

Laboratory Tests Frequently Used In Bovine Practice at Carnation Research Farm

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Introduction

Diagnosis is what makes the practice of veterinary medicine a challenging and rewarding experience for me. It has to include history as well as a clinical workup utilizing laboratory procedures, radiology, biopsy, exploratory surgery and necropsy. At Carnation Research Farm we use whatever tests and laboratory facilities needed to help us arrive at a definitive diagnosis. Outside reputable commercial and state labs as well as University facilities are employed.

There are a number of procedures however routinely carried out in our own facilities. They are quick manual tests which can be performed in a few minutes to help us in diagnosis during a clinical workup or treatment.

Tests and Applications

Blood calcium is the most frequent laboratory procedure performed on the bovine at Carnation Research Farm. The analysis is routinely performed on all cows that appear weak, have milk fever, are down, or are recognized toxic. The test is also used to monitor medication especially prior to retreatment with calcium solution.

Blood choride, Bicarbonate, and Total CO 2 are utilized in the bovine with digestive disorders. These are especially helpful in replacing electrolytes in patients with displaced abomasum, torsion of the abomasum and calves with enteritis.

CBC, Total Plasma Protein and Fibrinogen are used regularly to differentiate febrile inflammatory diseases. Correctly diagnosing abscesses traumatic reticulitis and peritonitis is made easier by these procedures.

Bacteriology is employed for any exudate or washing where bacterial presence is suspected. Mastitic milk samples are not only routinely cultured to support proper drug selection, but also for proper choice of effective preventive regimens.

Exudate cytology techniques are most frequently applies to paracentesis. Liver abscesses can often be differentiated from traumatic reticulitis. Swellings of any kind including subcutaneous abscesses, skin thickenings and joint fluid are aspirated and smears made for cytological examination.

Urinalysis - The Bililabstix ^(a) test is used routinely for determining ph, ketones, glucose and occult blood. Proteinuria is assessed with the 20% sulfosalicylic acid turbidity test. Microscopic examinations of sediment is not routinely performed on bovine urine.

Type of Test & Procedure

Blood Calcium is determined by Oxford Titrator ^(b). It is a quick and simple procedure consisting of titrating calcium with EDTA in the presence of calcein indicator. Calcein complexes with calcium causing fluorescence under ultraviolet light and the end point is indicated by disappearance of it. Essentially, the reagent set includes all materials necessary to determine calcium, with the exception of a device for dispensing 50 microliters of serum or plasma and disposable titration cups. An Oxford Sampler ^(c) is an ideal apparatus to measure 50 microliters. The titration cups are also available from Oxford Labs and listed in the Scientific Products catalogue.

For all rapid chemistries including calcium, chloride, bicarbonate and CO 2 blood samples are collected in 10cc vacutainer tubes containing one drop heparin. This allows immediate centrifugation. The entire procedure from collecting blood to reading results requires only 5-10 min. The test set includes a standard which should be performed in conjunction with each set of samples. Procedural directions are simple and straight forward. Results are calculated using the following formula:

$$\text{Calcium in sample (mg/dl)} = \frac{\text{Dial units to titrate sample}}{\text{Dial units to titrate standard}} \times \text{the value of the standard}$$

Blood Chloride and Bicarbonate are also measured by the Oxford Titrator ^(b). For chloride the method is based on a

(a) Bililabstix, Ames Division, Miles Laboratories Inc., P. O. Box 70, Elhart, Indiana 46515.

(b) Oxford Titrator, Oxford laboratories, 1149 Chess Drive, Foster City, California 94404. Available through Scientific Products, a division of American Hospital Supply Corp. Gen offices located at 1430 Waukegan Road, McGaw Park, Illinois 60085. Distribution centers in major cities throughout U.S.

(c) Oxford Sampler Instrument, Oxford Laboratories. Also available from Scientific Products. Catalog No. 9050 is recommended.

titration principle using an indirect indicator. To a serum sample, a solution containing diphenyl-carbazone, a mercury indicator, is added and titrated against a mercuric nitrate solution. The mercury II ion reacts with the chloride ion to form a soluble salt. The first trace of excess mercury II combines with the indicator and abruptly changes the color of the solution from yellow to light violet. The titrant volume required to titrate a standard is compared to that required for the sample to obtain sample chloride concentrations.

