dotFIT Multivitamin & Mineral Formulas Specialty Design Criteria

The peer reviewed referenced article titled, "Vitamin and Mineral Supplementation in Human Health—A Case for Public Policy," supplies the extra support documentation for the following information.[1]

Introduction to Formulating

All humans require the same vitamins and essential minerals (VM) to create, develop and maintain life.[2] The differences are the amounts necessary during various life phases[3] (see Appendix and Table 1). After 18 years of age, the consumed daily VM amounts necessary for non-diseased or non-genetically compromised people to potentially achieve better health published in the Dietary Guidelines for Americans (DGA) and referred to as the Dietary Reference Intakes (DRIs), varies little, with the true variances attributed to activity, size and to a far lesser degree, gender and age.[3, 4] The wide range of safety and efficacy within the established individual VM intake, which is from the Estimated Average Requirement (EAR), Recommended Dietary Allowances (RDA) or Adequate Intake (AI) up to the Tolerable Upper Limit (UL) or NO Observed Adverse Effect Level (NOAEL), for adults,[3] allows a single formula to adequately complement diets of the greater adult population,[3, 5, 6, 7, 8, 9] including fortified foods, [10, 11] to achieve recommended VM intakes (e.g. RDA/AI).[3] In fact, among adults complete vitamin and mineral formulas targeted by gender and age are generally marketing exaggerations and unnecessary,[3] with the exception of formulating for high activity, such as regular participation in prolonged physical exertion, such as competitive athletes and exercisers consistently partaking in long or difficult training bouts.[12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45] Moreover, as we propose, since humans all require the same VM at all life stages,[2,4] lifelong continuous complete vitamin mineral supplementation (LCVMS) starting with the prenatal followed by a formula with the dosage adjusted as necessary during development years up to age 18,[3] would all but eliminate the need for a customized elderly or gender-based vitamin and mineral supplement (VMS) because complete vitamin and mineral supplement (CVMS) use is not a treatment for a condition (other than correcting insufficiencies/deficiencies) but functions as a lifelong prevention tool.[1] And finally, continual adjusted personalized adult vitamin and mineral supplementation based on diet, aging and genetics may appear ideal,[46] but this practice is not practical (e.g. DNA, blood testing, etc.), affordable or realistic (including accuracy, definitions or subsequent corrections), in this moment in science,[47, 48] not to mention accounting for the ever-changing diets and food trends.[49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62] At present, testing to personalize VMS should be considered a clinical tactic and unnecessary for the vast majority of people needing to only correct their VM intakes from food alone to meet the RDAs. Customized dosing by age or genetics and especially when outside the individual VM established tolerable upper limit or DRIs should be considered a clinical treatment to be monitored by a qualified health professional.[47,48]

Table 1 - Dietary Reference Intakes (DRIs), LOAEL and NOAEL Definitions

DRIs are nutrient-based reference values for the U.S. and Canadian populations.

EAR - Estimated Average Requirement	A nutrient intake value that is estimated to meet the requirement of half the healthy individuals in a particular life stage and gender group.
RDA - Recommended Dietary Allowance	The dietary intake level that is sufficient to meet the nutrient requirement of nearly all (97 to 98 percent) healthy individuals in a particular life stage and gender group.
AI - Adequate Intake	A recommended intake value based on observed or experimentally determined approximations or estimates of nutrient intake by a group (or groups) of healthy people that are assumed to be adequate. Used when an RDA cannot be determined.
UL - Tolerable Upper Intake Level	The highest level of nutrient intake that is likely to pose no risk of adverse health effects for almost all individuals in the general population.

dotFIT Practitioner Improvements Over Consumer Channel MVM Products

Direct to consumer (DTC) MVM products often have shortcomings because they're forced to compete on price due to the wide array of similar products in the marketplace. Common inadequacies (addressed below) in MVM formulas found in mass retail include, but are not limited to, insufficient amounts of certain ingredients, incomplete/partial formulations, failure to account for food intake including known under-consumed nutrients, excessive heavy metal content, improper delivery medium (e.g. gummies, liquids, powders, etc.), weak absorbing or functional vitamin or mineral forms, lack of third-party testing for label accuracy and ingredient purity, lack of formula synergy with other necessary supplements (e.g. extra calcium, vitamin D, VM dependent anti-oxidants, etc.). Most notably is the fact that DTC products are not tied to properly trained practitioners who are responsible for their clients' health and fitness goals who often correctly integrate MVM with exercise and meal planning into personal/group training programs, i.e. holistic fitness programming and implementation.[63]

All these issues are addressed in dotFIT formulations, manufacturing, testing and individual recommendations, offering the highest potential for achieving desired VM health support outcomes when compared to other available MVM formulas or a non-supplemented state.

Formulation and Recommendations Overview

The dotFIT multivitamin and mineral supplement formulas (MVM) and recommendation criteria were established to solve for obstacles that might detour anyone from using a daily complete vitamin and mineral formula to properly fill the well-known vitamin and mineral gaps left from food intake alone.[3,4,5,6,7,8,9, 64, 65, 66, 67, 68] The overall design solves for safety and efficacy controversies, the ability to make educated but simple inexpensive choices and compel the endorsement of virtually all health and fitness practitioners to unambiguously recommend a daily low dose MVM to complement all typical food diets so that the VM content from food is corrected to achieve the Recommended Dietary Allowances (RDA) or Adequate Intakes (AI) when RDAs are unknown, while remaining significantly below the Tolerable Upper Limit (UL) or No Observed Adverse Effect Level (NOAEL)[1,3,6,10] (see Table 2). Further, because the dotFIT MVMs follow practitioner product guidelines, this united practitioner recommendation would be lifelong starting with the established practice by health and medical institutions that prescribe a prenatal MVM[69, 70, 71, 72, 73, 74, 75] and continue uninterrupted throughout life.[1]

dotFIT MVM formulas, Manufacturing and Recommendations Solve for:

