The 30/30 Club: Metabolic Breaking Point, or Fulfilling Genetic Potential – Have We Forgotten about Animal Welfare?

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Abstract

Major consumer concerns exist over current dairy practices that relate to herd size and "factory farming", lack of grazing in our production systems, and the "hyper-production" of our dairy cows. If we are to believe animal activists and mainstream media, large-scale confinement dairy herds are places where cows are forced to milk around the clock, and individuals are pushed to the breaking point with the use of hormones and feed additives, resulting in metabolic disease, poor well-being, and premature death. Using three real herds as examples, this article discusses the pros and cons of different production systems and asks whether there is any truth behind these claims. Have we pushed the dairy cow to metabolic breaking point and forgotten about animal welfare – or is there a different story to tell?

Résumé

Les consommateurs ont des préoccupations sérieuses concernant les pratiques actuelles dans les fermes laitières reliées à la taille du troupeau et à l'élevage de type industriel, au manque de paturage dans nos systèmes de production et à la surproduction de nos vaches laitières. Si l'on en croit les militants pour le bien-être des animaux et les médias, les troupeaux laitiers confinés d'envergure sont des endroits où les vaches sont forcées à produire du lait toute la journée et où les individus sont poussés à leur limite par l'utilisation d'hormone et de suppléments alimentaires entraînant des maladies métaboliques, un pauvre bien-être et la mort prématurée. En utilisant trois véritables troupeaux comme exemples, cet article discute du pour et du contre de différents systèmes de production et cherche à déterminer s'il y a du vrai dans ces affirmations. Avons-nous poussé les vaches laitières à leur limite métabolique et oublié le bien-être animal, ou y a-t-il une autre histoire derrière tout cela?

Introduction

For years, the US dairy industry has forged ahead, becoming increasingly industrialized, adopting scientific enhancements to feed and productivity, with the primary goal of producing a plentiful supply of cheap, safe food at least cost. There has been scant room for concern over animal well being, so why all the concern now?

There are a number of different reasons. One can look at the increasing urban-rural disconnect. Fewer families have relatives involved in farming, and many are completely unaware of how meat and milk are produced. The growth in disposable income also carries with it a desire and ability to purchase better quality food and allows the consumer to exercise greater choice – concern over the care of the animals producing that food is central to many when they make that choice. Concerns over food safety are real, and the recent meat recalls for *E. coli* 0157 and *Salmonella* issues have raised awareness and the belief that our food is no longer as safe as we once thought. With the industrialization of the dairy industry, many people find themselves living near a dairy Concentrated Animal Feeding Operation or "CAFO" (a dairy herd with more than 700 total cows) and one has only to read the newspaper or watch TV to "know" that these animal factories are mistreating animals and polluting the environment.

With such a backdrop, it is not surprising for authors such as Michael Pollan, for mainstream films such as Food Inc., and for animal activism led by organizations such as People for the Ethical Treatment of Animals (PETA) and the Humane Society of the US (HSUS) to increasingly shed doubt on modern farming practices and spread the word that we should all shop local and that vegetarianism is the healthier way to live if we are to stop needless animal cruelty and global warming.

So, are they right? Have we got it wrong? Have we developed a monster in our backyards that we need to distance ourselves from as veterinarians? Specifically, are we pushing our cows to the metabolic breaking point with no regard for animal well-being in animal factories? Or is the truth rather different?

While veterinary students are in themselves not typical of the general public as a whole (~75% female, ~15% vegetarian (a few are vegan) and by definition they are college educated), they are a useful barometer of current concerns regarding modern farming practices, and I willfully hold several ethical debates each year

with them. These discussions raise a wide variety of concerns related to the safety of milk and meat and the care of the animals that we use to harvest this food, and chief among them are lack of grazing, factory farming, and the high levels of production seen in today's dairy industry. In this article I will focus on these concerns and the different management systems utilized by the dairy industry and how they impact the dairy cow. To do so, I will use information from three herds with a long-standing relationship with our production medicine group, as well as access to excellent veterinary care delivered by their local practitioner (Table 1). All of the data presented are real, and the opinions are my own.

