

嬰幼兒營養常見問題



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嬰幼兒營養常見問題

1. 副食品的添加

- a. 副食品添加時機與方式，如何降低挑食營養不良的技巧，餵食的態度與方法。
- b. 綜合維他命添加時機，母乳嬰兒完全拒絕副食如何處理。

2. 配方奶的選擇。固體食物開始時間及方法。

3. 斷奶相關問題

4. 為什麼長不大

5. 寶寶溢吐奶及餵奶不順

6. 父母認為身高體重不足

益生菌的角色

母乳哺育營養問題(添加鐵劑及維生素D的時機)

母乳哺育親餵與瓶餵的迷思

❖ 嬰兒的理想營養：

1. 營養需要性
2. 嬰兒對營養質的耐適度
3. 長期食用造成的結果



Breast feeding



嬰兒配方

- 歷史
- 定義與條件
- **Infant Formula Act (1980 , U.S.A.)**
- 嬰兒配方食品(**1991** , 中央標準局)



Iron

Breast feeding

Full-term, breastfed infants need approximately 1 mg/kg/day of supplemental iron at 4 to 6 months of age, preferably from complementary foods.

Formula-fed

All formula-fed infants should receive only iron-fortified infant formula during the first year of life.

Infants should not drink cow's milk, goat's milk, or soy-based beverages because they contain a small amount of iron that is poorly absorbed by infants. Consumption of these milks may lead to iron deficiency anemia.



Nutritional rickets among children in the United States: review of cases reported between 1986 and 2003.

Weisberg P, Scanlon KS, Li R, Cogswell ME
Am J Clin Nutr. 2004;80(6 Suppl):1697S.

reviewed 166 published cases of **rickets** in children 4 to 54 months old
between 1986 and 2003, and reported that **96 %** of the affected
children were **breast-fed**

Exclusive breastfeeding for the first 4~6 months of life

足月正常嬰兒：

- 全母乳4~6個月
- 之後除繼續哺餵母乳外
需添加適當副食品
直到 1~2歲

A supplement of 400 IU per day of vitamin D is recommended for all breastfed infants.

American Academy of Pediatrics, November 2008

While Australia's breastfeeding initiation rate is currently high at 96%, only 15% of infants are exclusively breastfed to around 6 months.

The Effect of Oral Vitamin D3 Supplementation in Breastfeeding Newborns



新竹馬偕紀念醫院小兒科部¹;婦產科部²;
馬偕兒童醫院兒童內分泌科³;兒童胃腸科⁴;新生兒科⁵;
交通大學生物科技學系⁶

Maternal vitamin D (N=92)

- Mean 25 (OH)D : 16.88ng/ml \pm 7.04 (5.4-35.4)

- < 10 ng/ml : 15.2% (N=14)
- 10-20 ng/ml : 54.3% (N=50)
- 20-30 ng/ml : 22.8% (N=21)
- \geq 30 ng/ml : 7.70% (N=7)