- Distancing the practitioner and end user from the well-known mislabeling, safety (hidden drug spiking, heavy metal contamination, etc.)[76, 77, 78, 79, 80, 81, 82, 83, 84] and efficacy (under-formulation)[85, 86, 87, 88, 89, 90, 91, 92] problems associated with purchasing through standard consumer dietary supplement channels including mass retailers and internet sites while also shielding them from bogus supplement reviews[93] and false or inflated claims[84,88,89, 94, 95, 96, 97]
    - "From 2007 through 2016, 776 adulterated dietary supplements were identified by the FDA and 146 different dietary supplement companies were implicated. Most of these products were marketed for sexual enhancement (353 [45.5%]), weight loss (317 [40.9%]), or muscle building (92 [11.9%]), with 157 adulterated products (20.2%) containing more than 1 unapproved ingredient. The most common adulterants were sildenafil for sexual enhancement supplements (166 of 353 [47.0%]), sibutramine for weight loss supplements (269 of 317 [84.9%]), and synthetic steroids or steroid-like ingredients for muscle building supplements (82 of 92 [89.1%]). In 2014-2016, 117 of 303 adulterated samples (38.6%) were identified through online sampling and 104 of 303 (34.3%) were identified through the examination of international mail shipments"[78]
    - Consumer Labs reported in 2015 that the FDA found 62% of the 483 dietary supplement manufacturing facilities failed their inspections in 2014 with an average of 6 infractions at each facility. These were for

noncompliance with the current Good Manufacturing practices (cGMP) which all are required to follow. It is noteworthy that only a handful of manufactures were inspected, i.e. a small number of the total U.S. manufactures, meaning the problem is widespread.[81]

- Centrum Multivitamin faced a lawsuit over false health benefits. It was discovered that Centrum multivitamin products carried deceptive claims on their labels – that they support "energy and immunity," "heart health", "eye health," "breast health, "bone health" and "colon health. In actuality, the doses of the health support ingredients were far below what clinical trials had shown to be needed to back the support claims.[90] Bayer's One-A-Day MVM faced the same legal actions[89]
- Denham et al. found that 80% of supplements purchased in four mass retailers did not contain the label ingredients or worse, contaminated with drugs including steroids and amphetamines[82]
- 16 of the 42 multivitamins tested by Consumer Labs failed label claims [98]

- Keeping people from VM/nutrient overages common with indiscriminate use, [99, 100, 101] i.e. keep users below the UL no matter the VM content of typical diets or use of other dotFIT supplements. This is known as protecting and maintaining the VM (nutrient) "safe and recommended nutrient range" (SRNR) [102] published as the Dietary Reference Intakes (DRIs) and described above[3]
  - MVM recommendations are synergistic with other dotFIT supplements (all dotFIT supplement formulas are based on the use of dotFIT MVM, and typical western diets.[11,12,36,78, 103, 104, 105, 106, 107, 108] All supplements must also have standalone efficacy in case someone is not using the MVM [see individual product formulations in their respective sections online in the Practitioner Dietary Supplement Reference Guide (PDSRG)].
- Proper health screening to avoid known medical contraindication
  - Medical questionnaire algorithms are based on current Natural Medicines Data on disease, drug and supplement interactions also captured in the PDSRG's individual supplement documents.
- Third-party tested for label accuracy and unwanted chemicals/metals common with mass products[76,77,78,79,80,81,82,83,84,85,94,95,96,97, 109]
  - NSF Certified for Sport (NSFCS), Health Canada, etc. Information about manufacturing is available here: Product Manufacturers & 3rd Party Testing
- NSF Certification for Sport (NSFCS) to protect drug tested athletes from banned substances
- One daily formula for most consumers to ease compliance[1]*
  - Contains all known under-consumed nutrients and the right amount of other VM known to be potentially low (including high dose Vitamin D) among those with various food intakes, therefore, correcting food alone VM levels to the desired "RDA range" and eliminating the need for separate individual or other combination VM formulas unless necessary for clinical purposes[3,6,7,8,10,11,12,65,67,103,104,105,106,107]
- Controlled delivery: ingredient release patterns to help maintain daily maximum VM cellular activity
  - VM daily requirements are based on an average of the body's VM usage throughout an entire day, not immediate use, meaning if your MVM supplement releases all of its contents quickly after ingestion (common in consumer/mass market supplements), the amounts overwhelm the body's ability to utilize them in their respective VM-dependent systems forcing an excretion of the immediate unusable/un-storable excesses,[2,4] thus depriving the cells of otherwise full capacity operation throughout the day when VMs are released in the time-dependent quantities the cells can use from hour to hour. [110, 111, 112] In other words, you do not want to have to take a smaller dose of VMs every hour or two as your cells use them, forcing you to take at least 10 small MVM pills spread evenly throughout the day to meet your daily (RDA) needs. Using pharmaceutical control release technology, [113, 114, 115] you can get your complete daily dose in

a single pill (or two depending on size or extra calcium needs) because it's manufactured to release the VM in the increments the cells can use allowing continually supported VM dependent systems.[1, 116, 117]

- Proper age, activity, size and gender dosing
  - Ages 2-11 yrs: KidsMV
  - All 12-17 yrs: One (1) ActiveMV
  - Women 18-50 yrs: Women'sMV
  - Males 18-50 yrs: Two (2) ActiveMV
  - All hard training male and female athletes 18-65 yrs: Two (2) ActiveMV
  - 50+ yrs: Over50MV except athletes using ActiveMV;
  - 65+ yrs: Over50MV
  - Vegan/VegetarianMV adult alternative: VeganMV
- Full peer-review referenced evidence-based VM ingredient, dosing, forms and recommendation support contained in respective sections of the PDSRG and made available to all.

