

# CEPTOR



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Dr. David Alves - Manager of Veterinary Science and Provincial Veterinarian . . . . .	2	At their annual conference in Rapid City, SD, the American Association of Bovine Practitioners honored Dr. Ewen Ferguson from Campbellford, Ontario. The Association presented Ewen with the Bovine Practitioner of the Year Award. This award recognizes bovine practitioners in private practice who excel in every aspect of bovine medicine and contributions to their community. In his acceptance remarks, Ewen acknowledged the influence of his father, who instilled in him a "strong Scottish Protestant work ethic". Ewen also recognized the influence of his wife and children, who taught him that there is more to life than a "strong Scottish Protestant work ethic".
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products, “Pasture Mats, Pack Mats and Poly Pillow”, his research of cow behaviour, and his connections around the world, Doug has stimulated innovation and change in stall and barn design for almost a decade. Ontario’s bovine practitioners welcomed Doug as an honorary member in recognition of his contributions to the comfort and dignity of dairy cattle in Ontario, North America, and the world.

*Neil Anderson*

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### **Dr. David Alves is the new Manager of Veterinary Science and the Provincial Veterinarian for Ontario.**

As Manager, David will continue to work with friends and colleagues in the Veterinary Science group, OMAFRA, private veterinarians, industry, researchers and many other government agencies. The Veterinary Science group fills a public niche by serving Ontario through veterinary science, disease surveillance, outbreak investigation and technology transfer.

The Provincial Veterinarian co-ordinates public animal health work in Ontario through links with the Canadian Food Inspection Agency, laboratories, other provinces, universities, health departments, and the College of Veterinarians of Ontario.

Dr. Alves graduated from the Ontario Veterinary College in 1980 and worked in mixed practice for five years before returning to OVC to earn a PhD in epidemiology. For the past ten years David has worked as the epidemiologist in Veterinary Science of OMAFRA. David can be contacted at OMAFRA, 1 Stone Road West, Guelph, N1G 4Y2, (519) 826-3127, or email [david.alves@omafra.gov.on.ca](mailto:david.alves@omafra.gov.on.ca).

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### **Antimicrobial resistance in *Salmonella typhimurium* phage types**

Ontario’s medical community has concerns about the emergence of multidrug resistant strains of *Salmonella typhimurium* - the most commonly isolated serotype from clinical cases in cattle, swine and humans in Ontario. The strains are labeled by phage type. The multiple antimicrobial resistant definitive phage type 104 (MR DT104) is of particular concern for animal and public health. It is often resistant to ampicillin, chloramphenicol, streptomycin/spectinomycin, sulfonamides, and tetracycline (ACSSuT). This strain has been associated with many serious infections in food animals and humans in the UK, continental Europe and now, more frequently, in North America.

**Table 1** shows the frequency of *Salmonella typhimurium* isolates by phage type from food animal submissions to the Animal Health Laboratory (AHL), University of Guelph, from January 1998 through July 2000. The table also shows the percentage of isolates displaying the ACSSuT resistance pattern. Although chloramphenicol is not routinely part of the sensitivity panel for food animal isolates, a specific gene cluster confers the characteristic resistance to these 5 antibiotics.

Of 212 isolates tested, 113 were resistant to 5 or more antibiotics, and 10 of these were resistant

to 10 or more. All of these multiresistant isolates were phage types 104, 108, 193 and 208. In addition to ampicillin, spectinomycin, sulfonamides and tetracycline, *typhimurium* isolates were most commonly resistant to penicillin and oxacillin, and most commonly sensitive to trimethoprim-sulfa, cephalothin and gentamicin. Resistance to ciprofloxacin, a first line drug of choice in treating systemic human infections, is also becoming a concern. Ciprofloxacin is not usually included in the sensitivity panel for food animal isolates at the AHL, as it is not licensed for use in food animals. However, seven DT104 isolates were tested against this antimicrobial and found susceptible.

*Salmonella typhimurium* is a commonly isolated animal pathogen in Ontario. As the table indicates, the most prevalent phage types, not just DT104, display a high percentage of in vitro resistance to some of the most commonly used antibiotics in both veterinary and human medicine. How this relates to treatment efficacy is not known. Comparison of these data with the phage types and susceptibilities from human isolates would also be of value. However, current summary data are not available.

Based on the limited surveillance information, and the relatively small number of isolates, it is not clear what impact *S. typhimurium* in food animals has on the human antimicrobial resistance situation. Nevertheless, the frequent occurrence among clinical isolates of this virulent pathogen does raise a caution flag. Why the concern?

Researchers are now learning that both virulence and multiple antimicrobial resistance in some pathogens occur in groups of genes called “cassettes” and “pathogenicity islands”. Hence, multiple antimicrobial resistance and virulence have the potential to increase in leaps and bounds - not just one gene at a time. *Salmonella typhimurium* is one such pathogen, and being of zoonotic importance, the public health concern cannot be overemphasized.

Antibiotic use that only gives “sub-lethal” hits to these pathogens is more likely to induce resistance than prudent full-dose, short-term treatment. Prolonged sub-therapeutic use, mass medication, and growth promotant use of antibiotics are associated with “sub-lethal” hits. Prudent use guidelines become very important in preventing multiple antimicrobial resistance in humans and animals associated with pathogens like *Salmonella typhimurium*. The guidelines are available from the Canadian Veterinary Medical Association, [www.cvma-acmv.org](http://www.cvma-acmv.org) or 1-613-236-1162.

Veterinarians and their staff should make their clients aware of the public health risk when dealing with suspected or confirmed cases of salmonellosis. To minimize exposure, special emphasis should be placed on good personal hygiene, proper manure management and food preparation.

*Paul Innes and David Alves, OMAFRA.*

*Data courtesy of the Animal Health Laboratory, U. of Guelph and the Laboratory for Foodborne Zoonoses, Health Canada, Guelph.*

**Table 1. Frequency of *Salmonella typhimurium* isolates in food animals and multiple antimicrobial resistance in Ontario, 1998-2000.**

Phage type	Year	# isolates						# submissions	sensitivities done	# resistant to Am, Sp, Su, Tc	% resistant
		bov	por	eq	avian	other	total				
104	1998	32	11			1	44	40	33	29	88
	1999	23	32	2		8	65	45	35	33*	94
	2000	11	14	6			31	28	22	17*	77
108	1998	10	13				23	18	13	2	15
	1999	5	25				30	13	8	5	63
	2000	12	14	1			27	21	22	8	36
193	1998	2	6		5		13	12	11	7	64
	1999	1			2		3	3	3	3	100
	2000	1			1		2	2	1	1	100
208	1998	6					6	5	5	5	100
	1999	4	2		1		7	5	3	3	100
	2000	5	1		1		7	7	7	6	86
104a	1998										
	1999	1	1				2	2	1	1	100
	2000	1	1				1	2	1	1	100
104b	1998										
	1999		6				6	5	3	3	100
	2000		1				1	1	1	1	100
102	1998		6				6	3	3	2	67
	1999										
	2000										
10	1998	2					2	2	2	0	0
	1999	6					6	6	5	0	0
	2000	1					1	1	1	0	0
126	1998	2					2	1	1	0	0
	1999										
	2000										
195	1998	1					1	1	1	0	0
	1999			1			1	1	1	0	0
	2000										
2	1998	2			3		5	4	3	0	0
	1999										
	2000										
6	1998				1		1	1	1	0	0
	1999										
	2000										
66	1998	1					1	1	1	0	0
	1999										
	2000										
69	1998	4					4	4	4**	0	0
	1999										
	2000	4					4	4	4	0	0

\*1 isolate resistant to chloramphenicol (equine)

\*\* 1 isolate resistant to ciprofloxacin

## Salmonella typhimurium DT104 in broiler breeder premises

### Introduction

*Salmonella typhimurium* DT104 (StDT104) is a human pathogen that can also develop multiple resistance to antibiotics. Ontario surveillance data indicate that StDT104 accounts for approximately 33% of clinical isolates of *Salmonella* species from cattle, swine and poultry. In addition, 90% of these were resistant to four or more antibiotics. Surveillance data were needed along the broiler production chain to identify critical control points for this pathogen.



