

다양한 급원을 통한 비타민 및 무기질 노출량 평가

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Estimation of Exposure of Vitamins and Minerals through Different Sources

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- Intakes of vitamins and minerals from various sources
 - from diet
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Why we evaluate the exposure of vitamins and minerals through different sources?

1. Marked Improvement of dietary Intakes of vitamin & mineral of Koreans

Nutrient	>150% of Korean RDA (%)	Nutrient	>150% of Korean RDA (%)
Vit A	15	Vit C	49
Vit B1	24	Ca	6
Vit B2	11	P	51
Niacin	24	Fe	14

2001 Korean NHANES

2. Various sources providing vitamin and mineral highly in modern society :

(1) Diet + (2) High Potency Supplements {Vitamin and mineral supplements of functional foods for health (FFH-VM supp) & Pharmaceutical VM supp} + **(3) Fortified Foods + (4) Others ?**

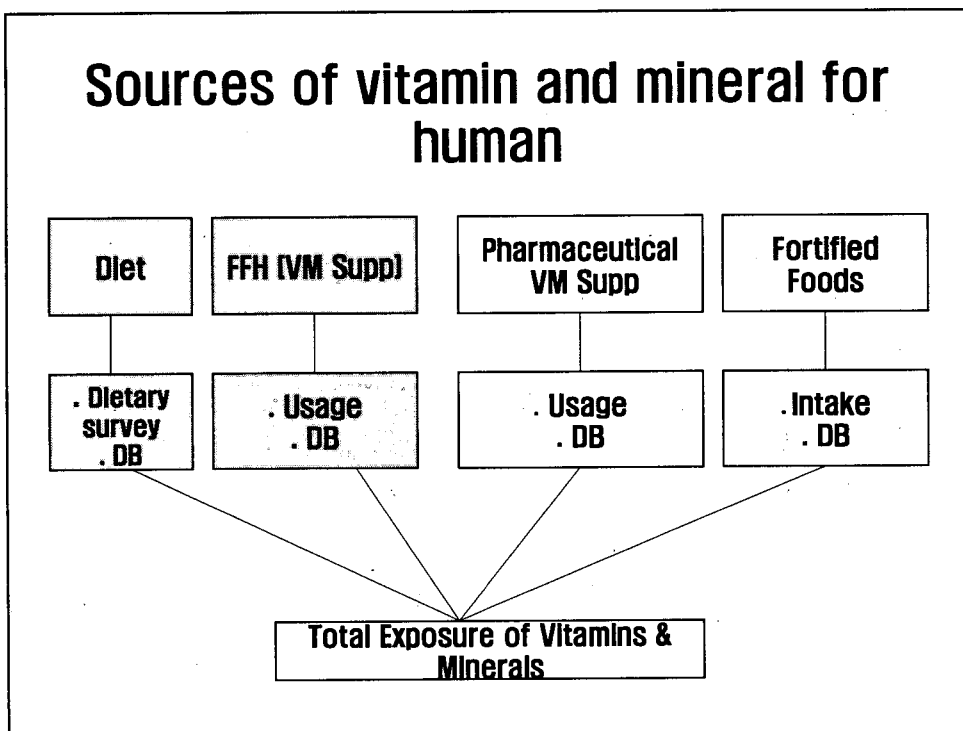

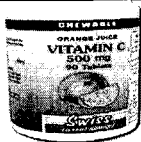
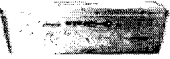


Table. Example of combined maximum Intake of vitamin C through various sources

Type	Brand name	Content	Dosage	Times of Korean RDA of Vitamin C for adults (70mg/d)
				
1. Diet	97% value of dietary intakes of vitamin C of adults: 418mg/d (2001 Korean NHANES)			6
2. FFH - VM supp	Herbal vitamin C 500mg	500mg/tablet	1 tablet (∴ Daily vit C intake: 500mg/d)	7



* Korean RDA (2000)

Type	Brand name	Content	Dosage	Times of Korean RDA of Vitamin C for adults (70mg/d)
				
3. Pharmaceutical VM supp	Vitamin C-1000 ('K' company)	1000mg/tablet	Usual: 500-1000mg/d Megadose: 3000-6000mg/d	7-14 43-86
4. Vitamin C-fortified foods	Orange juice ('S' company)	33mg/100mL	Portion size: 200mL (∴ Daily vit C intake: 66mg/d)	0.9

