Supplementary Table S2. Descriptive Summary of Twenty-five Studies Reporting Secondary or Tertiary Outcomes Only

Author, year [citation]	Location	Intervention or exposure	Population sampled for intervention (Outcome assessment)	Total number studied for intervention (Outcome assessment)	Replicates for intervention (Outcome assessment)	Outcomes assessed (Post-weaning study period)
Baumgaertner et al., 2024 [67]	US (North Dakota)	Basal diet targeting 0.28 kg/d gain or the basal diet plus an energy/protein supplement targeting 0.79 kg/d gain	Breeding heifers (Pre- and post-weaning heifer calves)	100 F0 heifers (45 Pre- and post-weaning heifer calves)	2 pens of 16 per treatment (tx) group (gp)	Colostrum IgG, vaccinal titres to IBR-BVD-PI-3 in F1 heifers; P4, insulin
Beck et al., 2005 [68]	US (Arkansas)	Mineral supplement with no Se, inorganic, or organic Se	Cows (Post-weaning calves)	6 gps 20 cows each (3 steer calves per gp)	2 replicates (reps) each of 3 tx gps (3 gps 6 steers each, commingled)	Lymphocyte proliferation, macrophage phagocytosis, IFN, glutathione peroxidase
Caramalac et al., 2017 [69]	US (Florida)	Cu, Zn, Mn supplement in hydroxy or sulfate-oxide forms, Negative control	Pre-weaning calves (Post-weaning calves)	44	4, 4, and 3 reps Year 1; 4, 4, 4 Year 2 for control, hydroxy and sulfate sups	Haptoglobin and ceruloplasmin; cortisol
Cruz et al., 2025 [51]	US (Montana)	Sulfate, organic complexed or hydroxy-based Cu, Mn, Zn supplement	Cows (Post-weaning calves)	72 cows	Treatment delivered individually, (1 rep commingled)	Mortality (Calculated for period from birth to end of backgrounding)
Dewell et al., 2006 [10][1]	US (Nebraska)	Neonatal serum IgG concentration categorized	Neonatal calves (Pre- and post-weaning calves)	1,556 calves	1 Herd (N/R)	Morbidity and mortality (To slaughter)
Fulton et al., 2023 [70]	US (South Dakota)	Inorganic (sulfate) or organic (proteinate) sources of Cu and Zn sups	Cows (Pre-weaning calf)	287 cows, 245 calves	1 rep per tx (N/A)	Serum total protein at 24–72 h; Antibodies to IBR, BVD, BRSV (N/A)
Gamsjäger et al., 2023 [9][1]	Canada (Alberta)	Neonatal serum IgG concentration categorized	Neonatal calves (Pre-weaning calves)	420 calves	6 herds (N/A)	Morbidity, Mortality (To weaning)
Gaspers, 2018 [52]	US (North Dakota)	Basal TMR ad lib +/- additional corn at 2% BW	Cows (Neonatal calves)	47 cows	2 reps per tx (N/A)	Colostrum and serum IgG concentration (N/A)
Goulais et al., 2026 [65]	US (Arkansas)	Injectable trace mineral (Cu, Mn, Se, Zn) administered 28 d before	Pre-weaning calves (Post-weaning calves)	115 calves (59 heifers, 56 steers)	12 pens of 10 calves post-weaning	Crude morbidity and mortality (Post-weaning receiving period = 42 d)