During 1998-99, an occurrence of StDT104 in the broiler industry provided an opportunity to investigate sources of contamination of poultry products with StDT104. Our objective was to determine where marked changes in the levels of the pathogen occurred in the production chain. This report highlights the results of this investigation.

## Methods

Several environmental samples were taken from five pullet barns, four breeder barns, four groups of multiple hatches, box pads, and four broiler barns. Carcass swabs and chill tank water samples were taken at the processing plant from the four broiler groups. Other samples included 120 cloacal swabs from hens at two infected barns, external/internal organ samples from 24 mice, swabs from drains and soil around the barns, and environmental samples from the barns before and after cleaning.

The Animal Health Laboratory at the University of Guelph processed samples for the initial isolation of *Salmonella* species. Health Canada conducted further testing for DNA characterization. Overall, the sampling tracked about 43,000 hens and an associated 135,000 broilers.

## Results

StDT104 was isolated from the environment of one pullet group and three breeder barns. The hatchery, box pad, broiler barn and processing samples were negative for StDT104. The negative hen and carcass swabs for StDT104 helped to validate the negative findings of the environmental sampling.

There does not appear to be a serious amplification of the risk of StDT104 in broiler products from an environmental isolate in a broiler breeder premise.

Rodents infected with StDT104 may perpetuate this pathogen, as rodent samples from an infected pullet barn were highly positive. Perimeter drains and soil were highly positive after clean out, suggesting a further environmental source of contamination.

DNA characterization showed that the chronically infected pullet barn and two breeder barns miles apart may have had a common source of infection.

StDT104 cultured in this study was not resistant to the fluoroquinolone class of antibiotics.

## Preventive steps to reduce the risk of *Salmonella typhimurium* DT104

1. Assure excellent management around the hatchery. Nest box management, egg cleanliness, and hatchery sanitation are barriers for StDT104. To reduce the risk at the hatchery, divert soiled eggs at the farm and the hatchery, sanitize all surfaces, clean and disinfect equipment, and control visitors.

2. Reduce the contamination of building drains and perimeter soil. Contaminated building and perimeter drains and perimeter soil may act as a reservoir to re-contaminate a barn with *Salmonella* spp. To reduce the risk of re-contamination of buildings, remove organic debris prior to disinfecting surfaces, disinfect barn drains, periodically remove soil from around drains and perimeters of barns, and add lime to surfaces around the barn perimeter. Remember that StDT104 can also be resistant to quaternary ammonium compounds.
3. Implement intensive rodent control. Infected mice may explain the repeated occurrence of StDT104 in a barn (across clean-outs and among floors). To control rodents, cut the grass short around the barn perimeter, use baiting stations, spread gravel or pave the perimeter of the building, and remove spilled feed from around feed bins.
4. Conduct regular sampling and bacteriological surveillance. To conduct a quick risk assessment of broiler houses, sample for *Salmonella* spp. at the hatchery whenever there are positive environmental samples in the breeding flock.

**Acknowledgements:** Contributions from Veterinary Science, and the Enhanced Food Quality and Safety Research Program of OMAFRA; University of Guelph - Animal Health Laboratory; Health Canada Laboratory for Foodborne Zoonoses; Poultry Industry Council and the Ontario Broiler Hatching Egg and Chick Commission are gratefully acknowledged.

*David Alves, Veterinary Science, OMAFRA, Fergus; Rachel Ouckama, Baltimore; Case Poppe, Health Canada, Guelph; Grant Maxie, Jackie Caccavella, Beverly McEwen, Animal Health Laboratory, U. of Guelph.*

## **Ontario BVD update**

Although there have been more bovine submissions to the Animal Health Laboratory, there have been fewer herds with a diagnosis of bovine virus diarrhea (BVD) for the period January - June 2000 than for the same period in 1999 (66 vs. 114). Most of the cases continue to be from submissions from dairy operations (41/66). Only 27 of the 66 cases contained age data. Approximately half the cattle were less than 1 year and 70% were less than 2 years of age. The reports show that morbidity and mortality remain low, with few animals involved in each case at the time of submission. The majority (36/57) of typed isolates was Type 1, 20 of 57 were Type 2, and there was one mixed isolate.



*Paul Innes, OMAFRA  
Animal Health Laboratory, U. of Guelph*

***Life is what happens to you while you are making other plans.***

**- A. J. Marshall**

## What's the withdrawal time for white penicillin, Doc?

What is the withdrawal time for white penicillin? “That depends” is a safe answer and a correct one. Previously, all “regular” penicillin (procaine penicillin G) was white and all long-acting penicillin (benzathine penicillin) was pink. This is no longer true. The simple color code used to distinguish types of penicillin no longer applies. There is a trend to phase out the long-acting or benzathine penicillins. When this happens, some of the confusion regarding the type of penicillin will be reduced.

Even among the brands of regular penicillin there are many opportunities for mistakes regarding doses and withdrawal times. The correct withdrawal time for any drug depends, in part, on the dose of active drug administered. However, careful reading of procaine penicillin G (PPG) labels indicates that the relationship between dose and withdrawal time is not always straightforward.

The most recent Compendium of Veterinary Products lists twelve different brands of procaine penicillin G. Eleven of the 12 products are licensed for swine. All 12 products have the same concentration of procaine penicillin G per mL but dosages and withdrawal times differ and can be confusing to producers.

As shown in **Table 1**, there are 3 different withdrawal times (5, 8 or 10 days) for PPG used in swine. The labels for three brands of PPG recommend a dosage of 1 mL per 15 kg of body weight for swine and a withdrawal time of 10 days. The labels for three other brands of PPG recommend a dosage of 1 mL per 20 kg of body weight for swine and a withdrawal time of 8 days. Among the remaining 6 brands of penicillin, 5 are licensed for swine. All 6 brands have a withdrawal time of 5 days. The 5 brands licensed for swine list dosages according to categories of body weight. The dosages recommended range from 1 mL per 25 kg of body weight to 1 mL per 50 kg of body weight. All five brands labeled for swine place upper limits on the total amount of product to be injected into any one animal regardless of the size. These limits range from 3 to 8 mL.

It's easy to get confused. Without the product name and the label, it is difficult for producers or veterinarians to confirm that “white penicillin” is being used according to the manufacturer's recommendations.

For the validation of quality assurance programs, an entry of “white penicillin” on the drug record with a dosage and withdrawal time is not good enough. Furthermore, producers face unnecessary challenges in their prudent use of PPG when suppliers change brands of PPG without alerting buyers to differences in dosages or withdrawal times.

Not all black cars are the same. Nonetheless, drivers change from one make to another – without reading the owner's manual – and there can be surprises. Similarly, producers drive home the needle with a different brand of penicillin without first reading the owner's manual – and may also be surprised to find they are using the drug in an extra-label manner. With a new penicillin, you may need to change dosage and withdrawal times, re-train employees, and re-write treatment protocols. Changing brands of penicillin can be more complicated than driving different makes of black cars.