The Oxford sampler is used again as a volumetric tool. Like the calcium procedure, chloride measurement is very rapid. Values are determined by a direct proportion calculation.

$$\frac{\text{Volume of chloride in sample (mEq/L)} \times \text{Dial units to titrate sample}}{\text{Dial units to titrate standard}} = \text{X volume of standard (mEq/L)}$$

The bicarbonate test serum is added to a solution containing phenolred acid-base indicator, a screening indicator, and a known fixed amount of hydrochloric acid. The mixture is agitated for a time sufficient to allow carbon dioxide (formed when the HCl reacts with bicarbonate in the sample) to escape. The amount of HCl in excess of that required to neutralize the bicarbonate is determined by titrating the solution back to the phenol-red end point with dilute sodium hydroxide. The titrant volume (in dial units) needed for titration of the sample plus the HCl is subtracted from the volume necessary to titrate the HCl only, in order to obtain the volume required for the bicarbonate in the sample. A simple calculation provides the answer again in mEq/L.

The *Total CO₂* is determined in minutes using a Harleco^(d) CO₂ kit. The total CO₂ content of serum consists of two fractions. The ionized fraction contains (HCO₃)⁻, (CO₃)⁻², and carbamino compounds. The unionized fraction contains H₂CO₃ and dissolved CO₂. The addition of dilute lactic acid converts the (HCO₃)⁻ in serum to CO₂. The released gas is measured by a volume change which causes the CO₂ syringe plunger to rise to a fixed position.

(d) Harleco - Philadelphia, Penn. 19143 (Order from Scientific Products.

(e) Coulter Electronics, Inc. Hialeah, Florida

(f) Camco Quik stain - Cambridge Chemical Products

(g) New Methylene Blue staining solution - Dairy Research Products, Inc. Fairfield, Maine

(h) B.D. EDTA Vacutainer tubes - available from Scientific Products

(i) TS Meter - A. O. Instruments Co. - Buffalo, New York 14215

Comparison of the test sample results to those of a standard allows for easy calculations. Once more a standard must be run with each series of samples as changes in atmospheric temperature and pressure will alter results.

CBC's and Hemoglobin at Carnation Research Farm today are performed with semiautomated equipment. The Carnation Farms Clinical Laboratory has been using a Coulter Counter, the last few years to establish total white and red cell counts and hemoglobin concentration. Previously the Unopette System[®] was used. Differential counts are made from coverslip preparations stained with either *Camco Quik Stain* for permanent slides or *New Methylene Blue* for rapid examination of unfixed blood smears. New Methylene Blue is used as described by Schalm. The staining solution consists of 0.5% New Methylene Blue in 0.85% saline to which is added 1.0cc of full strength formalin per 100cc of solution.

Technicians usually make counts from permanent stained slides while I scan New Methylene Blue preparations immediately following collections of specimen. Blood samples for hematology, total plasma protein, and fibrinogen are collected in 3cc EDTA anticoagulated vacutainer tubes.^h

Total Plasma Protein and *Fibrinogen* are performed as described by Schalm^{1,2} utilizing a TS Meter¹.

Procedure:

1. Blood is collected in a 3cc EDTA anticoagulated vacutainer tube.
2. After making blood smears, total white and red cell counts and determining hemoglobin level the tube containing the remaining sample is centrifuged at approximately 2200 rpm for 5 minutes to clear the plasma of cells.
3. A drop of plasma is removed to the refractometer for estimation of total plasma protein.
4. Two 75mm capillary hematocrit tubes are inserted into the plasma for 3/4 fill by capillary action.
5. The moist end of the capillary tubes are wiped dry and inserted into Seal Ease[®] for closure.
6. The opposite ends of the tubes are suspended by tape for three minutes in a 58°C water bath.
7. The capillary tube is centrifuged to sediment the precipitated fibrinogen.
8. The fibrinogen free plasma is transferred to the refractometer for redetermination of protein content. The difference between the reading in Step 3 and Step 8 equals the plasma fibrinogen in mg%.

