows

Monsanto's recombinant bovine growth hormone (rBGH), a genetically engineered growth hormone that became widely used in factory farm dairies after its approval by the FDA in 1993, was designed to increase milk production.<sup>71</sup> In 2000, rBGH became the largest-selling pharmaceutical product in the history of the dairy industry; in 2008, Monsanto sold it to Eli Lilly.<sup>72</sup>

Just as with Zilmax, the FDA approved rBGH based on company data, failing to fully address the safety concerns that prevented Canada and the European Union from ever allowing its use.<sup>73</sup> One FDA scientist working on the rBGH review noted major weaknesses in the FDA's work and publicly accused the agency of improper collaboration with Monsanto.<sup>74</sup> Public concerns about animal welfare and human health eventually led many food processors — from Kroger to Starbucks to Walmart — to stop sourcing some dairy products made with milk from rBGH-treated cows.<sup>75</sup>

Given the obvious disagreement over the safety of rBGH among scientific bodies, one would expect independent scientists to pursue this research topic and settle the issue. However, a published, scientific review of available safety data on rBGH in 2003 — a decade after the FDA had granted safety approval — did not show this to be the case.

Most of the citations in this 2003 review were unpublished Monsanto studies or studies published in FASS's industry-aligned journals, many of which were authored or funded by Monsanto or other industry groups.<sup>76</sup> For example, the review cited 23 studies that had usable data on mastitis, an udder infection that rBGH-treated cows are at increased risk of contracting.<sup>77</sup> (Cows suffering from mastitis also have implications for human health because the condition is treated with antibiotics, the overuse of which is linked to the proliferation of antibiotic-resistant bacteria that can cause hard-to-treat infections in humans.<sup>78</sup>)

Nearly a third of the studies (7 out of 23) cited in the 2003 review were non-published, non-peer-reviewed Monsanto studies.<sup>79</sup> And of the published, peer-reviewed studies, all but three were authored or funded by Monsanto or other corporate developers of rBGH, most of them published in FASS's *Journal of Dairy Science*.<sup>80</sup> It is telling that nearly a decade into rBGH's commercial use, the available scientific literature on critical safety issues was still dominated by industry research.

The 2003 review of rBGH specifically noted several gaps in safety research on topics related to mastitis, injection-site infections and reproductive problems.<sup>81</sup> It does not appear that all of the extenuating safety questions have been answered. A 2014 scientific review of rBGH, in its discussion of mastitis, cited only studies from the 1990s,<sup>82</sup> including several produced with industry involvement,<sup>83</sup> which calls into question how much new, independent research has been done to fill in the gaps in safety testing.

As was the case with Zilmax, it appears that industry scientists and industry-affiliated journals have played a large role in producing and disseminating research on rBGH. One search of the academic database Web of Science revealed that FASS journals have served as a leading publisher of research related to rBGH, and Monsanto scientists and former Monsanto scientists have been among the most frequent authors.<sup>84</sup> This includes Monsanto scientist Gary Hartnell, who has served in a number of official capacities at FASS, including as president of the organization.<sup>85</sup> Most of Hartnell's rBGH research is published in FASS journals.<sup>86</sup>



FASS journals also publish much of the rBGH research from Dale Bauman of Cornell University, another frequent author.<sup>87</sup> A high-profile proponent of rBGH, Bauman has worked as a paid consultant for Monsanto since the 1980s, at times failing to disclose his ties to the company in the rBGH studies that he authors.<sup>88</sup> His most recent rBGH article, a 2014 review published in the *Journal of Animal Science*, includes no conflict-of-interest disclosures.<sup>89</sup> In this review article, Bauman argues that milk from rBGH-treated cows is safe for humans, but much of the published, peer-reviewed literature on rBGH that he cites come from his own research or studies published in FASS journals, mostly from Monsanto.<sup>90</sup>

Bauman's review article appears to be a partial recapitulation of a favorable, unpublished safety review that he did in 2009 for Eli Lilly, presented at a meeting held by several FASS societies.<sup>91</sup> This report, which included a review of animal safety issues, notes that rBGH is "not associated with significant changes in...mastitis." The citations for this statement include seven studies published in the *Journal of Dairy Science*, at least five of which were authored or funded by Monsanto or Eli Lilly or Bauman himself.<sup>92</sup> Bauman and his co-authors cited these same seven studies, and two more, including one from Monsanto, to conclude that "cows receiving rbST [rBGH] are of normal health."<sup>93</sup>

## Arsenic in Chicken Feed

Approved by the FDA in the 1940s, arsenic-based drugs became widely applied in poultry production as growth promoters, used by as many as 70 percent of broiler producers in recent decades.<sup>94</sup> Growing public concerns about the use of arsenic — which can be carcinogenic in some forms — combined with new scientific evidence of safety concerns, led the FDA to ask industry to voluntarily remove the most commonly used variety, Pfizer's Roxarsone, from the marketplace in 2011. After intense public pressure, the FDA went on to ban Roxarsone and two other arsenicals entirely from chicken production in 2013, allowing turkey growers to continue to use one arsenical drug, Nitarsone.<sup>95</sup> In the Spring of 2015, FDA announced a plan to withdraw Nitarsone from the marketplace at the end of the year.<sup>96</sup>

As with Zilmax and rBGH, the European Union has never allowed arsenic-based drugs to be used in chicken feed.<sup>97</sup> In the United States, meatpackers and animal drug companies have long fought off safety concerns associated with the use of arsenic — but it does not appear that they have had a robust, independent, scientific basis for doing so.



It wasn't until decades after arsenic was introduced into chicken feed that meaningful, independent safety research emerged. A 2004 study by several U.S. Department of Agriculture (USDA) scientists used national monitoring data to estimate how much arsenic consumers were exposed to through poultry consumption. The authors noted that levels of arsenic were higher than was previously thought, which raised concerns about trends in increasing poultry consumption in American diets.<sup>98</sup> The authors noted that their "preliminary" analysis deserved additional studies.<sup>99</sup>

Government inaction on the issue prompted a non-governmental organization, the Institute for Agriculture and Trade Policy, to begin sampling chicken products found in grocery stores and fast food restaurants, finding that most of them contained detectable levels of arsenic.<sup>100</sup> This 2006 report noted the cumulative, lifetime risk that this arsenic exposure posed to consumers.<sup>101</sup>

In 2010, public health researchers from Johns Hopkins University weighed in with a study that sampled poultry from grocery stores, finding elevated levels of the inorganic form of arsenic, a known carcinogen.<sup>102</sup> The authors noted the increased risk of cancer that this arsenic posed for consumers over their lifetimes.<sup>103</sup>

In 2011, the FDA published the results from a study that the agency itself had conducted on Roxarsone, which also showed elevated levels of carcinogenic inorganic arsenic in poultry treated with Roxarsone.<sup>104</sup> This study, an extremely rare example of the FDA conducting its own safety research, was a long-overdue adjustment to the agency's long history of granting approval for animal drugs without adequate safety information.

In contrast to the critical safety studies emerging on arsenic in the 2000s, FASS's industry-aligned *Journal of Poultry Science* invited Frank Jones of the University of Arkansas to author a review of safety concerns in 2007,





which he largely dismissed as an issue of “perception,” not science.<sup>105</sup> Citing one of the unfavorable arsenic studies, Jones offered a critical counterpoint from “other scientists.” The citation on this counterpoint leads to an industry scientist who consults with a drug company producing one arsenical, which clearly has a financial interest in preserving the use of arsenic in poultry feed.<sup>106</sup>

The same year of Jones’s review, an FASS meeting sponsored by corporations including Pfizer, the manufacturer of Roxarsone, featured an industry presentation on the “Benefits of the broiler feed additive Roxarsone.”<sup>107</sup> And according to one search of the academic database Web of Science, FASS journals, prominently the *Journal of Poultry Science*, have played a leading role in publishing research related to Roxarsone.<sup>108</sup>

## The Federation of Animal Science Societies

The scientific journals published by FASS are some of the most widely cited publications in the field of animal sciences, one indication of the prominent and influential role that they play in the scientific discourse.<sup>109</sup> But, as noted throughout this report, FASS has played a critical and often dominant role in publishing industry research. Virtually every aspect of the organization — from sponsors to editorial members to society directors — includes industry participation.

In recent years, Monsanto executive Gary Hartnell has served as president of FASS,<sup>110</sup> and, as of this report’s publication, he sits on the FASS Scientific Advisory Committee on Biotechnology,<sup>111</sup> whose work promotes wider acceptance of genetically engineered crops.<sup>112</sup> Hartnell, who has a PhD in dairy science and did some of Monsanto’s early work with the animal drug rBGH,<sup>113</sup> appears to publish almost all of his studies in FASS journals, many in the *Journal of Dairy Science*, whose editorial board includes corporate representatives from companies including Monsanto.<sup>114</sup> (See FASS chart on page 6.) This journal is overseen by FASS’s American Dairy Science Association, where Hartnell also has served as president and which counts more than a dozen corporations as sustaining members, including Monsanto and Pioneer, which have contributed money for more than two decades.<sup>115</sup>

FASS journals are a top destination for studies authored and funded by agribusiness companies that serve as editors or sponsors. The animal health company Elanco, which is a corporate sponsor or review board member at two FASS societies and serves as an editor of one FASS journal,<sup>116</sup> co-authored or funded 63 articles in FASS journals over the most recent five-year period, according to an analysis using the Web of Science academic database.<sup>117</sup> This accounts for as many as a third of all of the published studies from the company.<sup>118</sup>

Other top destinations for Elanco research include journals where Elanco sits on the editorial board, sits on an executive committee or is a sponsor. This includes 13 studies in the *Journal of Veterinary Pharmacology and Therapeutics*, where Elanco sits on the executive council of the journal’s organizational body<sup>119</sup>; 11 studies published in *Veterinary Parasitology*, where Elanco sits on the editorial board<sup>120</sup>; and five articles in both the *Canadian Journal of Animal Science* and the *Journal of Meat Science*, which are sponsored by Elanco or administered by an organization directed by Elanco.<sup>121</sup>

FASS’s position as a top destination for industry science also can be seen in the most frequent authors in FASS journals. The Web of Science academic database indicates that from 2009 to 2013, the most frequent author in the *Journal of Animal Sciences* was Hans Stein of the University of Illinois, who co-authored 40 articles — at least three-quarters of which had help from companies and industry groups like Pioneer Hi-Bred, the National Pork Board and Evonick.<sup>122</sup>

Another top author was Deborah Vanoverbeke of Oklahoma State University. More than three-quarters of her 33 articles, including many on Zilmax, had industry help from companies like Intervet, Pfizer and Tyson. Vanoverbeke is not only a top author at the *Journal of Animal Science*, she is also an associate editor, which may present other conflict-of-interest issues.<sup>123</sup> Because FASS journals, like many agricultural journals, have not required authors to always disclose their sources of funding or conflicts of interest, the actual influence that industry plays in FASS journal articles may be greater than what the public is able to see.<sup>124</sup>

Beyond publishing industry science, FASS and its member societies use their stature as so-called independent scientific bodies to advocate industry positions and help influence the direction of federal policy making.<sup>125</sup> When FASS encounters science that challenges corporate agribusiness, it is not shy to condemn studies as “biased,” as it did with a highly publicized, independent report linking factory farms to antibiotic resistance.<sup>126</sup> Or, when a scientist published a study showing that Monsanto’s Roundup Ready genetically engineered corn may cause animal health problems, a FASS member society called the study poorly designed and misleading, piling on the criticism that Monsanto and its allies made about the study.<sup>127</sup> (See sidebar at right.)