A Tale of Three Dairies

Herd A is an organic grazing herd. Grazing has been a way of life for the herd owners, and that has been their primary goal. They became organic to capitalize on the excellent management practices they already had in place to receive a larger milk check. The herd has utilized crossbred cattle to optimize fertility, but in recent years production has suffered. Fresh cow health is average, lameness control is excellent, as is fertility and stillbirth rate. Somatic cell count and mastitis have been long-term issues for this farm – initially due to out-wintering cattle in inclement weather with little shelter, and more recently because of a switch to organic practices and a cessation of the use of dry-cow antibiotic therapy. An inability to treat cows with mastitis effectively has been associated with an increase in involuntary culling.

Herd B is a CAFO. It is family owned. They milk Holstein cows three times a day in a mattress freestall barn and feed a total mixed ration (TMR) with genetically modified corn and production enhancers such as monensin and bovine somatotropin (BST), administered per label instructions to all lactating cows. Dry cows do have access to an outside concrete lot, but the remainder of the lactation cycle is spent housed all year round. Fresh cow health is poor, and lameness and mastitis have been long-term problems on this farm despite excellent nutritional advice and daily hands-on veterinary care. Turnover rates have suffered as a result. The breeding program revolves around repeated use of estrus synchronization programs, while approximately 40% of repeat breedings are performed through heat detection. Production has been relatively flat, even as the herd has expanded to over 2,000 cows over the last few years.

Herd C is a mid-size freestall – not large enough to be a CAFO, but still larger than most people's perception of a family farm. It is family owned. They milk three times a day and feed a TMR containing production enhancers, but they use BST only for late breeding cows as a management tool to prolong herd life. The reproductive program utilizes a combination of estrus synchronization with hormones and heat detection, and achieves very good results. Although dry cows used to have access to pasture, recently they have been housed in a remodeled freestall barn, and considerable effort has been made to optimize cow comfort in the barn. An older barn has been remodeled to improve stall dimensions and comfort and a new barn has been constructed with sand-bedded stalls and dimensions appropriate for large, mature Holstein cows of high genetic merit. They receive regular veterinary visits and excellent nutritional advice. Fresh cow health is excellent, as is mastitis control. Lameness has been the focus of control efforts and is at very low levels. Production has increased dramatically over recent years and held constant during a period of farm expansion.

Table 1. A tale of three herds: objective measures of performance of herds A, B and C.

Measure	Herd A	Herd B	Herd C
No. cows	139	2151	550
Turnover rate (%)	25	40	25
Death rate (%)	2	9	5
Somatic cell count ('000/mL)	322	199	126
Mastitis rate (cow cases/100 cows)	48	75	28
Average DIM	191	188	184
Pregnancy rate (%)	20	17	25
Stillbirth rate (%)	1	10	7
Lame prevalence (%)	4	28	6
Turnover <60 DIM (%)	2	9	6
Transition Cow Index™	-85	-450	+1206
Milk/cow/day (lb)	46	83	98

Grazing and Organic

Herd A is as well managed an organic dairy herd that you will find, where cows have access to pasture almost year round, with good health and fertility producing approximately 50 lb (22.7 kg) of milk per cow, per day predominantly from forage. I believe that this would be the general public's idealized vision of the dairy industry – one that marketers have used and misused in recent times in an attempt to enhance milk sales. The keywords for herd A are grazing, organic and healthy, so let's examine the evidence a little more closely.

Proponents of grazing point to the fact that the dairy cattle are managed in their natural state, eating a feed that they have been designed to harvest and magically convert into a nutritious food for humans. Freedom to exhibit natural behavior is of major importance to those that wish to ensure good welfare, and grazing cer-

tainly fits that requirement well. There is some evidence that grazing herds have a lower prevalence of lameness, and the lower production may help reduce the risk for metabolic disease. Recent evidence would also suggest that allowing lame cows access to pasture may help to improve locomotion,[5] and when given the choice of housing or pasture, cows selectively prefer housing during the day and pasture during the night,[7] suggesting that for at least some of the time, cows prefer to graze and it is 'good' for them. When we examine the time budget of these animals, it is typical to see dairy cattle eating for about eight hours per day at pasture and resting for nine to 11 hours per day.