<20 ng/ml \rightarrow 69.5%

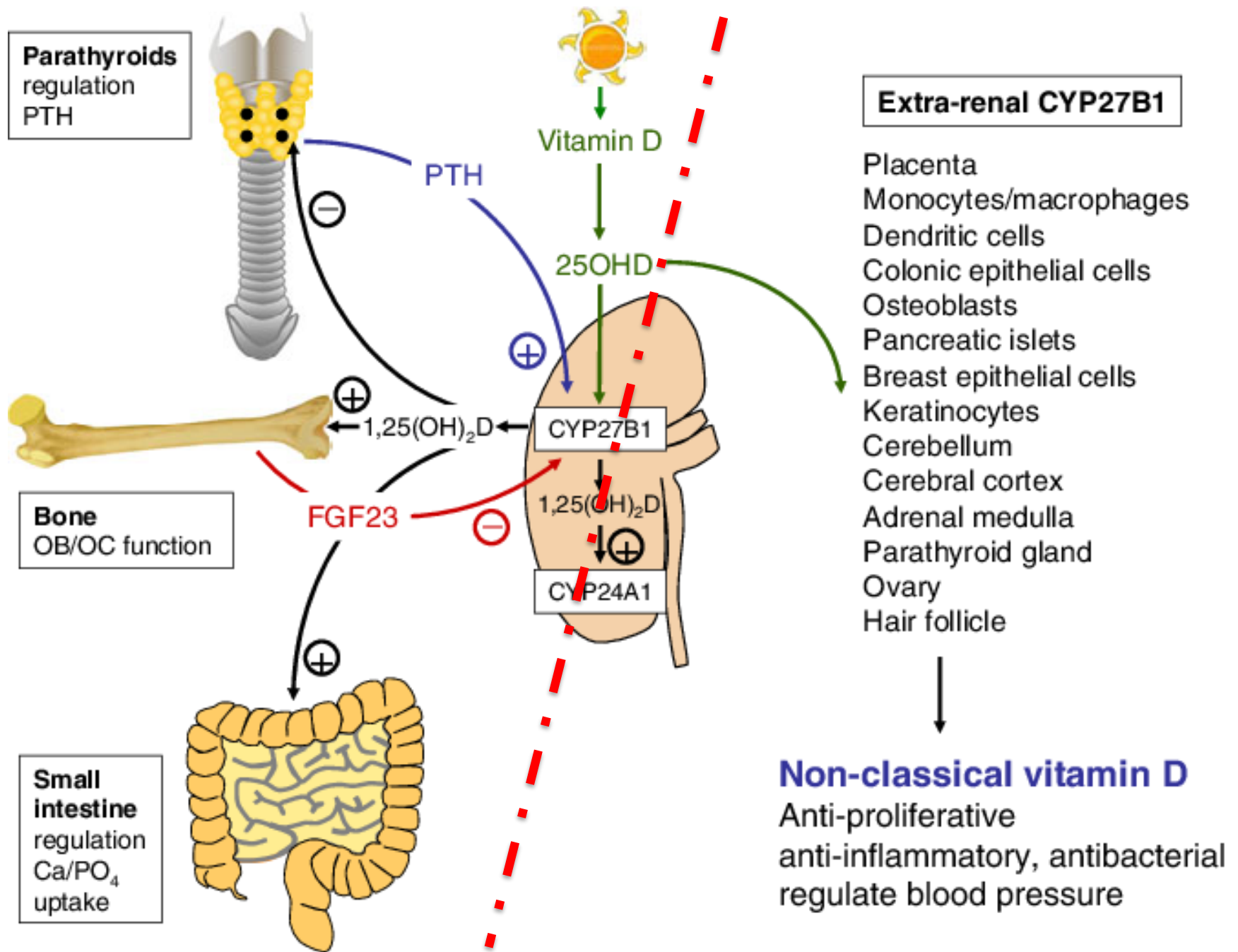
<30 ng/ml \rightarrow 92.3%

| Parameters | 400 IU (N=37) at Birth | at 4 m/o | Placebo (N=35) at birth | at 4m/o |
|-----------------|------------------------------|---------------------------|-------------------------------|-------------------------|
| 25(OH)D (ng/ml) | 16.34± 6.47 | 38.61±9.24 (16.7-60.3) | 17.42± 7.60 | 13.59± 8.78 (4-36.9) |
| < 10ng/ml | | 0 | | 45.7%(16) |
| 10-20 ng/ml | 64.8%(24) | 2.7%(1) | 54.3%(19) | 31.4%(11) |
| 20-30 ng/ml | 27%(10) | 18.9%(7) | 40% (14) | 20%(7) |
| ≥ 30 ng/ml | 8.1%(3) | 78.4%(29) | 5.7% (2) | 2.9%(1) |

DEFINING VITAMIN D SUFFICIENCY

1. Serum 25-hydroxyvitamin D — Vitamin D sufficiency is estimated by measuring 25-hydroxyvitamin D (25[OH]D or **calcidiol**) concentrations.
2. The optimal serum 25(OH)D concentration for skeletal health is controversial.
3. Based upon the trials of vitamin D supplementation and the Institute of Medicine (IOM) systematic review, some experts, including some UpToDate editors, favor maintaining the serum 25(OH)D concentration **between 20 and 40 ng/mL** (50 to 100 nmol/L), whereas other experts, including other UpToDate editors and the author of this topic, favor maintaining 25(OH)D levels **between 30 and 50 ng/mL** (75 to 125 nmol/L).
4. Thus, the range of common agreement is 30 to 40 ng/mL (75 to 100 nmol/L).
Experts agree **that levels lower than 20 ng/mL are suboptimal for skeletal health.**
5. The optimal serum 25(OH)D concentrations **for extraskeletal health** have not been established.