On the most pressing and controversial issues of the day related to animal agriculture — such as the use of antibiotics as growth promoters or the commercialization of genetically engineered animals — FASS and its journals often weigh in to provide “science-based” positions that support industry’s agenda.<sup>128</sup>

## Conclusion

Academic journals are designed to act as a meeting place for scientists to share new scientific findings and offer different interpretations on these findings. Scientists and the public should have confidence that the journal articles they read have been vetted by a series of rigorous, independent editorial reviews, but this confidence is called into question by the very large role that for-profit companies play in authoring, funding and providing editorial oversight over some prominent journals in the animal sciences — along with sponsoring the journals and the organizations that run them.

This level of influence allows a for-profit company to overwhelm the scientific literature surrounding its products. As the science surrounding Zilmax demonstrates, industry not

## Censoring Science: Retracting Unfavorable Articles

When University of California scientist Tyrone Hayes began publishing unfavorable studies showing animal health problems and environmental impacts associated with Syngenta’s widely used herbicide atrazine, Syngenta sought to attack Hayes’s professional career and personal life. Documents released through a court case reveal that Syngenta planned a variety of ways to discredit Hayes, including “asking journals to retract” his work, a tactic used by corporations to try to eliminate unfavorable studies.<sup>129</sup>

When French scientist Gilles-Éric Séralini of the University of Caen published a study linking Monsanto’s Roundup Ready corn and Roundup herbicide to animal health problems, Monsanto sent a letter to the editor of the journal where Séralini published, attacking Séralini’s work.<sup>130</sup> Numerous other scientists, including those from industry or with industry ties, piled on, also submitting letters.<sup>131</sup> The Elsevier journal ended up hiring one of Séralini’s critics, a former Monsanto scientist, to its editorial board, then shortly after retracted Séralini’s article.<sup>132</sup> Elsevier’s retraction specifically noted that it found no fraud, manipulation or intentional misrepresentation of data in the article, as critics had alleged, yet the publisher still decided to issue the retraction.<sup>133</sup> Hundreds of independent scientists launched a boycott of Elsevier, condemning the retraction as an example of academic publishers cravenly bowing to industry pressure.<sup>134</sup>

only can dominate the published research, but it often has no counterpoint — no group of scientists or science funders who are, for example, aggressively investigating the safety or efficacy of new animal drugs, or examining alternatives. This creates a potential for widespread bias to enter the scientific literature on industry products and practices.

Some of the influence that industry wields over scientific literature is obscured or impossible to discover because of weak disclosure rules at journals. This means that lawmakers and regulators do not always realize that the scientific literature they consult is paid for by industry or authored by deeply conflicted university scientists. It means that farmers are planting seeds, applying agrochemicals and producing animals with products and practices that sometimes have little, if any, independent review, including with regard to environmental or health risks.

Science, in and of itself, will never be the answer to our broken food system. But, if conducted with appropriate integrity and independence, science can provide a crucial base of knowledge that can help improve the sustainability and resilience of our farms, the safety of our food, and the livelihoods of our farmers and ranchers. This is why the corporate control of research must be addressed. Food & Water Watch recommends:

- Congress should instruct the FDA to dramatically revamp its animal drug approval process to be based primarily on independent science, instead of depending entirely on research furnished by drug sponsors.
- Congress should also instruct the FDA to issue a ban on the use of all beta-agonists, including Zilmax, given the evidence of animal welfare issues.
- The federal government, including the USDA, should dramatically expand its funding for animal drug safety research, ensuring that industry products and practices undergo independent scrutiny before approval.

- Every agricultural journal should require authors to publicly disclose all of their research funding sources and all financial ties that authors have to industry.
- Every agricultural journal should publish the full names and affiliations of all editors and advisors that it utilizes.
- Agribusiness should be barred from having any editorial influence over academic journals, including sitting on editorial boards or acting as peer reviewers. Journals should also restrict the roles of academic editors who have financial ties to companies that are manufacturing products and practices that are the subject of studies found in these journals.
- Congress should expand its recent mandate to document most industry money given to physicians and medical researchers (as part of the Affordable Care Act) to include all published scientific literature.<sup>135</sup> The USDA should create and maintain a publicly available database that lists all money that corporate agribusinesses are sending to academics through research grants, gifts, consulting gigs and travel expenses.



## Methodology

As noted in the text, much of the analysis of scientific literature found in this report came from Food & Water Watch's analysis of the Thomson Reuters Web of Science academic database and literature-search tool, in the spring of 2014. Web of Science is a human-curated database that includes 12,000 top-tier journals.<sup>136</sup> The "core" collection of this database contains tools that allow users to refine search results according to most frequent authors, most frequent journals and most frequent funders. When our data analysis depended on Web of Science as the unique source, we noted this.

Food & Water Watch's analysis of Zilmax included an expanded search that sought to find all published, peer-reviewed journal articles that examined the impacts of Zilmax on cattle, the only species for which Zilmax is currently marketed.<sup>137</sup> Because this analysis sought to understand the breadth of scientific literature related to Zilmax leading up to the animal safety concerns that emerged in 2013, we also consulted other academic databases, including Ebsco and ProQuest Science, conducting broad searches using the keyword "zilpaterol," the chemical name for Zilmax. We limited our search to include only peer-reviewed, published journal articles, excluding formats such as symposium presentations or commentaries that may not have gone through a peer-review process.

Food & Water Watch also looked for relevant citations found in any Zilmax studies that discussed safety,<sup>138</sup> as well as for any published research cited in the FDA's regulatory review of the drug.<sup>139</sup> We examined a list of studies related to beta-agonists and animal welfare posted on the Web site of Colorado State University Professor Temple Grandin<sup>140</sup> and consulted several public relations documents from Merck that purported to offer examples of research showing that Zilmax was safe.<sup>141</sup> It is possible that our search failed to capture every study, such as dated studies or studies from smaller or foreign journals that may not have been included in the academic search tools that we used.

From this collection of studies, we selected for our analysis any published journal articles written in English that specifically addressed the effects of Zilmax on cattle. The 78 studies included in our analysis can be found in the Appendix on page 14. In most cases, but not always, the subject of Zilmax was mentioned in the title, abstract and introduction. For example, we included a study that

examined the effects of shade or sun on cattle because the experimental cows were treated with Zilmax and because the results have been cited as potentially important to the animal safety issues associated with the drug — even though the effects of Zilmax were not the focus of the study and there was no experimental group of untreated cattle.<sup>142</sup> We also included studies designed to provide environmental and economic analyses of modern beef production that included a specific assessment of Zilmax's impact on cattle.

We excluded the entire category of studies related to residue detection of Zilmax, which did not examine the impact of Zilmax on cattle. Articles that examined the effects of Zilmax on non-cattle species (for which Zilmax has not been approved by the FDA) were also excluded. However, a few of these excluded studies provide some indications of safety issues that are noteworthy. One excluded paper examining the potential use of Zilmax as an illegal performance-enhancing drug in race horses found that Zilmax produced adverse reactions.<sup>143</sup> Two studies examined whether Zilmax might be used to encourage animals (not cattle) to maintain their appetites and continue to eat (and grow) in hot weather.<sup>144</sup> Although these studies were designed to examine production, not safety, one study found that Zilmax actually increased some measurements of ewe lamb's skin temperature, which could be related to the animal welfare issues seen in cattle.<sup>145</sup> Many in the animal science community have noted a link between the administration of Zilmax to cattle during the summer months and animal welfare issues related to heat stress.<sup>146</sup>

Merck, apparently aware of this animal welfare concern even before Zilmax was removed from the market, has funded researchers to look into the issue.<sup>147</sup> At a 2014 FASS event, Merck-funded authors presented a study showing that there was no "compelling evidence" that Zilmax is related to heat-related animal welfare issues.<sup>148</sup>

It is also worth mentioning that our Zilmax analysis did not consider the available research on ractopamine, a different but related beta-agonist drug. If there are substantial findings about animal safety concerns in the available research on ractopamine, these findings did not propel scientists to examine animal welfare issues with its competing drug, Zilmax, prior to its being removed from the marketplace.

## Journal Articles on Zilmax Analyzed by Food & Water Watch

This chart includes the 78 published, peer-reviewed studies on Zilmax that Food & Water Watch found in a search of three academic databases in the spring of 2014. See Methodology on page 13.

Citation	FASS Journal?	Industry-Employed Author?	Which Company?	Industry Funder?	Which Company?
Arp, T.S. et al. "Effects of dietary ractopamine hydrochloride and zilpaterol hydrochloride supplementation on performance, carcass traits, and carcass cutability in beef steers." <i>Journal of Animal Science</i> . Vol. 92, Iss. 2. February 2014.	Y	Y	Elanco, Cargill	Y	Elanco, Cargill
Arp, T.S. et al. "Effects of ractopamine hydrochloride and zilpaterol hydrochloride supplementation on longissimus muscle shear force and sensory attributes of beef steers." <i>Journal of Animal Science</i> . Vol. 91, Iss. 12. December 2013.	Y	Y	Elanco, Cargill	Y	Elanco, Cargill
Avendano-Reyes, L. "Effects of two beta-adrenergic agonists on finishing performance, carcass characteristics, and meat quality of feedlot steers." <i>Journal of Animal Science</i> . Vol. 84, Iss. 12. December 2006.	Y	N		N	
Baxa, T.J. "Additive effects of a steroidal implant and zilpaterol hydrochloride on feedlot performance, carcass characteristics, and skeletal muscle messenger ribonucleic acid abundance in finishing steers." <i>Journal of Animal Science</i> . Vol. 88, Iss. 1. January 2010.	Y	Y	Intervet	*	
Beckett, J.L. et al. "Effects of zilpaterol hydrochloride on growth rates, feed conversion, and carcass traits in calf-fed Holstein steers." <i>Journal of Animal Science</i> . Vol. 87, Iss. 12. December 2009.	Y	Y	Intervet	N/D	
Blaine, K.L. et al. "The effects of shade on performance, carcass classes and behaviour of heat-stressed feedlot cattle at the finisher phase." <i>Tropical Animal Health and Production</i> . Vol. 43, Iss. 3. March 2011.	N	Y	Crafcor Farming PTY	N/D	
Bloomberg, B.D. "Impact of health management, health treatments, and zilpaterol hydrochloride supplementation on carcass quality, color, and palatability traits in heifers." <i>Journal of Animal Science</i> . Vol. 91, Iss. 7. July 2013.	Y	N		N/D	
Boler, D.D. et al. "Effects of feeding zilpaterol hydrochloride for twenty to forty days on carcass cutability and subprimal yield of calf-fed Holstein steers." <i>Journal of Animal Science</i> . Vol. 87, Iss. 11. November 2009.	Y	Y	Intervet, Beckett Consulting	N/D	
Brake, D.W. et al. "Effect of nitrogen supplementation and zilpaterol-HCl on urea kinetics in steers consuming corn-based diets." <i>Journal of Animal Physiology and Animal Nutrition</i> . Vol. 95, Iss. 4. August 2011.	N	N		N	
Brooks, J.C. et al. "Moisture enhancement and blade tenderization effects on the shear force and palatability of strip loin steaks from beef cattle fed zilpaterol hydrochloride." <i>Journal of Animal Science</i> . Vol. 88, Iss. 5. May 2010.	Y	Y	Intervet, private consultant	N/D	
Brooks, J.C. et al. "Effects of zilpaterol hydrochloride feeding duration and postmortem aging on Warner-Bratzler shear force of three muscles from beef steers and heifers." <i>Journal of Animal Science</i> . Vol. 87, Iss. 11. November 2009.	Y	Y	Intervet, private consultant	N/D	
Capper, J.L. "The environmental and economic impact of removing growth-enhancing technologies from U.S. beef production." <i>Journal of Animal Science</i> . Vol. 90, Iss. 10. October 2012.	Y	N		Y	Sustainable Beef Resource Center

\* These studies either made disclosures that did not clearly state the funder or only partially disclosed their source of funding.