**Table 1. Product Names, Company Names, Abbreviated Dosages and Withdrawal Times for Injectable Procaine Penicillin G (White Penicillin)**

**(N.B. Products listed are not all labeled for use in swine.)**

Product Name	Company	Drug Level in Medication	Drug Dosage	Withdrawal
Propen LA	A.P.A	(300,000 IU/mL) 300 mg/mL	1 mL/15 kg OR 20,000 IU/kg	10 days
Ultrapen LA	P.V.U.	300 mg/mL (300,000 IU/mL)	1 mL/15 kg OR 20,000 IU/kg	10 days
Derapen SQ/LA*	Ayerst	300 mg/mL (300,000 IU/mL)	1 mL/15 kg OR 20,000 IU/kg	10 days
Pen G Injection	Citadel	300,000 IU/mL	1 mL/20 kg OR 15,000 IU/kg	8 days
Depocillin	Intervet	300,000 IU/mL	1 mL/20 kg OR 15,000 IU/kg	8 days
Hi-Pencin 300	Equivet	300,000 IU/mL	1 mL/20 kg OR 15,000 IU/kg	8 days
Penmed	Medprodex	300,000 IU/mL	1.5-2.0 mL/25-50 kg or 12,000- 18,000 IU/kg (not to exceed 5 mL/pig)	5 days
Penpro	A.P.A	300,000 IU/mL	1 mL/25 kg OR 12,000 IU/kg (not to exceed 5 mL/pig)	5 days
Penicillin G. Procaine	P.V.U.	300,000 IU/mL	1 mL/25 kg OR 12,000 IU/kg (not to exceed 5 mL/pig)	5 days
Ethacillin	Rogar/STB	300,000 IU/mL	1 mL/22-30 kg OR ~13,636 IU/kg (not to exceed 3mL/pig)	5 days
Procaine Penicillin G	Dominion	300,000 IU/ml	1 mL/50 kg OR 6,000 IU/kg (not to exceed 8 mL/pig)	5 days
Pen Aqueous (FOR CATTLE NOT SWINE)	Ayerst	300,000 IU/mL	1 mL/45 kg OR 6,667 IU/kg	5 days

\* intramuscular use only in swine.

Several veterinarians involved with the Canadian Quality Assurance (CQA) program want to establish a standard dosage and withdrawal time for procaine penicillin G that satisfies all brands. Such a standard dosage would be extra-label use and would require a prescription by each veterinarian making the recommendation to a client. For the CQA program, this would require only the veterinarians signature on the “Medication/Vaccination Usage Plan.”

*Tim Blackwell and Tom Sanderson*



## Placental edema of mares and endophytic fungi of grasses

Mares in their last month of gestation are very susceptible to a number of chemical and biological agents that can cause abortions, weak foals and neonatal death. Since 1999, there have been seven submissions of edematous placentas to the Animal Health Laboratory, University of Guelph, three of which were accompanied by an aborted or stillborn foal.



The most frequent association with placental edema has been fescue toxicity. Fescue grass and hay infected with the endophytic fungi *Neotyphodium coenophialum* (formerly *Acremonium*) may contain ergopeptine alkaloids. The main alkaloid in infected fescue is ergovaline. Approximately 20 ergopeptine alkaloids may be produced by the fungal endophytes infecting a variety of forage grasses and grain. Mares are very sensitive to these alkaloids and their consumption can result in a prolonged gestation and a thickened hemorrhagic edematous placenta. Foals may be born small, weak or stillborn.

In the 1999 foaling season, 7 of 8 mares on one farm foaled with either a dead or a weak foal and with a heavy edematous placenta. Three placentas ranged from 6.5 to 10 kg. The placental weight in the typical light horse should be less than 6 kilograms. Loch et al. (1987) found that the mean weight of 20 Quarter Horse placentas on a wet basis was 3.27 kg. Fescue was not present in the hay. However, the edematous placenta was consistent with ergopeptine alkaloid toxicity. The ergopeptine, ergocornine, was found to be present in the rye cereal straw bedding. Mares were observed to be eating large amounts of their bedding due to the poor quality of the hay.

In the year 2000 foaling season, an Ontario farm observed that 49% of the placentas weighed 6 kilograms or greater. The attending veterinarian observed edema in 18% of the placentas. Four Ontario farms, to date, have submitted heavy edematous placentas to the Animal Health Laboratory. One placenta weighed 14 kilograms. None of the current cases have had prolonged gestation periods that are typical of the classic fescue toxicity.

Since none of the farms have fescue in their hay, research is underway to look for other sources of ergopeptine alkaloids. The following practices will help with prevention or diagnosis.

1. Do not feed endophyte-infected fescue hay or graze infected pasture.
2. Do not bed with rye cereal grain straw.
3. Weigh and record the weights of placentas on foaling records.
4. Test the serum of mares greater than 300 days gestation for progesterin if they have poor udder development; or if the placental weights of previously foaled mares are greater than 6 kg. (Ultrasound may also be used to evaluate the placenta for edema.)
5. Submit a section of placenta from all perinatal deaths to the diagnostic laboratory.

### Explanatory Notes:

The ergopeptine alkaloids cause an excess production of dopamine that suppresses prolactin and progesterone levels.

A **progestin assay** can be used to monitor changes in progesterone levels as mares progress towards foaling. Progesterin is the progesterone-like hormone found in mares. Normal progesterin levels are approximately 3-5 nanograms through mid and late gestation. At day 300 progesterin rises sharply, peaking at 20 - 40 nanograms within the last week or two prior to foaling. In 50% of normal mares, these levels will drop again 6-10 hours prior to foaling. Mares that are affected by ergopeptine alkaloid toxicity do not show a rise in the progesterin level.

*Bob Wright*

## **Sometimes mixers are grinders**

When milk production and herd health failed to meet expectations following a recent herd expansion from 85 to 130 milking cows, the owner and I conducted an investigation that led us to an 8-year-old Patz 290 drum TMR mixer.

The drum mixer had to mix continually while filling because the inlet is at the bottom. It would plug if not turning. Total mixing time was 40 minutes. I had always believed that reel or drum style mixers didn't damage the feed. The herd seemed to be saying otherwise.

Our test was to do a one-cow hand-mixed TMR identical to the mix going into the mixer. The hand-mix showed a remarkable visual difference to the TMR from the mixer. The hand mix was much less shredded, fluffier, and proved more appealing to cows at the bunk. We tested several forage samples with the Penn State Particle Separator. Our samples included haylage from the silo before it went through the mixer (time zero), haylage after mixing for 10 minutes, and haylage after mixing for 40 minutes. I shook each sample with the Particle Separator and the results were amazing. The texture of the haylage at time zero was excellent – plenty of fibre on the top shelf and even the second shelf had “short” fibre. The top shelf had about 10% of the total. After 10 minutes in the mixer, the haylage on the top shelf weighed about the same but it was shredded and soft. The time zero haylage had more fibre on the second shelf than we found on the top shelf after mixing for 10 minutes. By 40 minutes of mixing, there was nothing left on the top shelf that would cause a cow to ruminate – everything was soft.

The herd owner did the same tests with corn silage the next day and found the same results. Our quick fix was the addition of hay to the diet on top of the TMR in the bunk. We found that the cows were ruminating better 48 hours later. Within a week, the Patz Company loaned the farm a top-loading mixer for a trial. Mixing time was 5 minutes and the TMR (photo at right) looked much more like the hand mix. I also noticed that the cows sorted far less.