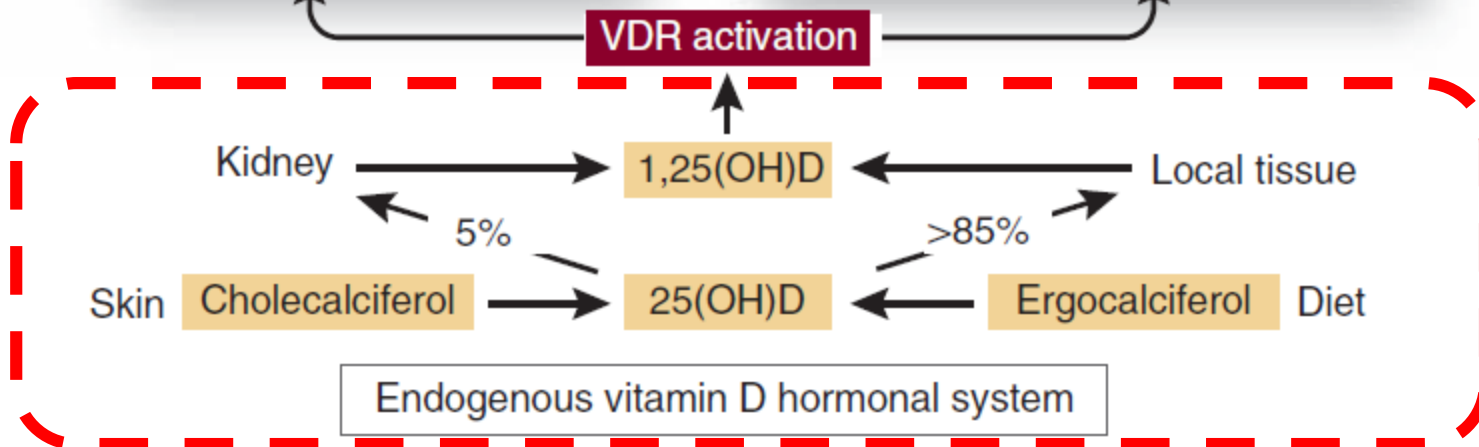
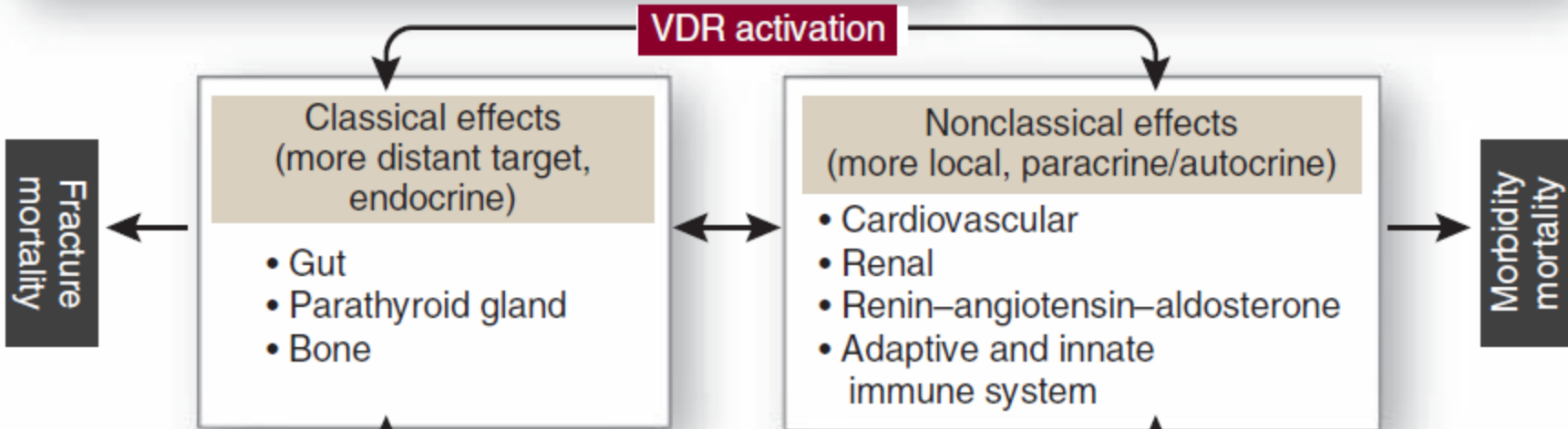
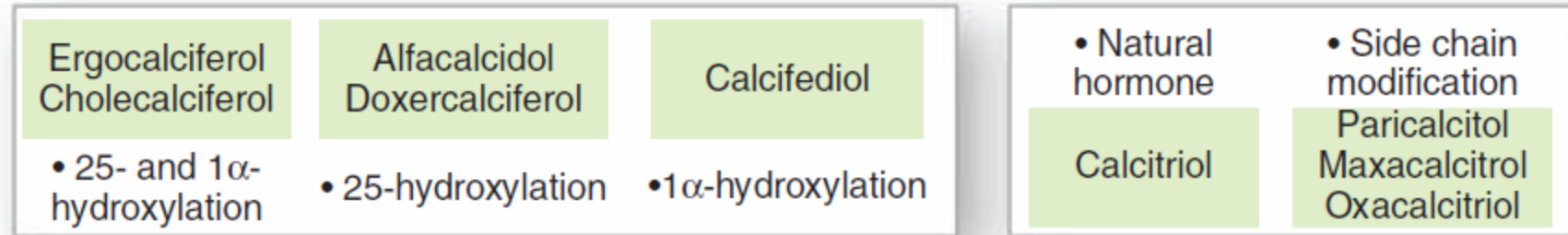




Vitamin D receptor-activating compounds

After intake needs enzymatic activation

Already active



CALCITRIOL

活性



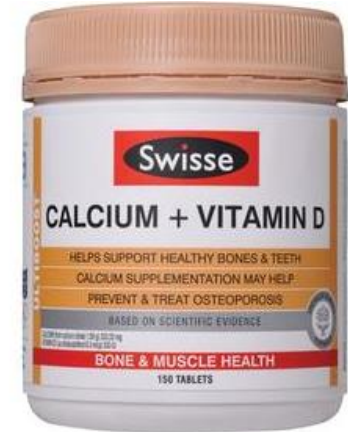
Mega doses of isolated nutrients can be harmful.

Benefits are highly limited.