However, grazing isn't without its problems. In Wisconsin, the Department of Natural Resources simply would not allow many herds to graze because of the risk of manure run-off contaminating waterways. The lower production, if taken to a national scale, would take us back to the 1940s and the market for milk would be such that we would need many more cattle to sustain the production required to meet the demand. Many of the same people that feel good about grazing cattle are also the same people that are trying to reduce their carbon footprint and help prevent global warming. Finding that our current carbon footprint for the dairy industry is 37% less than it was in the 1940s may surprise some and perhaps paint a different picture.[1] They may also be disappointed to learn that grazing emits 52% more CO2 equivalents than mixed dairy systems (UN FAO greenhouse gas emissions from the dairy sector report, 2010).

Finally, anyone involved in managing dairy herds on grass knows that they are not without their problems. There are grass staggers in the spring, parasitism, ketosis in early lactation and lameness – especially when young stock transition from pasture to the milking herd at the time of first calving, and where track maintenance is poor causing injuries as cows walk great distances to and from the milking center. These can all be serious welfare issues. Dealing with inclement weather during the winter can present a major challenge for udder health, and the provision of adequate feed year round can in some situations be problematic, leading to what can only be described as controlled starvation. Heat stress in the summer can also be a major concern in some climates where there is inadequate shade. For these reasons, it is common for grazing herds to construct winter housing to confine the animals in the winter – creating a facility that they use only part of the year, with many of the limitations that we complain about in herds that house year round. Herd A has overcome many of these management challenges, but not all of them – notably udder health.

Herd A became organic for the right reason – the management was already in place and it allowed them to attract a higher return for their milk sales. However, some organic dairy herds are poorly managed, badly housed, and become organic merely because they can get a higher milk price, not because it is the right thing to do for the cows. In fact there is little scientific evidence for organic herds having improved health and welfare,[6] although one study recently showed a lower prevalence of lameness.[8] The organic movement's desire to promote their product as antibiotic and hormone-free is also damaging to the industry as a whole, as it implies that conventional milk is somehow contaminated. If we follow the science, it clearly shows that there is no significant difference in the hormonal content of milk from organic dairies and conventional dairy herds that either use or do not use BST.[9] Organic milk actually contains significantly more estrogen and progesterone than conventional milk – it has more hormones in it.

In short, organic does not mean better or healthier, it just means the management used to produce the milk was different and followed a different philosophy, which consumers should be allowed to support, provided they are aware of the truth.

Confinement Factory Farming

Those that have genuine concerns regarding the welfare of dairy cattle could visit herd B and find enough issues to help confirm their pre-conceived notions about factory farming. By one definition, with more than 700 cows, this is a CAFO, with all-year-round total confinement of animals in large freestall barns and a milking parlor operating around the clock. It would fit many people's definition of a factory farm, even though it is owned by a single family and hence, by another definition, a family farm.

Depending on the day, we may find the problems that our confinement-housed dairy industry commonly faces – too many dead cows, too many lame cows, and fresh cows suffering from retained placenta, metritis, and displaced abomasum. These production related diseases may be associated by some with confinement and the 'hyperproduction' induced by genetic manipulation, production enhancers, and genetically modified feeds, and used as an example of why we should move away from this style of production system. We can certainly find associative evidence in the scientific literature that cows with high milk production are more susceptible to subacute ruminal acidosis, lameness, infertility, and metabolic disease to "prove" this point.

However, our research would suggest that risks for these common production related diseases could be reduced by making environmental and management changes. We don't believe they are an inevitable consequence of milking the kind of cow we have bred, but a failure to provide her with the things she needs to be

successful. Our keys to success are aimed at providing the cow adequate rest, unrestricted access to feed, and social stability, coupled with excellent disease surveillance by well-trained caregivers.