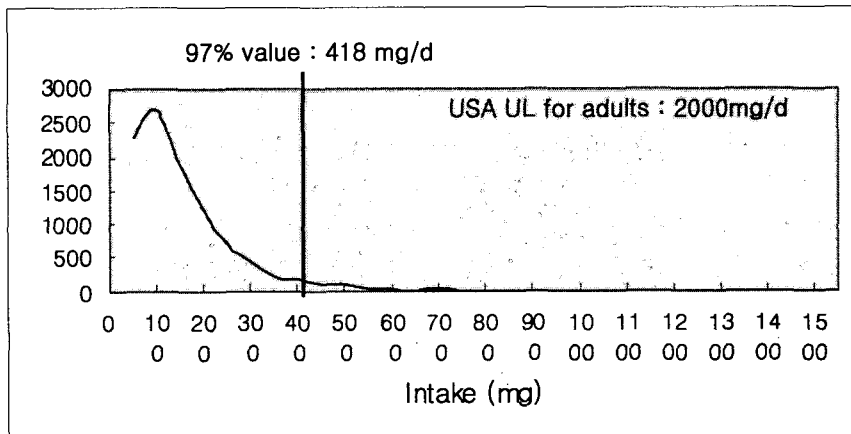
∴ **Combined intake of vitamin C through above sources: 1484-6984mg/d**
(USA UL of vitamin C for adults: 2000mg/d)



Intakes of Vitamin and Mineral from Diet

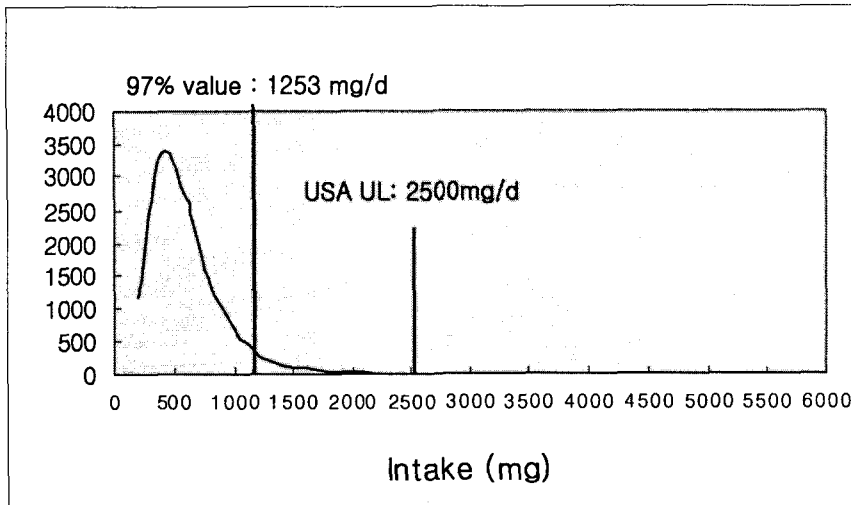


Distribution of dietary Intake of Vit C (n=9968)



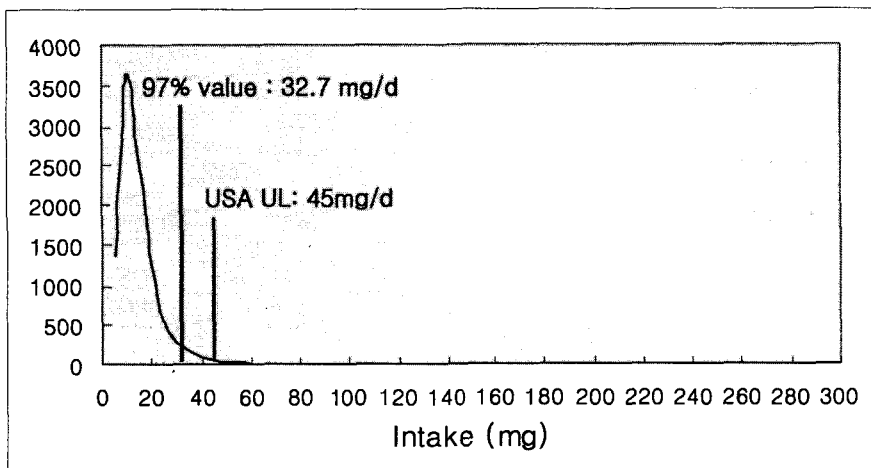
2001 Korean NHANES

Distribution of dietary calcium Intake (n=9968)



2001 Korean NHANES

Distribution of dietary Iron Intake (n=9968)