Cholecalciferol

非活性



親餵與瓶餵

親餵、瓶餵寶寶喝到營養有差嗎？

產後4至6週內，先從親餵開始

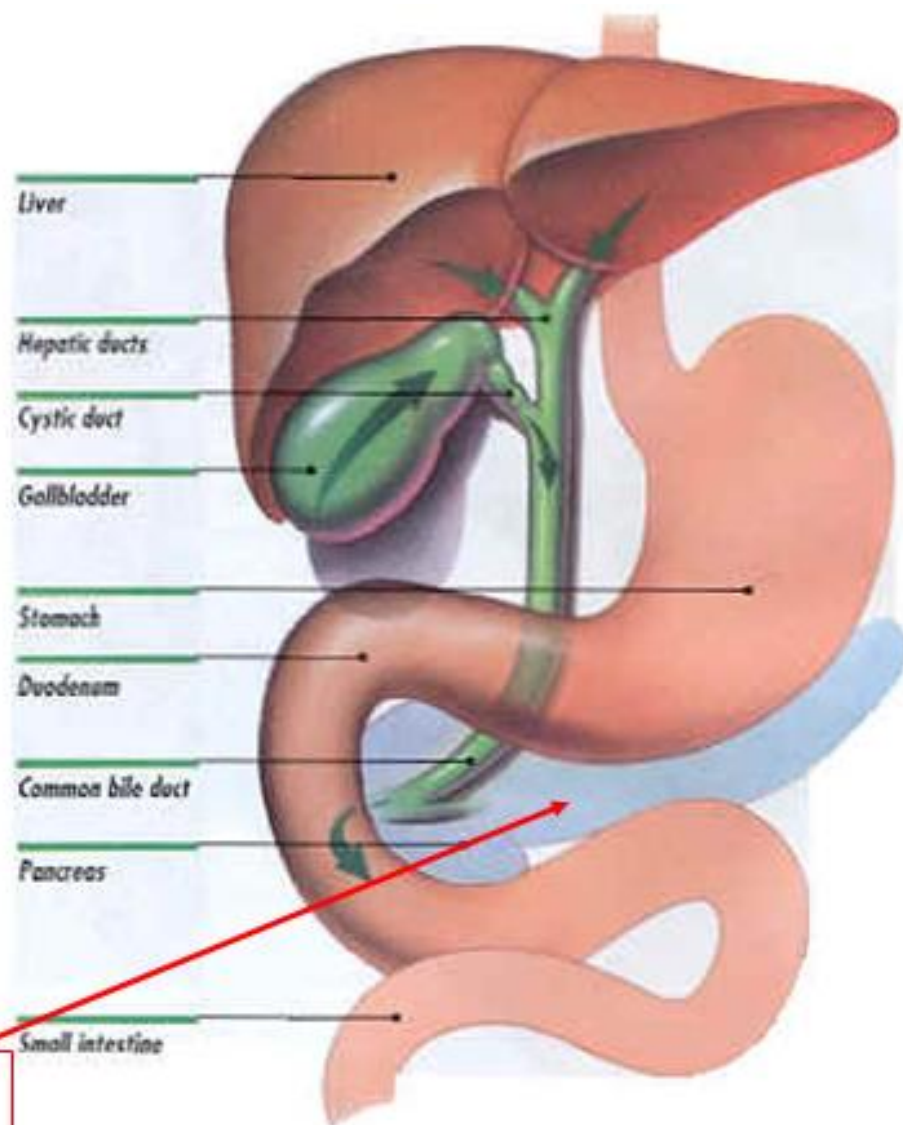


固體食物的添加(1)

- 何時進場？
- 添加何種食物？
- 如何添加？



- 胰臟分泌澱粉酶、脂肪酶和許多分解蛋白質的酵素，參與「澱粉、蛋白質、脂肪」之消化。約四~六個月之後的嬰兒，胰臟才開始慢慢成熟



胰臟

固體食物的添加(2)

- 凡 穀類食物 — **single grain foods, initially**
- 水果 / 蔬菜 — **single ingredient, initially**
Apple sauce, peaches, pears, carrots, green beans...
- 柑橘類較易過敏
- 1~2 y/o 飲食中最易發生缺失的營養品
Ca, Iron, Zinc, Folic acid

Vitamin D

Fruit Juice in Infants, Children, and Adolescents: Current Recommendations

.....From the American Academy of Pediatrics Policy Statement ([Pediatrics](#) May 2017)

1. Fruit juice offers **no nutritional benefits** for infants younger than 1 year.
2. Fruit juice offers no nutritional benefits over whole fruit for infants and children and has no essential role in healthy, balanced diets of children.
3. One hundred percent fresh or reconstituted fruit juice can be a healthy part of the diet of children older than 1 year when consumed as part of a well-balanced diet. Fruit drinks, however, are not nutritionally equivalent to fruit juice.
4. **Juice is not appropriate in the treatment of dehydration** or the management of diarrhea.
5. Excessive juice consumption may be associated with malnutrition (overnutrition and undernutrition).
6. Excessive juice consumption is associated **with diarrhea, flatulence, abdominal distention,** and tooth decay.
7. **Unpasteurized juice products** may contain pathogens that can cause serious illnesses and should be given to children cautiously, if at all.
8. A variety of fruit juices, provided in appropriate amounts for a child's age, are not likely to cause any significant clinical symptoms.
9. **Calcium-fortified juices provide a bioavailable source of calcium and often vitamin D but lack other nutrients** present in human milk, infant formula, or cow milk.

固體食物的添加(3)

• 高熱量食物 rather than
高蛋白食物

• 蛋白 vs. 蛋黃

• 2歲以下不必

低脂低膽固醇飲食



©2000000

嬰兒配方

- 一般嬰兒 / 較大嬰兒
 - 早產兒 / 低出生體重
 - 腹瀉 / 乳糜瀉
 - 過敏
 - 特殊疾病(肝膽病、腎臟病.....)
 -
- ✉ 新陳代謝疾病特殊配方

較大嬰兒配方

- Start infant formula
- Follow up (on) formula
- Follow up (on) infant formula



- 不耐受性

(Intolerance)

-- dose dependent

- 過敏

(Allergy, Hypersensitivity)

-- dose independent

原發性(Primary)醣不耐受性

1.先天性(Congenital)