The owner and I had been told that the damage we saw in the mix was due to events done to the haylage from swathing to silo to mixer – not in the mixer. Our results were different. This investigation opened my eyes. Sometimes mixers are grinders.

*David Douglas, Navan Veterinary Clinic*



## Longer tie-chains improve heat detection

Improved heat detection has been an unexpected, yet very pleasant, side effect to our campaign to improve cow comfort in several tiestall barns.

With short tie-chains, we observed cows that could not rest with their heads along their flanks. For some cows, we heard loud and unusual breathing noises due to their collar being pulled tight on their throat when they slept in this position. Our solution was to lengthen the chains. The extra chain length provided the freedom the cow needed and our advice proved to be successful.

However, the longer chain also allowed the cows to show better signs of heat. Our clients tell us the increased “actions” by their cows make heat detection a much easier job. They also say the stalls and the cows stay clean even though they had concerns about this before lengthening the chains. In a few barns, owners allow the chain to slide along the tie-rail rather than anchor it with a clamp.



To determine the ideal chain length for a cow, we suggest using a piece of cord and extend it from the tie-rail to the collar when the cow has her head resting on her side. We let the cord hang slack rather than pull it tight. Chain length varies with cow size.

If cows are not showing good signs of heat in your tiestall barns, try making the tie-chains longer. This simple and inexpensive modification will make heat detection much easier this winter.

*Ray Reynen, Kerry Blagrove, Rod Wieringa, Dave Hunsberger – Listowel Veterinary Clinic*

## Frequency of hock sores on four dairy farms

If the results of this small study were representative, hock sores could be the most prevalent disease of Ontario dairy cattle, pushing ahead of mastitis and lameness. Of course, the findings at four farms cannot represent the provincial herd. Data from several barns with sand bedding and mattresses would be needed. Nonetheless, the data kindle some questions that need answers and solutions.

**Table 1** on page 12 shows the number and frequency of hock sores, with a range from 15 to 90 percent, on four farms. When compared to Farm C with sand bedding, sore hocks were 27 times more likely to occur on Farm A with mattresses and moderate shavings, 52 times more likely on Farm B with mattresses and minimal shavings, and 10 times more likely on Farm D with tiestalls, mattresses and abundant straw bedding.

A 2 x 2 table to illustrate calculation of the cross products ratio for associations. For Farms A and C, the ratio is  $(279 \times 120) \div (21 \times 59) = 27$ .

Farm	Number with sores	Number without sores
Farm A	279	59
Farm C	21	120

These data show hock sores are common in three barns with mattresses and bedding and uncommon in a barn with sand bedding. On many farms, manure systems preclude the use of either sand or more bedding to prevent hock sores. Could other stall dimensions be important contributors to hocks sores? Other than bedding type, the resting areas ((curb to brisket board or manger curb) x (stall width)) are similar for the four barns (range 19 - 24 square feet).

**Table 1. Stall characteristics and hock appraisals for Holstein cattle in three freestall and one tiestall barn in Ontario, November 2000.**

<b>Stall Characteristics</b>	<b>Farm A</b>	<b>Farm B</b>	<b>Farm C</b>	<b>Farm D</b>
	Freestall, mattress, moderate shavings	Freestall, mattress, minimal shavings	Freestall, sand	Tiestall, mattress, Abundant straw
Width on centres – inches	44	46	46-51	48
Brisket board to curb – inches	66	66	68	72
Neck rail to mattress – inches	45	45	45	39**
Neck rail to curb – inches	60	66	66	
Platform area - ft <sup>2</sup>	19	20	21-23	24
<b>Hock appraisals</b>				
Total hocks	338	132	141	156
Number with sores	279	119	21	100
Percent with sores	82	90	15	64
Slight - number (percent)	*	24 (18%)	18 (13%)	49 (31%)
Score 1	159 (47%)	56 (42%)	3 (2%)	44 (28%)
Score 2	108 (32%)	34 (26%)	0	7 (4%)
Score 3	12 (4%)	5 (4%)	0	0

\* Slight and Score 1 were not differentiated for Farm A. Score 1 includes Slight rankings.

\*\* Tie rail height above mattress and bedding.

Observations at other barns leave us wondering if stall features other than bedding type are important contributors to hock sores. Do cows in sand-bedded stalls move their bottom leg more or less often than cows in stalls with mattresses? If the frequency of leg movement is similar, could sand be sparing the hock from both pressure and shear forces? Are hock sores less common in freestalls with mattresses and a greater unobstructed resting area? Are leg movements less frequent in freestalls with mattresses and a greater unobstructed resting area? Would an increase in unobstructed resting area provide a sparing effect on hock sores that approximates the sparing effect of sand bedding?

Hock sores are common, maybe more prevalent than mastitis. Although the search for control has focused on the bedding, several manufacturers and contractors are altering their stalls. Early reports indicate they are having good results.

*Neil Anderson, OMAFRA; Brooke Pace (D.V.M. and MSc. Intern, Mississippi State Univ.) and David Douglas - Navan Veterinary Clinic.*

**Editor's Note:** Dr. Brooke Pace is in her final year of a Masters Program in Dairy Production Medicine at Mississippi State University. Her home is Pennsylvania. Brooke collected these



data as part of a cow comfort study project while on a one-month internship with Dr. Douglas and his associates at the Navan Veterinary Clinic, Navan, Ontario.

## Leg movements and hock sores

Cows in some stalls are extremely restless when lying. With time-lapse video, we set out to count the leg movements of cows in stalls. Our concern is that restlessness and leg movements could contribute significantly to hock sores.

Our observations of leg movements were recorded in two barns with traditional free stalls (**Photo 1**). We focused the camera on 6 stalls and that allowed us to count the movements of 6 cows over several hours of recording. The freestalls had brisket boards positioned at 66 or 68 inches from the rear curb and loops mounted on 46 or 48 inch centres. The product of these two measurements is the resting area - approximately 20 - 21 square feet.



**Table 1. Average minutes between leg movements for 6 cows in traditional freestalls on two farms.**

	Top hind	Bottom hind	Front legs
Farm A	2.2	6.1	7.4
Farm B	4.0	10	10

For each hour of lying, these cows had 15 - 27 movements for the top hind leg. While doing so, the top hind leg drops over the curb and into the alley. Although we do not have closeup photography for confirmation, we believe the inside of the tuber calcus contacts the mattress or the curb during these movements. This movement could explain the hair loss and sores found on the inside of the tuber calcus.

In addition, for each hour of lying, these cows had 6 - 10 movements of the bottom hind leg across the mattress. The damage from these movements appears similar to that described for bedsores in human patients. The frequent movement of the bottom leg, pressure from body weight, and shear forces must be considered when looking for ways to control hock sores. Moreover, stall characteristics that lead to a more restful lying experience could prevent hock sores.

Although cows on pasture or bedded packs appear to move infrequently, as do those in stalls without brisket boards, we do not have data for comparison. That's a winter work project. Watch for more information in the next issue of **CEPTOR**.

*Neil Anderson, OMAFRA, Dr. Brooke Pace (MSc. Intern, Mississippi State Univ.) and David Douglas - Navan Veterinary Clinic.*

***Minds are like parachutes. They only function when they are open.* - Sir James Dewar, Scientist (1877-1925)**

## Hock sores: circular or oblique

Sometimes the shape of a lesion gives clues about the formation of the lesion. At least, that seems to be the case with bedsores in people. Could this be true with hock sores in cattle?

