Strength

To protect your cows.
To protect your calves.
To protect your future.

New year-round fetal protection with Bovi-Shield® GOLD™ FP:
- The first and only vaccine with the strength to deliver fetal protection from BVD persistent infection and IBR abortion for one full year.
- The convenience to vaccinate according to your schedule and still get fetal protection 24/7, 365 days a year.*
- The unparalleled safety to vaccinate pregnant cows and calves nursing pregnant cows when used according to label directions.

Protect your livelihood with the No. 1 veterinarian-recommended reproductive and respiratory vaccine, Bovi-Shield GOLD.¹

For more information, visit www.bovi-shieldgold.com.

*LABEL INDICATIONS: The Bovi-Shield GOLD line and PregGuard® GOL D™ FP 10 may be administered to pregnant cattle provided they were vaccinated, according to label directions, with any Bovi-Shield FP or PregGuard FP vaccine prior to breeding initially and within 12 months thereafter. The Bovi-Shield GOLD line of products may be administered to calves nursing pregnant cows provided their dams were vaccinated within the last 12 months as described above.
AABP OFFICERS

President-Elect
JOHN FERRY
DVM
Belleville, New York

Past-President
MARK SPIRE
DVM
Manhattan, Kansas

President
RICH MEIRING
DVM
Marysville, Ohio

Vice-President
CHARLIE HATCHER
DVM
College Grove, Tennessee

Exec. Vice-President
M. GATZ RIDDELL, JR
DVM
Auburn, Alabama

District 1
ROGER SALTMAN
DVM
Cazenovia, New York

District 2
DARCIE J. STOLZ
DVM
Strasburg, Pennsylvania

District 3
ART DONOVAN
DVM
Gainesville, Florida

District 4
MICHAEL BOLTON
DVM
Greenville, Michigan

District 5
ANDY JOHNSON
DVM
Seymour, Wisconsin
District 6  
BILL SEGLAR  
DVM  
Johnston, Iowa

District 7  
WADE TAYLOR  
DVM  
Oakley, Kansas

District 8  
CHARLIE E. DEYHLE, JR.  
DVM  
Canyon, Texas

District 9  
JOHN SCHNACKEL  
DVM  
Fort Collins, Colorado

District 10  
ALAN HERRING  
DVM  
Litchfield Park, Arizona

District 11  
SCOTT WALTNER  
DVM  
Eagle, Idaho

District 12  
RENY LOTHROP  
DVM  
Cambridge, Ontario, Canada

District 13  
SJOERT ZUIDHOF  
DVM  
Lethbridge, Alberta, Canada

Treasurer  
MARK WUSTENBERG  
DVM  
Bay City, Oregon

Exhibits Manager  
SAMUEL HUTCHINS, III  
DVM  
South Barre, Vermont

Editor  
ROBERT SMITH  
DVM  
Stillwater, Oklahoma

Parliamentarian ..... M. Gatz Riddell, Jr, DVM, Auburn, Alabama
AVMA Delegate ................. Mark Spire, DVM, Manhattan, Kansas
# Table of Contents

## General Sessions
- Transmission of *Mycoplasma bovis* and the Syndromes that Result in Beef and Dairy Cattle  
  Ricardo F. Rosenbusch .......................................................... 1
- Treatment of *Mycoplasma* Infections: Susceptibility of Field Isolates and Outcome of Treatment; Recovered Cattle: Risk or Bonus?  
  Roger D. Ayling, Robin A. J. Nicholas ........................................ 6
- Practitioners experience with *Mycoplasma bovis* Outbreaks  
  - Dairy Calves  
    Jan C. Gawthrop ................................................................. 11
  - Mycoplasma in Beef Cattle in Ontario  
    Peter Kozel ................................................................. 11
- Practitioners Experience with *Mycoplasma bovis* Outbreaks  
  - Dairy Cows  
    Fred J. Muller ................................................................. 14
- Present and Future Control of Cryptosporidiosis in Cattle  
  Daryl Nydam, Andrew S. Peregrine ...................................... 15
- Mannan-oligosaccharides and other Non-antibiotic Alternatives to the Management of Enteric Disease of Cattle  
  J. D. Quigley ................................................................. 19
- Siderophore Receptor and Porin Protein Technology for Control of *Salmonella* and *Escherichia coli* O157:H7 in Cattle  
  E.T. Stevens, D.U. Thomson .................................................... 25
- AVMA-Pfizer Business Practices Study  
  Fred D. Lehman, Robert L. Saltman ....................................... 30