*Calcium and potassium present the only caveat to a single MVM because if they're needed, the amounts generally would not fit in an acceptable pill size along with the other VMs. While impossible to quantify/validate all the individual VMs content of your foods (unless testing each food immediately before consumption), calcium and potassium food content are relatively easy to discover particularly since the inception of new labeling laws. Therefore, the proper formulations would leave these two minerals out, allowing persons to add separately only if needed, which a quick glance at one's diet/labels can determine. Additionally, dotFIT protein powders contain ~200 mg of calcium and 300 mg of potassium per serving.

Further Enhancement Details

Formulation Considering Food Intake & Possibility of Other Supplement Use

There is a safe and recommended nutrient range (SRNR) for vitamins and minerals established by scientific experts and published in the Dietary Guidelines for Americans (DGA). The known SRNR is within the DRIs defined in Table 1.[3] Therefore, the appropriate MVM would contain a population's known under consumed nutrients including unidentifiable/unknown lapses of any essential VMs (thus ~19-22 VMs), in amounts that correct nearly all VM nutrient gaps without exceeding ULs or NOAELs, regardless of an individual's dietary pattern, satisfying the population needs of the vast majority of modern western nations. These VM supplement amounts needed are calculated from the data (e.g. food intake including fortification, DRIs, etc.) shown in Table 2, with the resulting VM supplement range necessary to correct virtually everyone's VM RDA gaps (satisfying the above criteria) being displayed in the second to last column.

Table 2 – Dietary Reference Intakes, Mean Food Intakes and Resulting VM Supplement Dosages
Data gathered from multiple data collection sources based on the U.S. population greater than 4 years of age.

- Mean food intake[2,3,6,7,8,65,67,103,104,105]
  - This does not reflect the high percentages of the population below the VMs EARs/RDAs for many VM as shown in Figure 1. It is used here to give a baseline value to food's VM content to err on the side of caution with supplementing
- Percentage of people under the RDA and EAR[3,6,7,8,103, 118]
- Dietary Reference Intakes (RDAs, AIs, EARs, ULs), LOAEL and NOAEL[3,106,107]

Figure 2 - Updated 2015-2020 DGA Report Supporting Table 2 [1,3,6,7,8,103,118]

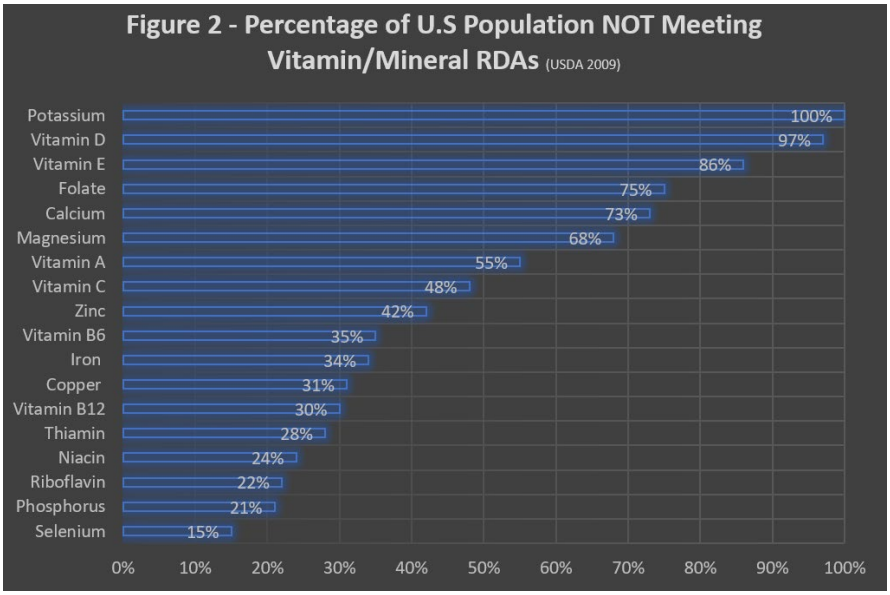


Table 2 – Dietary Reference Intakes, Mean Food Intakes and Resulting VM Supplement Dosages

Micronutrient	Mean Daily Intake (Food +Fortification)[9]	RDAs #AIs	ULs	LOAEL (L) NOAEL (N)	Mean Food-RDA Gap	Mean Food-UL Gap	Supplement Low-High Range[1]	%<RDA %<AI# %<EAR+
Preformed Vitamin A (PVA)[2] 1 IU retinol = 0.3 µg Retinol activity equivalent (RAE) 1µg=3.33 IU	621µg RAE	700-900µg RAE	3000µg	L-14,000 µg N -3,000µg	200µgRAE	2,350µg	500-1000µg PVA*	55 +43
***β-carotene as Vitamin A substitute/add[3]**	<2mg (4.5-6 mg =900 µg Retinol)	1IU from food=.05µg Retinol; 2IU supps=.15µg	N/A	N/A	N/A	N/A	1500IU-2500IUs[3]	N/A
Vitamin D 1µg=40IU	4.9µg	15-20µg	100µg	N-250µg[4]	10-15µg	90µg	20-40µg	97 +94
Vitamin E (α-tocopherol) 1 IU=.67mg d-alpha-tocopherol	7.4mg	15mg	1000mg[5]	L-500mg/kg	7-8mg	990mg	10-250mg	86 +86
Vitamin K	85.2µg	#90-120µg	ND	ND	5-35µg	N/A	35-100µg	#70
Vitamin B1 Thiamine	1.6mg	1.1-1.2mg	ND	ND	0	N/A	1-10mg	28 +4-7.2
Vitamin B2 Riboflavin	2.2mg	1.1-1.3mg	ND	ND	0	N/A	1.3-5mg	22 +2-3
Vitamin B3 Niacin	24.7mg	14-16mg	35mg[5]	L-50mg	0	N/A	10-30[5]	24 +1-2
Vitamin B5 Pantothenic acid	4-6mg	#5mg	ND	ND	0-1	N/A	2-5mg	ND

