ActiveMV – Multivitamin & Mineral Formula

Introduction

Ages 12-17 yrs Continuing Vitamin and Essential Mineral Supplementation

All humans require the same vitamins and essential minerals (VM) to create, develop and maintain life.[1] The differences are the amounts necessary for proper health and development during various life stages[2], which changes little after ages 14-18 years (see Appendix and Table 1).[2,3] However, from the beginning of life (including the prenatal vitamin) through the "early adolescent" growth and development period, there are significant differences in the required amounts of vitamins and minerals with the greatest adjustments taking place from birth to approximately 12 years of age, which the KidsMV satisfies through age 11 years.[2,3]* Please see the introduction section titled "Vitamins and Minerals in Developing Youth" [4] in the article on the KidsMV formula for details, mindful that the ActiveMV at one (1) tablet per day picks up where the KidsMV leaves off to correct the known vitamin and mineral gaps left from food alone to reach the proposed best vitamin and mineral safety and efficacy range described as an amount from the Recommended Daily Allowances (RDAs) or Adequate Intakes (AIs), when RDAs are unknown, up to below the tolerable Upper Limits [ULs] or No Observed Adverse Effect Levels (NOAEL) when known, for healthy humans from age 12-17 years.[2,3,5,6] For more on vitamins and minerals including supplementation in human health from the beginning of life through youth development, the reader is referred to pages 21-29 from the article titled "Vitamin and Mineral Supplementation in Human Health – A Case for Public Policy."[7]

Next Age Vitamin and Mineral Supplementation Adjustment

At 18 years of age based on size and activity, one would switch from one (1) ActiveMV to (2) two daily; or healthy active females would begin the Women's formula at one (1) per day to achieve the same correction.

* *A complete listing of Dietary Reference Intakes (DRIs) known for all gender and age groups including Recommended Dietary Allowances (RDAs) are available here.*

Body Size and Activity Increase Vitamin and Mineral Usage

Larger bodies have the potential to use more vitamins and minerals than smaller ones, especially if the extra size is primarily fat free mass (FFM) such as the general differences between men and women including athletes,[8] and becomes a rationale for slightly higher recommendations for some vitamins and minerals for men than women.[2] All else equal, activity increases the daily use of vitamins and minerals. In other words, in two physically similar humans, one significantly more active than the other, the former will use more vitamins and minerals to support the extra activity (e.g. energy production, movements, etc.) and recovery (e.g. muscle/cellular repair/synthesis/breakdown, glycogen restoration, etc.).[9,10,11,12,13,14,15,16,17,18,19,20,21,22,23] A weak argument can be made that bigger and/or more active people consume more energy than their smaller less active counterparts to support their size and activity and the extra food supplies their greater vitamins and mineral requirements. This is convenient thinking but an uneven solution since no matter size or activity differences, exercisers and athletes experience the same vitamin and mineral shortages as the general population when delivery is from food alone regardless of total calorie intake.[12,13,24,25,26,27,28,29,30,31,32] This problem can be exacerbated in athletes and exercisers for multiple reasons:[15] maintaining low body fat, dieting for any reason including making weight classes as in combat sports, experimenting with popular diets such as vegan, intermittent fasting and ketogenic diets. [11,12,13,14,16,24,25,26,27,28,29,30,31 33,34,35,36,37,38,39,40] And finally, more food of any kind does not guarantee an even as needed vitamin and mineral distribution to accurately fill all typical nutrient gaps.[40,41,42]

Men are approximately 10% larger than females with often an even greater percentage difference of FFM compared with a female counterpart, justifying more daily vitamin and mineral intake regardless of activity.[2,8] Adding regular high volume exercise activity brings the female's vitamin and mineral needs within the range of the majority of larger males under 50 years and near the regularly more active males such as recreational/competitive athletes under 65

years of age (mindful that the safe and known recommended range for everyone is the RDA through the UL).[43,44,45] At some point, size and activity matter less because aging slows down many vitamin and mineral dependent activities as eventually everyone loses size or performance production if they are long-term experienced exercisers/athletes – i.e. depending on the individual's training/competition experience, there will come the inevitable age-related performance and size decline.[46,47,48] This data becomes the rationale for vitamin and mineral supplemental amounts for very active people of both genders and most other males up to age 50 years. Less active females including regular exercisers (~30-60 minutes of activity, 3-6 days/week) with typical activities of daily living, would use the vitamin and mineral amounts captured in the Women's formula, which is appropriately adjusted with many vitamins and minerals slightly less than the total content in two (2) ActiveMVs.