## Beef Sessions
- Update on Veterinary Breeding Soundness Evaluation of Bulls  
  Dwight F. Wolfe ................................................................. 34
- Lameness in Cattle: Rules of Thumb  
  David C. Van Metre, John R. Wenz, Franklyn B. Garry .... 40
- Effects of Preconditioning on Health, Performance and Prices of Weaned Calves  
  David Lalman, Clement E Ward ............................................ 44
- Impact of Antimicrobial Use in Animals and Regulatory Response  
  Linda Tolleson ................................................................. 52
- Choosing a New Vaccine: A Solution or a Potential Problem  
  Robert Tremblay ............................................................. 58

## Feedlot Session
- *Mycoplasma bovis* - Unique Features, Pathogenesis and Lesions Update  
  Ted Clark ................................................................. 63
- *Histophilus somni* - Unique Features, Pathogenesis and Lesions Update  
  Ted Clark ................................................................. 68

## Dairy Sessions
- Labor Management: Organizing for Profit  
  Ben Shelton ................................................................. 72
- Implementing New Procedures on My Own Dairy  
  Donald E. Niles ............................................................ 77
- Managing the Organic Dairy  
  Robert C. Fry ................................................................. 79
- Strategies for Shortening the Dry Period  
  Ric R. Grummer, Robin R. Rastani ......................................... 89
- Milking Cows Four and Six Times per Day (4X-6X) and its Impact on Animal Performance  
  Geoffrey E. Dahl ............................................................ 95
- Applications of Biotechnology in Today's Dairy Industry  
  S. P. Oliver ................................................................. 99

## AABP & AASRP Sessions
- Incorporating Veterinary Care into the Sheep Production Cycle  
  David C. Van Metre ....................................................... 112
- Questions for the Cameld Consultant  
  LaRue W. Johnson .......................................................... 116
- Routine Cameld Procedures  
  LaRue W. Johnson .......................................................... 120
- Diagnosis, Treatment, and Prevention of Common Small Ruminant Parasites  
  Mary C. Smith ............................................................. 123
- Recognizing Common Infectious Diseases of Small Ruminants  
  Mary C. Smith ............................................................. 128

## Veterinary Technician Sessions
- Herd-based Testing for the Preventive Medicine Practice  
  Garrett R. Oetzel .......................................................... 133
- Herd-based Testing for Infectious Diseases  
  Jerry D. Olson .............................................................. 139
- Herd-based Testing for Young Stock  
  Sheila M. McGuirk .......................................................... 146
- Parasite Management Programs for Small Ruminants  
  Mary C. Smith, Dwight D. Bowman,  
  Marguerite K. Fongilo ...................................................... 149

