Dietary Supplements for the Active & Sporting Dog

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Sport Dog Specialty Medicine

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Disclosures

- Nutramax Laboratories

- Exubrion Therapeutics

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Overview

- Safety and efficacy
- Rationale for supplements/nutraceuticals
- Supplements for canine athletes and active dogs

Goals

- To take away at least one tool for your practice
  - Patient treatment
  - Client education
  - Staff education

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Why do we give nutraceuticals

- Improve performance
- Promote longevity

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Safety and Efficacy

- 1994 Dietary Supplement Health and Education Act (DSHEA)
  - Supplements categorized as food, no medications
  - Verifiable ingredient list

Safety and Efficacy

- 1994 Dietary Supplement Health and Education Act (DSHEA)
- Current Good Manufacturing Practices (cGMP)
  - Identity
  - Purity
  - Strength
  - Composition
- National Animal Supplement Council (NASC)

Safety and Efficacy

- Quality supplements
  - Third-party laboratory verification of product quality and safety
    - NASC, cGMP, USP
  - Supplements have been tested *in vitro* and *in vivo*
  - Company is financially sound
  - Run quality control measures as well as enforcing them
- Consumer Lab > www.consumerlab.com
- Dietary Supplement Label Database > www.dsld.nlm.nih.gov

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Improve performance

Exercise and the GI tract

- GI signs may accompany exercise
  - Abdominal discomfort, cramping
  - Acid reflux
  - Vomiting or diarrhea
  - Leakiness of the gut

- Causes
  - Splanchnic hypoperfusion
  - Mechanical (cecal slap syndrome)
  - Nutritional
  - Genetic

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Probiotics & Prebiotics and Exercise

- Clinical benefits
  - Inhibit proliferation of pathogenic bacteria
  - Protect the intestinal barrier
  - Prevent that bacterial translocation
  - Modulate immune function
  - Short-chain fatty acids

- Typical species of microorganisms used:
  - *Enterococcus*
  - *Streptococcus*
  - *Bifidobacterium*
  - *Lactobacillus*

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Probiotics and Exercise

Effects of a synbiotic on fecal quality, short-chain fatty acid concentrations, and the microbiome of healthy sled dogs

Jason W Gagné[1], Joseph J Wakshlag[1,5*], Kenneth W Simpson[1], Scot E Dowd[2], Shalini Latchman[1], Dawn A Brown[3], Kit Brown[3], Kelly S Swanson[4] and George C Fahey Jr[4]

Gagnéet al. BMC Veterinary Research2013,9:246

- Synbiotic group had:
  - Significantly fewer days of diarrhea
  - Significant increase in:
    - *Lactobacillus spp.*
    - *Bifidobacteria spp.*
  - Improved fecal scores

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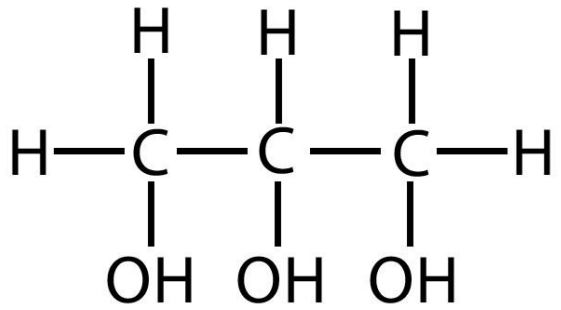
Glycerol



- Pre-exercise water supplement
- Creates an osmotic gradient in the circulation
  - Fluid retention
- Human studies have shown that increases in body water by 1 L or more
- Side effects

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Glycerol

Electrolyte and glycerol supplementation improve water intake by horses performing a simulated 60 km endurance ride

KATJA F. DÜSTERDIECK, H. C. SCHOTT II*, SUSAN W. EBERHART, KRISTINA A. WOODY and M. COENEN†

Equine vet. J., Suppl. 30 (1999) 418-424

- 5 horses running 60K treadmill run
- Supplemented with:
  1. Water
  2. Glycerol + electrolytes
  3. Electrolytes
- Findings:
  - Supplementation with electrolytes OR electrolytes with glycerol:
    - Improved voluntary water intake
    - Decreased weight loss
    - Stimulated water intake earlier than other groups

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Glycerol

Biochemical and metabolic changes due to exercise in sprint-racing sled dogs: implications for postexercise carbohydrate supplements and hydration management

Joseph J Wakshlag [1], Kimberly Snedden, Arleigh J Reynolds

Vet There, 2004 5(1):52-9.