For more on general adaptation to adequate vitamin and mineral intake (RDA through below the UL) versus less intake in active humans, the reader is again referred to the full article titled "Vitamin and Mineral Supplementation in Human Health – A Case for Public Policy."[7]

All dotFIT vitamin and mineral supplementation formulas consider: 1) recommended total vitamin and mineral intake (RDA/Adequate Intake[AI]) for the designated life stage established by the Dietary Reference Intakes (DRIs); 2) RDA/AI vitamin and mineral gaps when intake is from food alone (including fortified); 3) vitamin and essential mineral supplement safety range (mean food intake to UL considering food intake; 4) proposed vitamin and mineral safe and recommended supplement range to close the micronutrient gaps between the RDA/AI and food to achieve the scientific consensus of recommended vitamin and mineral intakes to complement most any western food diet regardless of gender or age.

Goal

(Formula and dosing recommendation carry on from where the KidsMV leaves off at age 12 with one (1) tablet daily through age 17 years, then properly adjusted by using two (2) tabs daily for males and very active females until age 50 yrs unless otherwise noted including software recommendation based on input).

To supply vitamins and minerals (VM) in amounts necessary to complement the VM content from typical food intake to reach the established Dietary Reference Intakes that promotes proper growth, development and good health in youth with the dosage altered as needed for the life phases and activity of persons ages 12-50 years (65 years for very active competitive athletes still participating in regular intense and extended training sessions). This formula considers food intake compared to the RDA and AI VM recommendations for best health, and supplies corrective amounts so that combined with diet, and other (if necessary*) supplement intake, keeps the designated user within the safe and DRI recommended VM range. The range is defined as starting close or equal to the age group VM RDA/AI and ends below the UL or NOAEL. Most importantly, so virtually "no one is left behind, "this formula contains 19 VM, any of which are known to be potentially shorted when food alone is the delivery, so that daily needs are shored up within any typical U.S. diet, other than those minerals that cannot fit in an acceptable pill size* such as calcium and potassium. Along with other often shorted VM, the DGA's seven (7) nutrients of concern (dietary fiber, choline, magnesium, calcium, and vitamins A, E, and C), except calcium and fiber (because of pill size), are contained within the ActiveMV in corrective amounts when added to known U.S. and other western nations' vitamin and mineral content from food. Finally, as described above, increased size and activity have the potential to utilize greater amounts of certain VM that if supplied as within the ActiveMV formula dosing recommendation, may contribute to better daily recovery to help support a prolonged ability to perform desired activities as well as functional independence.

Rationale

The rationale for lifelong vitamin and mineral supplementation (LCVMS) for all humans including athletes is detailed in the article titled: "Vitamin and Mineral Supplementation in Human Health – A Case for Public Policy,"[7] which is solely an educational publication but serves as a basis for proper vitamin and mineral usage (and will be noted) throughout the entire PDSRG Health Section. For an overview of rationale for all ages the reader is referred to the article

"Abstract" and "Introduction." The article also discusses lifelong complete vitamin and essential mineral supplementation rationale specific to activity, exercise, diet including related multivitamin and mineral use.[7] Below are additional rationale notes specific to activity and adults that support the dotFIT ActiveMV formulation and recommendation.

Note: *current research using active exercisers argues for VM to not just fill gaps,[12,13,24,25,26,27,28] but glean the benefits related to not necessarily acute performance (unless existing deficiency is corrected),[49] but long-term and continued performance[10,11,12,13,14,15,16,36] and especially Vitamin D.[17,18,19] For athletes/exercisers (including first time or reengaging exercisers), in line with what can happen with LCVMS, as noted in the KidsMV section, if you fracture less, have fewer sick days, more energy, recover/heal more quickly and miss fewer training/exercise sessions, gains accrue more rapidly allowing you the ability to play more often, and the healthy exercise addiction has a better chance of taking hold with the continuous (less interrupted) long-term gains.[16,17]*