Circular bedsores usually arise from pressure whereas elongated or oblique bedsores arise because of an additional component called shear. In physics, a shearing strain describes a deformation of an elastic body caused by forces that tend to produce an opposite but parallel sliding motion of the body's planes. During the kindly act of cranking the bed to an upright position, a patient's body slides down while the tissue and capillaries over the pressure point on the sacrum slide and stretch upwards. When the bed sore forms, the lesions are described as elongate.

**Table 1** shows the data from observations of 767 hocks on Holstein cattle on four farms. Fully 67% of the hocks had lesions (ranging from slight to severe). When categorized by shape, approximately 24% of the hocks had circular lesions and 44% had oblique lesions. Fully 35% of the 518 hock sores were circular and 65% were oblique.

The oblique-shaped hock sores are almost twice as common as circular-shaped sores. The movements of the bottom hind leg across resting surfaces expose the tissues of the hock to pressure and shear forces similar to those of our bedridden patient. To prevent bedsores, nurses exercise great care in moving patients and fit beds with special mattresses. For our cows, other than the choice of bedding, we need to provide a comfortable stall where cows show less leg movements while lying.



**Table 1. The number and frequency of circular and oblique-shaped hock sores on Holstein cattle on four Ontario dairy farms.**

	Number	Percent
Hocks examined	767	100
Hocks with lesions	518	67.5
Hocks with no lesions	249	32.5
Hocks with circular lesions	181	23.6
Hocks with oblique lesions	337	43.9

*Neil Anderson, OMAFRA, Dr. Brooke Pace (MSc. Intern, Mississippi State Univ.) and David Douglas -Navan Veterinary Clinic.*

## Better Nights. Better Days. Building freedom into freestalls.

After almost four decades of use in dairy barns, the freestall is undergoing a radical change in design philosophy. For producers, building more freedom into freestalls means better nights and better days, in the barn and in the house.

Freedom from husbandry seemed to drive design criteria for stalls in the past. To give us that freedom, we installed brisket boards and neck rails, and then we narrowed the loop spacing - all to position the cow to keep the stall clean. Sometimes, economics drove stall design - more cows in a given space. Nonetheless, our attempts at successful stall design ignored several fundamental freedoms of the cow. Design criteria have returned to the cow. That's good news for her, the producer and the banker.

The word freestall probably was meant to describe the freedom to choose a stall. Perhaps a new name - **the freedom stall** - would focus our attention on normal resting behaviour and the freedom to express it. At the same time, adhering to **six freedoms for stall design** would help define the space needed for our dairy cows to express normal resting behaviour. **Photos 1, 2, 3, and 4** show normal resting positions - completely on her side, one front leg forward, head on her side, two legs forward, and sitting upright.

To achieve these positions, the resting area must provide cows:

1. the freedom to stretch their front legs forward,
2. the freedom to lie on their sides, with unobstructed space for their neck and head,
3. the freedom to rest their heads against their sides without hindrance from a partition,
4. the freedom to rest with their legs, udders and tails on the platform,
5. the freedom to stand or lie without fear or pain from neck rails, partitions, or supports,
6. the freedom to rest on a clean, dry, and soft bed.

In the past year, manufacturers introduced several stall features that provide these freedoms: no brisket boards, open fronts, redesigned loops, neck rails 50 inches above the mattress, wider stalls, longer platforms, and new resting surfaces. When we build all the features into one stall, we have **the freedom stall** for an additional investment of approximately \$30.



Photo 1.



Photo 2.



Photo 3.



Photo 4.



Better nights. Better days. That’s the message on the home page of “The Sleep Council”. Through their website, they give advice about getting a good sleep - one that leads to a better day tomorrow. For many, the remedy for restless nights is a new mattress. That was the case for Janice and Bob. At 5 feet, she fits the new 80-inch mattress better than he fit the old 74-inch one with his height of 6 feet. This bedroom example also applies to the beds we build for our cows. For those choosing to build a “one-size-fits-all” stall, pick the size for the largest cows in the herd.

More Ontario producers and contractors are adopting the six freedoms as their design criteria and building more freedom into freestalls. Their rewards are better days and better nights in the barn and the house.

*Neil Anderson*

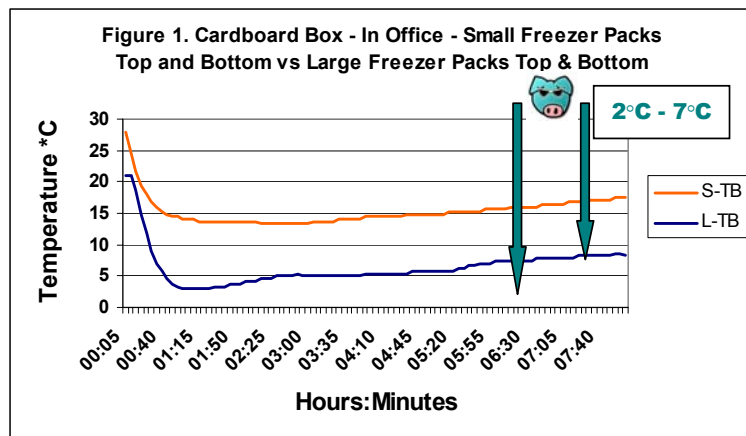
### How cool is cool in a cardboard box?

A cardboard box, with or without freezer packs, is a common way to transport vaccines home from a supplier. Without freezer packs, the cardboard box is not a cooler. How many freezer packs are needed to make it a cooler? Here’s what we found at Veterinary Science using small and large freezer packs with a cardboard box in our office.

Our cardboard box measured approximately 12 x 10 x 8 inches. We packed newspaper around the perimeter of the box for both small (S) and large (L) freezer packs.

**Figure 1** shows the temperature recordings. A large freezer pack near the top (T) and the bottom (B) of the cooler, and the thermometer between them, kept the temperature between 2°C and 7°C for about 6 hours under the conditions of our air-conditioned office.

Temperatures never reached the recommended safe range (2°C to 7°C) for storing vaccines with two small freezer packs.



**Our advice:** A cardboard box (with two large freezer packs and insulating newspaper) is a drive thru cooler. Use it for direct trips from your local vaccine supplier to your home. If you crave a coffee and bagel on the way home - make it to go. Although not tested in a car on a sunny day, we cannot recommend using a cardboard box for more demanding extremes of temperature. Nonetheless, we expect freezer packs on four of the six sides would make the cardboard box a better cooler.

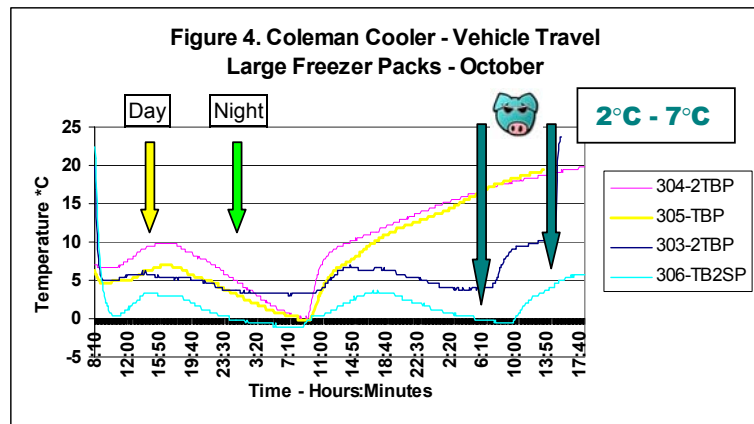
*Neil Anderson, OMAFRA; Tamara Keeley, Research Assistant, Guelph.*



## How cool is cool on the road?

Packing a Coleman™ cooler for a night on the road with vaccines isn't as simple as tossing a freezer pack on top and closing the lid. **Figure 4** shows our test results with a Coleman™ 9-quart cooler travelling in a GMC Jimmy or the trunk of a Toyota Camry.