Bacteriology done at Carnation Research Farm is fairly complete with capability for both aerobic and anaerobic culturing. Many special media are used for species identification, although samples most frequently analyzed are milk. For this purpose samples are collected into Hotis tubes and then subcultured on blood agar.

In the Hotis Test we use 20 ml glass or plastic topped vials to which has been added .75cc of a .5% bromocresol purple. These sample tubes are autoclaved for sterilization. Approximately 15cc of milk is collected and incubated 4-24 hrs before subculturing on blood agar.

Blood agar plates may be the most difficult to prepare and probably the most frequently used in our situation. We use Difco's, Tryptose Blood Agar Base as the basic ingredient. A known amount of dry medium is dissolved in water, brought to a boil and autoclaved. When the medium has cooled to between 110°-115° F, whole bovine blood is added to give a final concentration of about 5% blood. Source of blood is any young calf free of disease, immunization, or antibiotic treatments. It is collected in Diamond Laboratory A-C-D Evacuated Blood Collection Bottles^κ. The citrate in the bottle is helpful in growing most bacteria and provides the needed anticoagulating effect. This blood can be refrigerated several weeks without detriment.

When preparing plates, the blood is measured and added to the hydrated medium after it has cooled following autoclaving. Sterile tubing and syringe coupled with 3-way valve are used for dispensing the liquid medium to disposable sterile plastic plates^ι. Once the medium has solidified in the plates they are incubated 24 hours to ascertain sterility. They are then stored in the refrigerator packaged in plastic bags. For further identification of mastitis bacteria we make use of:

Coagulase test for staphylococcus sp.
Camp & Esculin test for strep. species
EMB medium for coliforms

Exudative Cytology is performed by streaking the sample on a slide or by making coverslip smears as with blood. Preparations are stained with New Methylene Blue for initial examination while others are permanently stained with blood or bacterial stains.

Comparison of Manual Chemistry Methodology vs. Automated Chemistry Profiles

Values for calcium, chloride, bicarbonate and CO₂ blood chemistries obtained from the Oxford Titrator and the Harleco Kit were compared to those generated by a Technicon SMAC Autoanalyzer^π.

One hundred eighteen purebred Holstein cows in the high producing string, 85 lbs. or above, were used for test comparison. Most cows were in early lactation and supposedly without disease. Two vials of blood were

collected simultaneously from each animal for submission to different laboratories. In table I, results of manual chemistry methodology are compared to those derived from automated instrumentation for calcium, chloride and carbon dioxide. Observed range, mean, standard deviation, and nonparametric normal range based on 2.5 and 97.5 percentiles are compared. There is a significant difference (P<0.01) between the methods for all three parameters. The standard deviations for SMAC analyses were significantly lower (P<0.01) than those by the manual method. Since two individuals performed the manual tests on the 118 samples it is possible variation in results may have been increased. This is supported by data developed by three technicians testing the same sample assembled in table II. While results compared favorably some variation was seen especially with the chloride procedure. In spite of decreased accuracy with the quick manual tests they are helpful in diagnosis and guiding treatment.

Examples of Cases and Results

Most cows evaluated for blood calcium at or near parturition at Carnation Research Farm have some degree of hypocalcemia. Cows with 6.5 to 8 mg% calcium immediately postpartum appear clinically normal. They usually do not go down until they reach calcium levels around 5.0-5.5 mg%. We use the calcium measurement as guide for therapy. A cow that is down with 3.0-5.0 mg% calcium will receive 500 cc of calcium gluconate IV + 500 cc S.Q., while one in the range of 5.5- 6.0 mg% might be treated with 500 cc IV but only 250 cc S.C. Animals with levels between 6.0 - 7.5 mg% are given 250 cc IV + 250 cc S.C. Toxic coliform mastitis cases frequently develop some hypocalcemia with levels ranging between 6.5 - 8.0 mg%.

Cases 1 and 2 illustrate how the complete blood cell count and fibrinogen determination are used to aid the diagnosis of traumatic reticulitis or abscess involvement.

Case 1. A four year old cow had been off feed for two days with depressed milk production. The temperature was 102.8° F, heart rate 76, respiratory rate 24, rumen motility 5 weak movements per two minutes, and ketones negative. The cow had a slightly sunken-eyed anxious expression. The digestive system was abnormal with somewhat scanty manure, while a positive grunt on xiphoid percussion was present. All other organ systems were normal.