2001 Korean NHANES

Intakes of Vitamin and Mineral from Functional Foods for Health

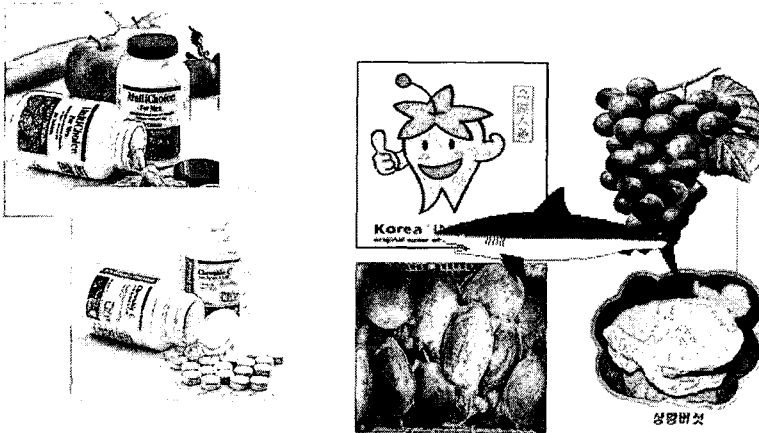


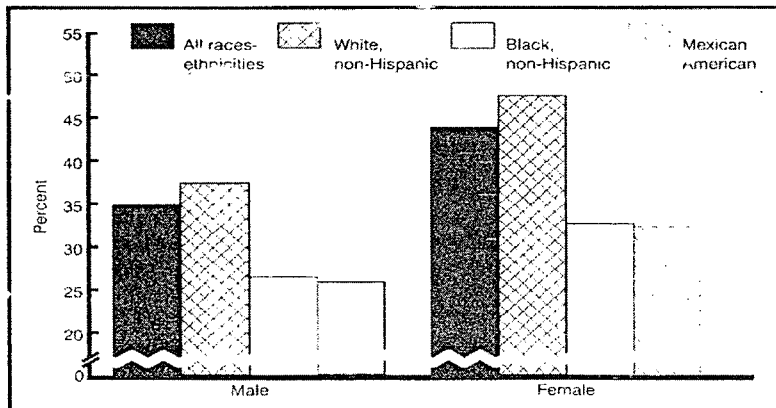
Table. Users of functional foods for health by lifecycle in Korea

Lifecycle	Health food users*, % (n)
School-age children	46% (384/837)
Adolescents	48% (410/858)
College students	34% (285/848)
Middle-aged	59% (557/946)
Elderly	49% (402/825)

*Users: Person who took functional foods for health more than 1-2 times/wk during previous 6 mo.

Kim WY *et al.* Tolerable upper intake levels for vitamins and minerals in functional foods for health (vitamins and minerals I), Funded by KFDA, No. 04052FUN124, 2004

Fig. Prevalence of dietary supplement use by sex and race-ethnicity in the United States, NHANES III, 1998-94



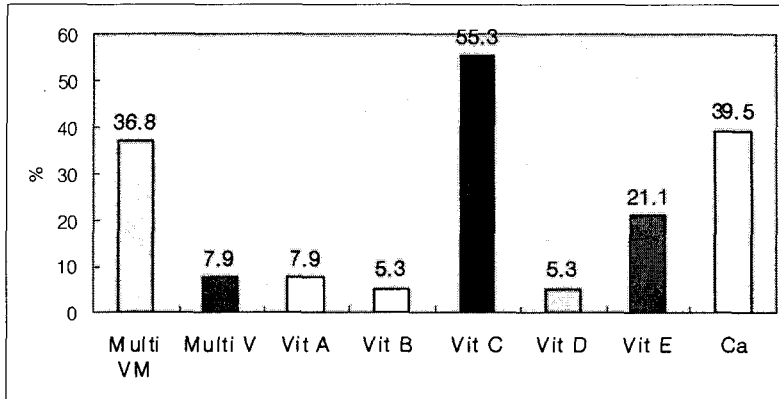
Ervin RB, Wright JD, Kennedy-Stephenson J. *Vital Health Stat* 244: 1-14, 1999

Table. Type of functional foods for health used by lifecycle in Korea Unit : %

Type	School-age children	Adolescents	College students	Middle-aged	Elderly
1. Nutritional supp	25.4	20.5	12.6	19.7	12.8
2. White ginseng	5.0	6.2	7.7	19.7	15.0
3. Red ginseng	6.9	16.1	10.6	29.1	25.7
32. Propolice-food	1.2	0.5	0.8	1.3	0.5