雙醣酵素缺乏

蔗糖-麥芽糖 不耐

乳糖不耐

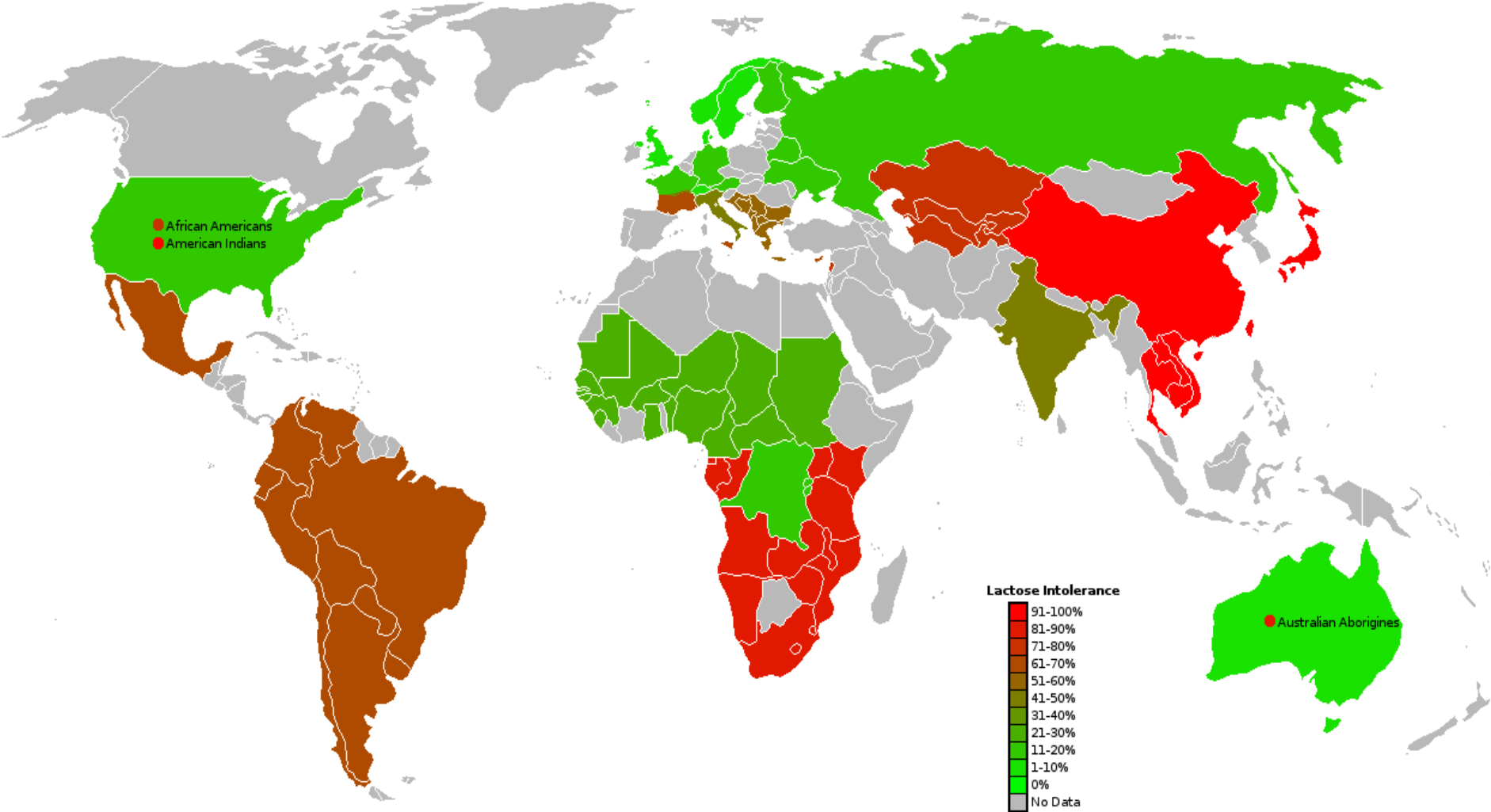
單醣不耐

2.個體發生學性(Ontogenetic) ... 乳糖

早發型 (Early onset) 3~7 天

晚發型 (Late onset) > 2~5 歲

Ontogenetic Lactose Intolerance



續發性醣不耐受性

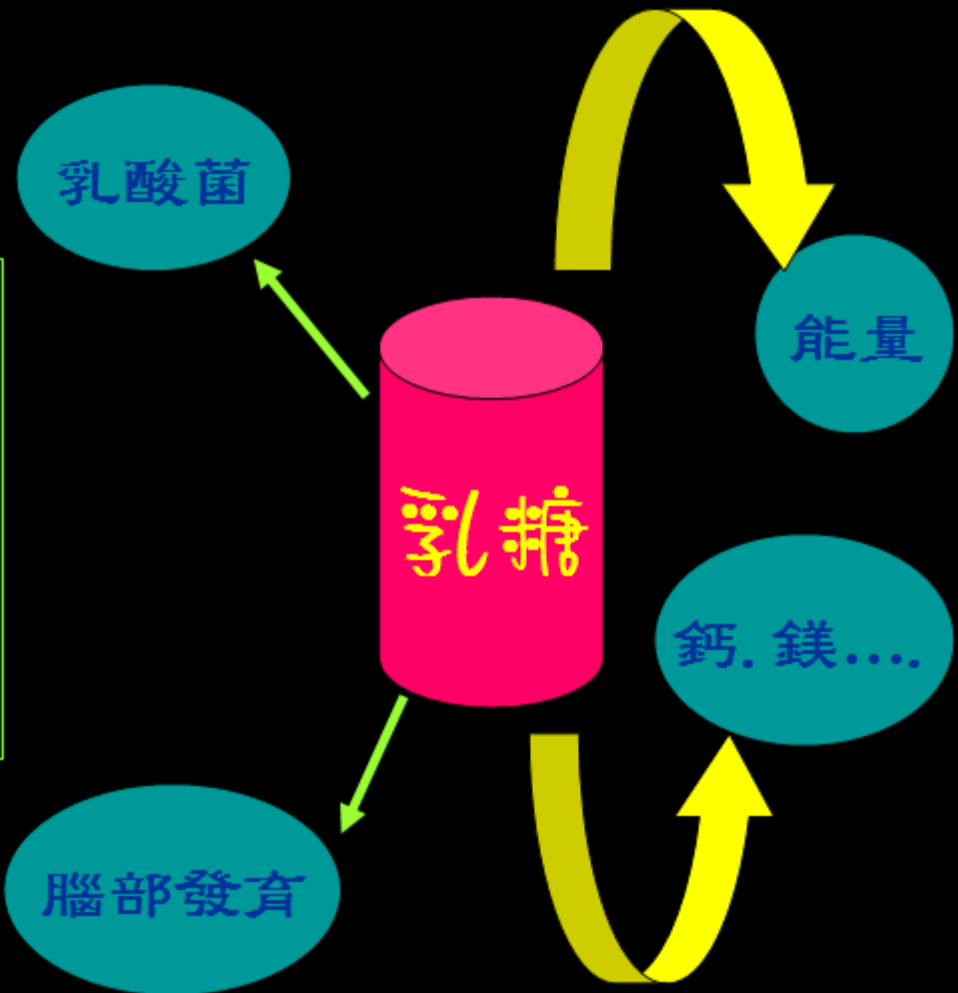