Laboratory Data:

CBC - RBC	5.6 x 10 ⁶
WBC	10,800
PCV	29.0%
Hemoglobin	9.8 gm/dl

(j) *Difco Laboratories - Detroit 1, Michigan*

(k) *A-C-D Evacuated Blood Collection Bottles - Diamond Laboratories, Des Moines, Iowa 50304*

(l) *Disposable Sterile Plastic Plates - Scientific Products*

(m) *Technicon SMAC Autoanalyzer - Pathologists Central Laboratory, 1100 E. Union, Seattle, Washington*

TABLE 1
COMPARISON OF MANUAL AND SMAC METHODS

PARAMETER	METHOD	NO.	OBS. RANGE	MEDIAN	MEAN	SD	NORMAL RANGE
CHLORIDE Meq/L	MANUAL	118	64 - 144	102.0	105.38	13.74	85.0 - 139.0
	SMAC	118	91 - 106	98.0	98.49	2.78	93.0 - 104.0
CARBON DIOXIDE MMo1/L	MANUAL	118	18 - 46	30.0	30.55	5.41	22.0 - 43.0
	SMAC	118	20 - 34	28.0	27.87	2.32	23.0 - 33.0
CALCIUM Mg %	MANUAL	118	5.8 - 11.7	8.6	8.67	1.02	6.5 - 10.8
	SMAC	118	6.9 - 11.0	9.5	9.51	0.63	8.0 - 10.8

Bands	216	
Mature Neutrophils	8,208	
Lymphocytes	2,160	
Monocytes	108	
Eosinophils	108	
Basophils	0	
T.P.P.	7.9 gm%	ratio 7.9:1
Fibrinogen	1,000 mg%	

DDX - Ruled out *Traumatic Reticulitis-Peritonitis*.

Cases 3 & 4 have similar physical examination data, but the final diagnosis was totally different. The laboratory information was quite helpful in diagnosis.

In **case number 3** the cow was fresh 12 days, was found in the milking string off feed and lethargic. Physical examination revealed a temperature of 103.5°F, HR-124, RR-40, RM 3 partial movements per 3 minutes and ketones negative. The cow was thin, with the elbows slightly abducted. The digestive system was determined to be abnormal. There was essentially no manure. There was poor rumen motility and severe xiphoid pain could be elicited. The circulatory system was abnormal as splashing sounds could be heard above muffled heart sounds. There was increased central venous pressure with a positive jugular pulse. All other systems were determined to be normal.

Diagnosis - Traumatic Reticulitis

Case 2. An 8 month old heifer was hunched up and appeared tense and nervous. The temperture was 103.2°F, PR-124, RR-116 and RM 2 partial movements/3 min. The heifer walked with a stiff stilted gait. There was tenderness throughout the abdomen with grunting easily induced on xiphoid percussion.

- DDX 1 Musculoskeletal - WMD, injury
2 Traumatic Reticulitis, Peritonitis
3 Neurological

Laboratory Data:

CBC - RBC	7.40 x 10 ⁶	
WBC	10,800	
PCV	33%	
Hemoglobin	11.0 gm/dl	
Bands	0	
Mature Neutrophils	3,888	
Lymphocytes	6,264	
Monocytes	432	
Eosinophils	216	
Basophils	0	
T.P.P.	7.6 gm/dl	ratio 10.86:1
Fibrinogen	700 gm/dl	
SGOT	49 u/L	

Laboratory Data:

CBC - RBC	6.55 x 10 ⁶	
WBC	25,138	
PCV	35%	
Hemoglobin	12.2 gm/dl	
Bands	503	
Mature Neutrophils	19,105	
Lymphocytes	5,028	
Monocytes	251	
Eosinophils	251	
T.P.P.	6.2 gm%	ratio - 7.75:1
Fibrinogen	800 gm%	

Diagnosis - Traumatic Reticulitis, Traumatic Pericarditis

Case 4 was a 6 yr old cow that had calved four days perviously, now had diarrhea, was weak and had difficulty getting up. Physical examination revealed temperature of 103.6°F, PR-104, RR-28, RM-7 fairly good movements per three minutes. The cow appeared thin, but alert. The blood calcium was 8.5 mg%. The cow was passing large volumes of loose manure and xiphoid pain could be produced. On auscultation-percussion a ping could be heard in the left posterior thorax and flank. On ballottement splashy sounds were heard in the right and middle lower flank. Rectally the rumen felt doughy in consistency, but other dilated visci could not be reached.