N/D = Not Disclosed

CONTINUED ►

Citation	FASS Journal?	Industry-Employed Author?	Which Company?	Industry Funder?	Which Company?
Choi, C.B. et al. "Administration of zilpaterol hydrochloride alters feedlot performance, carcass characteristics, muscle, and fat profiling in finishing Hanwoo steers." <i>Livestock Science</i> . Vol. 157, Iss. 2-3. November 2013.	N	Y	Merck Animal Health, MSD Animal Health	Y	MSD Animal Health
Claus, H.L. et al. "Effects of supplementing feedlot steers and heifers with zilpaterol hydrochloride on Warner-Bratzler shear force interrelationships of steer and heifer longissimus lumborum and heifer triceps brachii and gluteus medius muscles aged for 7, 14 and 21 d." <i>Meat Science</i> . Vol. 85, Iss. 2. June 2010.	N	Y	Intervet, private consultant	*	
Delmore, R.J. et al. "Perspectives on the application of zilpaterol hydrochloride in the United States beef industry." <i>Journal of Animal Science</i> . Vol. 88, Iss. 8. August 2010.	Y	Y	Intervet	N/D	
Edrington, T.S. et al. "Influence of beta-agonists (ractopamine HCl and zilpaterol HCl) on fecal shedding of <i>Escherichia coli</i> O157:H7 in feedlot cattle." <i>Journal of Food Protection</i> . Vol. 72, Iss. 12. December 2009.	N	Y	Intervet, Elanco, Cactus Feeders	Y	Elanco
Elam, N.A. et al. "Effect of zilpaterol hydrochloride duration of feeding on performance and carcass characteristics of feedlot cattle." <i>Journal of Animal Science</i> . Vol. 87, Iss. 6. June 2009.	Y	Y	Intervet	Y	Intervet
Garmyn, A.J. et al. "Warner-Bratzler and slice shear force measurements of 3 beef muscles in response to various aging periods after trenbolone acetate and estradiol implants and zilpaterol hydrochloride supplementation of finishing beef steers." <i>Journal of Animal Science</i> . Vol. 89, Iss. 11. November 2011.	Y	Y	Intervet	N/D	
Garmyn, A.J. et al. "The effects of zilpaterol hydrochloride on carcass cutability and tenderness of calf-fed Holstein steers." <i>Journal of Animal Science</i> . Vol. 88, Iss. 7. July 2010.	Y	Y	Intervet, Beckett Consulting	*	
Gunderson, J.A. et al. "Effects of zilpaterol hydrochloride feeding duration on crossbred beef semimembranosus steak color in aerobic or modified atmosphere packaging." <i>Journal of Animal Science</i> . Vol. 87, Iss. 11. November 2009.	Y	Y	Intervet, consultant	Y	Tyson
Gunderson, J.A. et al. "Feeding zilpaterol hydrochloride to calf-fed Holsteins has minimal effects on semimembranosus steak color." <i>Journal of Animal Science</i> . Vol. 87, Iss. 11. November 2009.	Y	Y	Intervet, consultant	Y	Tyson
Guzman, A. et al. "Reduced response to an estrous induction program in postpartum beef cows treated with zilpaterol and gaining body weight." <i>Animal Reproduction Science</i> . Vol. 130, Iss. 1-2. January 2012.	N	N		N	
Haneklaus, A.N. et al. "Effects of zilpaterol hydrochloride on retail yields of subprimals from beef and calf-fed Holstein steers." <i>Journal of Animal Science</i> . Vol. 89, Iss. 9. September 2011.	Y	Y	Intervet, Allen Consulting	N/D	
Hansen, S. et al. "The effect of vitamin D-3 supplementation on texture and oxidative stability of beef loins from steers treated with zilpaterol hydrochloride." <i>Meat Science</i> . Vol. 90, Iss. 1. January 2012.	N	N		N	
Hilton, G.G. et al. "Effect of zilpaterol hydrochloride supplementation on cutability and subprimal yield of beef steer carcasses." <i>Journal of Animal Science</i> . Vol. 88, Iss. 5. May 2010.	Y	Y	Intervet	N/D	
Hilton, G.G. et al. "Effects of feeding zilpaterol hydrochloride with and without monensin and tylosin on carcass cutability and meat palatability of beef steers." <i>Journal of Animal Science</i> . Vol. 87, Iss. 4. April 2009.	Y	Y	Intervet	N/D	

\* These studies either made disclosures that did not clearly state the funder or only partially disclosed their source of funding.

N/D = Not Disclosed

CONTINUED ►



Citation	FASS Journal?	Industry-Employed Author?	Which Company?	Industry Funder?	Which Company?
Holland, B.P. et al. "Effect of extended withdrawal of zilpaterol hydrochloride on performance and carcass traits in finishing beef steers." <i>Journal of Animal Science</i> . Vol. 88, Iss. 1. January 2010.	Y	Y	Intervet	*	
Holmer, S.F. et al. "The effect of zilpaterol hydrochloride on meat quality of calf-fed Holstein steers." <i>Journal of Animal Science</i> . Vol. 87, Iss. 11. November 2009.	Y	Y	Intervet, Beckett	N/D	
Hope-Jones, M. et al. "Effect of dietary beta-agonist treatment, vitamin D-3 supplementation and electrical stimulation of carcasses on colour and drip loss of steaks from feedlot steers." <i>Meat Science</i> . Vol. 90, Iss. 3. March 2012.	N	N		N	
Hope-Jones, M. et al. "The efficiency of electrical stimulation to counteract the negative effects of beta-agonists on meat tenderness of feedlot cattle." <i>Meat Science</i> . Vol. 86, Iss. 3. November 2010.	N	N		N	
Howard, S.T. et al. "Effects of ractopamine hydrochloride and zilpaterol hydrochloride supplementation on carcass cutability of calf-fed Holstein steers." <i>Journal of Animal Science</i> . Vol. 92, Iss. 1. January 2014.	Y	Y	Elanco, JBS	Y	Elanco, JBS
Howard, S.T. et al. "Effects of ractopamine hydrochloride and zilpaterol hydrochloride supplementation on longissimus muscle shear force and sensory attributes of calf-fed Holstein steers." <i>Journal of Animal Science</i> . Vol. 92, Iss. 1. January 2014.	Y	Y	Elanco, JBS	Y	Elanco, JBS
Kellermeier, J.D. et al. "Effects of zilpaterol hydrochloride with or without an estrogen-trenbolone acetate terminal implant on carcass traits, retail cutout, tenderness, and muscle fiber diameter in finishing steers." <i>Journal of Animal Science</i> . Vol. 87, Iss. 11. November 2009.	Y	Y	Intervet	Y	Intervet
Kononoff, P.J. "Impact of a leptin single nucleotide polymorphism and zilpaterol hydrochloride on growth and carcass characteristics in finishing steers." <i>Journal of Animal Science</i> . Vol. 91, Iss. 10. October 2013.	Y	Y	Quantum Genetix Canada, Cactus Research	N/D	
Korn, K.T. et al. "Supplemental vitamin D-3 and zilpaterol hydrochloride. I. Effect on performance, carcass traits, tenderness, and vitamin D metabolites of feedlot steers." <i>Journal of Animal Science</i> . Vol. 91, Iss. 7. July 2013.	Y	Y	DSM Nutritional Products	N/D	
Korn, K.T. et al. "Supplemental vitamin D-3 and zilpaterol hydrochloride. II. Effect on calcium concentration, muscle fiber type, and calpain gene expression of feedlot steers." <i>Journal of Animal Science</i> . Vol. 91, Iss. 7. July 2013.	Y	Y	DSM Nutritional Products	N/D	
Lawrence, T.E. et al. "Zilpaterol improves feeding performance and fabrication yield of concentrate-finished cull cows." <i>Journal of Animal Science</i> . Vol. 89, Iss. 7. July 2011.	Y	Y	Intervet	Y	Intervet
Lawrence, T.E. et al. "Technical note: Feeding zilpaterol hydrochloride to calf-fed Holstein steers improves muscle conformation of top loin steaks." <i>Meat Science</i> . Vol. 88, Iss. 1. May 2011.	N	Y	Intervet, Beckett, private consultant	N/D	
Lawrence, T.E. et al. "Predicting red meat yields in carcasses from beef-type and calf-fed Holstein steers using the United States Department of Agriculture calculated yield grade." <i>Journal of Animal Science</i> . Vol. 88, Iss. 6. June 2010.	Y	Y	Intervet, private consultant	Y	Intervet
Leheska, J.M. et al. "Dietary zilpaterol hydrochloride. II. Carcass composition and meat palatability of beef cattle." <i>Journal of Animal Science</i> . Vol. 87, Iss. 4. April 2009.	Y	Y	Intervet, Balanced Life Nutrition	N/D	

\* These studies either made disclosures that did not clearly state the funder or only partially disclosed their source of funding.

