



Oral Nutritional Supplements for Parturient Dairy Cows

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A number of oral electrolyte and nutritional supplements are now available for fresh cow drenching. A sampling of these supplements are listed in Table 1 below. Oral nutritional supplements should be positioned so that nutrients are supplemented according to each cow's medical problems and nutritional needs. For example, ketotic cows need extra glucose precursors; cows off-feed more than a few days need extra calcium, potassium and magnesium; older cows around calving benefit from extra calcium; and hypophosphatemic downers may benefit from extra phosphorus. Unfortunately, optimal or exact doses of need nutrients are not known. But we do know that a 'one-size-fits-all' approach does not work for oral nutritional support. Table 2 (next pages) lists suggested treatments for a variety of fresh cow disease situations.

Table 1. Oral Nutritional Support Products and Formulas

Name of Product / Formula	Total Weight	Potential Glucose	Available Calcium	Available Magnesium	Available Phosphorus	Available Potassium
	(g)	(g)	(g)	(g)	(g)	(g)
Goff's Formula - 1.5 lbs Ca prop, 200 g MgSO ₄ (7 H ₂ O), and 100 g KCl	981	659	139	17.8	---	47.2
Up and Over 1000 (400 g propylene glycol, 464.5 g Ca prop, q.s. 1 liter)	865	923	95	---	---	---
Calcium propionate (1.0 lbs)	454	439	93	---	---	---
Propylene glycol, 8 oz, undiluted	237	280	---	---	---	---
Glycerol, 8 oz, undiluted	298	292	---	---	---	---
Sodium monophosphate, 220 g (for hypo-PO ₄ downers)	220	---	---	---	44.4	---
Potassium chloride, 454 g (dose for downer cows)	454	---	---	---	---	214.3
McGuirk's rehydration formula	396	200	2	0.3	---	7.1

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Table 2. Guidelines for Oral Nutritional Supplementation of Dairy Cows

Treatment Category	Diagnostic Criteria	Goal of Supplement	Oral Nutritional Supplement
Prophylactic treatment Just prior to calving 1st lactation	No abnormalities	No strong risk factors for disease	No strong rationale for oral supplementation prior to calving in normal 1st calf heifers.
Prophylactic treatment Just prior to calving 1st lactation	Obese springing heifer	Help prevent ketosis (Type II)	<i>Ideal:</i> Dose with propylene glycol (or glycerol), 8 ounces once or twice daily.
Prophylactic treatment Just prior to calving 2+ lactation	No abnormalities Previous history of clinical MF	Help prevent hypocalcemia	<i>Ideal:</i> Dose with oral calcium paste or gel prior to calving (use calcium chloride, calcium propionate, or a combination of these two calcium sources) Pumping large volumes of fluid (5 gallons or more) into the esophagus or rumen at this time is not necessary and is more stressful to the cow than a small dose given into the mouth.
Prophylactic treatment Just after calving 1st lactation	No abnormalities	No strong risk factors for disease	No strong rationale for oral supplementation just after calving in normal 1st calf heifers.
Prophylactic treatment Just after calving 1st lactation	Dystocia or twins Obese springing heifer	Help prevent ketosis (Type II)	<i>Ideal:</i> Continue dosing with propylene glycol (or glycerol), 8 ounces once or twice daily; stop dosing after three days of treatment
Prophylactic treatment Just after calving 2+ lactation	No abnormalities	Help prevent hypocalcemia Help prevent ketosis	<i>Ideal:</i> Drench 1.5 lbs calcium propionate in 5+ gallons of warm water <i>OK:</i> Repeat dose of oral calcium paste after calving <i>OK:</i> Subcutaneous calcium (500 ml. 23% calcium gluconate, several sites) <i>Contraindicated:</i> IV glucose to any just fresh cow (probably hyperglycemic already; IV dextrose causes diuresis and electrolyte loss) <i>Contraindicated:</i> IV calcium to normal fresh cows (oral calcium works better and does not increase the risk for later hypocalcemic relapses) <i>Contraindicated:</i> Subcutaneous calcium solutions containing glucose (causes swelling and possible abscessation)
Prophylactic treatment Just after calving 2+ lactation	Dystocia or twins Obese cow Previous history of clinical MF	Help prevent hypocalcemia Help prevent ketosis (Type II)	Stronger justification for drenching with oral calcium propionate, as described above. Free-choice oral electrolytes might also be helpful (as long as free water is also available).