The circulatory system was also found to be abnormal. There was a rapid pulse and the heart sounds seemed slightly muffled.

Laboratory Data:

CBC - RBC	5.59 x 10 ⁶	
PCV	27%	
Hemoglobin	9.8 gm/dl	
WCC	11,669	
Bands	0	
Mature Neutrophils	2,801	
Lymphocytes	7,702	
Mononuclear Cells	1,050 (some of these may have been lymphocytes)	
Eosinophils	117	
T.P.P.	6.1 gm/dl	ratio 20:1
Fibrinogen	300 mg/dl	

Lymphocytes in the blood were variable in size and some had abnormally large nuclei and dark staining cytoplasm. Some of these cells had prominent nucleoli.

The fluid from a pericardiocentesis pointed to a diagnosis of *lymphosarcoma*, in conjunction with *LDA*.

Case 5. A two year old cow had *Klebsiella mastitis* three weeks ago but subsequently was back in the milking string for several days. After that the animal was not eating well. Physical examination revealed normal appearance, but elevated temperature 103.2°F, HR-60, RR-24, and two good rumen movements per minute. The CMT rating was 3 in all quarters, there was a positive ping on auscultation percussion in the left posterior thorax. A right side omentopexy was performed. Four days later the temperature was 103.4°F, PR-84, RR-48, RM-3 moderate movements per three minutes. The cow at this examination looked bright but appeared somewhat full. Some xiphoid pain could be detected. Pings could not be elicited on either side. The R/O list included:

1. coliform endotoxin response
2. viremia
3. peritonitis following surgery or from hardware disease

Laboratory Data:

CBC - RBC	5.42 x 10 ⁶	
WBC	7,600	
PCV	25%	
Hemoglobin	9.2 gm/dl	
Bands	0	
Mature Neutrophils	3,648	
Lymphocytes	2,584	
Monocytes	768	
Eosinophils	608	
T.P.P.	8.0 gm%	ratio 20:1
Fibrinogen	400 mg%	

Diagnosis - *Coliform endotoxemia*

Without any medication the temperature rose to 105.2° after one day. Ten milligrams of Dexamethasone + 20cc of Pen-strep was administered, and 24 hrs later the temperature was normal and the cow was returned to the milking string after two additional days.

Case 6. This was a 5 year old dairy cow, fresh 12 days, looked tough in the freestall, and had difficulty in getting up. Her temperature was 101.6°, HR-64, RR-28, RM-4 movements per two minutes and ketones 1+. The cow was slightly sunken-eyed and had a depressed facial appearance. The digestive system was found abnormal with a ping near the left flank and posterior thorax about 10 inches in diameter as determined by simultaneous auscultation and percussion. On rectal palpation, the rumen felt doughy and the uterus could not be retracted, but little exudate was massaged from the vagina. All the other systems examined were normal.

Laboratory Data

Cl ⁻	88 meq/L
HCO ₃ ⁻	28 meq/L
CO ₂	36 MMO/L

Diagnosis - *Simple*
diagnosis - *Simple L.D.A.*

Cases 7 & 8 were somewhat more complicated and illustrate the importance of obtaining laboratory data for aiding proper therapy.

Case 7. A four year old cow was due to calve in four days. She was doing poorly, and upon examination, appeared droopy and too thin approaching parturition. Some ptialism was noted and there was a visible bulge in the left anterior flank. The rectal temperature was 102.3°, PR-72, RR-36 and there were some weak continuous rumen movements. Urine ketones were negative. The digestive system was determined to be abnormal with the stool loose and scanty while rumen motility was poor and movements incomplete. There was a large area with a positive ping on auscultation percussion over the left posterior thorax and left flank. A full term live calf could be palpated rectally.