N/D = Not Disclosed

CONTINUED ►

Citation	FASS Journal?	Industry-Employed Author?	Which Company?	Industry Funder?	Which Company?
Loneragan, G.H. et al. "Increased mortality in groups of cattle administered the beta-adrenergic agonists ractopamine hydrochloride and zilpaterol hydrochloride." <i>PLOS ONE</i> . Vol. 9, Iss. 3. March 2014.	N	N		Y	Elanco
Lowe, B.K. et al. "The effects of zilpaterol hydrochloride supplementation on market dairy cow performance, carcass characteristics, and cutability." <i>The Professional Animal Scientist</i> . Vol. 28, No. 2. April 2012.	Y	Y	Intervet	N/D	
Luque, L.D. "Zilpaterol hydrochloride supplementation has no effect on the shelf life of ground beef." <i>Journal of Animal Science</i> . Vol. 89, Iss. 3. March 2011.	Y	Y	Intervet, private consultant	N/D	
McEvers, T.J. et al. "The effect of supplementing zilpaterol hydrochloride on feeding performance and carcass characteristics of steers sorted by leptin genotype." <i>Journal of Animal Science</i> . Vol. 92, Iss. 1. January 2014.	Y	Y	Merck, Cactus Research	N/D	
McEvers, T.J. et al. "Effect of leptin genotype and zilpaterol hydrochloride supplementation on the growth rate and carcass characteristics of finishing steers." <i>Canadian Journal of Animal Science</i> . Vol. 93, Iss. 2. June 2013.	N	Y	Merck, Cattleland Feedyards	N/D	
McEvers, T.J. et al. "Feeding performance, carcass characteristics, and tenderness attributes of steers sorted by the Igenity tenderness panel and fed zilpaterol hydrochloride." <i>Journal of Animal Science</i> . Vol. 90, Iss. 11. November 2012.	Y	Y	Merck, Johnson Research	N/D	
McEvers, T.J. et al. "Quantification of saleable meat yield using objective measurements captured by video image analysis technology." <i>Journal of Animal Science</i> . Vol. 90, Iss. 9. September 2012.	Y	Y	Intervet	Y	Intervet
Mehaffey, J.M. et al. "Effect of feeding zilpaterol hydrochloride to beef and calf-fed Holstein cattle on consumer palatability ratings." <i>Journal of Animal Science</i> . Vol. 87, Iss. 11. November 2009.	Y	Y	Intervet	Y	Intervet
Miller, E.K. et al. "Zilpaterol hydrochloride alters abundance of beta-adrenergic receptors in bovine muscle cells but has little effect on de novo fatty acid biosynthesis in bovine subcutaneous adipose tissue explants." <i>Journal of Animal Science</i> . Vol. 90, Iss. 4. April 2012.	Y	Y	Intervet	N/D	
Montgomery, J.L. et al. "Dietary zilpaterol hydrochloride. I. Feedlot performance and carcass traits of steers and heifers." <i>Journal of Animal Science</i> . Vol. 87, Iss. 4. April 2009.	Y	Y	Intervet, Johnson Research, AgriResearch Center, HMS Veterinary Development, Inc.	N/D	
Montgomery, J.L. et al. "Effects of dietary zilpaterol hydrochloride on feedlot performance and carcass characteristics of beef steers fed with and without monensin and tylosin." <i>Journal of Animal Science</i> . Vol. 87, Iss. 3. March 2009.	Y	Y	Intervet, Cactus Research	N/D	
Moron-Fuenmayor, O.E. et al. "Effects of zilpaterol hydrochloride and vitamin D-3 on beef quality in commercial heifers." <i>Revista Científica-Facultad De Ciencias Veterinarias</i> . Vol. 12, Iss. 6. November-December 2002.	N	N		N	
Neill, S. et al. "Effects of implanting and feeding zilpaterol hydrochloride on performance, carcass characteristics, and subprimal beef yields of fed cows." <i>Journal of Animal Science</i> . Vol. 87, Iss. 2. February 2009.	Y	N		Y	The Beef Checkoff

\* These studies either made disclosures that did not clearly state the funder or only partially disclosed their source of funding.

N/D = Not Disclosed

CONTINUED ►

Citation	FASS Journal?	Industry-Employed Author?	Which Company?	Industry Funder?	Which Company?
O'Neill, H.A. et al. "Interactive effect of dietary protein level and zilpaterol hydrochloride on feedlot performance and meat quality of steers." <i>South African Journal of Animal Science</i> . Vol. 40, Iss. 3. 2010.	N	N		N/D	
Parr, S.L. et al. "Performance of finishing beef steers in response to anabolic implant and zilpaterol hydrochloride supplementation." <i>Journal of Animal Science</i> . Vol. 89, Iss. 2. February 2011.	Y	Y	Intervet	Y	Intervet
Plascencia, A. et al. "Influence of the beta-agonist, zilpaterol, on growth performance and carcass characteristics of feedlot steers." <i>Journal of Animal and Veterinary Advances</i> . Vol. 7, Iss. 10. October 2008.	N	N		N/D	
Rathmann, R.J. et al. "Effects of zilpaterol hydrochloride and days on the finishing diet on feedlot performance, carcass characteristics, and tenderness in beef heifers." <i>Journal of Animal Science</i> . Vol. 90, Iss. 9. September 2012.	Y	Y	Intervet, Cactus Research	Y	Intervet
Rathmann, R.J. et al. "Effects of duration of zilpaterol hydrochloride and days on the finishing diet on carcass cutability, composition, tenderness, and skeletal muscle gene expression in feedlot steers." <i>Journal of Animal Science</i> . Vol. 87, Iss. 11. November 2009.	Y	Y	Intervet	Y	Intervet
Robles-Estrada, J.C. et al. "Effects of preslaughter withdrawal period on response of feedlot heifers to zilpaterol hydrochloride supplementation: Growth performance and carcass characteristics." <i>Journal of Animal Science</i> . Vol. 87, Iss. 5. May 2009.	Y	N		*	
Rodas-Gonzalez, A. et al. "Effects of postmortem calcium chloride injection on meat palatability traits of strip loin steaks from cattle supplemented with or without zilpaterol hydrochloride." <i>Journal of Animal Science</i> . Vol. 90, Iss. 10. October 2012.	Y	Y	Merck	N/D	
Rogers, H.R. et al. "Effects of zilpaterol hydrochloride feeding duration on beef and calf-fed Holstein strip loin steak color." <i>Journal of Animal Science</i> . Vol. 88, Iss. 3. March 2010.	Y	Y	Intervet, private consultant	N/D	
Romero, M. et al. "Influence of zilpaterol and mineral-yeast mixture on ruminal fermentation and growth performance in finishing steers." <i>Journal of Applied Animal Research</i> . Vol. 35, Iss. 1. March 2009.	N	N		N/D	
Schroeder, T.C. et al. "Economic impacts of Zilmax(R) adoption in cattle feeding." <i>Journal of Agricultural and Resource Economics</i> . Vol. 36, Iss. 3. December 2011.	N	N		Y	Intervet
Scramlin, S.M. et al. "Comparative effects of ractopamine hydrochloride and zilpaterol hydrochloride on growth performance, carcass traits, and longissimus tenderness of finishing steers." <i>Journal of Animal Science</i> . Vol. 88, Iss. 5. May 2010.	Y	Y	Elanco	N/D	
Shook, J.N. et al. "Effects of zilpaterol hydrochloride and zilpaterol hydrochloride withdrawal time on beef carcass cutability, composition, and tenderness." <i>Journal of Animal Science</i> . Vol. 87, Iss. 11. November 2009.	Y	Y	Intervet	*	
Stackhouse-Lawson, K.R. et al. "Growth promoting technologies reduce greenhouse gas, alcohol, and ammonia emissions from feedlot cattle." <i>Journal of Animal Science</i> . Vol. 91, Iss. 11. November 2013.	Y	N		N/D	

\* These studies either made disclosures that did not clearly state the funder or only partially disclosed their source of funding.

N/D = Not Disclosed

CONTINUED ►



Citation	FASS Journal?	Industry-Employed Author?	Which Company?	Industry Funder?	Which Company?
Stackhouse, K.R. et al. "Growth-promoting technologies decrease the carbon footprint, ammonia emissions, and costs of California beef production systems." <i>Journal of Animal Science</i> . Vol. 90, Iss. 12. December 2012.	Y	N		N/D	
Strydom, P.E. et al. "The effects of a beta-agonist treatment, Vitamin D-3 supplementation and electrical stimulation on meat quality of feedlot steers." <i>Meat Science</i> . Vol. 89, Iss. 4. December 2011.	N	N		N	
Strydom, P.E. et al. "Effects of duration of zilpaterol hydrochloride supplementation on growth performance, carcass traits and meat quality of grain-fed cull cows." <i>Animal</i> . Vol. 4, Iss. 4. April 2010.	N	N		Y	Intervet
Strydom, P.E. et al. "The comparison of three beta-agonists for growth performance, carcass characteristics and meat quality of feedlot cattle." <i>Meat Science</i> . Vol. 81, Iss. 3. March 2009.	N	Y	Intervet	N	
Sumano, Hector L. et al. "Clenbuterol and other beta-agonists, are they an option for meat production or a threat for public health?" <i>Veterinaria México</i> . Vol. 33, Iss. 2. 2002.	N	N		N/D	
Van Donkersgoed, J. et al. "Comparative effects of zilpaterol hydrochloride and ractopamine hydrochloride on growth performance, carcass characteristics, and longissimus tenderness of feedlot steers fed barley-based diets." <i>The Professional Animal Scientist</i> . Vol. 30, No. 1. February 2014.	Y	Y	Merck, Alberta Beef Health Solutions	Y	Merck
Van Donkersgoed, J. et al. "Comparative effects of zilpaterol hydrochloride and ractopamine hydrochloride on growth performance, carcass characteristics, and longissimus tenderness of feedlot heifers fed barley-based diets." <i>The Professional Animal Scientist</i> . Vol. 27, No. 2. April 2011.	Y	Y	Intervet, Alberta Beef Health Solutions	Y	Intervet
VanOverbeke, D.L. et al. "Effect of zilpaterol hydrochloride supplementation of beef steers and calf-fed Holstein steers on the color stability of top sirloin butt steaks." <i>Journal of Animal Science</i> . Vol. 87, Iss. 11. November 2009.	Y	Y	Intervet	*	
Vasconcelos, J.T. et al. "Effects of duration of zilpaterol hydrochloride feeding and days on the finishing diet on feedlot cattle performance and carcass traits." <i>Journal of Animal Science</i> . Vol. 86, Iss. 8. August 2008.	Y	Y	Intervet	Y	Intervet
Walter, L.J. et al. "Association of pro-melanin concentrating hormone genotype with beef carcass quality and yield." <i>Journal of Animal Science</i> . Vol. 92, Iss. 1. January 2014.	Y	Y	Merck, Cactus Feeders, Quantum Genetix Canada	Y	Merck
Weber, M.J. et al. "Effects of feeding a single or sequence of beta-adrenergic agonists on cull cow meat quality." <i>Meat Science</i> . Vol. 93, Iss. 2. February 2013.	N	N		*	
Weber, M.J. et al. "Effects of sequential feeding of beta-adrenergic agonists on cull cow performance, carcass characteristics, and mRNA relative abundance." <i>Journal of Animal Science</i> . Vol. 90, Iss. 5. May 2012.	Y	N		N/D	

\* These studies either made disclosures that did not clearly state the funder or only partially disclosed their source of funding.

