



FACULTY OF SCIENCE
MAHIDOL UNIVERSITY
WISDOM OF THE LAND



ฮอร์โมนโพรแลคติน เพื่อการดูดซึมแคลเซียมและสุขภาพกระดูก

ศาสตราจารย์ ดร. นทีทิพย์ กฤษณามระ



ศูนย์วิจัยแคลเซียมและกระดูก

Center of Calcium and Bone Research

(COCAB)



ภาควิชาสรีรวิทยา

คณะวิทยาศาสตร์

มหาวิทยาลัยมหิดล

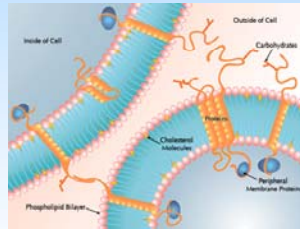


COCAB
Center of Calcium
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Faculty of Science - Mahidul University

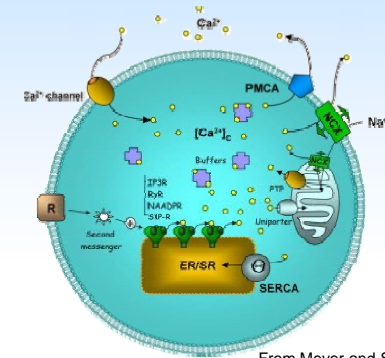


Skeletal system

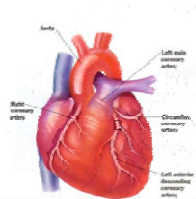
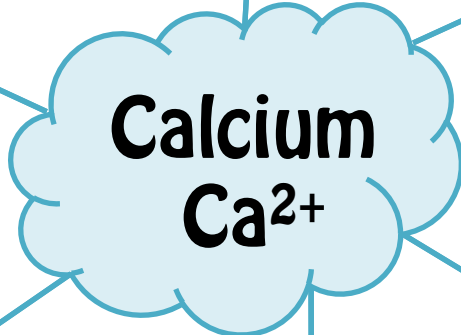
<http://www.adinstruments.com>