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Treatment Category	Diagnostic Criteria	Goal of Supplement	Oral Nutritional Supplement
Stage I milk fever Just after calving Usually 2+ lactation	Wobbly, cold ears, depressed Possible weight shifting, ataxia Still standing but weak	Prevent the hypocalcemia from progressing to Stage II (lateral recumbency)	<i>Ideal:</i> Oral calcium chloride paste, gel, or liquid drench <i>OK:</i> IV calcium, 500 ml 23% calcium gluconate (does increase the risk for relapse) <i>Poor:</i> Oral calcium propionate (probably absorbed too slowly to prevent progression to Stage II)
Stage II milk fever Just after calving Usually 2+ lactation	Lateral recumbency Flaccid paralysis Just before or just after calving	Correct the hypocalcemia Prevent musculoskeletal damage due to recumbency	<i>Ideal:</i> IV calcium, 500 ml 23% calcium gluconate administer over >4 minute period <i>Ideal:</i> Also include oral calcium propionate or calcium chloride (paste, gel, or liquid) to prevent relapse; wait until cow is standing and swallowing before giving the oral dose <i>OK:</i> Subcutaneous calcium, 500 ml 23% calcium gluconate, spread over several sites <i>Contraindicated:</i> IV or subcutaneous solutions containing added glucose (probably hyperglycemic already; IV dextrose causes diuresis and electrolyte loss) <i>Contraindicated:</i> more than 750 ml 23% calcium gluconate IV (no benefit to calcium status by giving more calcium than this; it only increases the risk for fatal arrhythmia)
Hypophosphatemia Early lactation Usually within ~3 days of calving Usually 2+ lactation	Alert downer Successful correction of hypocalcemia Confirmed low blood phosphorus (<2 mg/dl); blood sample must come from the tail vein	Correct the hypo- phosphatemia	<i>Ideal:</i> Drench 220 grams sodium monophosphate in 5+ gallons of warm water <i>Optional:</i> Add 100 g potassium chloride to the drench (especially if the cow is off-feed) <i>Optional:</i> Add 200 g magnesium sulfate to the drench (especially if the blood work shows depressed blood magnesium) <i>Optional:</i> Administer IV phosphorus (phosphate forms only) <i>Contraindicated:</i> IV or subcutaneous solutions containing added glucose <i>Contraindicated:</i> Hypophosphite sources of phosphorus (they are biologically inactive)
Hypokalemia Early lactation Any lactation	Usually follows repeated treatments for ketosis Usually 5 to 25 days in milk Confirm by blood K <2.2 mEq/l.	Correct the hypokalemia (without causing fatal arrhythmia)	<i>Ideal:</i> Drench with .5 lb (220 g) potassium chloride in 5 gallons warm water; repeat once every 12 hours until the cow gets up or dies <i>Optional:</i> IV potassium solutions (requires careful monitoring of blood potassium!) <i>Contraindicated:</i> IV glucose or oral glucose precursors (will drive potassium into the cells)
Grass Tetany (hypomagnesemia) Usually early lactation Any parity	Aggressive, belligerent downer Hyperesthesia +/- confirmation of low blood Mg (<1.5 mg/dl)	Correct the hypo- magnesemia (without getting hurt!)	<i>Ideal:</i> IV or subcutaneous magnesium sulfate solutions (e.g., 250 ml 20% magnesium sulfate) <i>Optional:</i> Magnesium-containing enema <i>Optional:</i> Oral magnesium supplementation by commercial paste, or 200 g magnesium sulfate in 5+ gallons of warm water (provide after IV or subcutaneous treatment to prevent relapse)

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Treatment Category	Diagnostic Criteria	Goal of Supplement	Oral Nutritional Supplement
Prophylactic treatment Early lactation Off-feed	Not eating TMR, or refusing grain or protein in component-fed herd +/- Droopy ears, mild depression +/- Positive ketones in milk or urine	Help prevent ketosis (or its further development) Enhance appetite by correcting possible hypocalcemia Prevent hypokalemia (especially if the off-feed is prolonged)	<i>Ideal:</i> Drench 1.0 to 1.5 lbs calcium propionate, 100 g potassium chloride, and 200 grams magnesium sulfate in 5+ gallons of warm water. <i>Alternative:</i> Use 8 ounces of propylene glycol or glycerol instead of the calcium propionate (this would be OK for first lactation, but calcium propionate is preferred for 2+ lactation) <i>Optional:</i> IV treatment with 250 ml 50% dextrose (usually only if the ketosis is severe) <i>Optional:</i> Add yeast or other direct-fed microbials to the drench mixture. <i>Optional:</i> Add alfalfa meal to the drench mixture. <i>Contraindicated:</i> Repeated (more than one dose) or high doses (>10 cc) of Pre-Def 2X by any route of administration (including intra-mammary) <i>Contraindicated:</i> Repeated drenching with glucose precursors without adding supplemental potassium <i>Contraindicated:</i> IV treatment with 500 ml of 50% dextrose (too much dextrose, too much electrolyte loss via the urine)
Dehydration treatment Any stage of lactation Severe toxemia (mastitis, metritis, etc).	Confirmation of source of the toxemia. Moderate to severe dehydration (skin tent test, sunken eyes)	Support the cow by correcting the dehydration	<i>Ideal:</i> Drench with 5 to 10 gallons of a balanced oral electrolyte solution (provides sodium potassium, chlorine, bicarbonate, and possibly other electrolytes) <i>Optional:</i> IV fluids (balanced electrolytes, isotonic or hypertonic). Provide free access to water if hypertonic solutions are given IV