Active Multivitamin and Mineral Formula

Compared to the general ingredient amounts in the dotFIT complete multivitamin and mineral formulas, the primary differences in the ActiveMV formula when using the two (2) pill dosage are: (mindful that all amounts vitamin and mineral content from food remain below the UL) 1) slight increases in beta-carotene/vitamin A, Vitamins C and E to support natural antioxidant/immune defenses to help overcome potential excesses in cellular oxidative damage caused by regularly high exercise activity but not so much to potentially compromise the necessary exercise induced adaptation response, yet still offer immune system support, especially during intense training and restricted energy intake[9,15] – i.e. potentially improve overall recovery;[21,50,51,52,53,54,55] 2) minor increases in vitamin D,[17,18,19] and 3) specific B vitamins and minerals such as iron and magnesium involved synergistically or uniquely in energy production, oxygen transport, muscle contraction and cardiovascular and bone health.[11,15,17,22,38,43,56,57,58,59,60,61,62,63]

Vitamins A, C & E as Antioxidants and Related Controversy

There had been some reports that high doses of vitamin C and E (>1000 mg; ≥400 IUs, respectively) in exercisers might attenuate a desired adaptation response. [64,65,66] *(It should be noted that the ActiveMV including a two (2) pill daily dose, has less than these amounts – and purposely based on erring on the side of caution related to maintaining desired adaptations while supplying enough to offer immune and muscle damage support as described above).* As an example, studies have suggested that antioxidant supplementation at these higher levels may interfere with exercise-induced cell signaling and have shown a decrease in training induced protein content (COX4, PCG-1a).[64,65,66] Other earlier and more recent studies have found potential benefits related to less exercise-induced oxidative stress muscle damage without upsetting other markers of muscle damage, therefore not necessarily effecting the desired adaptation process.[67,68, 69,70]

Regardless of the unsettled controversy of antioxidant supplementation for improving recovery, the reader should first know that experts say it is unclear if high-antioxidant supplementation blunts adaptation in well-trained exercisers[15,16,71] and therefore, dotFIT does not endorse extra vitamin A, C or E (outside what is contained in the dotFIT MVMs) for use to boost antioxidant capacity beyond the natural protection from the vitamins and minerals in the dosages described above and contained in the ActiveMV; and second, no studies have shown that high doses of C and E (>1000 mg; ≥400 IUs, respectively) have negatively affected performance in trained individuals*, where some studies have shown higher doses have positively contributed to recovery including immune system support.[9,15,16,17,21,50,51,52,53,54,55,72,73,74,75]

* Bjornsen et al. found high-dosage vitamin C (1000 mg) and E (240 mg) supplementation blunted certain muscular adaptations to strength training in ***untrained elderly men*** (60-81 yrs old) [76] – this dose is significantly higher than our recommendations for this population.

In summary, the ActiveMV does not contain vitamin A, C or E in amounts that have an uncertain relationship with blunting desired exercise adaptions but do contain amounts shown to support exercise recovery including immune

support in highly active and often energy restricted athletes. Further, vitamin and mineral supplementation is not meant to be a direct ergogenic aid, other than if correcting a deficiency state, which is rare in the general athletic population. Rather, daily usage should be recommended for assisting in long-term health that may improve daily recovery, reduce sick days and prolong the ability to compete or train at a higher level than otherwise (i.e. not correcting vitamin and mineral gaps from food intake to recommended DRI levels).

Specialized/Unique ActiveMV Formula Considerations

All ingredients contained in this formula maintain the basic rules described in the previous section of filling vitamin and mineral gaps left from food no matter the general western diet or designated age.[2,3,77] Additionally, this formula follows the same vitamin and mineral structural guidelines of all dotFIT complete multivitamin and mineral formulas (Vegan, Women's, Over50 and Active), in that the ingredient forms and dosages and their delivery, are consistent in what has shown to be potentially more beneficial than what is contained in MVM products commonly found in consumer channels (see previous section "dotFIT Multivitamin & Mineral Formulas Specialty Design Criteria" for more). These improvements over mass produced multivitamin and mineral products for this population (described above) include:

- **Food intake consideration:** regardless of generally acceptable energy containing diet, the formula is designed to complement the vitamin and mineral content in food to reach recommended levels (RDA to below the UL) and by design to make sure no one is left behind, meaning everyone based on food intake alone is below the RDA on at least one but generally many more vitamins and minerals and the ActiveMV shores up those known gaps while also supplying the additional potential needs for this specific age, size and/or activity group as outlined and referenced above.
- **All around synergy:** maintain a synergistic relationship with all dotFIT health products and the typical food intake for each age group. Therefore, including diet, during multiple product use in any combination, users remain in the known safe and recommended vitamin and mineral range, which is from the ~RDA/AI to below the UL or NOAEL as noted above and in the Introduction as described and charted in the previous section: "dotFIT Multivitamin & Mineral Formulas Specialty Design Criteria."
- **Contains both important forms of vitamin K, K1 and K2:**[78,79,80] K1 and K2 have similar and unique properties. K2 (menaquinone) has recently emerged as serving an important role in vascular and bone health.[81,82,83] Low dietary vitamin K2 intake in children is associated with early onset of poor bone health.[84] Calcium and vitamin D from food and supplements are complemented with vitamin K2 supplementation due to its increasingly recognized role as a calcium chaperone and the facilitator of vitamin K's role in the cardiovascular system, cardiac structure and function.[80,83,85,86,87,88,89,90,91,92,93,94]
- **Vitamin B12 in two forms:** methylcobalamin and cyanocobalamin. Both forms are important but methylcobalamin compared with other forms, is the most effective at being delivered to neurons to support brain health.[95,96]
- **Magnesium as Mg citrate and oxide:** magnesium is involved in more than 300 biochemical reactions of the body,[97,98] especially those that are involved in energy metabolism and neurotransmitter synthesis.[99] Aging is a major risk factor for magnesium deficiency.[100] Its total levels shrink due to a decrease in bone mass which is the most important magnesium source in the body.[101] Additionally, studies show magnesium dietary intake is inadequate in most population groups, especially middle and older adults.[102,103,104,105,106] Low magnesium levels have been associated with weakness and sleep problems. In fact, magnesium supplementation in middle and younger older aged men and women has been shown to improve both performance and sleep suggesting low dietary intakes.[101,107,108,109,110] Magnesium in this formula complements the typical American diet to help achieve desired magnesium levels and when needed, work synergistically with the dotFIT SuperCalcium, which also contains magnesium, thus keeping total intake in the safe and recommended nutrient range.[111] The magnesium in this formula is in both the oxide and citrate form for greater bioavailability compared to a single salt form.[112,113]

- **Choline bitartrate:** rarely found in multivitamin formulas,[114] choline is now considered an essential nutrient for proper muscle, liver and brain functions, lipid metabolism and cellular membrane composition and repair.[2,3,115] Depending on the age group, over 90% of Americans and populations of other modern western nations, have been found to be dangerously below the established AI [2,116,117,118,119] and therefore choline is now listed as a nutrient of concern by the DGA,[2] meaning without correction, potential related health problems loom (e.g. shortages negatively impact cell structure, neurotransmitter synthesis/neurological disorders, liver health, cardiovascular system, etc.).[115,120,121,122] Choline deficiency affects liver health because choline is required to form phosphatidylcholine present in very low-density lipoprotein particles.[115,122,123] Because of choline's indispensable role in cellular structural development as described above, choline is especially important during pregnancy, lactation, and early child development.[120,124] Two (2) ActiveMV tablets deliver 250 mg of choline to complement the typical dietary intakes.
- **Vitamin A:** contains 1200 mcg (4000 IU) of vitamin A from both preformed vitamin A, retinol acetate (375 mcg/1250 IU) and provitamin A, beta carotene (825 mcg/2750) since they both metabolize differently with unique and mutual actions.[125] However, partially attributed to genetics and other uptake factors,[126,127] there can be large interindividual differences in the ability to convert pro-vitamin A sources (e.g. alpha-carotene, beta-carotene, etc.) to the needed amount of vitamin A activity, known as retinol activity equivalents (RAE), therefore both forms can help offset the possibility of too much or too little vitamin A activity and potentially more accurately contribute to achieving the recommended levels.[128,129,130]
- **Vitamin D3:** contains higher levels compared to other multivitamin formulas to not just shore up low dietary vitamin D content from typical food intakes, but also meet the newer progressive recommendation that goes beyond solely achieving needs established for bone health,[131] to reach vitamin D levels associated with improved overall health and recovery[132] and especially for active exercisers including competitive athletes.[15,16,17,18,19,133] Serum vitamin D concentrations have been shown to have a positive correlation in athletic performance.[134,135] Furthermore, not unlike the general population worldwide,[2,10,136] there is also a significant prevalence of vitamin D insufficiency in athletes including tactical athletes (military),[137,138,139] and can be exceptionally seasonal.[139,140] There is an absence of general consensus that competitive athletes need higher levels of vitamin D than the general population needs to attain for optimal health (≥75 nmol/L or >30 ng/mL), in order to maximize their performance potential including full recovery from each training bout.[134,141] However, it has been postulated based on vitamin D's multiple effects on muscle function, that levels of >100 nmol/L (40 ng/mL) may help maximize its actions and therefore improve training and competition outcomes over time.[134] This proposed level would not be achievable without supplementation of vitamin D3. Butscheidt et al. reviewed the data on vitamin D's impact on musculoskeletal health and peak athletic performance.[142] They found several correlations between 25-OH-D3 serum levels and different aspects of competitive sports: 1) a serum level ≥ 30 ng/provides sufficient mineralization of non-mineralized bone matrix thus important to skeletal health; 2) this level was also positively correlated with an accelerated regeneration of muscular force; 3) levels >40 ng/mL offered a protective effect on the development of stress fractures; 4) researchers generally surmised that levels >50 ng/mL are required for athletes to achieve maximal physical performance.[142]