## Research Summaries - 1
- Preliminary Report on the Incidence of Laboratory-confirmed Clinical Salmonellosis in Northeast USA Dairy Herds  
  C.J. Cripps, LD Warnick, DV Nydam, PL McDonough,  
  YT Grohn, KE Reed .......................................................... 154
- Signs and Prognosis of Male Cattle with Urethral Occlusion  
  S. Gronau, G. Rademacher, W. Klee ...................................... 155
- Uterine Torsion in Cattle: 55 Field Cases  
  P. Aubry, L. DesCoteaux ................................................... 156
- Multiattribute Evaluation of Two Simple Tests for the Detection of *Cryptosporidium parvum* Oocysts in Calf Feces  
  Lise A. Trotz-Williams, S. Wayne Martin, Donald Martin,  
  Todd Duffield, Kenneth E. Leslie, Daryl V. Nydam,  
  E. Sockovie, Andrew S. Peregrine ........................................ 157
- Effect of Pasteurization Temperature on Immunoglobulin G, Viscosity and Pathogen Viability in Bovine Colostrum  
  S. McMartin, S. Godden, J. Feirtag, L. Metzger, R. Bey,  
  S. Goyal ................................................................. 158
- Effects of Growth Hormone Releasing Hormone Delivered by Plasmid Injection and Electroporation on the Immune Function and Body Condition Scores in Holstein Heifers  
  Patricia A. Brown, William C. Davis,  
  Ruxandra Draghia-Akli ..................................................... 159
- The Effect of Feeding Medicated or Non-medicated Milk Replacer on Growth, Morbidity and Mortality of Holstein Heifer Calves  
  J.J. Averill, R.J. Erskine, P.C. Bartlett .................................. 160
- Diaphyseal Femoral Fractures in Cattle: 24 Cases  
  S. Nichols, D.E. Anderson, B.L. Hull, M. Miessler .......... 161
- Calf Respiratory Disease and Pen Microenvironments in Naturally Ventilated Calf Barns in Winter  
  A. Lago, T.B. Bennett, S.M. McGuirk, N.B. Cook,  
  K.V. Nordlund .............................................................. 162
- Fecal Shedding of *Mycobacterium avium* subsp  
  *paratuberculosis* in Calves: Implications for Disease Control and Management  
  Michael W. Bolton, Daniel L. Grooms,  
  John B. Kaneene .......................................................... 163
• Clinical and Subclinical Diseases Predisposing to Johne's Disease in Dairy Cattle
  Eran A. Raizman, Scott J. Wells, Sandra M. Godden ........................................... 164
• A Deterministic Mathematical Model of *Mycobacterium avium* subsp. *paratuberculosis* (MAP) Transmission on Commercial US Dairy Farms
  R.M. Mitchell, S.M. Stehman, R.H. Whitlock, A. Benedictus, Y.H. Schukken ........................................ 165
• Using ELISA Adjusted Optical Density (OD) Measures to Predict *Mycobacterium avium paratuberculosis* Shedding Status of Individual Dairy Cattle
  Roxanne Pillars, John B. Kaneene, Daniel Grooms ........................................ 166
• Efficacy of Monensin Sodium for the Reduction of Fecal Shedding of *Mycobacterium avium* subsp. *paratuberculosis* in Infected Dairy Cattle

**Research Summaries - 2**

• Evaluation of the Use of Cephepin Sodium Intramammary Therapy in the Close-up Dry Period to Reduce Subclinical Mastitis in Adult Dairy Cattle
  D. Cole, W. Graves, R. Smith, Doug Ensley, J. Fain, J. Rosenberg ........................................ 168
• Association between Local (Udder) Clinical Signs and Important Outcomes of Clinical Mastitis Episodes in Dairy Cattle
  J.R. Wenz, R. Elia, K. Whitman, F.B. Garry ........................................ 169
• Efficacy of Intramammary Pirlimycin as a Pre-calving Antibiotic Treatment for Nulliparous Heifers
  J.P. Roy, D. Du Tremblay, L. DesCôteaux, S. Messier, E. Bouchard ........................................ 170
• Evaluation of the Petrifilm™ Culture System for the Identification of Mastitis Bacteria as Compared to Standard Bacteriological Methods
  Matthew Walker, Ken Leslie, Erin Vernooy, Anna Bashiri, Randy Dingwell ........................................ 171
• Relationship between Antibiotic Susceptibility of Mastitis Pathogens and Treatment Outcomes
  Fernanda G. H. Hoe, Pamela L. Ruegg ........................................ 173
• Cumulative Cure Rates for the Major Pathogens Causing Mastitis
  A.Lago, J. Gaska, N.B. Cook ........................................ 174
• Effect of Prepartum Intramammary Treatment of Heifers on Somatic Cell Count, Milk Production and Mastitis Postpartum
  K.K. McCarthy, R.A. Kreft, P.M. Sears ........................................ 175
• Effect of Pre-milking Stimulation on Milking Performance
• Herd and Spatial Factors Affecting the Proportion of False-Positive Results on the Caudal Fold Tuberculin Test in Michigan Cattle
  B. Norby, P.C. Bartlett, J.B. Kaneene, D.L. Grooms, L.M. Granger ........................................ 177
• Serum Mineral Concentrations and Risk of Periparturient Disease
  R.J. Van Saun, Amy Todd, G.A. Varga ........................................ 178
• Use and Interpretation of Pooled Metabolic Profiles for Evaluating Transition Cow Health Status
  Robert J. Van Saun ........................................ 180
• Use of Bulk Tank Milk to Determine the Herd-level Prevalence of *N. caninum* in Dairy Herds on Prince Edward Island
• Comparison of the Ovsynch Protocol and Exogenous Progesterone with Insemination at an Induced Estrus as Therapeutic Strategies for Ovarian Cysts in Lactating Dairy Cows
  M.B. Crane, P. Melendez, C.A. Risco, A. de Vries, L.F. Archbald ........................................ 183