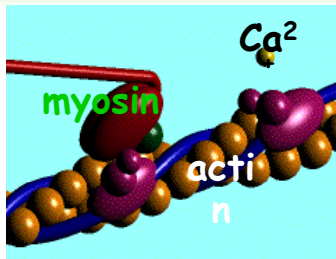
Membrane integrity



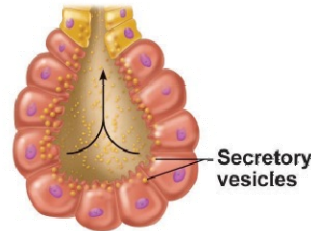
Intracellular
signal transduction



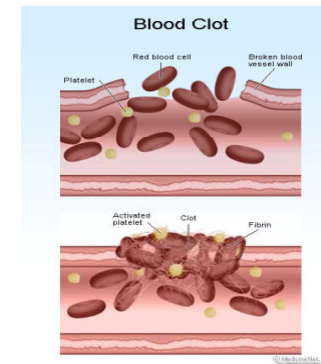
Muscle contraction



From http://www.sci.sdsu.edu/movies/actin_myosin_gif.html



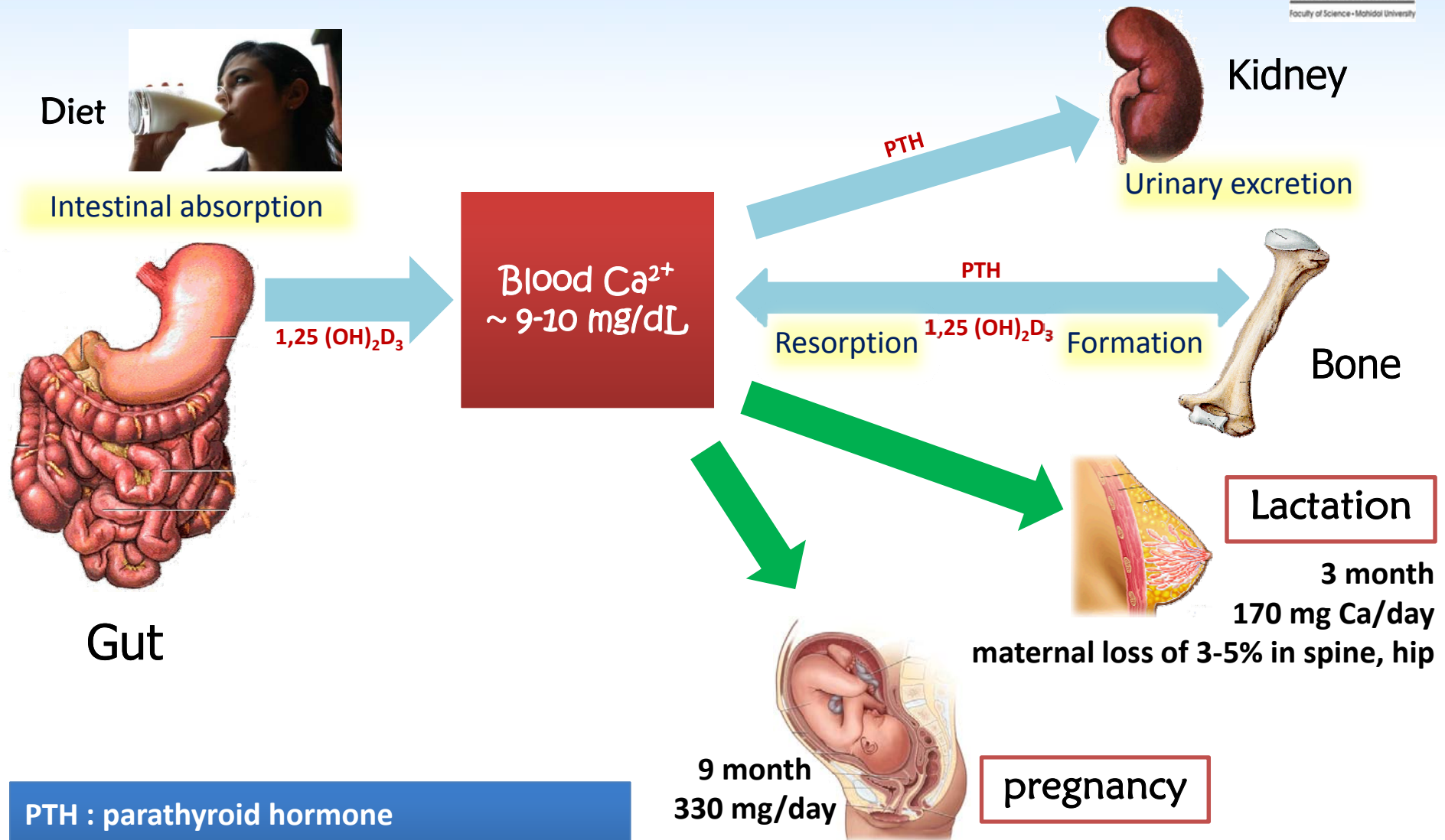
Glandular secretion



From www.emedicinehealth.com

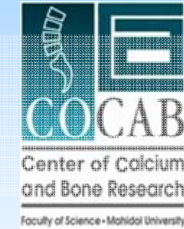
Blood clotting

Calcium Homeostasis



PTH : parathyroid hormone
 $1,25(\text{OH})_2\text{D}_3$: active vitamin D hormone

