Vitamin D status and hypertension

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UV B

Epidermis

Dermis

D3

D2

MILK

25D

PTH

Transcription factor

VDR

RXR

VDRE

1,25 D
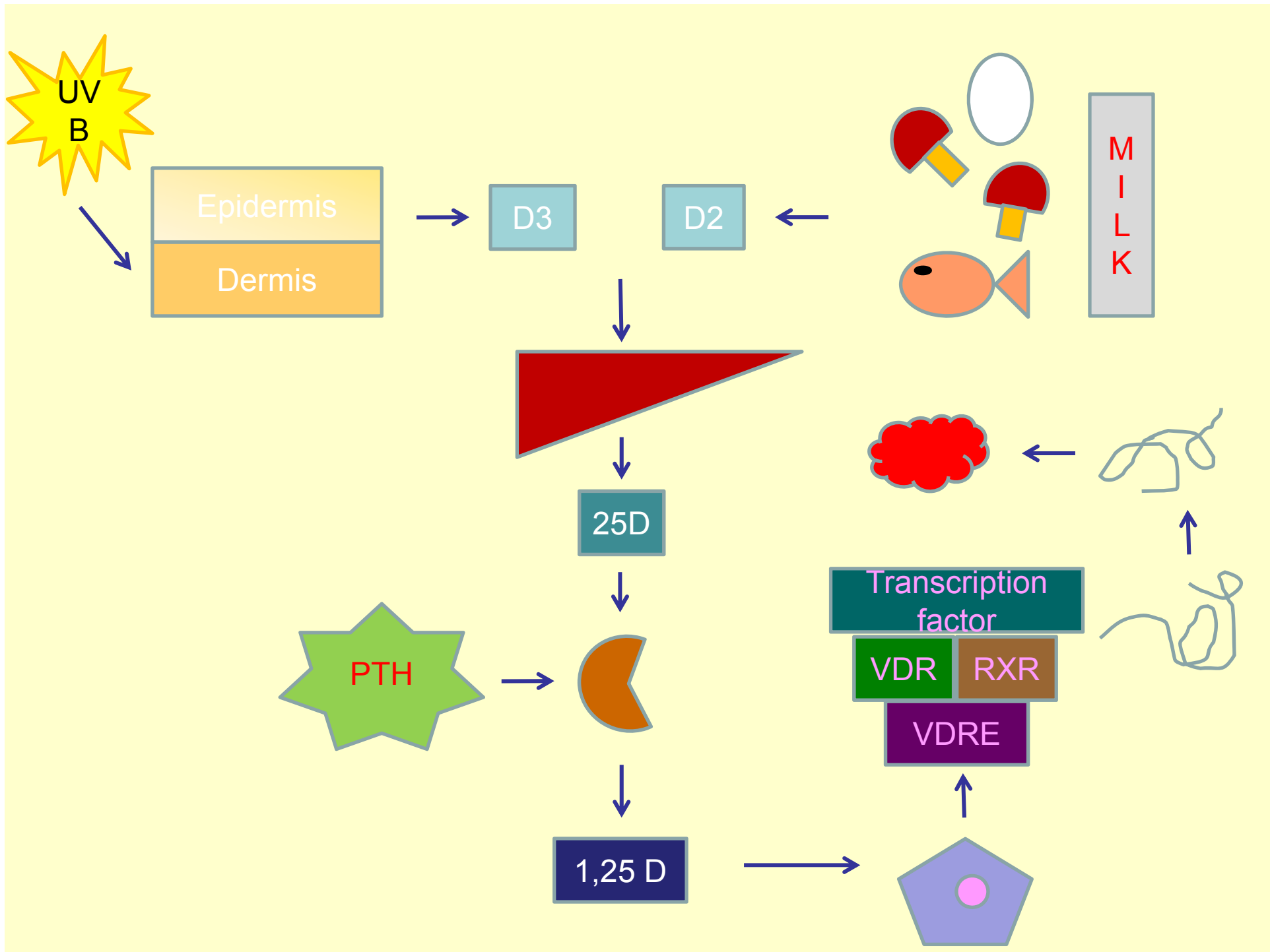
Introduction

Old thinking

- ❖ 1α-hydroxylase in renal tissues
- ❖ PTH-regulated
- ❖ VD receptors in skeletal and intestinal tissues
- ❖ Roles in calcium homeostasis