**Research Summaries - 3**

• Comparison of Bacteria Populations within Clean and Recycled Sand used for Bedding in Dairy Facilities
  M.A. Kristula, W. Rogers, J.S. Hogan, M. Sabo ........................................ 185
• The Relationship between Locomotion Scores and Lameness Lesions in Dairy Cattle
  Gerard Cramer, Kerry Lissemore, Dave Kelton, Chuck Guard, Ken Leslie, Janyk Laferriere ........................................ 186
• Herd Level Risk Factors for Non-infectious and Infectious causes of Lameness for Ontario Dairy Herds
  Gerard Cramer, Kerry Lissemore, Dave Kelton, Chuck Guard, Ken Leslie ........................................ 187
• Effect of Rubber Flooring on the Development of Claw Lesions in Lactating Dairy Cows Housed in Free Stall Barns
  J. Vanegas, M.W. Overton, W.M. Sisco, S.L. Berry ........................................ 188
• Production Effects of *Mycobacterium avium* subsp. *paratuberculosis* Infection Based on Diagnostic Test Results
  J.E. Lombard, B.A. Wagner, B.J. McCluskey, F.B. Garry ........................................ 189
• Evaluation of Environmental Sampling to Determine Distribution and Dairy Herd Infection Status for *Mycobacterium avium* subsp. *paratuberculosis*
  J.E. Lombard, R.L. Smith, B.A. Wagner, B.J. McCluskey ........................................ 190
• Johne's Disease: the Effect of Feeding Monensin to Reduce the Bioburden of *Mycobacterium avium* subsp. *paratuberculosis* in Neonatal Calves
• MAP Super-shedders: Another Factor in the Control of Johne's Disease
  R.H. Whitlock, R.W. Sweeney, T. Fyock ........................................ 193
• Uterine Bacterial Isolates and Reproductive Performance in Lactating Holstein Cows with Uterine Health Disorders, Large Calves and Fever
  Doug Hammon, Heidi Johnson, Cory Wareham, Rusty Stott ........................................ 194
• Effect of Different Prostaglandin Treatment Protocols on Luteolysis and Ovulation in Dairy Cows
• Effect of Parturition Induction of Term Pregnancies on Calf Survival, Production and Reproduction in Holstein Dairy Cows
  A. Villarroel, V.M. Lane ........................................ 197
• Prevalence, Risk Factors and Treatment of Postpartum Anestrus in Dairy Cattle
  B.R. Walsh, J.S. Walton, K.E. Leslie, S.J. LeBlanc ........................................ 199

**Research Summaries - 4**

• Investigation of Bovine Respiratory Disease Pathogens using Immunohistochemistry Testing on Selected Samples
• Effects of NPCoat Intranasal™ on Health and Productivity of Beef Cattle
  David Nash, Mary Wray, Scott MacGregor, Dallas Horton ........................................ 202
• Risk Analysis for Beef Cow-Calf Retained Ownership Decision Making: Utilization of Historical Performance Data
  B.J. White, J.D. Anderson ........................................ 203
Poster Sessions

- Performance of Dairy Calves Raised Indoors vs. Outdoors in One Commercial Danish Dairy Farm
  R. Engelbrecht Pedersen, M. Trinderup, I. Dalgaard ...

Research Summaries - French Translations

- Development of a New Diagnostic Test for the Detection of Passive-Released Immunoglobulin G1 (IgG1) in Newborn Calves Using Immunostick ELISA Technology
  D. P. Mackie, E. F. Logan ...

Advertisers’ Index

Addison Biological Laboratory, Inc. ........................................ 57
Bayer HealthCare LLC .................................................. 50, 51
Elanco Animal Health ..................................................... 304, inside back cover
Fort Dodge Animal Health .................................................. 13
Intervet, Inc. ............................................................. 24a
NAVC ........................................................................... 67
Novartis Animal Health ...................................................... front of book
Pfizer Animal Health .......................................................... inside front cover, 301, back cover
Schering-Plough Animal Health Corp. ................................... 74-76
University of Missouri-Columbia ........................................ 56

Notice to Readers

Articles published in the Proceedings of the American Association of Bovine Practitioners are not peer-reviewed or refereed. All statements, opinions and conclusions contained in articles in the Proceedings are those of the author(s), and are not necessarily those of the American Association of Bovine Practitioners (AABP) unless specifically approved by the AABP Board of Directors.
Costly, fast and fatal: Clostridium perfringens Type A

By Jim Rhoades, DVM
Director of Veterinary Services
Farm Animal Business
Novartis Animal Health US, Inc.