Kim WY *et al.* Tolerable upper intake levels for vitamins and minerals in functional foods for health (vitamins and minerals I), Funded by KFDA, No. 04052FUN124, 2004

Fig. Types of VM supp of functional foods for health used by middle aged Koreans



Kim WY *et al.* Tolerable upper intake levels for vitamins and minerals in functional foods for health (vitamins and minerals I), Funded by KFDA, No. 04052FUN124, 2004

Table. Cases of overlapping consumption of FFH-VM supp by middle aged Koreans

Number of products taken at the same time	Percentage of total overlapped users of FFH-VM (n=23)	Percentage of total users of FFH-VM (n=38)
2	83	50
3	9	5
4	4	3
5	4	3

Kim WY *et al.* Tolerable upper intake levels for vitamins and minerals in functional foods for health (vitamins and minerals I), Funded by KFDA, No. 04052FUN124, 2004

Table. Dosage of single type of FFH-VM supp used by middle aged Koreans

Type	USA UL	Dosage	Type	USA UL	Dosage
Vitamin A (RE μ g)	3000	≈600	Vitamin E (mg α -TE)	1000	200-800
Niacin (mg)	35	125-200	Ca (mg)	2500	217-715
Vitamin C (mg)	2000	210-1050			

Kim WY *et al.* Tolerable upper intake levels for vitamins and minerals in functional foods for health (vitamins and minerals I), Funded by KFDA, No. 04052FUN124, 2004

Table. Consumption of vitamins & minerals from FFH-VM supp by middle aged Koreans

Nutrient	USA UL	Consumption Mean (Range)	Nutrient	USA UL	Consumption Mean (Range)
Vitamin A (RE μ g) (<i>n</i> =23)	3000	614 (123-606)	Vitamin E (mg α -TE) (<i>n</i> =5)	1000	54 (3-302)
Niacin (mg) (<i>n</i> =44)	35	44 (5-200)	Ca (<i>n</i> =42)	2500	360 (46-1050)
Vitamin C (mg) (<i>n</i> =59)	2000	266 (14-1050)			

Kim WY *et al.* Tolerable upper intake levels for vitamins and minerals in functional foods for health (vitamins and minerals I), Funded by KFDA, No. 04052FUN124, 2004

Intakes of Vitamin and Mineral from Pharmaceutical VM supp



Table. Usage rate of pharmaceutical VM supp by lifecycle in Korea

Lifecycle	Survey area	Usage rate (%)	Published year
Preschool children	National	34	1998
School-age children	“	33	2002
Adolescents	“	31	2001
Middle-aged	City	70	2000
Elderly	National	45	1997

Table. Usage rate of VM supp in other countries

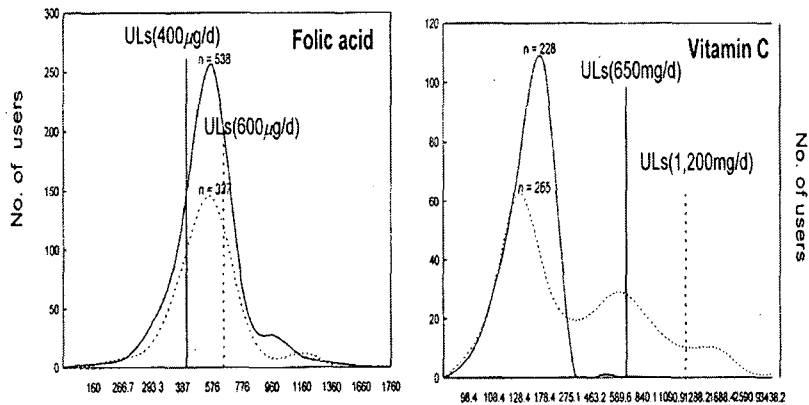
Subjects	Survey area	Usage rate (%)	Published year
Adults In USA	National Health Interview Survey 1992	46	1996
All age-groups (>2mo) in USA	NHANES III	40	1999
Preschoolers In USA	USA	54	1997
Adults In Germany (25-74yr)	Southern areas	46	1998
Adults In Denmark (70-75yr)	Municipality of Roskilde	62	1990
Adults In Netherlands (19-91yr)	National	54	2003

Table. Dosage of single type of pharmaceutical vitamin & mineral supplements used popularly in Korea