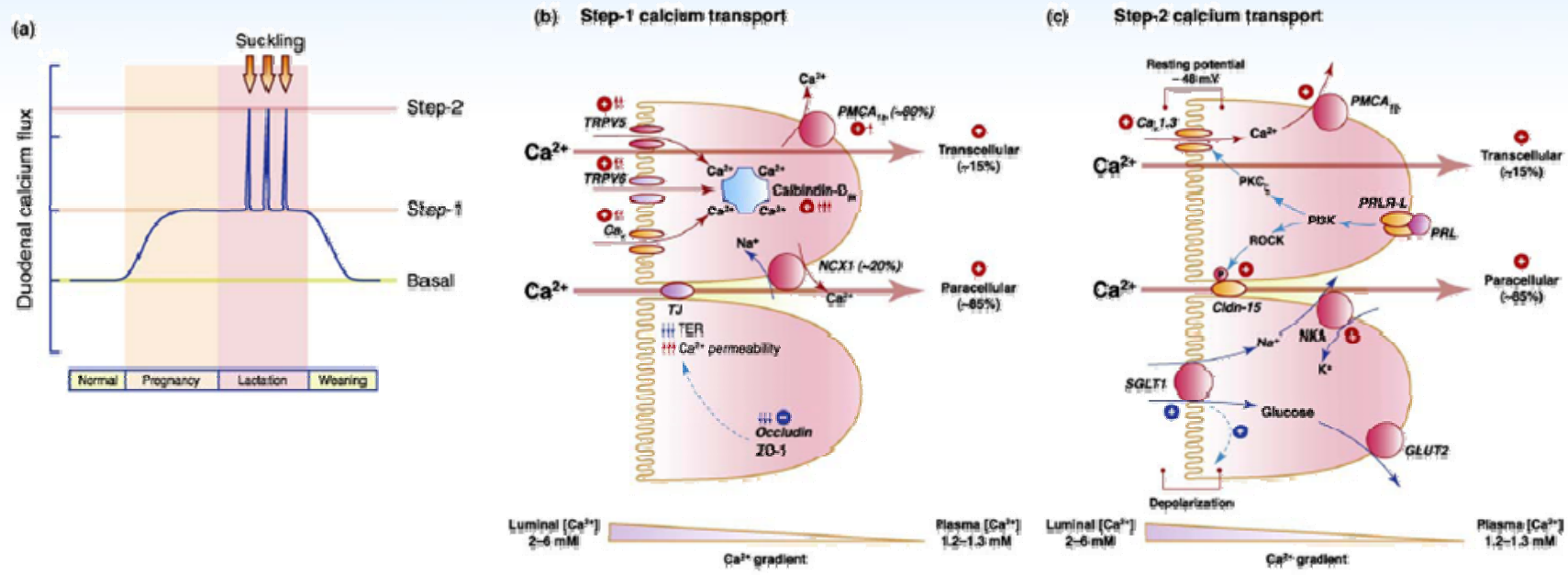
Human plasma PRL levels



Condition	Concentration (ng/mL)
Non-pregnant	7-10
Pregnant	100-200
Lactating	200-400
Suckling (15 min)	400-1,000
Prolactinoma	250-1,000

(Prentice 2000, Bowman & Miller 2001)