N/D = Not Disclosed

- 1 Food & Water Watch. *Public Research, Private Gain*. 2012.
- 2 Flanagan, Annette et al. "Prevalence of articles with honorary authors and ghost authors in peer-reviewed medical journals." *Journal of the American Medical Association*. Vol. 280, No. 3. July 15, 1998; Mowatt, Graham et al. "Prevalence of honorary and ghost authorship in Cochrane Reviews." *Journal of the American Medical Association*. Vol. 287, No. 21. June 5, 2002; Ross, Joseph et al. "Guest authorship and ghostwriting in publications related to Rofecoxib." *Journal of the American Medical Association*. Vol. 299, No. 14. April 16, 2008; Wilson, Duff and Natasha Singer. "Ghostwriting is called rife in medical journals." *New York Times*. September 10, 2009.
- 3 Bosch, Xavier. "Exorcising ghostwriting..." *EMBO Reports*. Vol. 12, Iss. 10. May 13, 2011 at 489.
- 4 Benson, Margaret E. "Animal sciences: a proud tradition." *The Inside Scoop*. Washington State University Department of Animal Sciences. Spring 2012; Capper, Jude. Curriculum Vitae. Available at <https://wsu.academia.edu/JudeCapper/CurriculumVitae> and on file at Food & Water Watch. Accessed November 18, 2014; National Research Council. Agenda for Meeting 5 on Sustainability Considerations for the Future of Animal Science Research. Available at <http://www8.nationalacademies.org/cp/meetingview.aspx?MeetingID=7281&MeetingNo=5> and on file at Food & Water Watch. Accessed November 12, 2014; Capper, Jude. "Environmental impact of animal agriculture." PowerPoint presentation at National Research Council committee meeting on "Sustainability Considerations for the Future of Animal Science Research." May 13, 2014; O'Brien, D. et al. "A case study of the carbon footprint of milk from high-performing confinement dairy farms." *Journal of Dairy Science*. Vol. 97, Iss. 3. March 2014.
- 5 Personal correspondence with Montana State University.
- 6 Diels, Johan. "Association of financial or professional conflict of interest to research outcomes on health risks or nutritional assessment studies of genetically modified products." *Food Policy*. November 22, 2010 at 200 to 201; Lesser, Lenard et al. "Relationship between funding source and conclusion among nutrition-related scientific articles." *PLOS MEDICINE*. January 2007 at Discussion; Friedman, Lee S. et al. "Relationship between conflicts of interest and research results." *Journal of General Internal Medicine*. Vol. 19, Iss. 1. January 2004 at Discussion; Als-Nielsen, B. et al. "Association of funding and conclusions in randomized drug trials." *Journal of the American Medical Association*. Vol. 290, No. 7. August 20, 2003 at 924; Krinsky, Sheldon. "Combating the funding effect in science: what's beyond transparency?" *Standard Law & Policy Review*. Vol. XXI. 2010 at 107 to 109.
- 7 Grant, Bob. "Elsevier published 6 fake journals." *The Scientist*. May 7, 2009; Elsevier. [Press release]. "Statement from Michael Hansen, CEO of Elsevier's health sciences division, regarding Australia based sponsored journal practices between 2000 and 2005." May 7, 2009.
- 8 Association of Research Libraries. [Issue brief]. "John Wiley and Sons' acquisition of Blackwell Publishing." 2007; Dobbs, David. "When the rebel alliance sells out." *New Yorker*. April 12, 2013; Springer. [Press release]. "Springer to acquire pharma marketing and publishing services from Wolters Kluwer." November 9, 2011; Morgan Stanley. Equity Research Report, Europe. "Media Industry Overview: Scientific Publishing: Knowledge Is Power." September 30, 2002; Owens, Simon. "Is the academic publishing industry on the verge of disruption?" *U.S. News & World Report*. July 23, 2012; Van Noorden, Richard. "Open access: The true cost of science publishing." *Nature*. Vol. 495, Iss. 7442. March 27, 2013.
- 9 Springer. "Facts and Figures 2014." 2014 at 2; Reed Elsevier. Annual Reports and Financial Statements. 2013 at 14; Informa. Annual Report. 2013 at 05; John Wiley and Sons. U.S. Securities and Exchange Commission (SEC) Filing. 10-K. April 2014 at 15.
- 10 Lin, Thomas. "Mathematicians organize boycott of a publisher." *New York Times*. February 13, 2012; Gowers, Timothy. Gower's Weblog. "Elsevier — my part in its downfall"; The Cost of Knowledge. Running tally of researchers boycotting Elsevier. Available at <http://the-costofknowledge.com/> and on file at Food & Water Watch. Accessed October 21, 2014.
- 11 Grant (2009); Elsevier (2009); Wilson, Duff. "Merck to pay \$950 million over Vioxx." *New York Times*. November 22, 2011.
- 12 Singer, Natasha. "Merck paid for medical 'journal' without disclosure." *New York Times*. May 13, 2009.
- 13 Huffstutter, P.J. and Tom Polansek. "Lost hooves, dead cattle before Merck halted Zilmax sales." *Reuters*. December 30, 2013.
- 14 "Cattle futures soar on drug ban by Tyson." *Lincoln Journal Star*. August 8, 2013; Huffstutter and Polansek (2013).
- 15 U.S. Food and Drug Administration (FDA). Center for Veterinary Medicine (CVM). New animal drug application 141-258. Zilmax (Zilpaterol Hydrochloride). August 10, 2006 at 13. Note: The main portion of the animal safety study looked at toxicological and safety effects, while a very small, secondary portion of the study conducted heart rate monitoring of 12 cattle. The FDA noted that the safety of Zilmax is also supported by the drug effectiveness studies submitted by Intervet, the developer of Zilmax. These studies were not designed to examine animal safety and did little more than report that there were no animal safety problems observed during the studies.
- 16 Lowe, Peggy. "Suspended drug sales focuses attention on cattle-feeding additive." *Harvest Public Media*. December 17, 2013; European Commission. Council Directive 96/22/EC of 29 April 1996 concerning the prohibition on the use in stockfarming of certain substances having a hormonal or thyrostatic action and of  $\beta$ -agonists, and repealing Directives 81/602/EEC, 88/146/EEC and 88/299/EEC At Article 3 (a) and Article 4 (1)).
- 17 Lowe (2013).
- 18 Polansek, Tom and P.J. Huffstutter. "U.S. cattle deaths linked to Zilmax far exceed company reports: study." *Reuters*. March 12, 2014.
- 19 Grandin, Temple. "Making slaughterhouses more humane for cattle, pigs, and sheep." *Annual Review of Animal Biosciences*. January 16, 2013 at 496; Petersen, Melody. "As beef cattle become behemoths, who are animal scientists serving?" *Chronicle of Higher Education*. April 15, 2012.
- 20 All Zilmax data cited in this section comes from an analysis of the 78 published studies that Food & Water Watch found in a search of three academic databases conducted in the spring of 2014. See Methodology at 13.
- 21 Note: Merck and Intervet funded and/or authored 48 of the 60 industry studies. Other corporate authors and funders include corporate meat processors, private consultants and the drug company Elanco, which produces a competitor beta-agonist drug called ractopamine.
- 22 See as examples: Garmyn, A.J. et al. "The effects of zilpaterol hydrochloride on carcass cutability and tenderness of calf-fed Holstein steers." *Journal of Animal Science*. Vol. 88, Iss. 7. July 2010; Kellermeier, J.D. et al. "Effects of zilpaterol hydrochloride with or without an estrogen-trenbolone acetate terminal implant on carcass traits, retail cutout, tenderness, and muscle fiber diameter in finishing steers." *Journal of Animal Science*. Vol. 87, Iss. 11. November 2009; Korn, K.T. et al. "Supplemental vitamin D-3 and zilpaterol hydrochloride. I. Effect on performance, carcass traits, tenderness, and vitamin D metabolites of feedlot steers." *Journal of Animal Science*. Vol. 91, Iss. 7. July 2013; Rathmann, R.J. et al. "Effects of duration of zilpaterol hydrochloride and days on the finishing diet on carcass cutability, composition, tenderness, and skeletal muscle gene expression in feedlot steers." *Journal of Animal Science*. Vol. 87, Iss. 11. November 2009; Shook, J.N. et al. "Effects of zilpaterol hydrochloride and zilpaterol hydrochloride withdrawal time on beef carcass cutability, composition, and tenderness." *Journal of Animal Science*. Vol. 87, Iss. 11. November 2009.