Type	USA UL	Dosage	Type	USA UL	Dosage
Vitamin A (RE μ g)	3000	1200-2400	Vitamin E (mg α -TE)	1000	90-900
Niacin (mg)	35	20-500	Ca (mg)	2500	90-1200
Vitamin C (mg)	2000	25-1000			

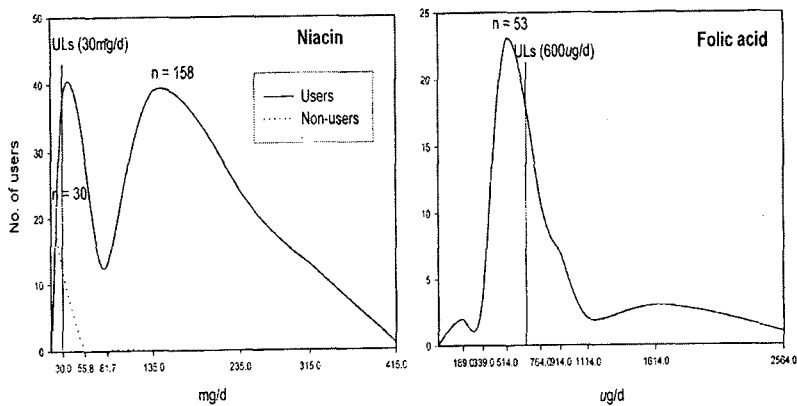
www.kimsonline.co.kr

Fig. Distributions of combined intakes of folic acid & vitamin C from diet & pharmaceutical VM supp in elementary schoolchildren in Korea



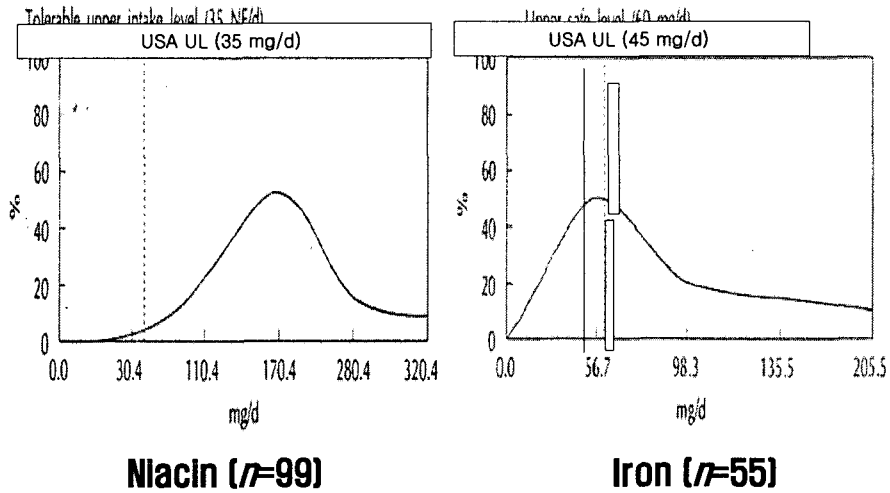
non-users (---) and users (—) Kim SH *et al. Nutr Res* 22: 433-448, 2002

Fig. Distributions of combined intakes of niacin & folic acid from diet and pharmaceutical VM supp in 3rd grade students of high schools in Korea



non-users (---) and users (—) Kim SH *et al. J Med Food* 6: 27-42, 2003

Fig. Distribution of combined intakes of niacin & Iron from diet and pharmaceutical VM supp in middle-aged Koreans



Kim SH. *JARAHE* 5: 127-134, 1998

Intakes of Vitamin and Mineral from Fortified Foods



Patterns of fortified food consumption of adolescents in Korea

- **-Type of fortified foods consumed frequently according to type of fortified nutrient:**
- **Ca > Fe > Vit B1 & D > C & B2**
- **-Type of nutrients consumed from fortified foods:** Vit A, B1, B2, B6, B12, C, D, E, Ca & Fe
- **- There is no relationship between major type of nutrient contained in natural food and type of fortified nutrient.**

Table. Major nutrients fortified of each food group consumed by adolescents in Korea

Food group	Major nutrient fortified
Milk & their products	Ca & Fe
Beverages	Vit C & Ca
Sweets/ Biscuits	Vit B-complex & Ca
Ramnyons	Ca
Breads	Ca & Fe

Yang JK *et al.* *Korean J Food Culture* 19: 447-459, 2004

Table. Example of daily intake of calcium from Ca-fortified foods frequently chosen by adolescents in Korea