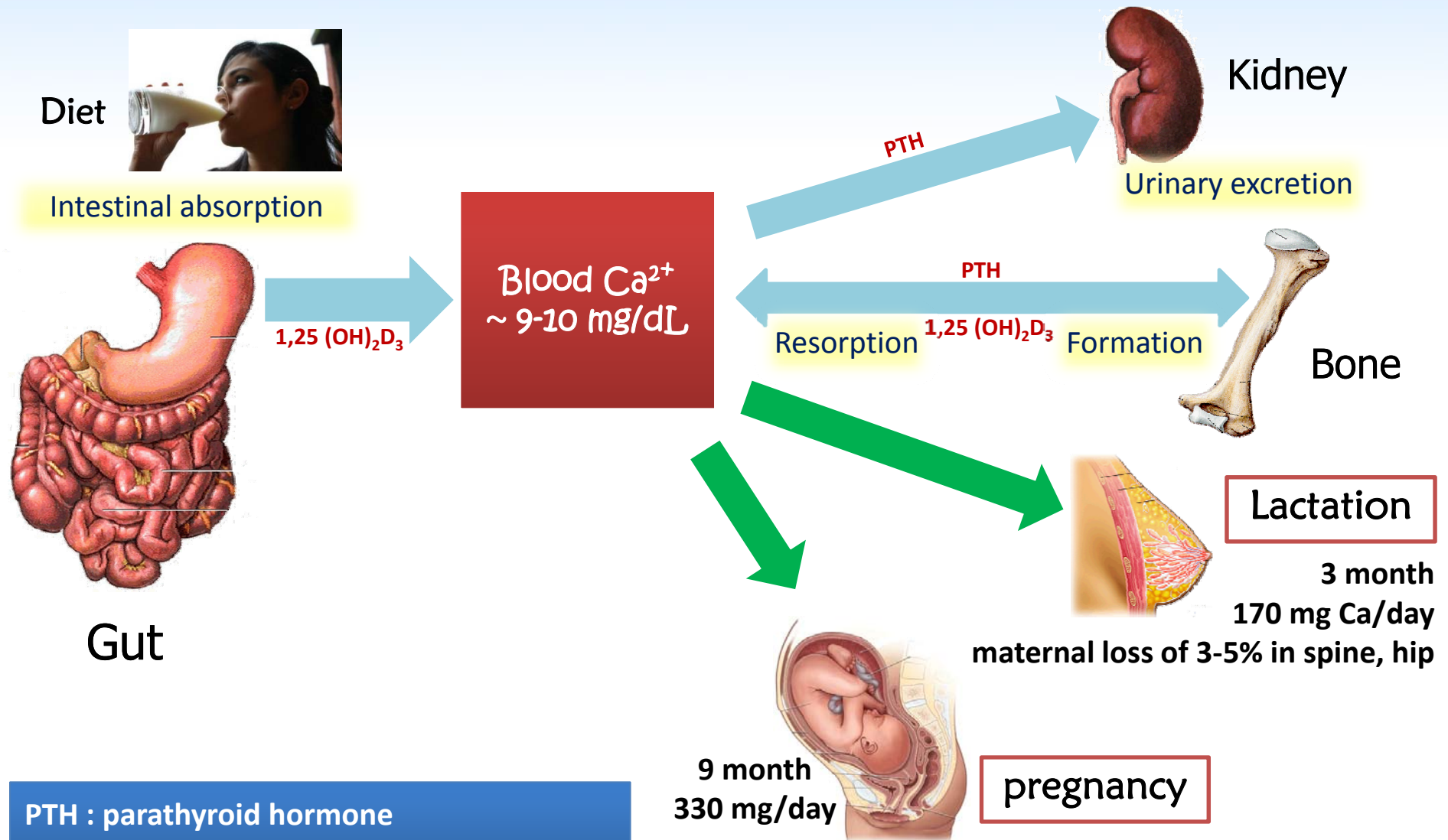
PRL-R expression in intestine, kidney and bone indicates a direct calciotropic action of PRL in these organs.



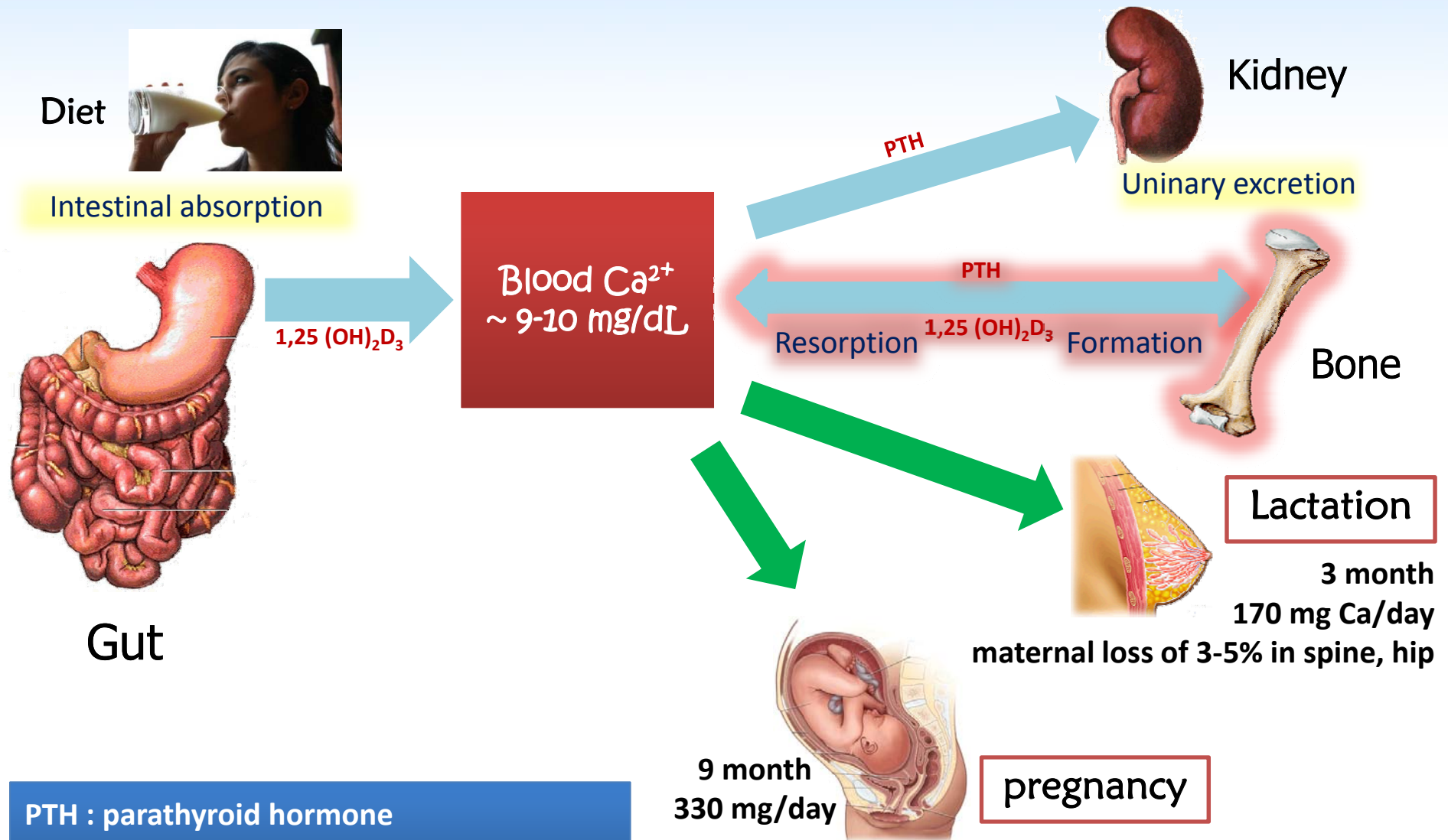
Key:

- Transport of calcium
- Transport of other substances
- Signaling pathway of PRL
- Hypothetical pathway
- ⊕ Upregulated (Step-1) / stimulated (Step-2) by PRL
- ⊕ Possibly stimulated by PRL
- ⊖ Downregulated by PRL
- Ⓟ Phosphorylation induced by PRL

Charoenphandhu N, Wongdee K, Krishnamra N. Is prolactin the cardinal calciotropic maternal hormone? Trends in Endocrinology & Metabolism 2010; 21(5): 395-456.



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Anterior pituitary tumor

Klibanski et al. 1980, Greenspan et al. 1986

Antipsychotic drug

Marken et al. 1992, Borison et al. 1996

Prolonged lactation

Cross et al. 1995, Lopez et al. 1996, Krebs et al. 1997, Tojo et al. 1998

Hyperprolactinemia

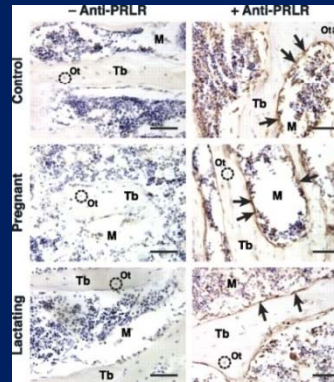
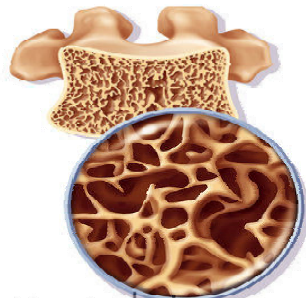
Rationale

Hypogonadism

•Hyperprolactinemia without hypogonadism is a risk factor for decrease in bone density.

(Biller et al. 1992, Meaney and Keane 2003)