- Dogs received 1L of 1% glycerol solution daily x 3 day event vs. dogs receiving plain water
  - No change in TBW in glycerol treated dogs
  - 5% decrease in TBW in untreated dogs

Glycerol

- Evening before once
  - 10 ml/L water
- 3-4 hours day of, prior to competition
  - 10 ml/L water
- 1-2 hours following glycerol
  - Plain water

- Risks
  - Osmotic diarrhea
  - Osmotic cellular injury
  - Known renal toxin > AKI

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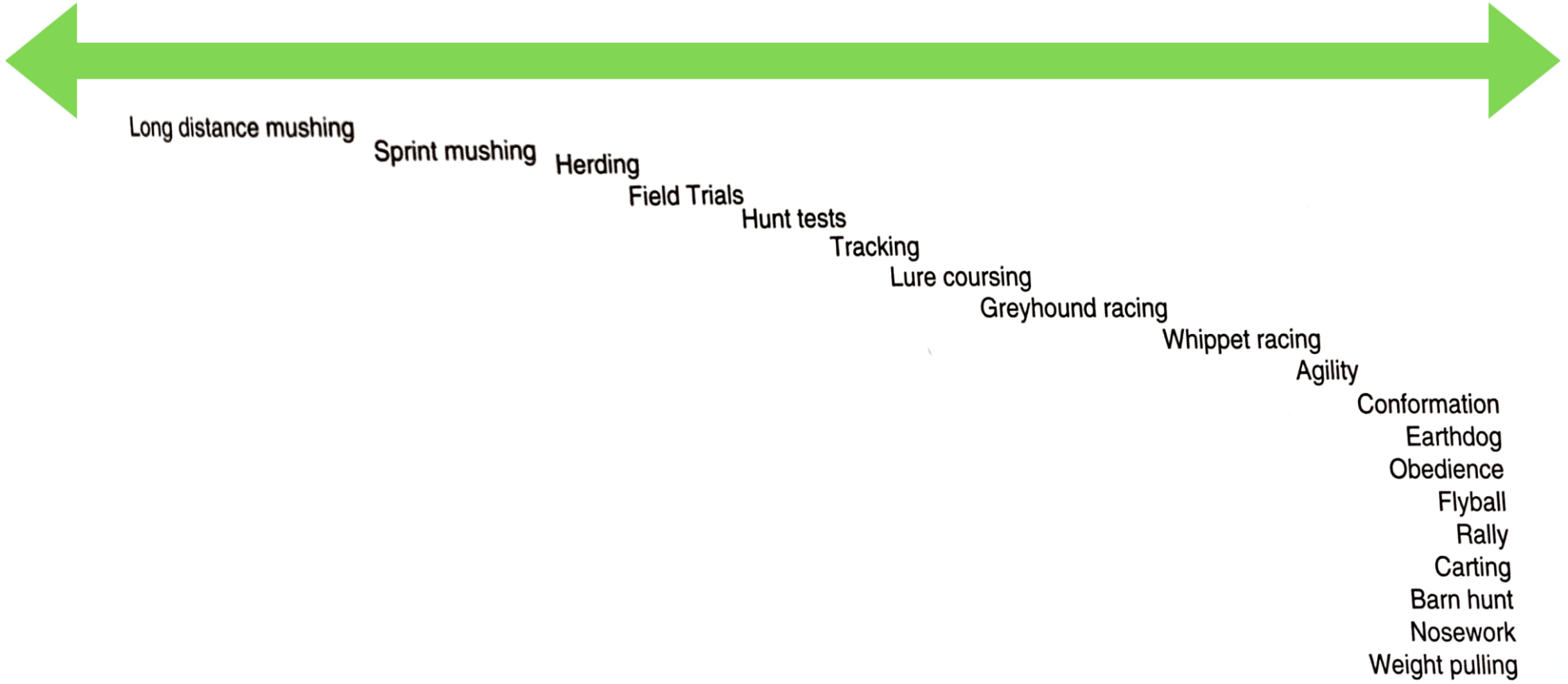
Post-exercise recovery