While grazing cattle may remain quite healthy when resting for only 10 hours per day, data collected from freestall-housed dairy herds in Wisconsin, combined with other behavior studies, would suggest that cows kept in confinement facilities require more rest to prosper. We recommend at least 12 hours per day available for lying down in a comfortable stall.[3] I believe this increased rest helps the cow compensate for greater time spent on concrete in confinement facilities, which may negatively impact lameness and well-being. Time budgets for feeding, drinking, and socializing are relatively fixed at around seven hours per day in TMR-fed housed herds, and the remaining time available for rest depends on milking time, access to a stall (influenced by pen stocking density and the comfort of the stall), and time spent in lock-ups. Our data shows we must limit time out of the pen to less than three hours per day if we are to maintain greater than 12 hours per day available for rest. Time out of the pen milking will relate to the size and efficiency of the parlor, distance from the parlor, and pen stocking density. Crucially, in the fresh cow pen, time spent in lock-up also impacts the time available for rest in these high-risk animals, and it is these three critical elements which I believe limit optimal herd size from a cow behavior perspective. My current estimates would suggest that 1,500 to 2,000 cows milked through one parlor represents the upper limit for herd size for optimal modern freestall facility design.[3] This is not as large as some of the facilities currently being built, but is far and away larger than the farms that most of my veterinary students view as 'welfare-friendly family farms'.

Farmers have many choices for stall bedding materials, and Herd B chose rubber-crumb filled mattresses. While these provide a comfortable surface for young cattle and non-lame cows to rest on, we have shown that lame lactating cows struggle to maintain their rest on these mattress surfaces because it is difficult for them to rise and lie back down. We have observed improved resting behavior in sand-bedded stalls, where lame cows maintain resting time and take fewer longer lying bouts per day. We believe it is this benefit that assists lame cows to rest and recuperate, while lame cows in mattress-bedded herds stay lame for longer.[4]

We have made the case that cows are herd animals and social creatures – they all like to do the same thing at the same time (they are allelomimetic), and if you regroup them, they spend more time in social interactions than performing other activities such as resting and eating. Around the transition period, we have made the case that this is extremely important, as the cow's dry matter intake is already falling and we aim to limit this reduction to prevent periparturient disease. To do so, we have promoted the concept of 30 inches (76 cm) of bunk space per cow and we have limited social re-grouping during the transition period, with dramatic improvements in metabolic disease status in early lactation.[2]

Finally, excellent disease recognition and care can go a long way to preventing disease progressing and worsening. The fresh pen is a place for the best person on the farm, not the least educated or able.

When we look at Herd B, we do not see broken down cows from metabolic exhaustion resulting from factory farming. We see mistakes in barn design and management that can be addressed and improved upon that do not preclude society from accepting this kind of production system as an acceptable way to dairy farm. Currently, recommendations to improve cow comfort and management are being implemented on Herd B.

The 30/30 Herd

Herd C is an example of a new breed of farm in Wisconsin and elsewhere. They are members of the "30/30 club", a group of herds with greater than 30,000 lb (13,600 kg) of rolling-average milk per cow with turnover rates in the 30's or less – hence 30/30.

Herd C has done everything that has been asked of them to improve cow comfort and well being. They employ an outstanding, passionate caregiver to deal with sick cows, they have modified stalls to improve comfort, and built a new barn for older cows with sand bedding and generous stall dimensions. They have installed the latest recommendations for lighting, ventilation, and heat abatement, and receive excellent nutritional and veterinary advice on a regular basis. In virtually all areas, the health of the cows is excellent, reproductive performance is excellent, and milk production is phenomenal. In simple terms, they produce twice as much milk per cow as herd A, with the same standards of health and well-being. At the same time, they are a large herd of almost 600 cows, they use technology such as monensin and genetically modified crops to enhance production, the cows do not get to graze outdoors, and they have all the trappings of being labeled a 'conventional' herd. They do use BST, but not solely as a production enhancer but rather to help retain late-breeding cows in the herd. Over the last decade, we have tracked milk production in this herd, as they have continued to adopt the latest technologies and advice to increase production from 70 lb (31.8 kg) per cow, per day to over 100 lb (45.5 kg) per cow, per day while improving health and well being of their cattle. Their experiences have not occurred in isolation, and Table 2 lists the other herds in Wisconsin that are included in the elite 30/30 club.

Table 2. Data from 24 herds in Wisconsin receiving AgSource DHIA recording that belong to the "30/30 club" in December 2009.