Osteoporosis

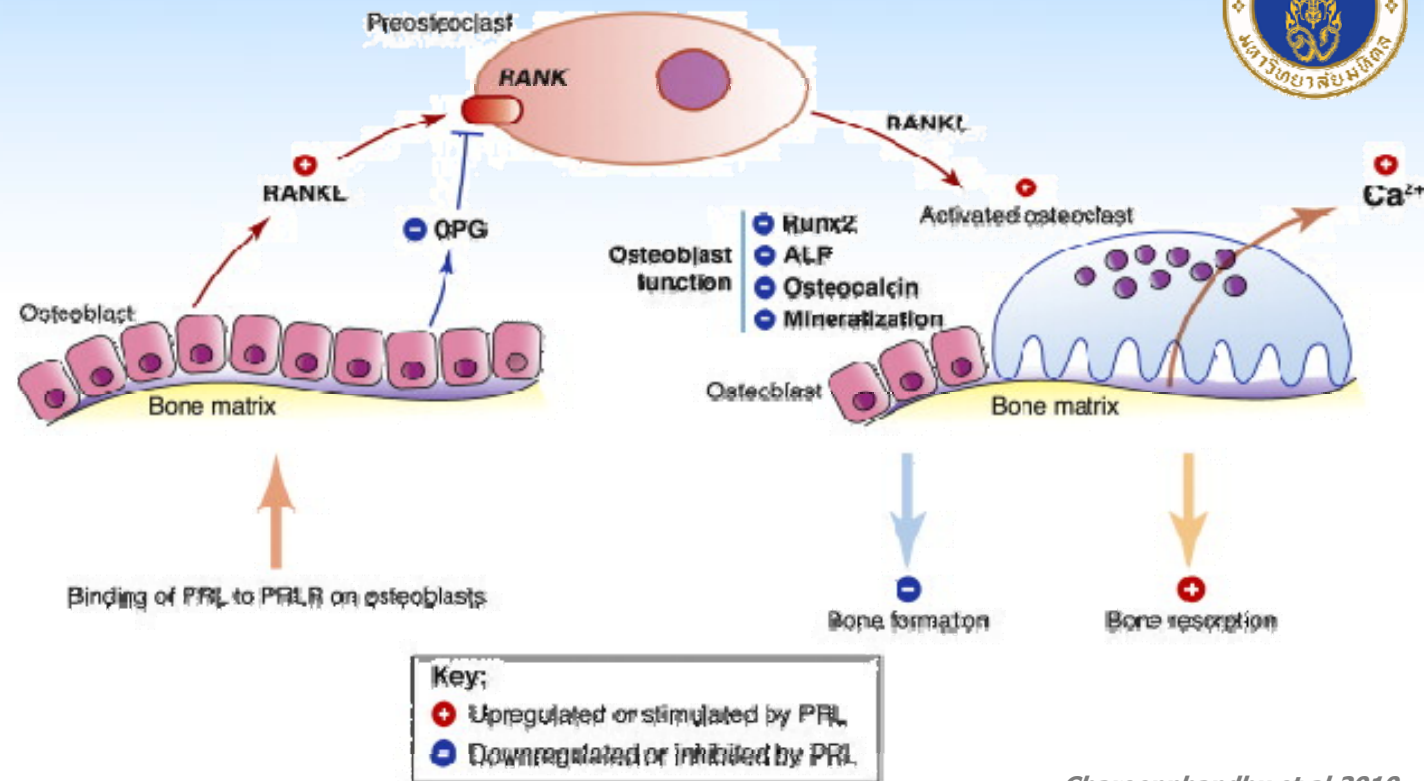


•PRL-R are present in bone.

(Suntornsaratoon et al. Am J Physiol Endocrinol Metab 2010)

Hypothesis

Prolactin could regulate bone remodeling by acting directly on the bone forming cell, osteoblast.