The temperature recordings (Figure 4) rose and fell with the time of day showing that daytime and nighttime ambient temperatures affect temperature inside the cooler. If the temperature outside the cooler falls below 0°C, the temperature inside the cooler will also drop below the freezing point. We used large freezer packs for the four trials shown in Figure 4.



For trial 304, we used two freezer packs on top and one on the bottom with newspaper packing (2TBP). We had clear sunny skies with daytime highs at or greater than 15°C and nighttime temperatures less than 0°C. The cooler traveled to Eastern Ontario. The temperature inside the cooler reached 10°C during the afternoon of the first day. On the second day, the Jimmy became a greenhouse during the afternoon and the cooler quickly lost its cool by about 27 hours into the trip.

For trial 305, we used one freezer pack on top and one on the bottom with newspaper packing (TBP). The weather was similar to that for trial 304. However, the cooler traveled in the trunk of the Toyota. The temperature in the cooler remained below 10°C for a respectable 24 hours and the cooler lost its cool by 30 hours.

For trial 303, we used two freezer packs on top and one on the bottom of the cooler and newspaper packing (2TBP). The weather was foggy and overcast with daytime temperatures less than 14°C and nighttime temperatures at 3-4°C. It traveled in the trunk of the Toyota. Under these conditions, the cooler kept its cool with little fluctuation for about 48 hours.

For trial 306, we used one freezer pack on the top, one on the bottom and one on each of two sides of the cooler. We had clear skies, with daytime high temperatures near 15°C and nighttime low temperatures less than 0°C. The cooler traveled in the Toyota. Under these conditions, the cooler kept its cool for more than 48 hours.

**Our Advice:** The Coleman™ cooler (with three or four large freezer packs and newspaper packaging) performed well as an **overnight cooler**. However, on freezing nights, when you book into the B&B, we recommend carrying both the cooler and your pajamas into your room. Don't leave the cooler in the car to freeze. In the summer, we recommend keeping the cooler in the air-conditioned car and out of the sun. In winter, don't scorch it with the car heater or freeze it in the trunk while travelling. With a little care, you should successfully keep cooler temperatures within the safe range (2°C to 7°C) for vaccines for 18 hours.

*Neil Anderson, OMAFRA; Tamara Keeley, Research Assistant, Guelph.*

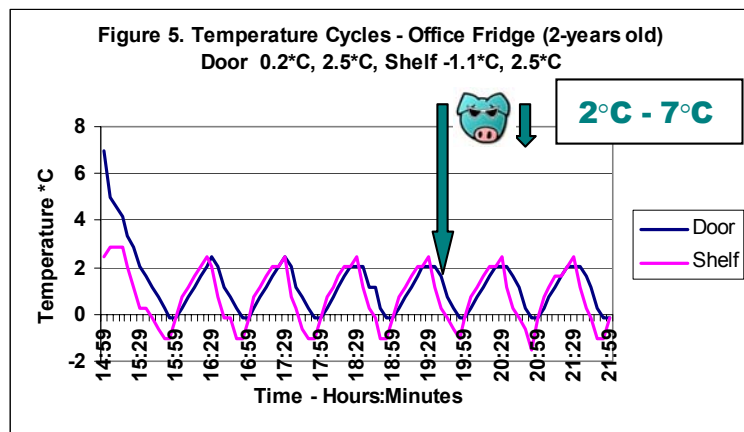
## How cool is cool in a refrigerator?

The refrigerator is an important link in the cold chain for safe storage of vaccines. Generally, we consider a refrigerator to be working fine as long as the pickles don't freeze or the milk doesn't sour.

For vaccines, we need more precise temperature monitoring because both heat and freezing will render vaccines useless. Temperatures for safe storage must be between  $2^{\circ}\text{C}$  to  $7^{\circ}\text{C}$ . Moreover, **do not freeze vaccines**. Just because it is running, doesn't mean a refrigerator is maintaining temperatures in the safe range for vaccines. Here's what we found after recording temperatures in four refrigerators.

Figures 5, 6, 7 and 8 show the temperature cycles in four refrigerators: a 2-year old office fridge, a 19-year old home fridge, a 25-year old lab fridge, and a 30-year old porch fridge. Look at the figures carefully because the scales differ.

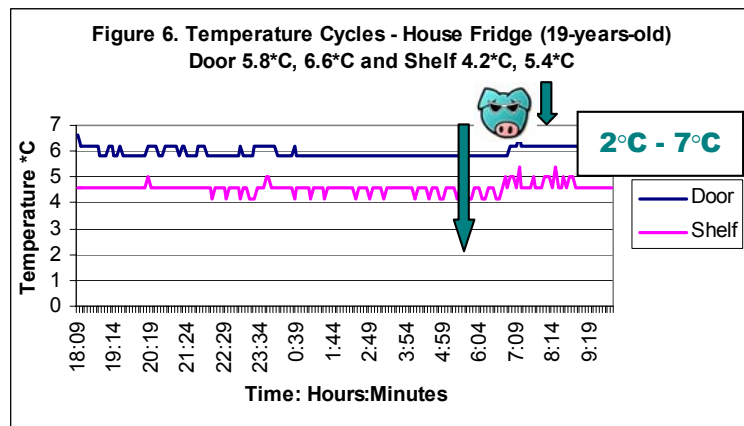
A common feature of each refrigerator is the cyclic fluctuation in temperature. The range of temperature fluctuation varied slightly with each refrigerator. The house fridge operated at the warmest and the office fridge the coldest temperature. Temperatures on the shelf were consistently colder than temperatures on the door. Temperatures on the shelf of the office and porch fridge fell below freezing. Two refrigerators (50%) operated within the safe storage range for vaccines.



Although the graphs are not shown, temperatures varied by location on the shelf. At the back of our lab fridge, we recorded temperatures below freezing throughout an entire day. Some shelf locations are colder and that's why the pickles freeze there. These cold spots are poor locations for vaccine storage.

In the two-year old office fridge (Figure 5.) temperature cycled about every hour. The range was 3.6 degrees Celsius. The warmest temperature was  $2.5^{\circ}\text{C}$  and the coldest temperature was minus 1.1 degrees.

In the 19-year old house refrigerator, (Figure 6.) temperature cycled about ½-hourly. The coldest temperature was  $4.2^{\circ}\text{C}$  on the shelf and the warmest was  $6.6^{\circ}\text{C}$  on the door, for a range of 2.4 degrees.