Laboratory test performed at this time were:

Cl-	100 meq/L
CO ₂	30 MMol/L
HCO ₃	36 meq/L
CA	9.3 mg%

A right side laparotomy was performed. The calf was removed by caesarean section and the abomasum was replaced in its normal position and fixed by a right side omentopexy. Treatment included some antibiotics because of retained placenta. For about three days the patient seemed to be getting along well but deterioration followed. The cow became anorectic, developed sunken eyes, diarrhea, and some metritis from the retained placenta. Temperature was 103.2°, PR-80, RR-32, rumen motility-1 partial, plus two weak movements per three minutes. The physical examination revealed a redisplacement of the abomasum to the left side.

Laboratory Data at this time included:

CBC - RBC	6.52
WBC	9,520
PCV	30%
Hemoglobin	11.5
Bands	95
Mature Neutrophils	3,424
Lymphocytes	4,280
Monocytes	1,617
Eosinophils	95
T.P.P.	7.7 gm%
Fibrinogen	700 mg/%
Chloride	87 meq/L
Bicarbonate	43 meq/L
CO ₂	42 MMol/L

A ventral paramedium laparotomy was performed which revealed a ripped omentum near its attachment site to the right flank. A ventral abomasopexy was performed and the animal treated with oral Electro Plux C® plus parenteral antibiotics. Twenty-four hours later electrolyte chemistry showed:

Chloride	104 meq/L
Bicarbonate	35 meq/L
CO ₂	27 MMol/L

The cow recovered without further problems.

Case 8. A 5 yr old Holstein cow calved twins several days earlier. She had a retained placenta, was not eating, appeared weak, gaunt and droopy. The patient had a temperature of 101.6°F, HR-84, RR-12 and one partial rumen movement per minute, with urine ketones 1+. The digestive system was found abnormal. The manure was scanty and course and a ping could easily be produced in the left flank by auscultation-percussion. The retained placenta was still tightly attached and could not be removed. Other systems examined were normal.

Laboratory tests at this time included:

CBC - RBC	6.36
WBC	9,401
PCV	30%
Hemoglobin	12.7 gm/dl
Bands	2,350
Mature Neutrophils	1,128
Lymphocytes	4,606
Eosinophils	0
Monocytes	0
T.P.P.	7.1 gms %
Fibrinogen	700 mg %
Calcium	9.0 mg %
Chloride	90 meq/L
Bicarbonate	23 meq/L
CO ₂	13 MMol/L

ratio 10.1:1

A right side omentopexy was performed the next day. Additional treatment included — (1) Procaine penicillin, (2) three gallons of water + two ozs KCl + one oz NaCl, (3) 250 cc calcium, (4) 500 cc Dextrose.

Later the cow ate some and looked brighter, but by the fourth day post surgery she appeared debilitated, weak, had sunken eyes, and extended her head. On physical examination there were no further signs of displaced viscera, but some xiphoid pain existed possibly from surgery or metritis. Urine ketones were strong. The patient was treated daily with dextrose, insulin, propylene glycol, procaine penicillin plus six gals. water with two ozs KCl + 4 ozs NaCl. On the sixth day following surgery the cow was worse with complete anorexia. A ping was detected in her upper left flank. The temperature at this time was 101.2°F, HR-80, RR-12, RM-0, and ketones moderate. It was feared that the omentopexy had torn loose and the abomasum had redisplaced.

Laboratory tests at this time included:

Cl-	100 meq/L
HCO ₃	15 meq/L
CO ₂	24 MMol/L

On day 7 the temperature was 101.5°F, HR-80, PR-10, RM-0 and the ketones reacted strong while the appetite was minimal. A mild ping persisted in the upper left flank on auscultation-percussion. LDA recurrence was not definitive but was considered a possibility along with the retained placenta and ketosis.

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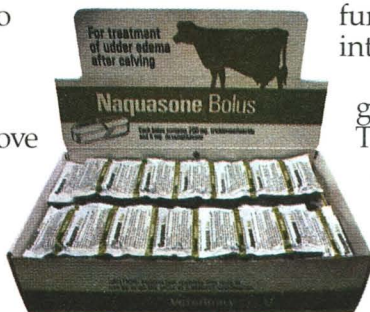
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*Each bolus contains 200 mg trichlormethiazide and 5 mg dexamethasone.