Micronutrient	Mean Daily Intake (Food +Fortification)[9]	RDAs #AIs	ULs	LOAEL (L) NOAEL (N)	Mean Food-RDA Gap	Mean Food-UL Gap	Supplement Low-High Range[1]	%<RDA %<AI# %<EAR+
Vitamin B6	2.0mg	1.3-1.7mg	100mg	N-200mg	0	98mg	2-10mg	35 +10-15
Vitamin B7 Biotin	35-70µg	#30µg	ND	ND	0	N/A	30-100µg	ND
Folate	542µg	400µg	1000µg[5]	L-5000µg	0	500µg	200-400µg[5] (not incl. pregnancy)	75 +9-15
Vitamin B12	5.3µg	2.4µg	ND	ND	0	N/A	2-30µg	30 +2-4
Choline	275-400mg (~315mg)	#425-550mg	3500mg	L-7500mg	100-250mg	3000mg	250-450mg	#92 +N/A
Vitamin C	70-84mg	75-90mg	2000mg	L-3000mg	10-20mg	1900mg	100-1000mg	48 +40
Calcium	850mg	1000-1200mg	2000-2500mg	L-5000mg	150-350mg	1150mg	0-1000[7]	73 +49
Chromium	23-50µg	#25-30µg	ND	ND	5µg	N/A	50-100µg	ND
Copper	1.0-1.6mg	900µg	10mg	N-10mg	0	8.5mg	.5-1gm	31 +4.5
Fluoride	N/D	#3-4mg	10mg	N-10mg	N/A	N/A	Fortification only	N/A
Iodine	138-353µg	150µg	1100µg	L-1700µg	0-20µg	7-800µg	25-100µg	ND
Iron	10-16mg	8-18mg	45mg	L-70mg	0-8mg	30mg	5-15mg	34 +8
Magnesium	280mg	320-420mg	350mg[5]	L-360[5]	5-250mg	N/A[5]	200-300mg	68 +52
Molybdenum[6]	N/A	45µg	2mg	N-900µg	N/A	N/A	N/A	N/A
Manganese[6]	1.8-2.3mg	#1.8-2.3mg	11mg	N-11mg	0	0	N/A	N/A
Phosphorus	1350mg	700mg	3-4gm	N-10.2gm	0	8gm	0-200mg	21 +1.5
Chloride[6]	N/A	#2.3gm	3.6gm	ND	N/A	N/A	N/A	N/A
Potassium	2600mg	#4.7gm	ND	ND	2000mg	N/A	0-2000 mg[7]	100 +100
Selenium[8]	109µg	55µg	400µg	N-800µg	0[8]	300 µg	50-75µg[8]	15 +1
Zinc	12mg	8-11mg	40mg	L-60mg	0	28mg	10-15mg	42 +12
Sodium	3,433mg	#1500mg	2300mg	ND	-1200mg	-1200mg	None	ND

[1] Low based on most anyone achieving RDAs; highs covering sub-populations variant nutrient metabolism (e.g. bioavailability or functional availability differences, etc.), age resistance and/or strong evidence that higher levels may benefit a majority with no downside to others - but total intakes always below the ULs

[2] As preformed vitamin A only (1 IU is the biological equivalent of 0.3 mcg retinol, or of 0.6 mcg beta-carotene)

[3] 1 IU from supplements = 0.15 mcg RAE;1 IU from food = 0.05 mcg and converted to vitamin A only as needed (no known toxicity except to long-term smokers)

[4] EFSA Established NOAEL (Scientific Opinion on the Tolerable Upper Intake Level of vitamin D EFSA Panel on Dietetic Products, Nutrition and Allergies (NDA)

[5] ULs applies to supplemental amounts only

[6] No evidence of more needs than from food thus no applicable supplement data

[7] If low in diet, generally requires a separate supplement based on pill size

[8] Soil variability and tight safe effective range requires a minimum supplement amount
[9] US mean Intake, thus does not discount the percentage of people under the RDA/EAR

Range for Maximum Benefits (Figure 3)