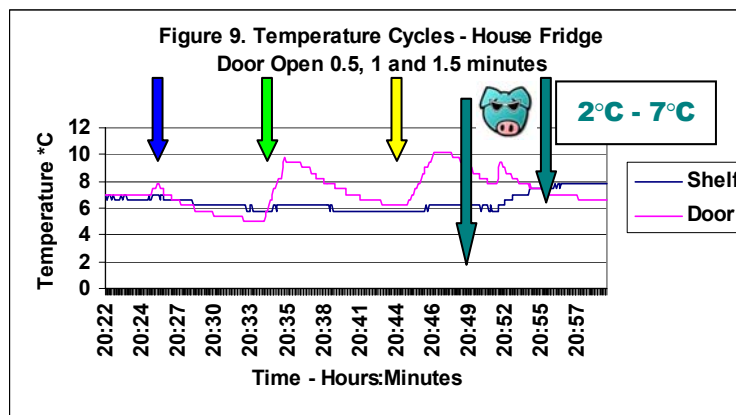
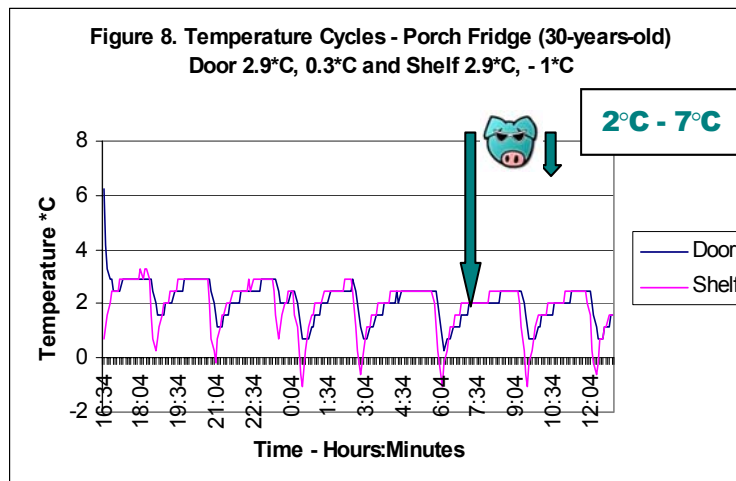
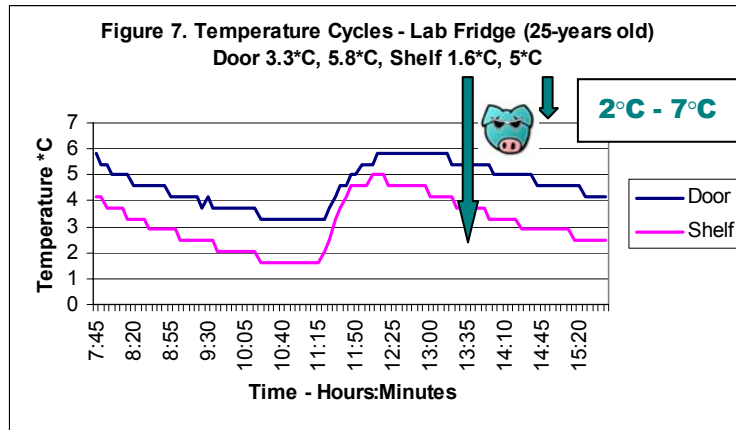
In the 25-year old lab fridge (**Figure 7.**), temperature cycled every 4 hours. The coldest temperature was 1.6°C on the shelf and the warmest temperature was 5.8°C on the door, for a range of 4.2 degrees.

In the 30-year old porch fridge (**Figure 8.**), temperature cycled every 3 hours. The coldest temperature was minus 1°C on the shelf and the warmest temperature was 2.9°C on the door, for a range of 3.9 degrees.

**Figure 9** shows temperature changes on the door and the shelf of the 19-year old house fridge after opening the door for 0.5, 1 and 1.5 minutes. Shelf temperatures stayed quite constant with less than 1-degree change with the door open for 1.5 minutes. However, temperatures on the door increased to greater than 10°C. Recovery took about 15 minutes.

**Our advice: Make your refrigerator vaccine friendly.**

Give your refrigerator a regular checkup by taking its temperature several times over several days. Keep records and study them carefully. Expect cyclic fluctuations. Overall, your refrigerator must maintain temperatures between 2°C to 7°C to protect your investment in vaccines. With some adjustment, most refrigerators will maintain this temperature. The most stable temperatures occur on the shelf. That's why the shelf is the best place to store vaccines. A refrigerator for lunches and snacks is a poor place to store vaccines because of frequent opening of the door. The fridge must not freeze the contents.



*Neil Anderson, OMAFRA; Tamara Keeley, Research Assistant, Guelph.*

## How cool is cool out of the fridge?

Although we cannot measure the length of cool, we sure can measure duration of time. Exposure of vaccines to extremes of temperature is important to safe handling and potency. Labels caution us to **Store at 2°C to 7°C** and **do not freeze**.

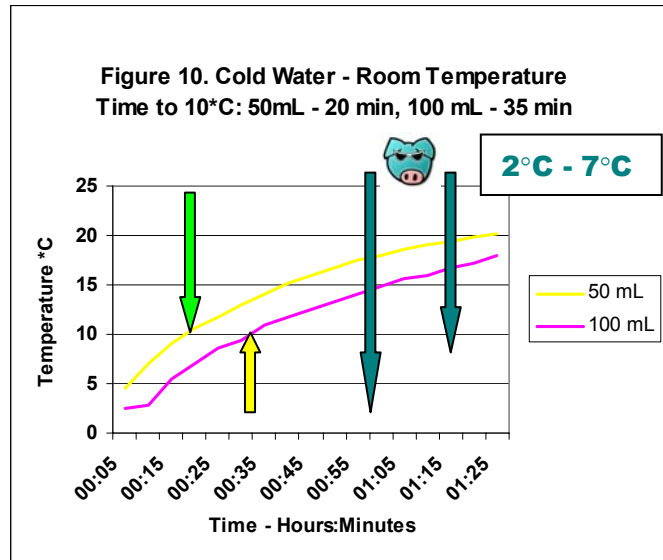
When removing medicines from the refrigerator to the barn, how quickly will they warm? For our tests, we used water rather than actual vaccines.

**Figure 10** shows the temperatures we recorded in 50 and 100 mL vials of water after they came out of our office refrigerator and into room temperature.

The water in the 50-mL vial warmed to 10°C in 20 minutes and to room temperature in approximately one hour. The water in the 100-mL vial warmed to 10°C in 35 minutes and to room temperature in 1.5 hours.

Vaccines and other medications may warm more quickly or slowly than our water samples. However, the rate of warming at room temperature should be a warning.

Use medications promptly and return them to the refrigerator quickly.



**Our advice: Learn from the coffee shop motto - always fresh.** At our local coffee shop, the time of brewing is written on each pot of coffee. If it's not sold within the 20-minute "fresh-brewed" time frame, the coffee goes down the drain. This simple and elegant coffee shop monitoring system should be used for vaccines on farms.

The next time you remove a vaccine from your refrigerator, write the time that it came out of the refrigerator on the bottle. When it is empty or returned to the refrigerator, note the elapsed time. Did you warm it for more than 15 minutes? If so, consider using a cooler and freezer packs while working with vaccines in the barn. Alternatively, remove only the amount of product that you can use within 15 minutes.

We understand that this advice may seem overzealous. However, without information about the potency of our common vaccines after exposure to room temperatures for extended time, we recommend erring on the side of caution. Keep them cool. Likewise, do not freeze vaccines while working with them.

*Neil Anderson, OMAFRA; Tamara Keeley, Research Assistant, Guelph.*

## Three meals per day for cold housed calves

As fall fades away and winter strikes, we prepare ourselves to stay warm. We dig out our sweaters, boots, hats and gloves. This is also the time to remember the special needs of our calves in cold housing. Rather than putting a sweater on them, put on at least one extra meal a day. That's what they need to meet their requirements for heat loss from cold temperatures.