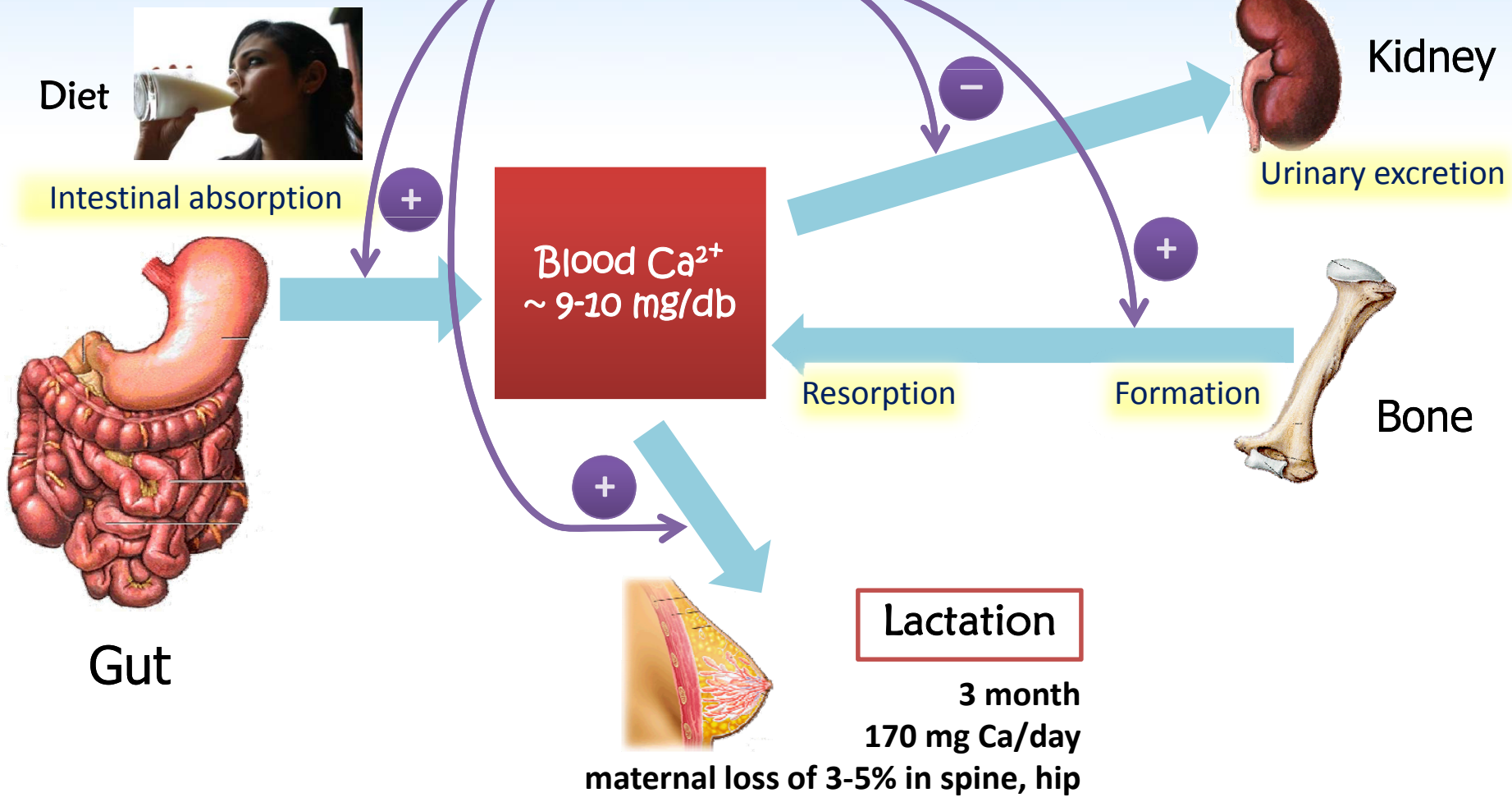
Charoenphandhu et al. 2010
TRENDS in Endocrinology & Metabolism

Possible mechanism of PRL-enhanced bone resorption in late lactation. PRL exerts a direct action on bone through osteoblasts because osteoclasts do not express PRLR. Binding of PRL to PRLR on osteoblasts upregulates the expression of the receptor activator of nuclear factor- κ B (RANK) ligand (RANKL), and downregulates osteoprotegerin (OPG), a decoy factor that blocks the RANKL–RANK interaction. After binding to its receptor RANK, RANKL induces osteoclastogenesis, activates osteoclasts, and maintains the survival of activated osteoclasts, thereby inducing bone demineralization to release more calcium into the plasma. PRL also suppresses osteoblast functions by decreasing the expression of *Runt*-related transcription factor (Runx)-2, alkaline phosphatase (ALP) and osteocalcin, as well as the osteoblast-induced matrix mineralization. **The net result of PRL action on bone is therefore to stimulate bone resorption and inhibit bone formation.**

Pituitary Gland

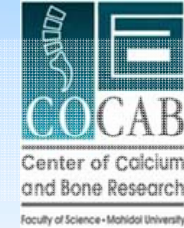


PROLACTIN



Prolactin is a calcium regulating hormone in lactation

Acknowledgements



- Thailand Research Fund. Senior Research Scholar Award (เมธีวิจัยอาวุโส สกว.)
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Thank
You