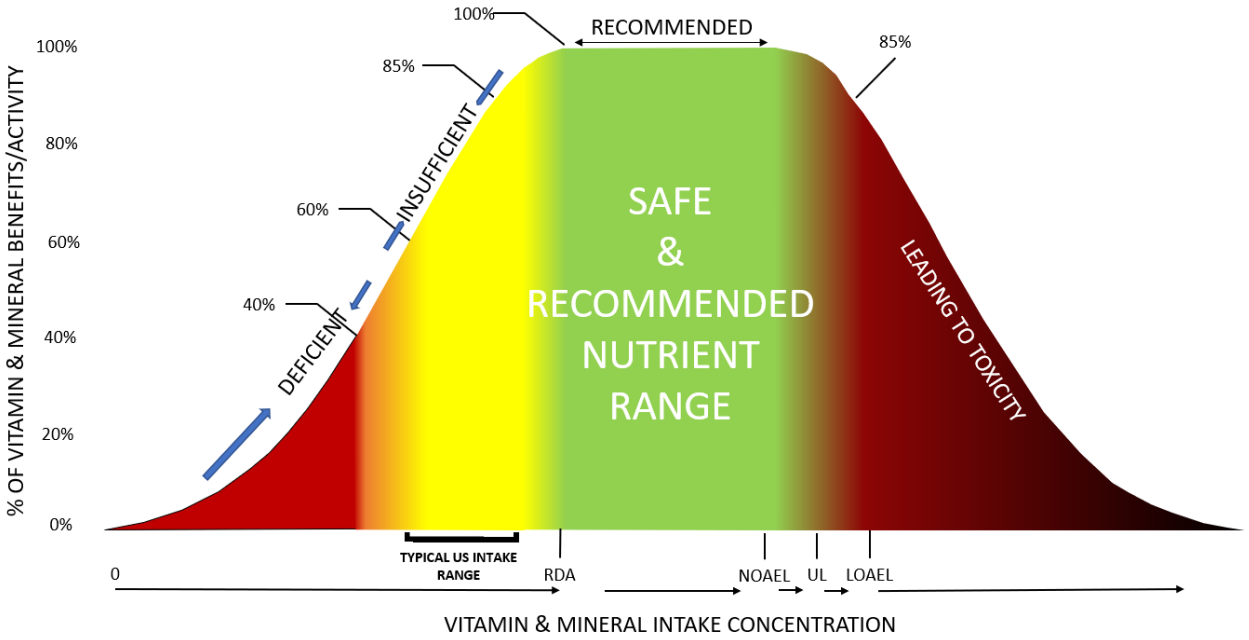
Readers are reminded that because of the synergy of essential nutrition throughout all phases of life, vitamins and essential minerals are dependent on each other in all areas of metabolism and therefore insufficiencies of a single vitamin or mineral can cause a negative domino effect, albeit overtime – i.e. insidious health risk effects.[1]

The SRNR is depicted below using the data from Table 2 and shows potential overall cellular functioning benefits at different VM concentrations ranging from deficiency to recommended. Typical known U.S. intakes from food alone are shown in the yellow area, and depending on the vitamin or mineral, reach about 40-85% benefits if the RDA is 100%. The "sweet-spot" is shown in green, which, based on the DRIs would be the ~RDA to slightly below the NOAEL and definitely below the UL. Maintaining this sweet spot should be a lifelong goal and entirely possible using properly designed formula incorporating the above criteria to fill in the known gaps, depicted as an average by the white area.

Figure 3 Definitions

- **Nutrient (vitamins and essential minerals [VM]):** *a substance that provides nourishment essential for growth and the maintenance of life*
- **VM deficiency:** *gross under-consumed nutrient leading to overt symptoms that left untreated (repletion) will cause eventual sickness or death*
- **VM insufficiency:** *nutrient intakes below the RDA or Estimated Average Requirement (EAR) that left untreated (repletion), may not have overt symptoms, but insidious outcomes related to short and long-term development and health such as disease manifesting so gradually, it would be established before becoming evident, thus likely irreversible.*
- **RDA:** Recommended Dietary Allowance - the dietary intake level that is sufficient to meet the nutrient requirement of ***nearly all (97 to 98 percent) healthy*** individuals in a particular life stage and gender group.
- **AI:** Adequate Intake - a recommended intake value based on observed or experimentally determined approximations or estimates of nutrient intake by a group (or groups) of healthy people that are assumed to be adequate—used when an RDA cannot be determined.
- **UL:** Tolerable Upper Intake Level - the highest level of nutrient intake that is likely to pose no risk of adverse health effects for almost all individuals in the general population.
- **NOAEL:** No Observed Adverse Effect Level - the highest concentration or amount/dose of a substance found *NOT* to cause an adverse reaction.
- **LOAEL:** The Lowest Observed Adverse Effect Level - the lowest concentration or amount/dose of a substance found to cause an adverse reaction.

Figure 3 - Safe and Recommended Vitamin and Mineral Range



- Green = DGA established goal (~RDA to below NOAEL/UL) for intake of vitamins and minerals to maximize benefits including long term health (100% VM activity)
    - Virtually no one achieves through food alone
- Yellow = Insufficient range for many VM thus decreased benefits allowing potential for insidious outcomes related to short and long-term development and health (~60-85% VM activity)
    - Current average U.S. intake of VM from food alone including fortified foods
- Orange = Deficient through insufficient leading to overt and insidious health outcomes respectively unless treated (40-60% VM activity)
    - VM intake of lowest quartile of the U.S. population when compared to the Healthy Eating Index (HEI) [119]
- Red = Deficient leading to death if not corrected (<40% VM activity)
    - Uncommon in western developed nations

Formulas by Age, Gender and Activity

As described above, the same micronutrient supplement criteria (e.g. food intake, correction to RDA safety range, etc.) would be used for all genders and age groups with established RDAs and part of all dotFIT individual MVM formulations:

- Pre-conception through breastfeeding: existing prenatal formulas containing complete VM – not just folate or lesser combinations
- Infants <1 year: existing complete CVM liquid formulas following breastfeeding or immediate use because of no breastfeeding
- 1-3 yrs: approximately 1/2 of the same CVM formula for 4-11 yrs. (everyone ends in desired range as shown in the KidsMV formula and recommendation
- 12-17 yrs: slightly less than a standard adult formula

- 18+ yrs: small variances in amounts primarily based on size/activity but mostly standardized

Here are the lifelong (womb to tomb) MVM recommendatons (also shown in Table 3)