雙醣酵素缺乏

乳糖不耐

蔗糖-麥芽糖 不耐

多醣不耐

單醣不耐



牛奶蛋白過敏之治療：

- **Casein?**
- **Soy protein?**
- **Goat's milk protein?**
- **Casein hydrolysate?**
- **Whey hydrolysate?**
- **Elemental diets?**
(Vivonex, Vivonex pediatric,....)

水解蛋白配方

- 全水解
- 半水解

分子量



水解蛋白配方的预防效果取决于水解过程能否降低水解产物的过敏原性。所以，并非所有的水解蛋白配方都有过敏预防作用

Normal Barrier Function Between Intestine Cells

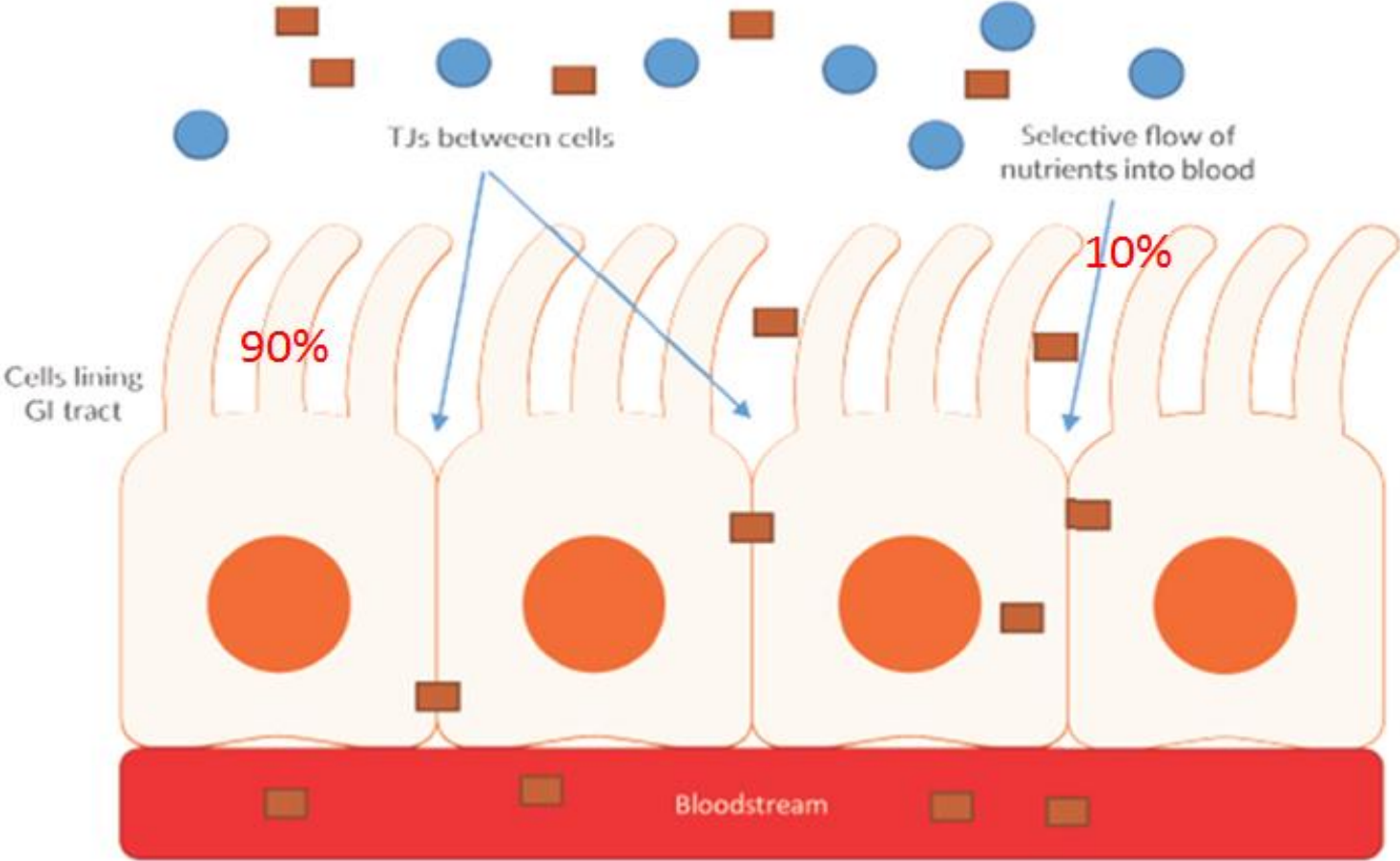
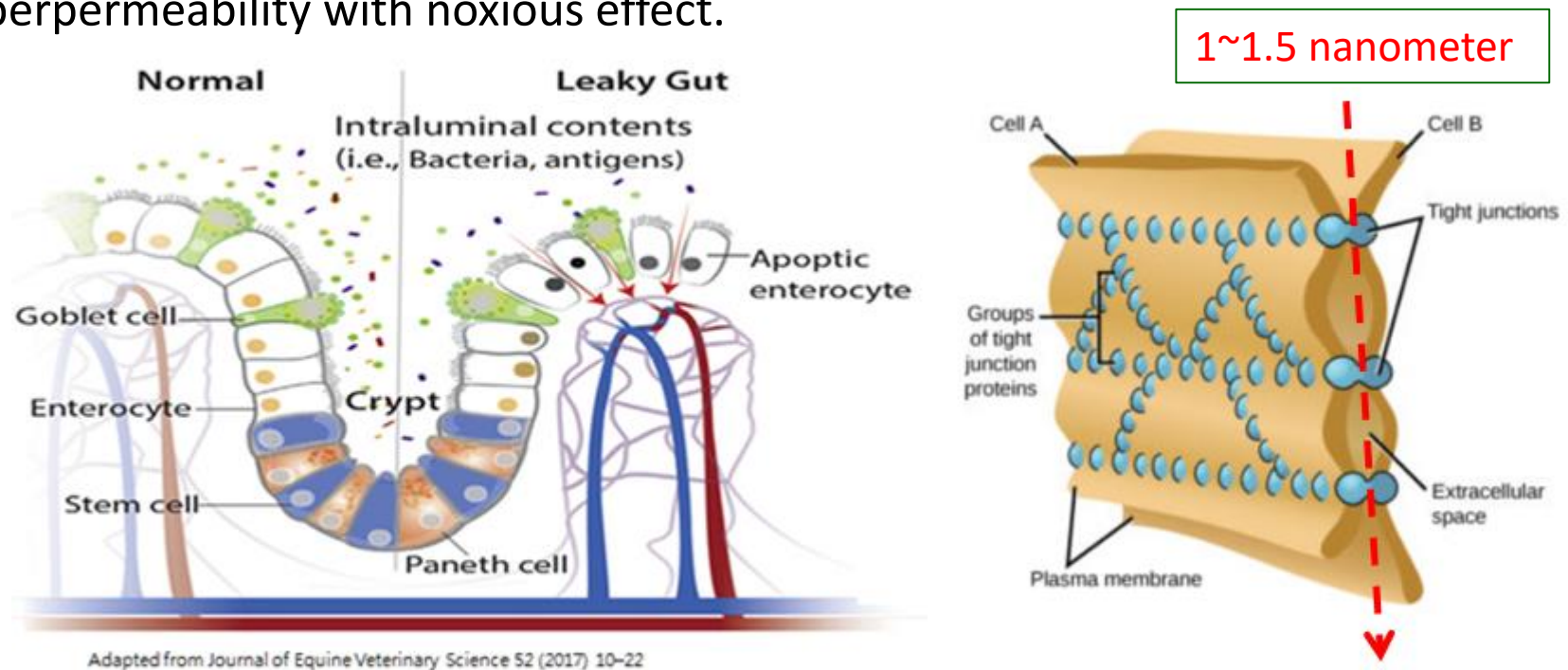