Herd	Cows	RHA Milk (lb)	Turnover Rate (%)	Transition Cow Index	Annual Weighted Average SCC ('000/ml)	Pregnancy Rate (%)	Average Age at First Calving (Months)	Sire Net Merit ($)	Average Days Dry
1	2722	33128	35	1779	181	17	23	338	60
2	1391	30684	37	1072	225	16	24	182	58
3	941	32996	30	691	168	21	23	274	55
4	744	30981	37	1349	174	17	24	194	55
5	733	30461	34	524	186	20	24	254	57
6	670	31083	34	1358	281	18	24	179	61
7	607	30987	33	857	156	17	23	287	58
8	558	32414	32	1476	130	21	24	236	55
9	518	30392	34	756	95	22	23	255	58
10	460	30894	35	542	128	20	24	285	53
11	384	32192	39	789	159	20	24	216	60
12	349	30092	35	709	321	18	24	250	64
13	330	31476	34	781	153	14	23	472	65
14	300	30588	27	1374	122	19	24	216	52
15	239	31445	31	897	194	11	24	265	50
16	119	30259	28	884	285		24	372	47
17	118	33940	39	1945	193	15	23	292	51
18	110	32118	37	489	163		24	162	43
19	101	30527	34	375	173		29	252	51
20	92	35068	16	1424	188		26	374	79
21	75	30258	28	1363	111	27	24	366	53
22	73	30445	25	414	218	13	24	281	41
23	49	31942	39	2127	126		25	126	64
24	30	30072	29	1990	447		27	226	40
MEAN	**488**	**31435**	**33**	**1082**	**191**	**18**	**24**	**265**	**55**

As of December 2009, 24 herds in Wisconsin belong to the '30/30 club' (data courtesy of AgSource Cooperative Services). They all have DHIA bulk tank estimates within 5%, suggesting that the production numbers are reliable.

Note there are 14/24 (58%) herds with greater than 250 cows and five herds have more than 700 cows, and are therefore defined CAFOs. Average turnover rate is 33%, annual weighted average SCC is 191,000/ml, pregnancy rate is 18%, average age at first calving is 24 months, and average days dry is 55. All the herds milk Holstein cows and sire net merit averages +265. Note that not all of these herds do everything well. Some have long dry periods, some have high SCC, and others have low pregnancy rates. However, of note is that all of these herds have strong positive Transition Cow Index (TCI) values, which is indicative of excellent fresh-cow health and performance, with an average of +1,082.

Metabolic Exhaustion or Elite Well-being?

Some would look at the production of 30/30 club herds and suggest that these cows are genetic monsters bred to be production units – frail animals pushed to their limits, living on a knife-edge and on the brink of metabolic exhaustion. That is what the animal activist groups would like to have us think, but we do not believe this to be the case. It is true to say that in the mid-90s our genetic indices favored selection for production over conformation and health/fitness traits, but that is no longer true. Figure 1 shows the current (2009) weighting of genetic indices around the world for Holstein cattle. The US ranks third and fifth in the world for indices that use the most conformation and health/fitness traits, bested only by Scandinavia and the Netherlands. Only one country, Spain, continues to have milk yield as a positive effect in their production