- 23 See as examples: Kellermeier et al. (2009); Kononoff, P.J. et al. "Impact of a leptin single nucleotide polymorphism and zilpaterol hydrochloride on growth and carcass characteristics in finishing steers." *Journal of Animal Science*. Vol. 91, No. 10. October 2013.
- 24 Montgomery, J.L. et al. "Effects of dietary zilpaterol hydrochloride on feedlot performance and carcass characteristics of beef steers fed with and without monensin and tylosin." *Journal of Animal Science*. Vol. 87, Iss. 3. March 2009 at Results and Discussion.
- 25 *Ibid.* at Discussion.
- 26 Van Donkersgoed, J. et al. "Comparative effects of zilpaterol hydrochloride and ractopamine hydrochloride on growth performance, carcass characteristics, and longissimus tenderness of feedlot steers fed barley-based diets." *The Professional Animal Scientist*. Vol. 30, No. 1. February 2014 at Abstract and Results and Discussion; Van Donkersgoed, J. et al. "Comparative effects of zilpaterol hydrochloride and ractopamine hydrochloride on growth performance, carcass characteristics, and longissimus tenderness of feedlot heifers fed barley-based diets." *The Professional Animal Scientist*. Vol. 27, No. 2. April 2011 at Abstract and Results and Discussion.
- 27 *Ibid.*
- 28 Note: Merck's public relations materials cite a study co-authored by Intervet as evidence of the safety of Zilmax. Examining only 34 cows, the study's authors observed no changes in locomotion in Zilmax-treated cattle. See Merck Animal Health. [Statement]. "Merck Animal Health scientific studies on animal safety and well-being." Undated; Lowe, B.K. et al. "The effects of zilpaterol hydrochloride supplementation on market dairy cow performance, carcass characteristics, and cutability." *The Professional Animal Scientist*. Vol. 28, No. 2. April 2012.
- 29 Merck Animal Health. [Corporate Flyer]. "Zilmax: Animal Well-Being." 2013; Merck Animal Health (undated).
- 30 Avendano-Reyes, L. et al. "Effects of two beta-adrenergic agonists on finishing performance, carcass characteristics, and meat quality of feedlot steers." *Journal of Animal Science*. Vol. 84, No. 12. December 8, 2014.
- 31 American Society of Animal Science (ASAS). About ASAS: Board of Directors. Available at <https://www.asas.org/about-asas/asas-board-of-directors> and on file at Food & Water Watch. Accessed April 22, 2014.
- 32 ASAS. Membership Services: Corporate Sustaining Members. Available at <https://asas.org/membership-services/member-information/corporate-sustaining-members> and on file at Food & Water Watch. Accessed April 22, 2014.
- 33 *Journal of Animal Science*. Editorial Board. Available at <https://www.animalsciencepublications.org/publications/jas/edboard> and on file at Food & Water Watch. Accessed April 8, 2014.
- 34 American Dairy Science Association (ADSA). ADSA Board of Directors. Available at <http://www.adsa.org/AboutADSA/Leadership.aspx> and on file at Food & Water Watch. Accessed April 22, 2014.
- 35 ADSA. ADSA Corporate Sustaining Members. Available at <http://www.adsa.org/Membership/CorporateSustainingMembership/Corp/CurrentCorporateSustainingMembers.aspx> and on file at Food & Water Watch. Accessed April 22, 2014.
- 36 *Journal of Dairy Science*. 2014 Masthead. Available at <http://www.journalofdairyscience.org/pb/assets/raw/Health%20Advance/journals/jods/editorial97-10.pdf> and on file at Food & Water Watch. Accessed June 20, 2014; Loftén, J.R. "Invited review: palmitic and stearic acid metabolism in lactating dairy cows." *Journal of Dairy Science*. Vol. 97, Iss. 8. August 2014 at author affiliations (Kertz); Hill, T.M. "Amino acids, fatty acids, and fat sources for calf milk replacers." *The Professional Animal Scientist*. Vol. 23, No.4. August 2007 at author affiliations (Bateman).
- 37 Poultry Science Association. Board of Directors. Available at <http://www.poultryscience.org/bod.asp?autotry=true&ULnotkn=true> and on file at Food & Water Watch. Accessed April 22, 2014.
- 38 Tyson Foods. U.S. Securities and Exchange Commission (SEC) Filing. 10-K. Fiscal Year ending September 27, 2014 at 2.
- 39 Poultry Science Association. Publications. Available at <http://www.poultryscience.org/publications.asp?autotry=true&ULnotkn=true> and on file at Food & Water Watch. April 22, 2014.
- 40 *Ibid.*
- 41 *Poultry Science*. Editorial Board. Available at [http://www.oxfordjournals.org/our\\_journals/ps/editorial\\_board.html](http://www.oxfordjournals.org/our_journals/ps/editorial_board.html) and on file at Food & Water Watch. Accessed October 16, 2014.
- 42 *Journal of Applied Poultry Research*. Editorial Board. Available at [http://www.oxfordjournals.org/our\\_journals/japr/editorial\\_board.html](http://www.oxfordjournals.org/our_journals/japr/editorial_board.html) and on file at Food & Water Watch. Accessed October 16, 2014.
- 43 American Registry of Professional Animal Scientists. Governing Council. Available at [http://www.arpas.org/society.asp?view=officers\\_board](http://www.arpas.org/society.asp?view=officers_board) and on file at Food & Water Watch. Accessed October 17, 2014.
- 44 American Registry of Professional Animal Scientists. Corporate Sponsors. Available at <http://www.arpas.org/sponsors.asp?view=corporate> and on file at Food & Water Watch. Accessed April 22, 2014.
- 45 *The Professional Animal Scientist*. Editorial Board. Available at <http://pas.fass.org/site/misc/edboard.xhtml> and on file at Food & Water Watch. Accessed April 22, 2014; Midwestern Section ASAS and Midwestern Branch ADSA Scientific Sessions & Business Meeting. Program. March 15–17, 2010 at 11; ASAS. 2014 Joint Annual Meeting. "Conference Information & Scientific Program." 2014 at 23 (Branine); Taylor, M.S. et al. "Blood mineral, hormone and osteocalcin responses of multiparous Jersey cows to an oral dose of 25-Hydroxyvitamin D3 or Vitamin D3 before parturition." *Journal of Dairy Science*. February 2008 at author affiliation; Seymour, William. LinkedIn page. Available at [https://www.linkedin.com/profile/view?id=60517734&authType=NAME\\_SEARCH&authToken=tQZU&locale=en\\_US&srchid=1979078021425655946687&srchindex=1&srchtotat=1&trk=vsrp\\_people\\_res\\_name&trkInfo=VSRPsearchId%3A1979078021425655946687%2CVSRPtargetId%3A60517734%2CVSRPcmpt%3Aprimary](https://www.linkedin.com/profile/view?id=60517734&authType=NAME_SEARCH&authToken=tQZU&locale=en_US&srchid=1979078021425655946687&srchindex=1&srchtotat=1&trk=vsrp_people_res_name&trkInfo=VSRPsearchId%3A1979078021425655946687%2CVSRPtargetId%3A60517734%2CVSRPcmpt%3Aprimary) and on file at Food & Water Watch. Accessed October 15, 2014.
- 46 Federation of Animal Science Societies (FASS). Publications. Available at <http://www.fass.org/page.asp?pageID=51> and on file at Food & Water Watch. Accessed November 21, 2014; Midwestern Section ASAS and Midwestern Branch ADSA Scientific Sessions & Business Meeting. 2010 at 11; ASAS. 2014 Joint Annual Meeting. 2014 at 34; Petersen (2012).
- 47 *Journal of Animal Science*. Editorial Board. Available at <https://www.animalsciencepublications.org/publications/jas/edboard> and on file at Food & Water Watch. Accessed February 18, 2015.
- 48 American Meat Science Association (AMSA). Publications and Resources. Available at <http://www.meatscience.org/events-education/rmc> and on file at Food & Water Watch. Accessed November 21, 2014; AMSA. AMSA Newsletter. Vol. 51e, No. 205. June 27, 2014 at 1.
- 49 Miller, Markus. Curriculum Vitae. Available at [http://www.depts.ttu.edu/afs/people/docs/CV\\_Miller.pdf](http://www.depts.ttu.edu/afs/people/docs/CV_Miller.pdf) and on file at Food & Water Watch. Accessed August 12, 2014.
- 50 Gunderson, J.A. et al. "Feeding zilpaterol hydrochloride to calf-fed Holsteins has minimal effects on semi-membranosus steak color." *Journal of Animal Science*. Vol. 87, Iss. 11. November 2009.
- 51 *Ibid.*
- 52 *Ibid.*
- 53 Petersen (2012).
- 54 Miller. Curriculum Vitae.
- 55 Johnson, Bradley J. Curriculum Vitae. Available at [http://www.depts.ttu.edu/afs/people/docs/CV2008\\_1\\_\\_bradley.pdf](http://www.depts.ttu.edu/afs/people/docs/CV2008_1__bradley.pdf) and on file at Food & Water Watch. Accessed February 11, 2015.
- 56 Gunderson (2009).
- 57 Petersen (2012).
- 58 *Ibid.*
- 59 McEvers, T.J. et al. "The effect of supplementing zilpaterol hydrochloride on feeding performance and carcass characteristics of steers sorted by leptin genotype." *Journal of Animal Science*. Vol. 92, Iss. 1. January 2014.
- 60 ASAS. [Press release]. "ASAS responds to 'Who are animal scientists serving?'" April 17, 2012.
- 61 *Ibid.*



- 62 Keefe, Lisa. "Zilmax studies presented at animal science symposium." *Meatingplace*. July 23, 2014; Merck Animal Health. [Press release]. "New data about Zilmax being presented at 2014 ADSA-ASAS-CSAS joint annual meeting." July 23, 2014; ASAS (2014) at 59 to 60, 195, 234.
- 63 Carroll, Jeffrey et al. Abstract presented to ASAS. "Supplementation of zilpaterol hydrochloride to crossbred Angus heifers does not increase stress responsiveness or homeostatic metabolic parameters after a combined corticotropin releasing hormone and vasopressin challenge." Submitted June 24, 2014. Available at [http://www.ars.usda.gov/research/publications/publications.htm?SEQ\\_NO\\_115=306908](http://www.ars.usda.gov/research/publications/publications.htm?SEQ_NO_115=306908) and on file at Food & Water Watch. Accessed November 14, 2014; ASAS (2014) at 102; Shaffer, Erica. "A closer look at Zilmax." *MeatPoultry.com*. July 16, 2014; Bergin, Nicholas. "UNL research defends Zilmax study." *Lincoln Journal Star*. July 18, 2014; Personal correspondence with Ty Schmidt. University of Nebraska, Animal Sciences Department.
- 64 Loneragan, Guy et al. "Increased mortality in groups of cattle administered the b-adrenergic agonists ractopamine hydrochloride and zilpaterol hydrochloride." *PLOS ONE*. March 12, 2014; Cranford, Leslie. "Texas Tech scientist raises concern of using beta agonists in beef cattle." *Texas Tech Today*. March 13, 2014.
- 65 Loneragan (2014) at 3 and 10.
- 66 See Food & Water Watch. "Antibiotic Resistance 101: How Antibiotic Misuse on Factory Farms Can Make You Sick." February 2014.
- 67 Loneragan (2014) at 10; McKinnon, Bill. "Beef Quality Corner — 'Dark Cutters.'" *Livestock Update*. Virginia Tech Cooperative Extension. March 1998; FDA CVM (2006) at 6.
- 68 *PLOS ONE*. "PLOS editorial and publishing policies." Undated at "Competing Interests." Available at <http://www.plosone.org/static/policies.action#competing> and on file at Food & Water Watch. Accessed October 27, 2014. Note: Two of the studies' three authors, both academics, disclosed ties to Elanco and/or Intervet, the makers of Zilmax and ractopamine. The study also notes that "initial funding" for the ractopamine analysis came from Elanco, but the authors distance themselves from Elanco, saying that their final analyses were "performed solely in the service of the first author's employment at Texas Tech University." It is also noteworthy that at least one of the authors, Guy Loneragan, the first author, acts as a consultant and adviser to Tyson and JBS, corporate meatpackers that were publicly opposed to Zilmax at the time of the article's publication. This consulting gave Loneragan a prominent voice in the initial animal safety discussions that lead to the removal of Zilmax from the market in 2013. As noted in the text, the timing of this research publication — only after Zilmax was removed from the marketplace — is also noteworthy. See Huffstutter, P.J. and Lisa Baertlein. "Exclusive: video of 'lame' cattle stirs new concern over growth drugs." *Reuters*. August 13, 2013; Charles, Dan. "Inside the beef industry's battle over growth-promotion drugs." NPR. November 21, 2013.
- 69 Polansek and Huffstutter (2014).
- 70 Loneragan (2014); Polansek, Tom and P.J. Huffstutter. "Halt in Zilmax sales fuels demand for rival cattle feed product." *Reuters*. August 23, 2014.
- 71 FDA CVM. Freedom of information summary for new animal drug application 140-872. POSILAC® (sterile sometribove zinc suspension). November 5, 1993.
- 72 Collier, Robert. "Regulation of rbST in the US." *AgBioForum*. Vol. 3, No. 2 & 3. 2000 at 156 to 163; Lilly. [Press release]. "Elanco announces acquisition of Posilac® dairy business." August 20, 2008.
- 73 FDA CVM (1993); Dohoo, Ian et al. Health Canada Drug and Health Products. "Report of the Canadian Veterinary Medical Association expert panel on rbST." November 1998 at section 7; Groves, Martha. "Canada rejects hormone that boosts cows' milk output." *Los Angeles Times*. January 15, 1999; European Commission, Directorate General for Health and Consumer Protection. "Report on Public Health Aspects of the Use of Bovine Somatotropin." March 1999. Available at [http://ec.europa.eu/food/fs/sc/scv/out19\\_en.html](http://ec.europa.eu/food/fs/sc/scv/out19_en.html).
- 74 Schneider, Keith. "F.D.A. accused of improper ties in review of drug for milk cows." *New York Times*. January 12, 1990; Siler, Julia Flynn. "All things right and dutiful: A vet who blew the whistle." *Business Week*. September 1, 1991.
- 75 Yousfi, Jennifer. "Monsanto sells off controversial milk-hormone to focus on seed product lines." *Money Morning*. August 23, 2008; Wal-Mart Stores, Inc. [Press release]. "Wal-Mart offers private label milk produced without artificial growth hormone." March 21, 2008.
- 76 Dohoo, I.R. et al. "A meta-analysis review of the effects of recombinant bovine somatotropin 2; Effects on animal health, reproductive performance, and culling." *Canadian Journal of Veterinary Research*. Vol. 67, Iss. 4. October 2003 at 263 to 264.
- 77 *Ibid.* at Results and Discussion under "Udder Health." See Dohoo's citations at 7 to 29; Elanco. Posilac drug label. Available at [https://www.elancocentral.com/posilac\\_label.pdf](https://www.elancocentral.com/posilac_label.pdf) and on file at Food & Water Watch. Accessed July 23, 2014.
- 78 See Food & Water Watch (2014).
- 79 Dohoo (2003) at 263 to 264.
- 80 *Ibid.* See Dohoo citations 9, 10, 11, 13, 17 to 23, 25 and 26; Feder, Barnaby. "In battling for biotech, Monsanto is the leader." *New York Times*. December 24, 1993.
- 81 Dohoo (2003) at 258 and 260 to 261.
- 82 Soliman, E.B. and M.A.A. El-Barody. "Physiological responses of dairy animals to recombinant bovine somatotropin: A review." *Journal of Cell and Animal Biology*. Vol. 8, Iss. 1. January 2014 at "Effects of rbST on animal health and immune system."
- 83 Burton, J.L. et al. "Health and reproductive performance of dairy cows treated for up to two consecutive lactations with bovine somatotropin." *Journal of Dairy Science*. Vol. 73, Iss. 11. November 1990 at author affiliation; Pell, A.N. et al. "Effects of a prolonged-release formulation of sometribove (n-methionyl bovine somatotropin) on jersey cows." *Journal of Dairy Science*. Vol. 75, Iss. 12. December 1992 at author affiliations; White T.C. et al. "Clinical mastitis in cows treated with sometribove (recombinant bovine somatotropin) and its relationship to milk yield." *Journal of Dairy Science*. Vol. 77, Iss. 8. August 1994 at author affiliations; Chalupa, W. et al. "Responses of dairy cows supplemented with somatotropin during weeks 5 through 43 of lactation." *Journal of Dairy Science*. Vol. 79, Iss. 5. May 1996.
- 84 Food & Water Watch analysis of Thomson Reuters Web of Science academic database. See Methodology. Search terms used: "recombinant bovine somatotropin" and "Posilac." Note: It was beyond the scope of this report to individually review the hundreds of articles that appeared in this search. Likewise, no single academic database is likely to yield every research article on a given topic. Bovine somatotropin has been researched for decades, in both recombinant and non-recombinant forms, and under a variety of names. Top Monsanto scientists or former Monsanto scientists authoring rBGH articles include Gary Hartnell, J.C. Byatt, J.J. Veenhuizen, R.L. Hintz and R.J. Collier. See: McLaughlin, C.L. et al. "Performance, clinical chemistry, and carcass responses of finishing lambs to recombinant bovine somatotropin and bovine placental lactogen." *Journal of Animal Science*. Vol. 71, Iss. 12. December 1993 at author affiliations.
- 85 Hartnell, Gary. "Message from the FASS Board President, Dr. Gary Hartnell." FASS Newsletter. Fall 2007.
- 86 Food & Water Watch analysis of Thomson Reuters Web of Science academic database. See Methodology.
- 87 *Ibid.*
- 88 Biello, David. "Can bovine growth hormone help slow global warming." *Scientific American*. July 2, 2008.
- 89 Collier, R.J. and D.E. Bauman. "Update on human health concerns of recombinant bovine somatotropin use in dairy cows." *Journal of Animal Science*. Vol. 92, No. 4. April 2014.
- 90 *Ibid.* Muirhead, Sarah. "Meta-analysis on rbST shows no unmanageable effects on cow health." *Feedstuffs*. July 23, 2014. Note: Of the published, peer-reviewed studies designed to study rBGH that Bauman cites, at least eight have industry authors or funders or were authored by Bauman: Barbano, D.M. et al. "Influence of milk somatic cell count and milk age on cheese yield." *Journal of Dairy Science*. Vol. 74, Iss. 2. February 1991 at author affiliation; Bauman, D.E. "Bovine somatotropin: Review of an emerging technology." *Journal of Dairy Science*. Vol. 75, Iss. 12. December 2012; Bauman, D.E. et al. "Production responses to bovine somatotropin in Northeast dairy herds." *Journal of Dairy Science*. Vol. 82, Iss. 12. December 1999 at author affiliation; Collier, R.J. et al. "Effects of sustained release bovine