Typical Use (Starting Where KidsMV Recommendation Ends)

Persons as described below who are not pregnant, lactating or trying to conceive (these would be assigned to a prenatal formula, which is similar in formulation)

- Ages 12-17 years: take one (1) daily immediately following first food meal of the day

- Males 18-50 years take two (2) daily: one (1) immediately following first food meal of the day and one (1) after the last meal
- Male and female athletes who train intensely and are ages 18-65 years: take two (2) as described above
    - Participating in daily extended training sessions and regularly controlled energy intakes

Note

- ***Females 18-50 yrs with normal activity including recommended exercise will switch to the dotFIT Women's formula that contains the same VMs with some amounts gender customized***
- ***50 yrs+: Over50MV except the hard training athletes using ActiveMV***

For contraindications, precautions, etc., see previous section "dotFIT Multivitamin & Mineral Formulas Specialty Design Criteria" as there are no ingredients in the ActiveMV that reach the UL or NOAEL including when added to typical food intake.

Supplement Facts Panel

Supplement Facts

Serving Size: 1 Tablet
Servings Per Container: 60

	Amount Per Serving	% Daily Value
Vitamin A (as beta carotene and as retinol acetate)	1200 mcg (4000 IU)	133%
Vitamin C (from ascorbic acid and calcium ascorbate)	400 mg	444%
Vitamin D3 (as cholecalciferol)	15 mcg (600 IU)	75%
Vitamin E (as d-alpha tocopheryl succinate)	101 mg (150 IU)	673%
Vitamin K (as Vitamin K1 [phytonadione] and Vitamin K2 [menaquinone-7])	50 mcg	42%
Thiamin (as thiamine mononitrate)	5 mg	417%
Riboflavin (as riboflavin-5-phosphate sodium)	2.5 mg	192%
Niacin (as niacinamide)	15 mg	94%
Vitamin B6 (as pyridoxal-5-phosphate monohydrate)	3 mg	176%
Folate	170 mcg DFE (100 mcg folic acid)	43%
Vitamin B12 (as cyanocobalamin and methylcobalamin)	15 mcg	625%
Biotin	150 mcg	500%
Choline (from choline bitartrate)	100 mg	18%
Iron (from ferrous fumarate)	5 mg	28%
Iodine (from kelp)	25 mcg	17%
Magnesium (from magnesium oxide and magnesium citrate)	100 mg	24%
Zinc (from zinc citrate)	7.5 mg	68%
Selenium (from L-selenomethionine)	35 mcg	64%
Copper (from copper gluconate)	0.5 mg	56%
Chromium (from chromium picolinate)	50 mcg	143%

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