If Clostridium perfringens Type A isn’t on your radar yet, it should be. While not yet widely recognized, C. perfringens Type A is an emerging economic threat for dairy producers, because of its association with serious and often deadly gastrointestinal diseases in both cows and calves.

Research has indicated that C. perfringens Type A is associated with hemorrhagic bowel syndrome (HBS) in mature cows.1 HBS strikes healthy animals without warning, and has a fatality rate of 85 percent or higher. It generally affects larger, more productive dairy herds in the western United States. But every herd is at risk.2

In dairy and beef calves, there’s research linking C. perfringens Type A with abomasal ulcers, abomasal hemorrhage and abdominal tympany, all of which are frequently fatal. Yet standard seven-way clostridial vaccines don’t protect against C. perfringens Type A, nor do they offer cross-protection. Even worse, the diseases associated with C. perfringens Type A are just about impossible to treat.

Clostridium Perfringens Type A Toxoid

Because treatment measures are expensive – and mostly unsuccessful – prevention and management strategies are the best line of defense. That’s why you can’t afford not to consider the new Clostridium Perfringens Type A Toxoid from Novartis Animal Health.

The first-ever conditionally licensed C. perfringens Type A vaccine for cattle, this product is labeled for use in healthy cattle as an aid in the control of disease syndromes caused by the alpha toxin of C. perfringens.

Clostridium Perfringens Type A Toxoid far surpasses USDA requirements, producing double the level of titers required for a conditional license. In addition, field studies involving 867 dairy and beef cattle – both open and pregnant, and of various ages and breeds – demonstrated product safety in animals as young as one month of age.

Another benefit: Clostridium Perfringens Type A Toxoid comes from Novartis Animal Health, a company with years of experience in developing custom Type A products. At Novartis, we have a well-deserved reputation for providing potent toxoids, so you can be confident in the product. When your clients are battling a killer like C. perfringens Type A, you need confidence in the product you recommend.

HBS on the rise

Also known as jejunal hemorrhage syndrome or bloody gut, HBS is more prevalent in dairy cows, especially in early lactation, but it also has been reported in beef cattle.3 While no single cause has been identified for HBS, C. perfringens is believed to be a contributor as it is commonly isolated from the gastrointestinal tracts of afflicted animals. In addition to C. perfringens Type A, mold has been implicated, specifically Aspergillus fumigatus found in livestock feeds.

HBS begins with a sudden and sometimes massive hemorrhage into the small intestine, resulting in blood clots that obstruct the intestine. Although affected cows are often found dead or dying with no warning signs, clinical symptoms of HBS include: sudden and complete anorexia; rapid pulse and respiratory rate; pale mucous membranes; severe decrease in milk production; severe depression; dark, tar-like feces – often containing clots of digested blood; abdominal distention – especially the lower right; normal or below-normal rectal temperature; and scattered, low pitched “pings” in the lower right abdomen.

HBS is a particularly disturbing disease because it often strikes healthy animals without warning, and about 85 percent of infected animals die within 24 to 36 hours after the onset of symptoms. Treatments are usually unsuccessful, so emphasis should be placed on preventative measures, such as vaccinating the pregnant cow to provide her with active immunity. By vaccinating during the dry period, you also may provide the offspring with passive immunity through colostrum.4 Another key to prevention is evaluating and addressing nutritional factors that may predispose cattle to HBS.

With something this fast and this deadly, you’d think that everyone would be paying close attention. Yet a 2002 NAHMS producer survey showed that only 1 percent felt knowledgeable about the disease, and more than 87 percent had never heard of it. This, despite the fact that the number of operations reporting their initial case of HBS increased dramatically from 1996 to 2002, according to NAHMS.

Clearly, we can’t afford to keep the problem of C. perfringens Type A off the radar. The good news is, we have a simple solution to add to the prevention kit: Clostridium Perfringens Type A Toxoid from Novartis.