- somatotropin (sometribove) on animal health in commercial dairy herds." *Journal of Dairy Science*. Vol. 84, Iss. 5. May 2001 at author affiliation; Collier, R.J. et al. "Factors affecting insulin-like growth factor I (IGF-1) concentration in bovine milk." *Journal of Dairy Science*. Vol. 74, Iss. 9. September 1991 at author affiliation; Laurent, F.B. et al. "Influence of bovine somatotropin on the composition and manufacturing properties of milk." *Journal of Dairy Science*. Vol. 75, Iss. 8. August 1992 at author affiliation; O'Donnell, A.M. et al. "Survey of the fatty acid composition of retail milk differing in label claims based on production management practices." *Journal of Dairy Science*. Vol. 93, Iss. 5. May 2010 at author affiliations; Ruegg, P.L. et al. "Effect of the use of bovine somatotropin on culling practices in thirty-two dairy herds in Indiana, Michigan, and Ohio." *Journal of Dairy Science*. Vol. 81, Iss. 5. May 1998 at author affiliations; Vicini, J.T. et al. "Survey of retail milk composition as affected by label claims regarding farm-management practices." *Journal of American Dietetics*. Vol. 108, Iss. 7. July 2008 at author affiliations.
- 91 Raymond, Richard et al. "Recombinant Bovine Somatotropin (rbST): A safety assessment." Presented at the joint annual meeting of the ADSA, the Canadian Society of Animal Science and ASAS. Montreal, Canada. July 14, 1999.
  - 92 *Ibid.* at Question 20. Citations include: Collier (2001) at author affiliation; White (1994) at author affiliation; McClary, D.G. et al. "The effects of a sustained-release recombinant bovine somatotropin (somidobove) on udder health for a full lactation." *Journal of Dairy Science*. Vol. 77, Iss. 8. August 1994 at author affiliation; Ruegg (1998) at author affiliations; Judge L.J. et al. "Recombinant bovine somatotropin and clinical mastitis: incidence, discarded milk following therapy, and culling." *Journal of Dairy Science*. Vol. 80, Iss. 12, December 1997; Bauman (1999) at author affiliation; Tauer, L.W. et al. "The empirical impact of bovine somatotropin on New York dairy farms." *Journal of Dairy Science*. Vol. 80, Iss. 6. June 1997.
  - 93 Raymond (1999) at Question 24. The two additional citations are: Wells, S.J. et al. "Effect of long-term administration of a prolonged release formulation of bovine somatotropin (sometribove) in clinical lameness in dairy cows." *American Journal of Veterinary Research*. Vol. 56, Iss. 8. August 1995; Santos, J.E.P. et al. "Effect of bST and reproductive management on reproductive performance of Holstein dairy cows." *Journal of Dairy Science*. Vol. 87, Iss. 4. April 1987 at author affiliation.
  - 94 Linskey, Annie. "Lawmakers want arsenic removed from chicken feed." *Baltimore Sun*. February 10, 2011; Chapman, H.D. and Z.B. Johnson. "Use of antibiotics and roxarsone in broiler chickens in the USA: analysis for the years 1995 to 2000." *Journal of Poultry Science*. Vol. 81. March 2002 at Abstract.
  - 95 Strom, Stephanie. "F.D.A. bans three arsenic drugs used in poultry and pig feeds." *New York Times*. October 1, 2013.
  - 96 FDA. Center for Veterinary Medicine Update. "FDA Announces Pending Withdrawal of Approval of Nitarsone." April 1, 2015.
  - 97 Fears, Darryl. "Maryland set to join Canada, EU in banning arsenic in chicken feed." *Washington Post*. April 10, 2012.
  - 98 Lasky, T. et al. "Mean total arsenic concentrations in chicken 1989-2000 and estimated exposures for consumers of chicken." *Environmental Health Perspectives*. Vol. 112, No. 1. January 2004 at Results and Discussion.
  - 99 *Ibid.* at Discussion.
  - 100 Institute for Agriculture and Trade Policy. "Playing Chicken: Avoiding Arsenic in Your Meat." 2006 at 5 to 7.
  - 101 *Ibid.*
  - 102 Nachman, K.E. et al. "Roxarsone, inorganic arsenic, and other arsenic species in chicken: A US-based market basket sample." *Environmental Health Perspectives*. Vol. 121, Iss. 7. July 2013; Tavernise, Sabrina. "Study finds an increase in arsenic levels in chicken." *New York Times*. May 11, 2013.
  - 103 *Ibid.*
  - 104 Dunham, Bernadette. Transcript of FDA Media Call. "FDA study findings leading to the suspension of 3-Nitro (Roxarsone) Sales." June 8, 2011 at 4; Kawalek, J.C. et al. FDA. Final Report on Study 275.30. February 10, 2011.
  - 105 Jones, F.T. "Invited Review: A broad view of arsenic." *Poultry Science*. Vol. 86. July 24, 2007 at 2 and 9.
  - 106 *Ibid.* at 9 to 10; See Bernard, B. K. "Arsenic in food: Opinion parading as science." *Environmental Health Perspectives*. Vol. 113, Iss. 4. April 2006 at A225.
  - 107 FASS. 2007 Joint Annual Meeting. "Conference Information and Scientific Program." Held July 8-12, 2007. At 100.
  - 108 Food & Water Watch analysis of Thomson Reuters Web of Science academic database. See Methodology. Search terms included poultry or chicken and Roxarsone or 3-Nitro. Note: It is beyond the scope of this report to individually review the hundreds of articles that appeared in this search. Likewise, no single academic database is likely to yield every research article on a given topic.
  - 109 Malesios, C. and Z. Abas. "Examination of the impact of animal and dairy science journals based on traditional and newly developed bibliometric indices." *Journal of Animal Science*. Vol. 90, No. 13. January 20, 2015 at Abstract.
  - 110 Hartnell (Fall 2007); Hartnell, Gary. FASS. Board of Directors. Available at <http://www.fass.org/fassboard.asp?autotry=true&ULnotkn=true> and on file at Food & Water Watch. Accessed June 20, 2014.
  - 111 FASS. "FASS Scientific Advisory Committee on Biotechnology Position Statement on FDA Draft Risk Assessment on Cloning." January 3, 2007; FASS. Scientific Advisory Committee on Biotechnology. Committee Members. Available at [http://www.fass.org/sac\\_biotech.asp](http://www.fass.org/sac_biotech.asp) and on file at Food & Water Watch. Accessed June 20, 2014.
  - 112 FASS. "FASS Facts: Are the meat, milk and eggs from livestock fed biotech feeds safe? Yes!" Undated.
  - 113 "New officer of the American Dairy Science Association." *Journal of Dairy Science*. Vol. 88, Iss. 12. December 2005 at 4514; Jordan, D.C. et al. "Effects of recombinant methionyl bovine somatotropin (sometribove) in high producing cows milked 3 times daily." *Journal of Dairy Science*. Vol. 74, No. 1. January 1991; McLaughlin, C.L. et al. "Comparison of performance, clinical-chemistry, and carcass characteristics of finishing lambs treated with recombinant ovine or bovine somatotropins." *Journal of Animal Science*. Vol. 71, Iss. 6. June 1993.
  - 114 Food & Water Watch analysis of Thomson Reuters Web of Science academic database. See Methodology; Proceedings from Southwest Nutrition and Management Conference. 2010 Conference Brochure. Undated. Available at [http://animal.cals.arizona.edu/swnmc/Proceedings/2010/Brochure\\_2010.pdf](http://animal.cals.arizona.edu/swnmc/Proceedings/2010/Brochure_2010.pdf) and on file at Food & Water Watch. Accessed October 15, 2014; Hartnell, Gary. Proceedings from Southwest Nutrition and Management Conference. "Do genetically engineered crops make economic sense?" February 26, 2010 at 97; *Journal of Dairy Science*. 2014 Masthead. Available at <http://www.journalofdairyscience.org/pb/assets/raw/Health%20Advance/journals/jods/editorial97-10.pdf> and on file at Food & Water Watch. Accessed June 20, 2014.
  - 115 Hartnell, Gary. ADSA Presidential Report. *Journal of Dairy Science*. Vol. 90, Iss. 10. 2007 at 5814; ADSA. ADSA Corporate Sustaining Members. Available at <http://www.adsa.org/Membership/Corporate-SustainingMembership/Corp/CurrentCorporateSustainingMembers.aspx> and on file at Food & Water Watch. Accessed June 20, 2014.
  - 116 *Journal of Animal Science*. About *Journal of Animal Science*. Available at <http://www.journalofanimalscience.org/site/misc/about.xhtml> and on file at Food & Water Watch. Accessed October 17, 2014. ASAS. "Open Letter to USDA-ARS Concerning USSES." August 5, 2014; *Journal of Applied Poultry Research*. Editorial Board. Available at [http://www.oxfordjournals.org/our\\_journals/japr/editorial\\_board.html](http://www.oxfordjournals.org/our_journals/japr/editorial_board.html) and on file at Food & Water Watch. Accessed July 15, 2014; ADSA. ADSA Awards. Available at <http://www.adsa.org/membership/adsaawards.aspx> and on file at Food & Water Watch. Accessed October 17, 2014.
  - 117 Food & Water Watch analysis of Thomson Reuters Web of Science academic database. See Methodology.
  - 118 *Ibid.*
  - 119 American Academy of Veterinary Pharmacology and Therapeutics. Constitution and Bylaws. Undated at Article III, Section 2. Available at <http://c.ymcnd.com/sites/www.aavpt.org/resource/resmgr/imported/Constitution%20and%20Bylaws%20-%202014-04-02.pdf> and on file at Food & Water Watch. Accessed November 11, 2014; *Journal*