- Trying to conceive or pregnant: Prenatal vitamin
- After birth, children are either breast feeding or drinking infant formula. If it's the former then they're getting their MVM from the mother's prenatal vitamin through breast milk since she takes that until breastfeeding stops. If not breast feeding, the MVM is in the infant formula as the milk-based formula will be fortified with vitamins and minerals and therefore it is the baby's MVM until they develop teeth. At 2 yrs of age (providing they have acceptable teeth) they start using the dotFIT chewable (Kid's MV) and from then on:
- 2-4 yrs: take 1 dotFIT Kid's MVM
- 4-11 yrs: take 2 dotFIT Kid's MVM (1 with AM meal and 1 with PM meal)
- 12-17 yrs: take 1 dotFIT Active MV
- 18-50 yrs: all men and all competitive athletes (male and female), take 2 dotFIT Actives (1 with AM meal; 1-PM) as long as strenuously competitive until age 65 (otherwise after 50, switch to 1 dotFIT Over 50MVM)
- Women 18-50 yrs: if not "very active," such as at the level of competitive sport (i.e. extended daily training periods) all women take 1-dotFIT Women's MVM
- 51+ yrs: All take 1 dotFIT Over50MV unless using Active until 65 as described above
- 65+ yrs: All take 1 dotFIT Over50MV

These recommendations are the basis of the algorithm in the dotFIT Nutrion program software to make recommendatons easy for our practitioners/trainers and shown in Table 3, mindful the formulations' ingredient amounts fall within the "supplement low-high range" calculated from Table 2. Clients simply answer the quick Q&A and the program recommends the proper MVM. (See respective dotFIT MVM sections for detailed formulations).

Table 3 - dotFIT MVM Recommendations by Age, Gender and Activity

Multivitamin and Mineral Formula	ActiveMV (1 tablet)	ActiveMV (2 tablets)	Women'sMV	Over50MV	KidsMV
Males/Females: 2-4 yrs					1 chewable
Males/Females: 5-11 yrs					2 chewables
Males: 12-17 yrs	X				
Males: 18-50 yrs <150 lbs with no to light exercise only	X				
Males 18-50 yrs All others (≥ 150 lbs or athletes and intense exercisers)		X			
Males: 51-64 yrs **All not** engaged in intense training/exercise				X	
Males: 51-64 yrs Intense athletes/exercisers		X			
Males: 65 yrs+				X	
Females: 12-17 yrs	X				

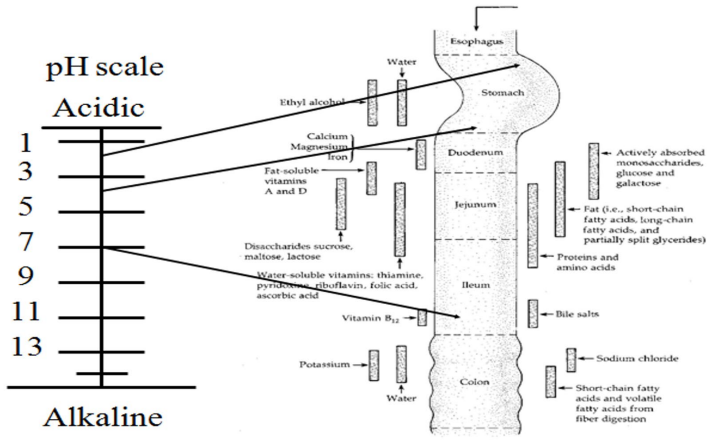
Multivitamin and Mineral Formula	ActiveMV (1 tablet)	ActiveMV (2 tablets)	Women'sMV	Over50MV	KidsMV
Females: 18-50 yrs **All not engaged in** intense training or exerciser			X		
Females: 18-50 yrs Intense athletes/exercisers		X			
Females: 51-64 yrs All except below				X	
Females: 51-64 yrs ≥150 lbs Intense athletes/exercisers		X			
Females: 65 yrs+				X	

Delivery System

dotFIT multivitamin and mineral formulas (MVMs) are prepared using pharmaceutical technology known as hydroxypropylmethylcellulose (HPMC), a form of cellulose within the coating to control the VM release patterns. [120, 121, 122] HPMC allows the continuous release of a product's ingredients as the compound moves down your digestive tract. [123] The pH in the gastrointestinal (GI) tract becomes less acidic the further downstream and offers release points when using HPMC (Figure 4). [124, 125]

Figure 4 – pH of the GI Tract and Areas of Release Using HPMC

Areas of release (duodenum-ileum) using hydroxypropylmethylcellulose (HPMC) a form of cellulose, within the coating. [118 -123]