Author, year [citation]	Location	Intervention or exposure	Population sampled for intervention (Outcome assessment)	Total number studied for intervention (Outcome assessment)	Replicates for intervention (Outcome assessment)	Outcomes assessed (Post-weaning study period)
		weaning or at weaning; negative control (no ITM)				
Gunter et al., 2003 [53]	US (Arkansas)	Inorganic or organic (seleno-yeast) Se supplement	Cows (Pre-weaning calves)	120 cows Y1	2 reps /tx gp	Mortality (N/A)
Hall et al., 2022 [54]	US (Oregon)	Se boluses trimesters 1, 2, or 3	Cows (Post-weaning calves)	84 cows (46 calves)	Individual tx N/R	Morbidity (To slaughter)
Hurlbert et al., 2024 [55]	US (North Dakota)	Vitamin-mineral sup during gestation commercial product	Breeding heifers (Neonatal heifer calves)	72 heifers	Treatment delivered individually, (1 rep commingled)	Neonatal serum IgG concentrations (N/A)
Moriel and Arthington, 2013 [71]	US (Florida)	Limit-fed creep	Pre-weaning calves (Post-weaning calves)	278 cow-calf pairs	2 (neg control), 3, and 3 reps	Serum anti-PRBC immunoglobulin titers and plasma concentrations of haptoglobin and ceruloplasmin
Muehlenbein et al., 2001 [13]	US (Nebraska)	Inorganic Cu (sulfate), organic Cu , or organic Cu and Zn sups	Breeding heifers (Pre-weaning calves)	Y1 = 75 heifers Y2 = 120	Tx delivered individually	Morbidity (N/A)
Murray et al., 2016 [56] 1	Canada (Alberta)	Colostrum administered to calves born from dystocia	Neonatal calves (Pre-weaning calves)	267 herds	N/A	Mortality (To weaning)
Petit and Berthiaume, 2006 [57]	Canada (Québec)	Ca salts of palm oil or flaxseed sup, or negative control	Cows (Pre-weaning calves)	Y1 = 119 cows Y2 = 105	3–4 reps per tx gp Y1 and 2	Mortality (N/A)
Ricks, 2018 [58]	US (South Carolina)	Rumen-protected unsaturated fatty acid sup	Cows (Neonatal calves)	56 cows	Tx delivered individually	Colostrum and serum IgG concentration (N/A)
Stokes et al., 2018 [59]	US (Illinois)	Repeated Cu, Se, Mn, and Zn injections during gestation at 205, 114, and 44 ± 26 days prepartum	Breeding heifers (Pre-weaning calves)	190 heifers	N/R	Morbidity (N/A)
Stalker et al., 2006 [60]	US (Nebraska)	1.Irrigated pasture vs hay 2. Protein sup (0.45 kg/day) in 2 X 2 factorial design	Cows (Neonatal calves)	Y1 = 136 cows, Y2 = 113, Y3 = 113	2 reps per tx gp	Neonatal serum IgG
Waldner and Uehlinger, 2017 [61] 1	Canada (Alberta, Saskatchewan)	Serum Vitamin A/E levels categorized	Neonatal calves (Pre-weaning calves)	150 herds, 899 calves	N/A	BRD morbidity, Morbidity, Mortality

Author, year [citation]	Location	Intervention or exposure	Population sampled for intervention (Outcome assessment)	Total number studied for intervention (Outcome assessment)	Replicates for intervention (Outcome assessment)	Outcomes assessed (Post-weaning study period)
Waldner and Rosengren, 2009 [11][1]	Canada (Alberta, Saskatchewan)	Neonatal serum IgG concentration categorized; Vitamin E/Selenium injections	Neonatal calves (Pre-weaning calves)	152 herds, 935 calves, 601 sampled @ 2–8 d old	N/A	BRD morbidity, Morbidity, Mortality
Wilcox et al., 2026 [66]	Canada (Saskatchewan)	Injectable trace mineral (Cu, Mn, Se, Zn) plus granular trace mineral, 4 wk pre-calving and 4 wk pre-breeding; control (granular trace mineral alone)	Cows (Pre-weaning calves)	ITM = 97, 97, 100 cows; control = 98, 100, 101 cows (years 1-3)	NR	Crude pre-weaning mortality (Pre-weaning period)
Wilson et al., 2016 [62]	US (Illinois)	Ground hay plus dried distillers' grains with solubles (DDGS) vs corn bran plus ground cornstalks fed to 100% and 125% of TDN requirements, respectively.	Cows (Pre- and post-weaning calves)	106 cows	5 reps per tx gp, (2 reps commingled)	Morbidity (To slaughter)
Wilson et al., 2015a [63]	US (Illinois)	Limit-fed ground mixed, cool-season grass hay, limit-fed corn coproducts and ground cornstalks differing in RUP and fat content.	Cows (Pre- and post-weaning calves)	191 cows	8 reps per tx gp, (2 reps commingled)	Morbidity, Mortality (To slaughter)
Wilson et al., 2015b [64]	US (Illinois)	DDGS sup (2.1 kg/cow/day) (CP = 23%; fat = 7%); Negative control.	Cows (Post-weaning calves)	251 cows	6 reps per tx, (3 reps commingled)	Morbidity (To slaughter)

Abbreviations: BoCoV = Bovine coronavirus; BoHV-1 = Bovine Herpesvirus-1; BPIV-3 = Bovine parainfluenzavirus-3; BRSV =Bovine Respiratory Syncytial Virus; BVDV = Bovine Viral Diarrhea Virus; Cu = Copper; IFN = interferon; Ig = Immunoglobulin; F0 = Foundational generation of breeding program; F1 = First generation crossbred; Gp = Group; Mn = Manganese; N/A = Not Applicable; N/R = Not Reported; PRBC = Porcine Red Blood Cell; Rep = Replicate; Se = Selenium; Sup = Supplement; Tx = Treatment; Zn = Zinc.

[1] Study design: Observational study. All citations not superscripted are controlled trials.

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