Zink, C and Van Dyke, JB. Canine Sports Medicine and Rehabilitation

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Post-exercise recovery

Anaerobic system

- Excess lactate requires energy from oxidative metabolism
  - Converted by to pyruvic acid
  - Converted back to glucose in liver
  - Replenishes muscle glycogen stores

Aerobic system

- Oxygen debt
- Depletion of muscle glycogen stores

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Post-exercise carbohydrates

- Recovery of glycogen stores
- 1.5 – 2 g/kg body weight
- Give within 30 minutes post-exercise

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Astaxanthin

- Naturally found in reddish-colored marine algae
  - *Haematococcus pluvialis*
- Salmon, trout, other marine organisms
- Keto oxycarotenoid
- Antioxidant and anti-inflammatory properties

Astaxanthin

- In dogs, dietary astaxanthin has been shown to:
  - Increase concentrations of IgG and IgM
  - Increase B cell populations
  - Decrease plasma concentrations of CRP

- 2-8 mg/dog/day

- May decrease the myocyte's ability to produce own antioxidants
  - Give leading up to competitions, increased workload

Additional Antioxidants

- Vitamin E
  - Improved overall total antioxidant status
  - Improved performance in sled dogs

- Vitamin C
  - Scavenge superoxide and other reactive oxygen species
  - Decreases oxidation

Promote Longevity

Omega-3 fatty acids

- Eicosapentaenoic acid (EPA) + docosahexaenoic acid (DHA)

- Decrease production of inflammatory cytokines
  - IL-6
  - IL-1

- Decrease expression of inflammatory mediators
  - TNF-α
  - Cycloxygenases
  - Lipoxygenases
  - Metalloproteases

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Omega-3 fatty acids

Evaluation of the effects of dietary supplementation with fish oil omega-3 fatty acids on weight bearing in dogs with osteoarthritis

James K. Roush, DVM, MS, DACVS; Alan R. Cross, DVM, MS, DACVS; Walter C. Renberg, DVM, MS, DACVS; Chadwick E. Dodd, DVM; Kristin A. Sixby, DVM; Dale A. Fritsch, MS; Timothy A. Allen, DVM, DACVIM; Dennis E. Jewell, PhD; Daniel C. Richardson, DVM, DACVS; Phillip S. Leventhal, PhD; Kevin A. Hahn, DVM, PhD, DACVIM

JAVMA, Vol 236, No. 1, January 1, 2010

Effects of feeding a high omega-3 fatty acids diet in dogs with naturally occurring osteoarthritis

M. Moreau[1,2], E. Troncy[1,2], J. R. E. del Castillo[1], C. Bédard[3], D. Gauvin[1,2] and B. Lussier[2,4]

DOI: 10.1111/j.1439-0396.2012.01325.x

- Dietary clinical trials
- Both showed improvement in PVF by force plate analysis
- Both showed improvement in subjective owner pain scores

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Omega-3 fatty acids

Enhanced omega-3 index after long- versus short-chain omega-3 fatty acid supplementation in dogs

Tonje E. Dominguez | Kiranpreet Kaur | Lena Burri

Vet Med Sci. 2021;7:370-377

- 10 dogs fed 1,155mg EPA/DHA from krill oil
- 10 dogs fed 1,068mg EPA/DHA from flaxseed oil

- EPA/DHA concentrations significantly increased in dogs fed krill oil
- EPA/DHA concentrations significantly decreased in dogs fed flaxseed oil