- of *Veterinary Pharmacology and Therapeutics*. Current members of executive council. Available at <https://m360.aavpt.org/GroupDetail.aspx?id=83146> and on file at Food & Water Watch. Accessed October 16, 2014; Lainesse, Chantal. LinkedIn profile. Available at <https://www.linkedin.com/pub/chantal-lainesse/52/536/3b> and on file at Food & Water Watch. Accessed October 16, 2014.
- 120 *Veterinary Parasitology*. Editorial Board. Available at <http://www.journals.elsevier.com/veterinary-parasitology/editorial-board/> and on file at Food & Water Watch. Accessed October 15, 2014; American Association of Veterinary Parasitologists. *AAVP Newsletter*. Vol. 24, No. 3. October 2002 at 3, 9 and 12.
  - 121 Canadian Animal Science Society. Executive Committee 2013–2014. Available at <http://www.csas.net/index.php?r=SBCms/executive.html> and on file at Food & Water Watch. Accessed July 15, 2014; AMSA (2014) at 1.
  - 122 Food & Water Watch analysis of Thomson Reuters Web of Science academic database. See Methodology.
  - 123 *Journal of Animal Science*. Editorial Board. Available at <http://www.journalofanimalscience.org/site/misc/edboard.xhtml> and on file at Food & Water Watch. Accessed November 18, 2014.
  - 124 Petersen (2012).
  - 125 ASAS. “2011 Letter in Support of FDA Review.” August 2, 2011; ASAS. Congressional Briefing Handout. “ASAS ‘Snack and Fact’ Briefings: The contribution of animal production to global food security.” 1300 Longworth House Office Building, Washington, D.C. October 28, 2013.
  - 126 FASS. “FASS shares AVMA’s concerns regarding Pew report on industrial farm animal production.” January 6, 2010; FASS. Webinar. “Gestation Sow Housing.” Broadcast on May 11, 2012, 1:00–2:30 p.m.
  - 127 ASAS. [Press release]. “Tumor study misleads public.” September 20, 2012; Monsanto Co. “Monsanto Comments: ‘Long term toxicity of a Roundup herbicide and roundup-tolerant genetically modified maize.’” November 1, 2012. Monsanto Co.. [Press release]. “Monsanto responds to French rat study (Seralini, et al. 2012).” September 21, 2012.
  - 128 Hamernik, Deb. ASAS. “Production of genetically-modified salmon eggs approved by Canada.” *Taking Stock*. December 19, 2013. Available at <http://takingstock.asas.org/?p=10432> and on file at Food & Water Watch. Accessed June 20, 2014; ASAS (October 2013); FASS. “Preserving the benefits of antibiotics for people and animals.” August 12, 2010; FASS. “Biotechnology as a tool to enhance sustainability for animal agriculture.” May 5, 2011; Fahrenkrug, S.C. et al. “Precision genetics for complex objectives in animal agriculture.” *Journal of Animal Science*. Vol. 99, Iss. 4. March 2010.
  - 129 Howard, Clare. “Pest control: Syngenta’s secret campaign to discredit atrazine’s critics.” *100 Reporters*. June 17, 2013; Aviv, Rachel. “A valuable reputation.” *The New Yorker*. February 10, 2014.
  - 130 Seralini, Gilles-Eric et al. “Long-term toxicity of a Roundup herbicide and Roundup-tolerant genetically modified maize.” *Food and Chemical Toxicology*. Vol. 50, Iss. 11. November 2012; Pollack, Andrew. “Foes of modified corn find support in a study.” *New York Times*. September 19, 2012; Hammond, Bruce et al. Letter to the editor. *Food and Chemical Toxicology*. Vol. 54. November 2012.
  - 131 Pollack, Andrew. “Paper tying rat cancer to herbicide is retracted.” *New York Times*. November 28, 2013; Gibbs, Jessica. “Scientists like UNL professor know the challenge of taking sides.” *Omaha World-Herald*. May 19, 2014; Wager, Robert et al. Letter to the editor. *Food and Chemical Toxicology*. Vol. 53. March 2013; Pollack, Andrew. “Genetically engineered crops: The next generation.” *New York Times*. February 14, 2006; Hayes, A. Wallace. *Food and Chemical Toxicology*. [Press release]. “Food and Chemical Toxicology Editor-in-Chief, A. Wallace Hayes, responds to letters to the editors.” Undated.
  - 132 Casassus, Barbara. “Study linking GM maize to rat tumours is retracted.” *Nature*. November 28, 2013.
  - 133 Reed Elsevier. [Press release]. “Elsevier announces article retraction from *Food and Chemical Toxicology*.” November 28, 2013.
  - 134 Institute of Science in Society. Open letter on retraction and pledge to boycott Elsevier. Available at [http://www.i-sis.org.uk/Open\\_letter\\_to\\_FCT\\_and\\_Elsevier.php](http://www.i-sis.org.uk/Open_letter_to_FCT_and_Elsevier.php) and on file at Food & Water Watch. Accessed October 24, 2014.
  - 135 H.R. 3590. 111th Cong. § 6002. (2010).
  - 136 Testa, Jim. Web of Science. “The Thomson Reuters Journal Section Process.” May 2012. Available at <http://wokinfo.com/essays/journal-selection-process/> and on file at Food & Water Watch. Accessed March 31 2014.
  - 137 Merck. SEC Filing. 10-K. 2013 at 8 and 2012 at 6.
  - 138 Notably, this included citations found in the introduction of Loneragan (2014).
  - 139 FDA CVM (2006) at 15. Note: The FDA did not consult any published scientific studies on animal safety.
  - 140 “Grandin, Smith team up to support Animal Sciences building.” *CSU Matters*. November 2014 at 1; Grandin, Temple. “List of references related to welfare issues with beta-agonists.”
  - 141 Merck Animal Health (2013); Merck Animal Health (undated).
  - 142 Beckett, J.L. et al. “Effects of zilpaterol hydrochloride on growth rates, feed conversion, and carcass traits in calf-fed Holstein steers.” *Journal of Animal Science*. Vol. 87, Iss. 12. December 2009; Grandin. “List of references related to welfare issues with beta-agonists.”
  - 143 Wagner, S.A. et al. “Adverse effects of zilpaterol administration in horses: Three cases.” *Journal of Equine Veterinary Science*. Vol. 28, Iss. 4. April 2008.
  - 144 Davila-Ramirez, U. et al. “Effects of zilpaterol hydrochloride and soybean oil supplementation on feedlot performance and carcass characteristics of hair-breed ram lambs under heat stress conditions.” *Journal of Animal Science*; Macias-Cruz, U. et al. “Effect of zilpaterol hydrochloride on feedlot performance and carcass characteristics of ewe lambs during heat-stress conditions.” *Production Animal Science*. Vol. 50, No. 10. 2010.
  - 145 Macias-Cruz (2010) at Table 2.
  - 146 Loneragan (2014); Grandin (2013); Hillelurn, Matthew. “Panic at the feedlot.” Texas Tech University. *The Agriculturist*. Spring 2014.
  - 147 Hillelurn (2014).
  - 148 *Ibid.*; Lowe, Peggy. “Study: Zilmax doesn’t affect cattle health.” *Harvest Public Media*. July 16, 2014; ASAS (2014) at Abstract 150; *Journal of Animal Science*. E-supplement 2. Vol. 92. 2014 at 74.

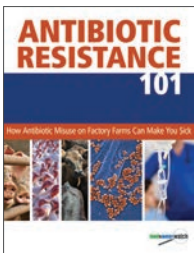


# More Food & Water Watch Research on Animal Agriculture



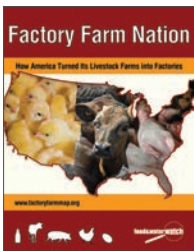
## **Public Research, Private Gain: Corporate Influence Over University Agricultural Research**

From domestication of the blueberry to tools to combat soil erosion, land-grant universities have revolutionized American agriculture for general public benefit, almost entirely through investments from state and federal governments. But this report outlines how, as public funding has stalled in recent decades, these universities have turned to agribusiness to fill the void, compromising the public mission of the institutions. Private sector funding not only corrupts the public research mission of land-grant universities, but also distorts the science that is supposed to help farmers improve their practices and livelihoods and influences the rules that govern the food system.



## **Antibiotic Resistance 101: How Antibiotic Misuse on Factory Farms Can Make You Sick**

Every single day, factory farms are feeding their animals regular, low doses of antibiotics to prevent disease in filthy, crowded living conditions. This practice creates a perfect breeding ground for bacteria that are resistant to antibiotics. Antibiotic-resistant bacteria can spread from farm animals to humans via food, through animal-to-human transfer on farms and in rural areas, and through contaminated waste entering the environment. The Centers for Disease Control and Prevention estimates that at least 2 million Americans each year experience antibiotic-resistant infections, leading to at least 23,000 deaths.



## **Factory Farm Nation: How America Turned Its Livestock Farms Into Factories**

Over the last two decades, small- and medium-scale livestock farms have given way to factory farms that confine thousands of cows, hogs and chickens in tightly packed facilities. Farmers have adopted factory-farming practices largely at the behest of the largest meatpackers, pork processors, poultry companies and dairy processors. The largest of these agribusinesses are practically monopolies, controlling what consumers get to eat, what they pay for groceries and what prices farmers receive for their livestock.



## **Fact Sheet: Ractopamine**

Ractopamine is a drug intended to make livestock grow faster, with leaner meat and less fat. The livestock demonstrate higher feed efficiency, which means that they produce more meat from the same amount of feed. Even better, in the view of meat companies, ractopamine has no obvious effects on the quality of the meat. But using ractopamine may pose human health risks and can compromise animal health and welfare, and its continued use in the United States hurts the agriculture industry as a whole because much of the world does not allow it.

For more Food & Water Watch research, visit  
**[foodandwaterwatch.org/research](http://foodandwaterwatch.org/research)**



## Food & Water Watch



### **National Office**

1616 P Street, NW  
Suite 300  
Washington, DC 20036  
(202) 683-2500

**[foodandwaterwatch.org](http://foodandwaterwatch.org)**