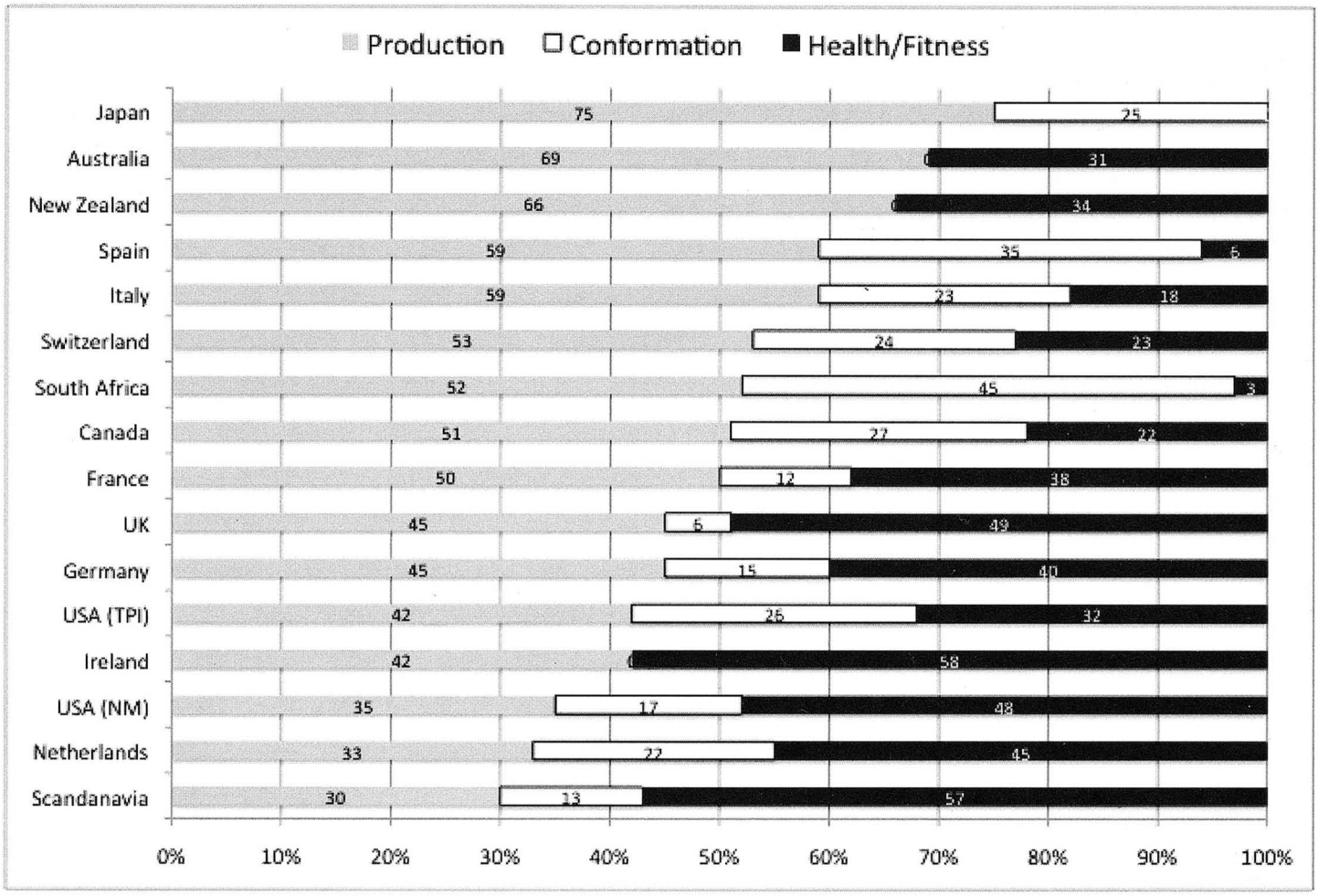

Figure 1. Relative contribution of production, conformation and health/fitness traits to genetic selection indices around the world in 2009.

index, and the grazing industries of Australia and New Zealand currently have the fewest fitness traits in their indices, along with Japan.

As for the nature of these herds and their willingness to do what is right for the cows they own, we have helped design and remodeled five of the eight largest herds on the list and when we visit these herds, and admire their cows and marvel at their performance, our conclusion (and that of the students that we bring along with us) is that the cows in these herds are among the healthiest and "happiest" you will see anywhere. They are all family owned. For sure, they represent the elite of the dairy industry, but the very fact that they exist at all flies in the face of the viewpoint that our dairy industry is broken beyond repair.

Our belief is that these farms are not anomalies, but rather they are the future. A future where we continue to question what we are doing and provide farmers solutions to promote economic survival, and at the same time ensure that our cattle are well cared for. Consumers have diverse tastes and viewpoints, and we will not please all of the people all of the time. Farmers should be able to graze their cattle if they choose, and people should be able to buy organic milk if they wish to do so. At the same time, the dairy industry has to be accountable and create improvements where they are needed. We must question how big a herd is 'too big', what kind of lying surface is best for our cows, what pen design is optimal for transition cows, and what testing we can utilize to make sure that milk is residue and pathogen free. It will never be hormone-free.

Above all, we need to make sure that consumers know the food they are eating is safe, and that the animals producing it are well cared for. We have a way to go to deliver that message, but I believe we have started along the path.

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