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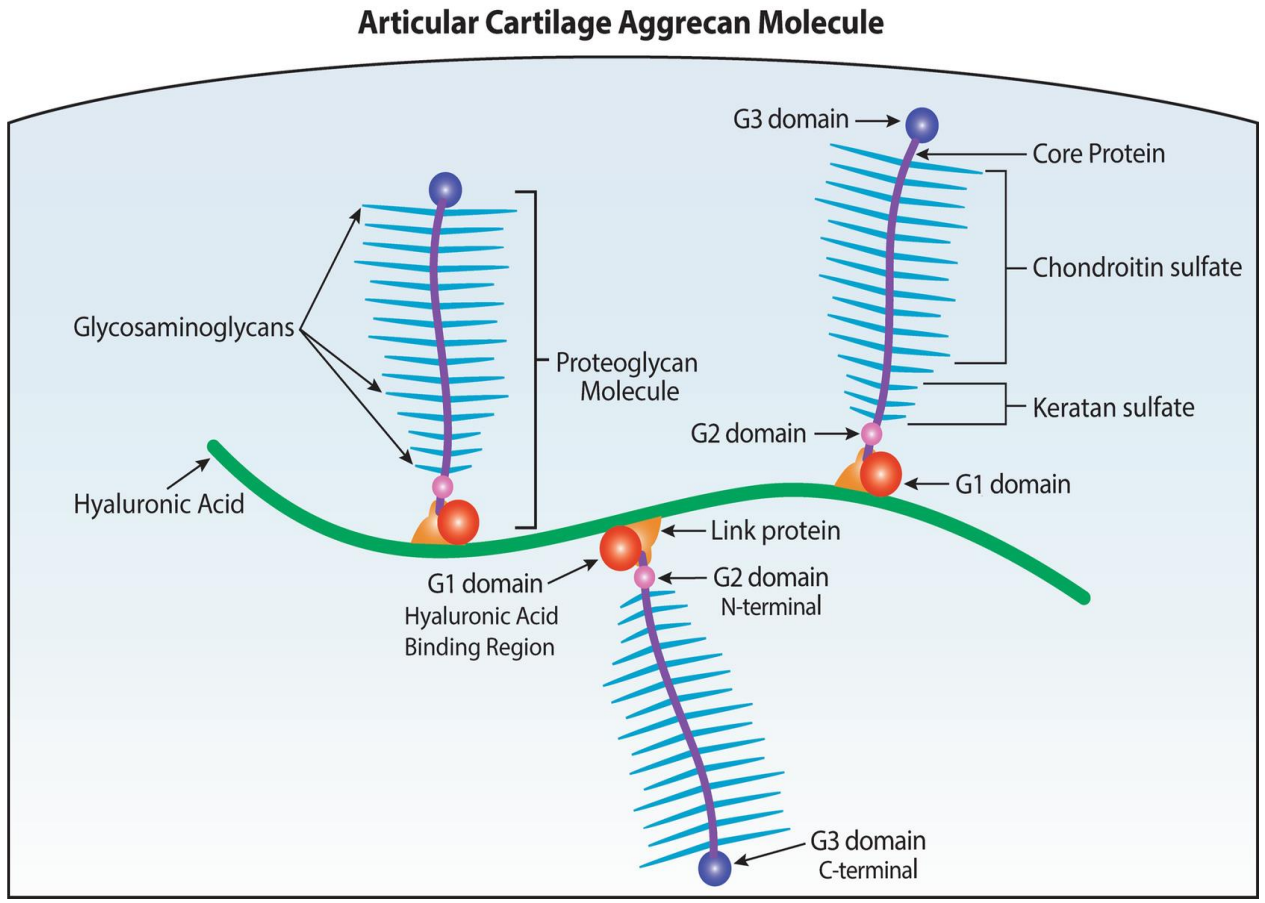
Glucosamine and Chondroitin sulfate



Gahunia H.K., Pritzker K.P.H. (2020) Structure and Function of Articular Cartilage. In: Gahunia H., Gross A., Pritzker K., Babyn P., Murnaghan L. (eds) Articular Cartilage of the Knee. Springer, New York, NY.

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Glucosamine and Chondroitin sulfate

- 2012, Gupta et al.
  - G+CS better than placebo
  - Better pain relief when UC-II added in
  - G+CS slower to get pain relief than UC-II
- 2007, Altilio et al.
  - G+CS better than placebo
  - G+CS offered moderate pain relief
  - UC-II offered significant pain relief
  - G+CS + UC-II offered best pain relief & decreased lameness scores
- 2007, McCarthy et al.
  - G+CS improved pain scoring, weight bearing
  - G+CS had no change in lameness scoring
  - Carprofen improved pain scoring, weight bearing, lameness scores

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Avocado & soy unsaponifiables

- Composed of the total fraction of unsaponifiables of avocado and soybean oils
  - Mixed 1:2
- Inhibits IL-1β
  - Secondarily inhibits production of IL-6, IL-8, PGE_2
- Stimulates collagen synthesis in rabbit articular chondrocytes