Prudent Drug Usage Guidelines

The production of safe and wholesome animal products for human consumption is a primary goal of members of the AABP. In reaching that goal, the AABP is committed to the practice of preventive immune system management through the use of vaccines, parasiticides, stress reduction and proper nutritional management. The AABP recognizes that proper and timely management practices can reduce the incidence of disease and therefore reduce the need for antimicrobials; however, antimicrobials remain a necessary tool to manage infectious disease in beef and dairy herds. In order to reduce animal pain and suffering, to protect the economic livelihood of beef and dairy producers, to ensure the continued production of foods of animal origin, and to minimize the shedding of zoonotic bacteria into the environment and potentially the food chain, prudent use of antimicrobials is encouraged. Following are general guidelines for the prudent therapeutic use of antimicrobials in beef and dairy cattle.

1. The veterinarian’s primary responsibility to the client is to help design management, immunization, housing and nutritional programs that will reduce the incidence of disease and the need for antimicrobials.

2. Antimicrobials should be used only within the confines of a valid veterinarian-client-patient relationship; this includes both dispensing and issuance of prescriptions.

3. Veterinarians should properly select and use antimicrobial drugs.
   a. Veterinarians should participate in continuing education programs that include therapeutics and emerging and/or development of antimicrobial resistance.
   b. The veterinarian should have strong clinical evidence of the identity of the pathogen causing the disease, based upon clinical signs, history, necropsy examination, laboratory data and past experience.
   c. The antimicrobial selected should be appropriate for the target organism and should be administered at a dosage and route that are likely to achieve effective levels in the target organ.
   d. Product choices and regimens should be based on available laboratory and package insert information, additional data in the literature, and consideration of the pharmacokinetics and pharmacodynamics of the drug.
   e. Antimicrobials should be used with specific clinical outcome(s) in mind, such as fever reduction, return of mastitic milk to normal, or to reduce shedding, contagion and recurrence of disease.
   f. Periodically monitor herd pathogen susceptibility and therapeutic response, especially for routine therapy such as dry cow intramammary antibiotics, to detect changes in microbial susceptibility and to evaluate antimicrobial selections.
   g. Use products that have the narrowest spectrum of activity and known efficacy in vivo against the pathogen causing the disease problem.
   h. Antimicrobials should be used at a dosage appropriate for the condition treated for as short a period of time as reasonable, i.e., therapy should be discontinued when it is apparent that the immune system can manage the disease, reduce pathogen shedding and minimize recurrence of clinical disease or development of the carrier state.
   i. Antimicrobials of lesser importance in human medicine should be used in preference to newer generation drugs that may be in the same class as drugs currently used in humans if this can be achieved while protecting the health and safety of the animals.
   j. Antimicrobials labeled for use for treating the condition diagnosed should be used whenever possible. The label, dose, route, frequency and duration should be followed whenever possible.
   k. Antimicrobials should be used extra-label only within the provisions contained within AMDUCA regulations.
   l. Compounding of antimicrobial formulations should be avoided.
   m. When appropriate, local therapy is preferred over systemic therapy.
   n. Treatment of chronic cases or those with a poor chance of recovery should be avoided. Chronic cases should be removed or isolated from the remainder of the herd.
   o. Combination antimicrobial therapy should be discouraged unless there is information to show an increase in efficacy or suppression of resistance development for the target organism.
   p. Prophylactic or metaphylactic use of antimicrobials should be based on a group, source or production unit evaluation rather than being utilized as standard practice.
   q. Drug integrity should be protected through proper handling, storage and observation of the expiration date.

4. Veterinarians should endeavor to ensure proper on-farm drug use.
   a. Prescription or dispensed drug quantities should be appropriate to the production-unit size and expected need so that stockpiling of antimicrobials on the farm is avoided.
   b. The veterinarian should train farm personnel who use antimicrobials on indications, dosages, withdrawal times, route of administration, injection site precautions, storage, handling, record keeping and accurate diagnosis of common diseases. The veterinarian should ensure that labels are accurate to instruct farm personnel on the correct use of antimicrobials.
   c. Veterinarians are encouraged to provide written guidelines to clients whenever possible to describe conditions and instructions for antimicrobial use on the farm or unit.