New thinking

- ❖ 1α-hydroxylase in extrarenal tissues
- ❖ Not PTH-regulated
- ❖ VD receptors in other tissues
- ❖ Possible roles in infectious and non-communicable diseases
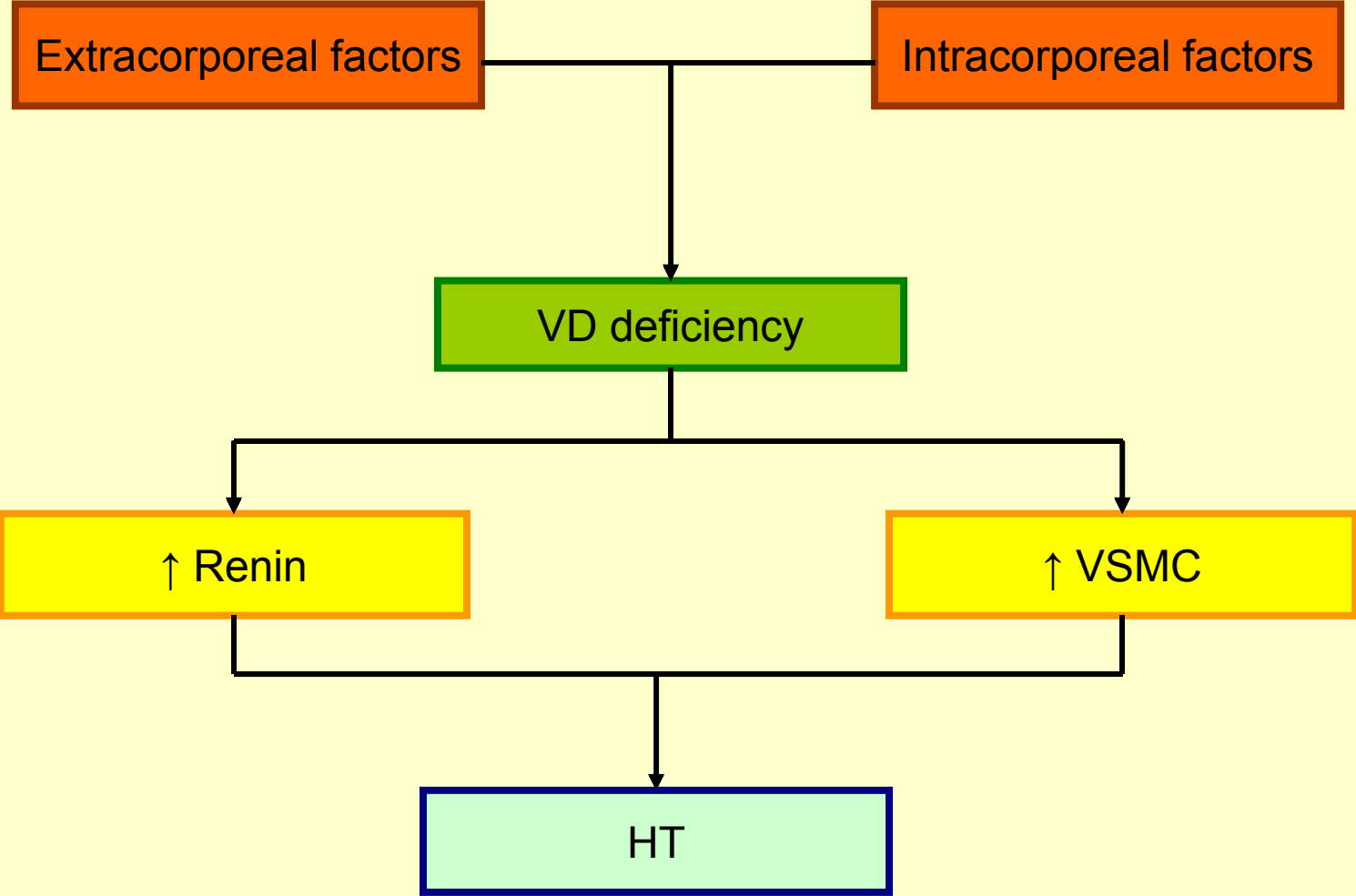
Rationale