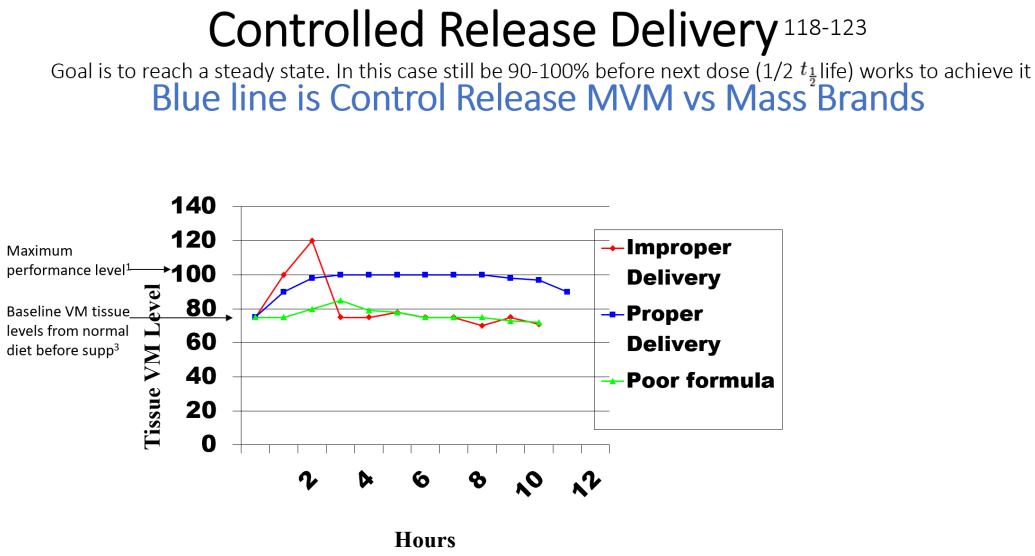


Vitamins and minerals protected thru stomach with release staring at a pH of ~3-4 and continues thru ~7

Controlled Release Tablets versus Standard Consumer MVM Products

The consumer market for MVM products contains many formulas with different delivery systems such as tablets, capsules, chewables, liquids, gummies, powdered, etc. Each non-traditional form (e.g. liquid, [126] powder, [127] gummy [128, 129]) [130] is focused on the consumer experience related to ease of ingestion, taste and/or price. These problems inherent in these flawed VM delivery systems primarily include: 1) ingredients not protected through stomach acid where there is little to no absorption; 2) weaker ingredient stability and formula dosage uniformity; 3) easy to over or under dose; 4) undesired release pattern – i.e. all upon ingestion. Therefore, as appealing as these products may sound (or taste), they are less effective in overall VM tissue delivery especially if they contained all necessary VMs. Thus, what may be good marketing, turns out to be lacking in science.[126,127,128,129,130] All these issues can be solved using a pill form. Like most pharmaceutical drugs where proper ingredient release is critical, a correctly tableted MVM formula offers the greatest potential to protect and control the ingredients release patterns so that they properly survive gastrointestinal transit, including the harsh pH of the stomach, to arrive in proper quantities to their target tissues. [131, 132, 133, 134, 135, 136, 137, 138] Therefore, dotFIT MVM formulas utilize this same effective drug delivery technology to protect and release the VMs throughout the GI tract so they arrive at their target destinations in usable increments throughout the day.[113,114,115,116] As opposed to other MVM formulations, the dotFIT MVM formula's goal is always to keep the body's vitamin and mineral dependent systems at recommended levels,[110,111,112, 139] mindful that VMs are involved in the functional performance of virtually all body systems.[1,2,4] Figure 5 depicts the goal actions of dotFIT control released MVM formulas versus standard commercial brands.

Figure 5 – Controlled Released Delivery of dotFIT MVM Formulas



VM Forms

Absorption of vitamin and minerals into the body depends on multiple factors as described in the opening article[1] including food forms of VM.[2,4] Animal forms are generally more readily absorbed than plant VMs because following ingestion, animals can convert and even manufacture plant based VMs into more usable human forms such as heme-iron [140, 141, 142] and vitamin B12, [143, 144] and animal consumption transfers the more bio-available or functional form to the consumer.[2,4,144, 145] Therefore, ideally prepared MVM supplementation would contain the more metabolically active forms (e.g. vitamin co-enzyme, mineral salts, etc.) and/or bioavailable VM structures, thus not having to rely as much on the body converting a less active VM source to the usable form.[2,4,144] Although nothing can take the place of the overall synergistic effect of vitamins and minerals with other important food components (e.g. flavones, fibers,

amino acids, fatty acids, etc.) from healthy consumed foods, pre-prepared VM forms explain why often times vitamins or minerals from supplements are better absorbed/utilized than food sources as the proper (more active) forms can overcome common digestive/nutrient extraction problems including aging, dietary fiber intake, or lack of the body's ability to convert a food form vitamin or mineral to the desired needed form necessary to overcome a deficiency or insufficiency. [146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156]

The vitamin and mineral ingredient forms in the dotFIT MVM's are the known more active forms the body uses as compared to forms commonly incorporated in "non-practitioner products." (i.e. mass-market retail).[2,4,88,89,90,144, 157, 158, 159] This means the ingredients have a higher potential to be "functionally absorbed," not simply available or bioavailable to be absorbed including less nutrient antagonism. [160, 161, 162, 163, 164] Bioavailability is only an ingredient's potential absorption into the body. [165] Functionally available forms are what gets into the area of action; i.e. it is functionally absorbed to produce the desired effect in the target tissues.[146, 166, 167, 168] Additionally, for some nutrients, equal absorption does not mean equal biological effects because the nutrient sources are chemically different, resulting in differences in nutrient activity, including areas of action. [169, 170, 171, 172, 173, 174]

All this said, the reader is warned that there is much unsubstantiated hype or marketing around which forms of the individual vitamins and minerals are best. In the final analysis, and far more important to the desired outcome of CVMS, is that the total individual vitamin and mineral amounts are set at diet RDA correction levels (known VM shortages/under-consumed) as long as the vitamins and minerals in the supplement are prepared in their commonly known active forms or salts as the RDA accounts for varied bio-availability.[3,158,159, 175, 176, 177]

Notable VM Form Enhancements Compared to Common Mass Consumer Brands

Readers are referred to the article titled, "Vitamin and Mineral Supplementation in Human Health—A Case for Public Policy" *for individual vitamin and mineral functions, forms related to proper absorption, transport and final VM dependent system destination and actions.*[1]

General VM structural improvements over mass produced MVM products include, but are not limited to:

- Both preformed (acetate) and provitamin A (beta-carotene)
    - Each has unique and mutual functions [178] and both forms help overcome human variances in beta-carotene conversion [179, 180, 181, 182, 183]
- Vitamin B12 (Cyanocobalamin and methylcobalamin)
    - Two distinct metabolic pathways[172, 184, 185]
- Vitamin C as calcium ascorbate and ascorbic acid
    - Buffering effect while maximizing dose[159]
- Vitamin E as alpha tocopherol
    - Most common functional form found in the body[163]
- Vitamin K1 (phytonadione) and K2 (menaquinone)
    - Unique primary co-factor destinations[139,167,174, 186,, 187, 188, 189, 190, 191]
- Zinc as citrate
    - Higher functional availability than oxide[158]
- Magnesium as both oxide and citrate
    - More functionally available for the many different magnesium dependent systems, than a single form[156,164, 192]
- Iron as ferrous fumarate
    - Low dose with higher bioavailability[155,162]

Summary

The dotFIT MVM products are formulated and third-party tested to give the user the best available solution for complementing their diet, within all life stages and activity levels to achieve the Dietary Guidelines for Americans' (DGA) established recommended vitamin and mineral intake that would continue to promote health. The dotFIT MVM design criteria including recommendations is to solve for the regular shortcomings of the common consumer channel MVM products (direct to consumer [DTC]) such as insufficient ingredient amounts, incomplete/partial formulations, failure to address food intake including known under-consumed nutrients, excessive heavy metal content, improper delivery medium, weak absorbing or functional vitamin or mineral forms, absence of third-party testing for label accuracy and ingredient purity, and lack of synergistic design with additional necessary supplements (e.g. calcium, vitamin D, VM dependent anti-oxidants, etc.). Additionally, DTC products are not tied to properly trained practitioners. Along with solving the safety and efficacy controversies, the overall design allows everyone the ability to make educated but simple inexpensive choices and compel virtually all health and fitness practitioners to unambiguously recommend a daily low dose MVM to complement typical food diets so that the VM content from food is corrected to achieve the Recommended Dietary Allowances (RDA) or Adequate Intakes (AI) when RDAs are unknown, while remaining significantly below the Tolerable Upper Limit (UL) or No Observed Adverse Effect Level (NOAEL).

Unique Features

- Contains the population's known under-consumed VMs along with the others necessary to satisfy unidentifiable/unknown lapses of VM (thus ~19-22 VMs) including choline and high dose Vitamin D3
- Formulas designed to correct nearly all VM gaps to the goal "RDA range" at all life-stages and activity levels without exceeding ULs (or No Observed Adverse Effect Level [NOAEL]), regardless of an individual's acceptable caloric intake level, satisfying the vast majority of our modern western nations' populations, i.e. proper age, gender and activity dosing with total VM intake compliant with DRIs
- Formulas consider food intake and other supplement use to prevent overages based on Uls, i.e. synergistic with all dotFIT products such as when supplemental calcium or antioxidants (vitamin and/or mineral as co-factors/activity) are necessary—all products are based on the use of a dotFIT MVM to stay within the established safe and recommended nutrient range
- VMs are in their active bioavailable and functionally available forms, ratios and strengths to achieve desired functional target tissue activities throughout the day
- Controlled-release delivery systems to achieve desired daily VM levels and help prevent tissue over-saturation and losses
- Manufactured in a regularly inspected NSF certified facility, in compliance with enforced Good Manufacturing Practices (GMPs) exclusively for dotFIT, LLC.
- Third-party tested including the Active and Vegan MVM being NSF Certified for Sport which ensures it is free of banned substances
- Full peer-reviewed referenced and evidence-based VM ingredient, dosing, forms and recommendation support contained in respective sections of the Practitioner Dietary Supplement Reference Guide (PDSRG) and made available to all

Precautions

dotFIT multivitamin and mineral formulas are considered safe for the general population at the proper dosage as described in Table 2.[193] Given the risk-to-benefit ratio, the long-term use of dotFIT multivitamin and mineral formulas is much safer than consuming the typical American diet without nutrient augmentation[1,3,6,12]

Contraindications

dotFIT multivitamin and mineral formulas are contraindicated in pregnancy. Women who are pregnant or trying to conceive should use a prenatal formula. Lactating women should use the Women's MV formula unless advised otherwise by a physician. Because of the iron content, except for the Over50 MVM, which does not contain iron, the dotFIT multivitamin and mineral formulas are contraindicated for those with hemochromatosis (an inherited disease that leads to iron-overload, affecting 0.5 percent of the population [194]) or other rare iron related conditions [195] and for anyone suffering adverse reactions to any of the supplement's ingredients. Smokers should avoid too much supplemental beta-carotene because 20-30 mg/d (~33,000 IU-50,000 IU) is associated with an increased risk of lung cancer, whereas former smokers appear to be unaffected. [196] The dotFIT MVM contain 2500I Us of beta-carotene or less except the VeganMV, which contains 10,000 IUs. The dotFIT MVM contain vitamins K and E at values below amounts associated with contraindications when using blood thinning medications (e.g. Warfarin/Coumadin), but persons using this type of medicine should consult their physicians before use of any supplements containing vitamin K and E. [197, 198]

Adverse Reactions

None known or reported in clinical research. [199]

Upper Limit/Toxicity

See Table 2 for a list of known ULs, NOAELs and LOAELs for individual vitamin and minerals in the dotFIT MVM formulas. All VMs in these formulas are below the UL and NOAEL/LOAEL and remain so when added to VMs from typical diets including fortified foods.[2,3,6,7,8,65,67,103,104,105,106,107,118]

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