Meal	Brand name	Portion size	Ca content(mg)/ portion size
Breakfast	제티 시리얼	1 cup, 40g	175
	칼슘 우유	1 pack, 200mL	422
	빠로 가는 칼슘 치즈	1 slice, 18g	468
Snack	계란과자	40g	42
Lunch	강화라면	1 pack, 120g	89
	어묵	40g	23
	불가리스	1 bottle, 150mL	165
Snack	칼슘연양갱	1 pack, 195g	210
	미네럴워터	1 cup	58
Dinner	칼슘짜장	1 pack, 200g	198
	고칼슘 오렌지주스	1 cup	210
	몽쉘 크림케이크	1 pack, 32g	34
Total 2094mg/d			
USA UL for teenagers: 2500mg/d			

Future study

- Combined maximum exposure of vitamins & minerals from diet, FFH- & pharmaceutical- VM supp and fortified foods can be more than ULs for risk group.

- Upper limits of FFH-VM supp should be established as FFH-VM supp is common sources of vitamin & mineral in modern society.

- What is needed to determine the upper limits of vitamin & mineral of FFH-VM supp?

- Maximum intakes of vitamin & mineral by Koreans according to age group and gender:

- 1) from diet
- 2) from pharmaceutical VM supp
- 3) from fortified foods

- Usage patterns of FFH-VM supp

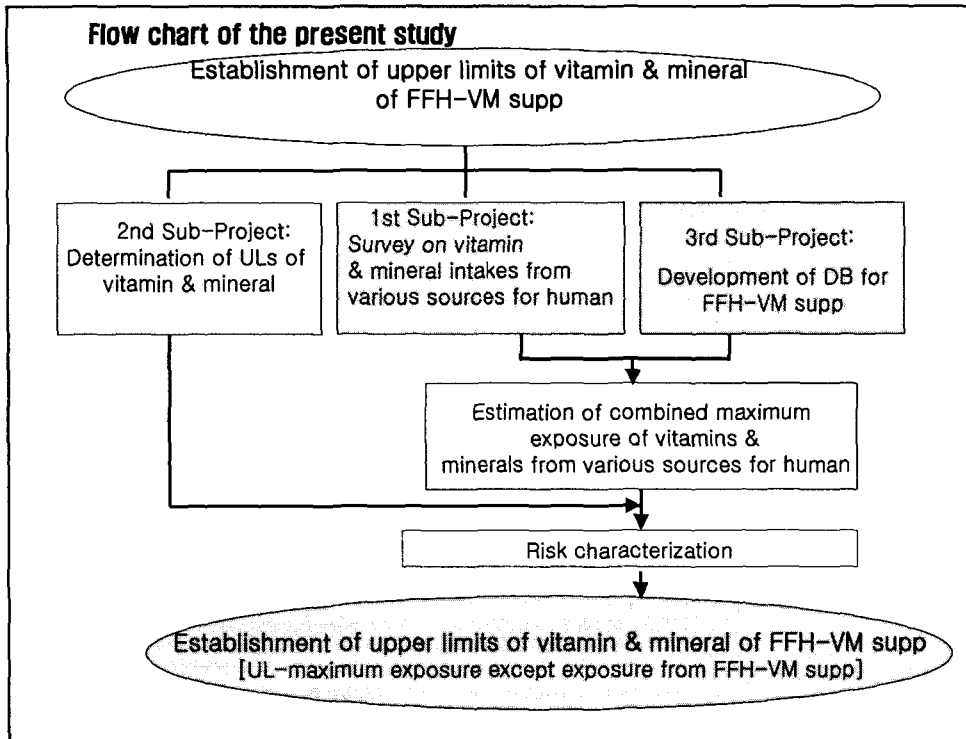
- Observe the tendency of other countries about their works on upper limits of vitamin and mineral of dietary supplements

- Method of determining upper limits of vitamin & mineral of FFH-VM supp

Upper Limits of Vitamin and Mineral of FFH-VM Supp {by Indirect (Difference) Method}

Upper limits of vitamin & mineral of FFH-VM supp =

UL of nutrient – combined maximum exposure of nutrient from various sources except FFH-VM supp

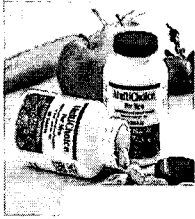


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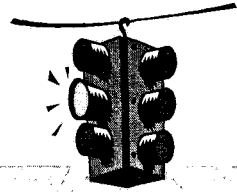
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Thank you !!!



Are there any questions? Shkim@kongju.ac.kr