Laboratory studies

 ❖ 1,25D suppresses renin expression from juxtaglomerular cells

 ❖ 1,25D blocks vascular smooth muscle cell (VSMC) growth

Observational studies

Interventional studies

Many support anti-HT effect of VD

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┌──────────────────────────┐         ┌──────────────────────────┐
│  Extracorporeal factors  │─────────│  Intracorporeal factors  │
└──────────────────────────┘         └──────────────────────────┘
                              │
                              ▼
                    ┌──────────────────┐
                    │  VD deficiency   │
                    └──────────────────┘
                              │
              ┌───────────────┴───────────────┐
              ▼                               ▼
      ┌──────────────┐               ┌──────────────┐
      │   ↑ Renin    │               │   ↑ VSMC     │
      └──────────────┘               └──────────────┘
              │                               │
              └───────────────┬───────────────┘
                              ▼
                    ┌──────────────────┐
                    │        HT        │
                    └──────────────────┘
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Objectives

Explore among the middle-aged, middle-class Thais living in Thailand:

Existence of vitamin D deficiency

Association between vitamin D status and hypertension

Methods

Study design
   Matched nested case-control study
Study population
   1985-1997 EGAT employees

Conditions	Case	Control
HT in 1985	no	no
HT in 1997	yes	no
Number	137	137
Matching variables	age and gender	age and gender

Baseline characteristics by cases and controls

Characteristics	Cases (n=137)	Controls (n=137)	*P*-value
Age (years)	42 (4.3)	42 (4.3)	NA
Female	118 (86)	118 (86)	NA
BMI	23.03 (2.7)	22.21 (2.5)	**0.01**
Smoking	65 (47)	62 (45)	0.72
Alcohol consumption	86 (63)	96 (70)	0.20
Diabetes	8 (6)	4 (3)	0.24
Cholesterol (mg/dl)			
Total cholesterol	219.51 (38.3)	215.20 (45.9)	0.40
HDL	45.49 (11.6)	48.18 (9.7)	**0.04**
LDL	138.80 (44.4)	140.13 (44.4)	0.80
Triglyceride (mg/dl)	155.98 (90.3)	132.15 (76.0)	**0.02**
Uric acid (mg/dl)	5.6 (1.2)	5.5 (1.4)	0.52
25(OH)D (ng/ml)	33.96 (13.9)	32.03 (12.6)	**0.23**
Vitamin D deficiency (36%)	30 (22)	42 (30)	**0.04**

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Conditional logistic regression

Cutoff values

Variables	Cutoff values	
25(OH)D	28 ng/ml	
BMI	25 kg/m^2	23 kg/m^2
HDL	35 mg/dl	
Triglyceride	200 mg/dl	

Adjusted for age and gender

HT	Odds ratio	*P* value
Vitamin D deficiency	0.59	0.05
High BMI	**2**	**0.02**
High HDL	0.5	0.05
High triglyceride	1.59	0.14

Estimated odds ratios of hypertension for vitamin D deficiency

Models	Analysis 1
Age, gender	0.59 (0.35-0.99)
Age, gender, BMI	0.60 (0.35-1.01)
Age, gender, HDL	0.55 (0.33-0.94)
Age, gender, triglyceride	0.58 (0.35-0.98)
Age, gender, triglyceride, HDL	0.55 (0.32-0.94)
Age, gender, triglyceride, HDL, BMI	0.56 (0.33-0.96)

BMI

Models	Analysis 2
Age, gender	0.59 (0.35-0.99)
Age, gender, BMI	0.59 (0.35-0.99)
Age, gender, HDL	0.55 (0.33-0.94)
Age, gender, triglyceride	0.58 (0.35-0.98)
Age, gender, triglyceride, HDL	0.55 (0.32-0.94)
Age, gender, triglyceride, HDL, BMI	0.55 (0.33-0.94)

BMI + D deficiency

Discussion

➢ D deficiency was not a rarity in Thailand

➢ D deficiency is negatively, non-causally, associated with hypertension

➢ D status did not change over time

Conclusion

➢ Vitamin D deficiency existed in Thai subjects

➢ Hypertension is associated with higher BMI

➢ Hypertension is not associated with vitamin D status