For clinical synopsis see following page.

XII World Congress on Diseases of Cattle

September 7-10, 1982

Amsterdam, The Netherlands

*Detailed program, registration form
and other information from:*

**Congress Secretariat
Organisatie Bureau Amsterdam BV
Europaplein
1078 GZ AMSTERDAM
THE NETHERLANDS**

Clinical synopsis:

NAQUASONE**

(brand of trichlormethiazide and dexamethasone)

Clinical synopsis: Response: Visible in 24-48 hours; average recovery in 3-4 days.

Precautions: Veterinarian should be aware of the possible side effects of dexamethasone such as suppression of inflammation, reduction of fever, increased protein degradation and its conversion to

carbohydrate leading to a negative nitrogen balance, sodium retention and potassium diuresis, retardation of wound healing, lowering of resistance to many infectious agents such as bacteria and fungi, reduction in numbers of circulating lymphocytes.

Contraindications: Animals with severe renal function impairments and untreated infections.

Warnings: Milk taken from dairy animals during treatment and for 72 hours after the latest treatment must not be used for food. Clinical and experimental data have demonstrated that corticosteroids

administered orally or parenterally to animals may induce the first stage of parturition when administered during the last trimester of pregnancy and may precipitate premature parturition followed by dystocia, fetal death, retained placenta and metritis.

*Each bolus contains 200 mg trichlormethiazide and 5 mg dexamethasone.

TABLE II

TECHNICIAN VARIATION FOR MANUAL TESTS

PARAMETER	UNITS	TECH I	TECH 2	TECH 3
CALCIUM	Mg%	9.42	9.31	9.54
CHLORIDE	Meg/L	101.0	101.0	106.0
OXFORD HCO ₃	Meq/L	25.8	23.5	23.5
HARLECO CO ₂	Mmol	29.1	29.1	28.2

Treatment at this time included:

1. IV dextrose with B complex vitamins
2. Procaine penicillin
3. Insulin
4. Hydroxy-analogue of methionine and propylene glycol
5. A ventral laparotomy was performed, but in this case the right side omentopexy was still firm with the abomasum in place.
6. Two ozs KCl

The eighth day following the original surgery, the cow was in poor condition and was unable to get up. Blood sent out to a commercial laboratory for a complete profile included:

Calcium	10.3 mg%
Sodium	140 meq/L
Potassium	2.1 meq/L
CO ₂	13 MMol/L
Chloride	120 meq/L
Glucose	98 meg%
Magnesium	1.8 mg%
Phosphorus	4.4 mg%

Added to the previous day's treatment were 3,000 meq. NaHCO₃ IV + three ozs NaHCO₃ orally.

9 A.M.

Cl-	100 meq/L
HCO ₃ -	8 meq/L
CO ₂	15 MMol/L

1 P.M. Cl-

HCO ₃ -	95 meq/L
CO ₂	14 meq/L
	18 MMol/L

4 P.M. CO₂ was 18 MMol/L

During the night the cow got up unassisted.

On day nine the bicarbonate and chloride were markedly elevated to 32.5 meq/L and 115 meq/L respectively.

The cow's temperature was 103.2°F and she was up again after having been down for two complete days. Dextrose, insulin, proc. penicillin and oral KCl, propylene glycol and methionine therapy was continued.

On post op. day 10, laboratory tests included:

HCO ₃ -	- 20 meq/L
Cl-	-106 meq/L

On day 11, although the cow still looked somewhat lethargic, she was up and ruminating, but drinking and urinating excessively.

Urinalysis showed:

Specific Gravity	1.005
Ph	5
Protein	Trace
Glucose	++
Occult Blood	++
Bilirubin	negative
Ketones	negative

On day 13 her body temperature was 103.2°. She was up eating well despite a retained placenta and some metritis. Rumen motility had improved to 6 moderate movements/3 minutes.

Bicarbonate and chloride values were normal at 21.5 meq/L and 104 meq/L respectively.

All therapy was stopped except for proc. penicillin and oral propylene glycol. The cow retained the placenta for several more days and then made a complete recovery.

I believe these cases illustrate the role of using quick blood chemistry tests in sound diagnosis and therapy.

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