The common advice is to increase the milk replacer by 1 percent for every 1 degree the temperature falls below 32°F. **Table 1** shows temperatures in Fahrenheit and Celsius and the corresponding recommendation for an increase in milk replacer. For example, the increase in milk replacer is approximately 20% when the calf housing is at -10°C. A total daily feeding of 8 - 10 litres in warm weather increases to a requirement of 9.5 - 12 litres at -10°C. Some producers gradually increase the amount offered at each of two meals. Others find the volume required in extremely cold weather to be more than they care to feed at a single meal. Therefore, they feed a third meal during the day.

If calves are giving you the cold stare this winter, they are likely asking for another meal, not a sweater. Extra milk replacer is the key to keeping them warm and healthy in cold weather.

**Table 1. The percent increase in milk replacer recommended to meet requirements for heat loss in cold calf housing.**

Temperature in the Calf Housing		Percent Increase in Milk Replacer
>32°F	>0°C	As per label directions
23°F	- 5°C	Increase 7%
14°F	- 10°C	Increase 18%
5°F	- 15°C	Increase 27%
- 4°F	- 20°C	Increase 36%
- 13°F	- 25°C	Increase 45%
- 22°F	- 30°C	Increase 54%

*Neil Anderson*

### Veterinarians held in high esteem: Gallup

In a recent Gallup Honesty and Ethics poll, veterinarians received the third highest ranking for honesty among the top 10 professional occupations. Veterinarians were deemed more honest than medical doctors, teachers, clergy, judges, police and dentists.

Just ahead of veterinarians were pharmacists, and the top-ranking profession, nurses (who were among 20 added occupations not previously rated by Gallup). This was the first time veterinarians were ranked in the top ten professions.

*JAFMA, Vol. 217, No. 8, October 15, 2000*

Top 10 professionals and occupations considered most honest by the American people:

1. Nurses (73%)
2. Pharmacists (69%)
3. **Veterinarians (63%)**
4. Medical doctors (58%)
5. K-12 teachers (57%)
6. Clergy (56%)
7. Judges (53%)
8. Policemen (52%)
9. Dentists (52%)
10. College teachers (52%)

## Resources

**Exotic Formulary: Avian, Ferrets, Rabbits, Reptiles, Rodents.** Antinoff, N. et al. American Animal Hospital Association Press. 1999. 132 pp. ISBN 1-58326-000-5. US \$23.00  
AAHA, PO Box 172108, Denver, CO 80317-2108.

Poster:

**Body Condition Scoring of Horses.** English and French.  
22" x 28", full colour, and laminated. OMAFRA Order # AF0090/00. \$10.00

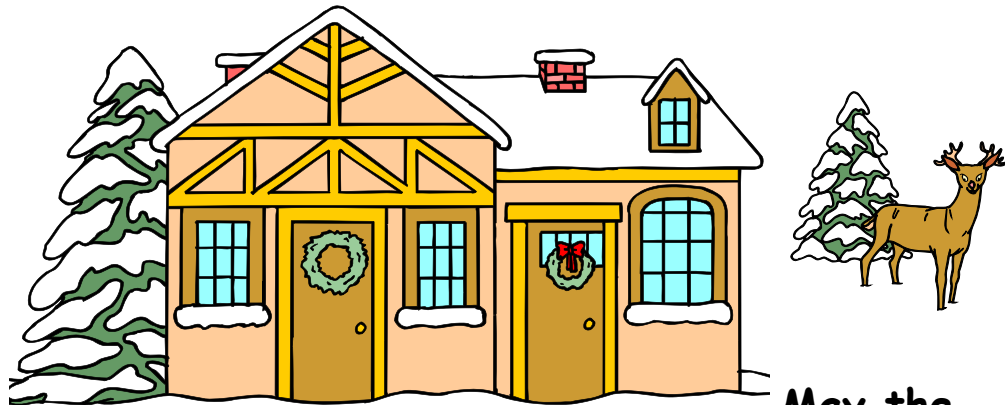
Factsheets:

**Body Condition Scoring of Horses,** Order # 98-101; **Body Weight Estimation of Horses,** Order # 98-093; **Human Health Concerns when Working with Medications around Horses,** Order # 00-063; **Leptospirosis and Equine Recurrent Uveitis in Horses,** Order # 00-065.

OMAFRA Publication Order Centre, 1-888-466-2372 (within Ontario) or 519-826-3700.

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# Season's Greetings!



May the coming year be filled with health and comfort for you and all creatures in your care.

## Continuing Education

- Jan 13-17, 2001 North American Veterinary Conference, Orlando, FL. Dr. Colin Burrows, 352-375-5672
- Jan 16-19, 2001 Free Stall Housing Design Seminars, Woodstock, ON. 519-537-6621, [jack.rodenburg@omafra.gov.on.ca](mailto:jack.rodenburg@omafra.gov.on.ca)
- Jan 18-21, 2001 Western Canadian Association of Bovine Practitioners, Annual Conference, Calgary, Alberta. Phone/Fax: 306-651-3383 or <http://www.cattle.ca>
- Jan 22-26, 2001 Lake Tahoe Equine Conference. Incline Village, NV. Dr. Tim O'Brien, Davis, CA. 530-756-4899, [tobrien@ucdavis.edu](mailto:tobrien@ucdavis.edu)
- Jan 25-28, 2001 Michigan Veterinary Medical Association Annual Meeting, Lansing, MI. Dr. Peter Presto, 517-347-4710
- Jan 30-Feb 1, 2001 Milking Systems and Parlors: Planning and managing for quality milk and profitability. Radisson Penn Harris Hotel and Convention Center, Camp Hill, PENN. [www.nraes.org](http://www.nraes.org) or email [NRAES@Cornell.edu](mailto:NRAES@Cornell.edu)
- Feb 1-3, 2001 Ontario Veterinary Medical Association Annual Conference, Toronto, ON 905-875-0756
- Feb 6-8, 2001 Ontario Large Herd Operators Symposium 7, Regal Constellation Hotel, Toronto, ON. Ruth Cudmore, 519-846-2290, [cudmore@golden.net](mailto:cudmore@golden.net)
- Feb 8, 2001 Lameness in Dairy Cattle Symposium. Roger Blowey, UK. Contact Dr. Reny Lothrop, 519-622-6988 or [msah@bond.net](mailto:msah@bond.net).
- Feb 11-14, 2001 40<sup>th</sup> Annual meeting of the National Mastitis Council. Reno, NV. Pre-meeting "Somatic Cell Count Symposium", [www.nmconline.org](http://www.nmconline.org)
- Feb 24-27, 2001 American Association of Swine Practitioners, Nashville, TN. 515-465-5255 or [aasp@nectins.net](mailto:aasp@nectins.net)
- Feb 26-28, 2001 Free Stall Housing Design Seminars, Kemptville, ON. 519-537-6621, [jack.rodenburg@omafra.gov.on.ca](mailto:jack.rodenburg@omafra.gov.on.ca)
- Sept 13-15, 2001 Second International Mastitis Symposium. Joint meeting National Mastitis Council and American Association of Bovine Practitioners. Vancouver, BC, CAN. [www.nmconline.org](http://www.nmconline.org) or [www.aabp.org](http://www.aabp.org). Note: Abstracts for NMC due November 30, 2000.

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Tel: (519) 846-3410 Fax: (519) 846-8101 Email: [neil.anderson@omafra.gov.on.ca](mailto:neil.anderson@omafra.gov.on.ca)

Topics for future issues include: .....

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**Deadline for next issue: February 28, 2001**