Avocado & soy unsaponifiables

- 2009, Boileau et al.
  - CCL transection model
  - ASU vs. placebo
  - Mild decrease in gross cartilage lesions and synovitis
  - Significant decrease in microscopic cartilage lesions
  - Decreased loss of subchondral bone
  - Calcified cartilage thickness
- 2007, Altinel et al.
  - Placebo vs. low dose vs. high dose
  - 300mg ASU qday vs. q3days
  - Increased levels of TGF-β1 and TGF-β2 in synovial fluid vs. placebo

Egg shell membrane

Effectiveness of NEM® brand eggshell membrane in the treatment of suboptimal joint function in dogs: a multicenter, randomized, double-blind, placebo-controlled study

Kevin J Ruff[1]
Kenneth J Kopp[2]
Pamela Von Behrens[3]
Mark Lux[4]
Matthew Mahn[5]
Matthew Back[1]

[1]ESM Technologies LLC, Carthage, [2]Kopp Veterinary Consulting, St Louis, [3]Clarkson-Wilson Veterinary Clinic, Chesterfield, [4]Mackenzie Pointe Animal Hospital, St Louis, [5]Midwest Veterinary Referral Center, Chesterfield, MO, USA

- ESM proprietary formula has been shown to decrease joint pain in humans with OA

- 51 dogs with OA
- Evaluated with :
  - Canine Brief Pain Index
  - Subjective lameness & joint pain scoring
  - Serum CTX-II levels

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- Results:
  - CBPI scores in TX group improved at 1 week, not at 6 weeks
  - CBPI QOL scores improved at 6 weeks
  - Subjective pain scoring show the TX group had decreased pain response at six weeks
    - No improvement in lameness or mobility scores
  - Serum CTX-II significantly decreased in TX group

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Polysulfated glycosaminoglycan (PSGAG)

- Slow-acting disease modifying agent
- Targets PGE_2
- Used for OA, degenerative joint disease
  - Improve cartilage matrix
  - Decrease inflammation
  - Relieve pain
- Licensed for IM use in US
- Shown to be effective when given SQ

Polysulfated glycosaminoglycan (PSGAG)

Owner Perceptions of Long-Term Systemic Use of Subcutaneous Administration of Polysulfated Glycosaminoglycan

Gabriella Varcoe, DVM, Julia Tomlinson, BVSc, PhD, Jane Manfredi, DVM, PhD

- 69 dogs evaluated for adverse events by survey
- 68/69 dogs used concurrent medication and/or rehabilitation therapy
- 13/69 (18.8%) dogs had an adverse event
  - Difficulty giving injection
  - Discomfort at injections site
  - Loose stool
  - Lethargy
  - Pain on palpation at injection site
  - Vomiting
  - Thrombocytopenia

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JAAHA 57:5;Sept/Oct, 2021

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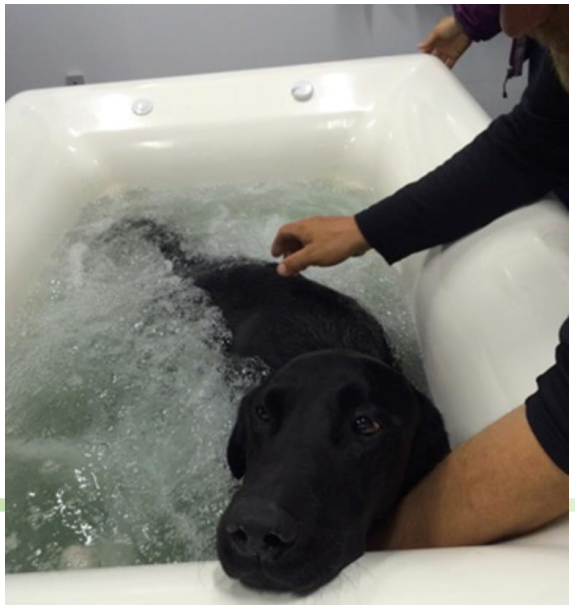
Supplements in the Sporting & Active Dog

- Improve performance
  - Prebiotics + Probiotics = Synbiotic
  - Glycerol pre-exercise
  - Carbohydrates (maltodextrin) post-exercise
  - Antioxidants
    - Astaxanthin



- Promote longevity
  - Omega-3 fatty acids
  - Glucosamine + chondroitin sulfate
  - Avocado & soy unsaponifiables
  - Egg shell membrane
  - Adequan

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Thank you!

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