Image courtesy of ALPCO, Salem, NH

1. Exchange between the intestinal lumen and submucosa of proteins can occur via two mechanisms: [transcellular transport](#) (via endo-/exocytosis) and [paracellular transport \(via TJs\)](#) subject to molecular weight.
2. Molecules sized 1–1.5 奈米 are transported paracellularly, meaning ‘beside’ cells, through modulation of TJs.
3. Macromolecules greater than 15 Å however are too large and are not trafficked across the epithelial layer in the presence of competent TJs (**Fasano**, 2008). Malfunctioning TJs due to incorrect assembly will therefore cause intestinal hyperpermeability with noxious effect.

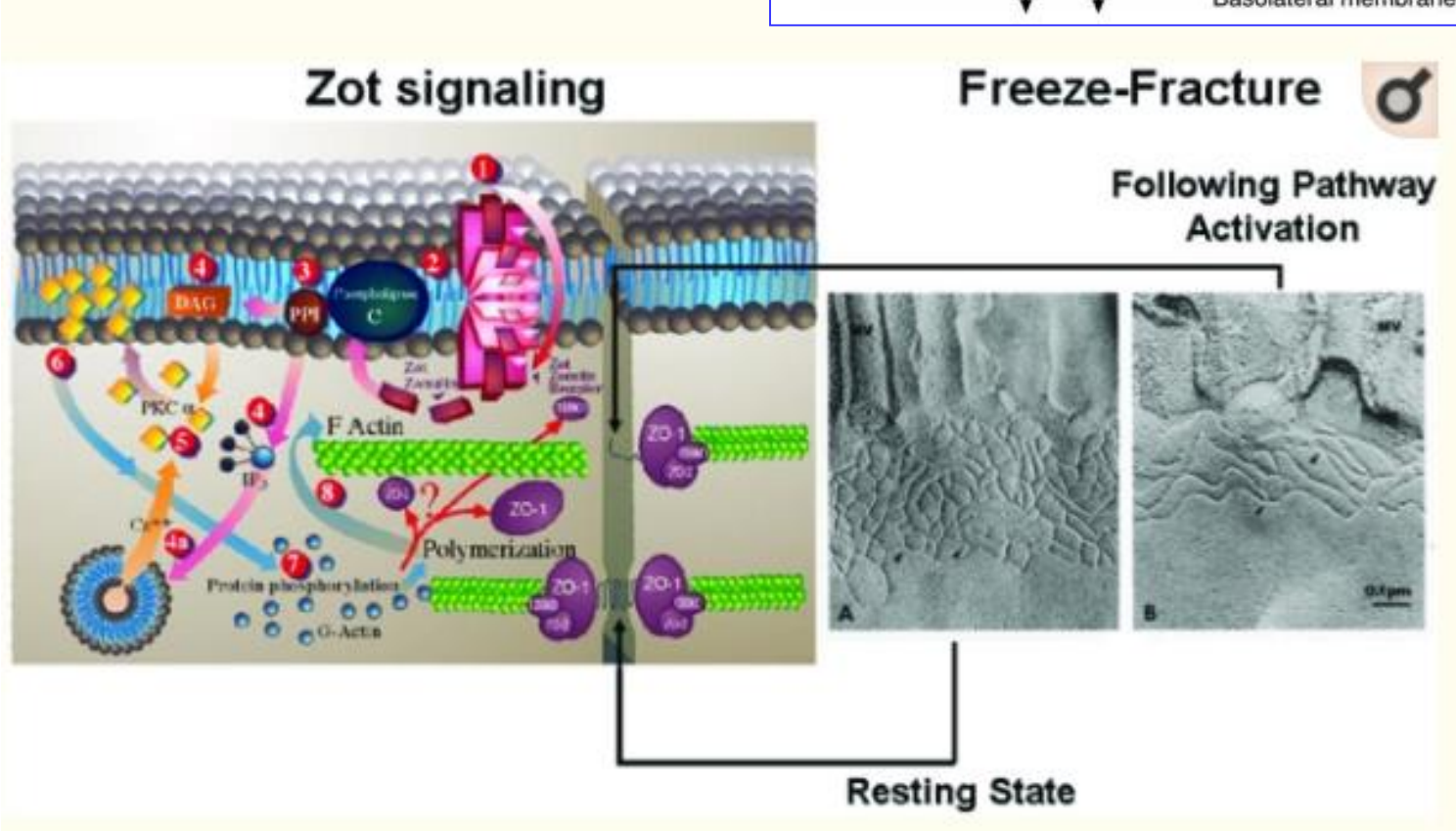
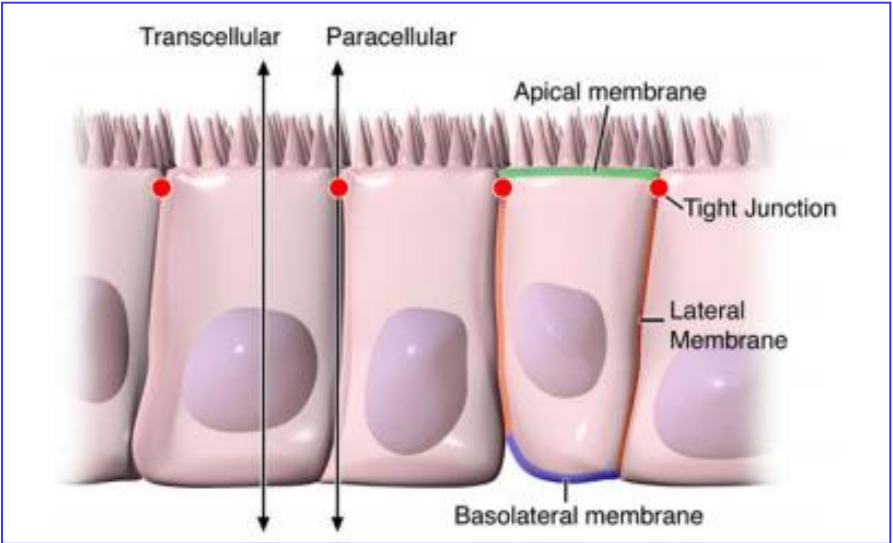




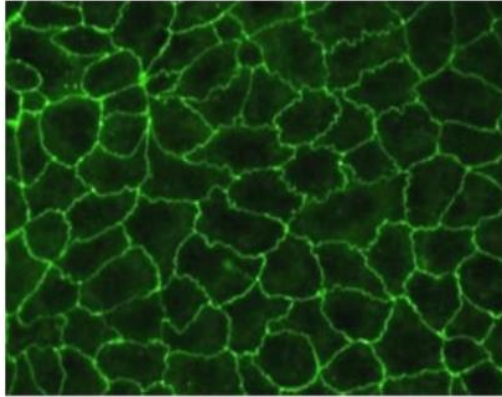
Dr. Alessio Fasano
 Director
 Center for Celiac Research
 Mass General Hospital
 for Children

Zot: Zonula occludens toxin
 (secreted by cholera pathogen)

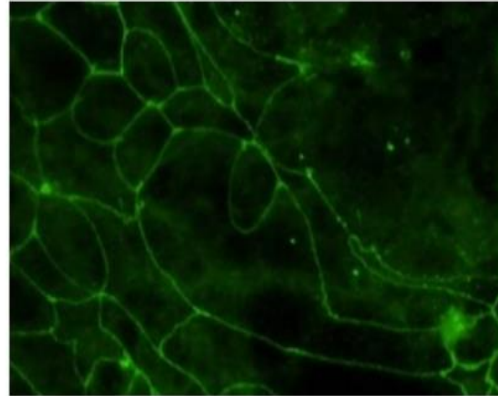
Zonulin : Zot analogue



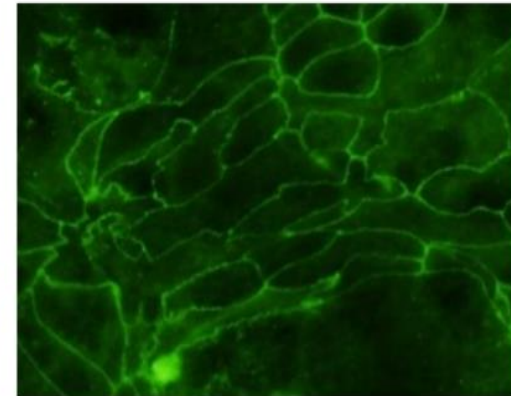
The appearance of tight junction protein ZO-1 after LPS stimulation



A: Normal situation



B: LPS 3 hours

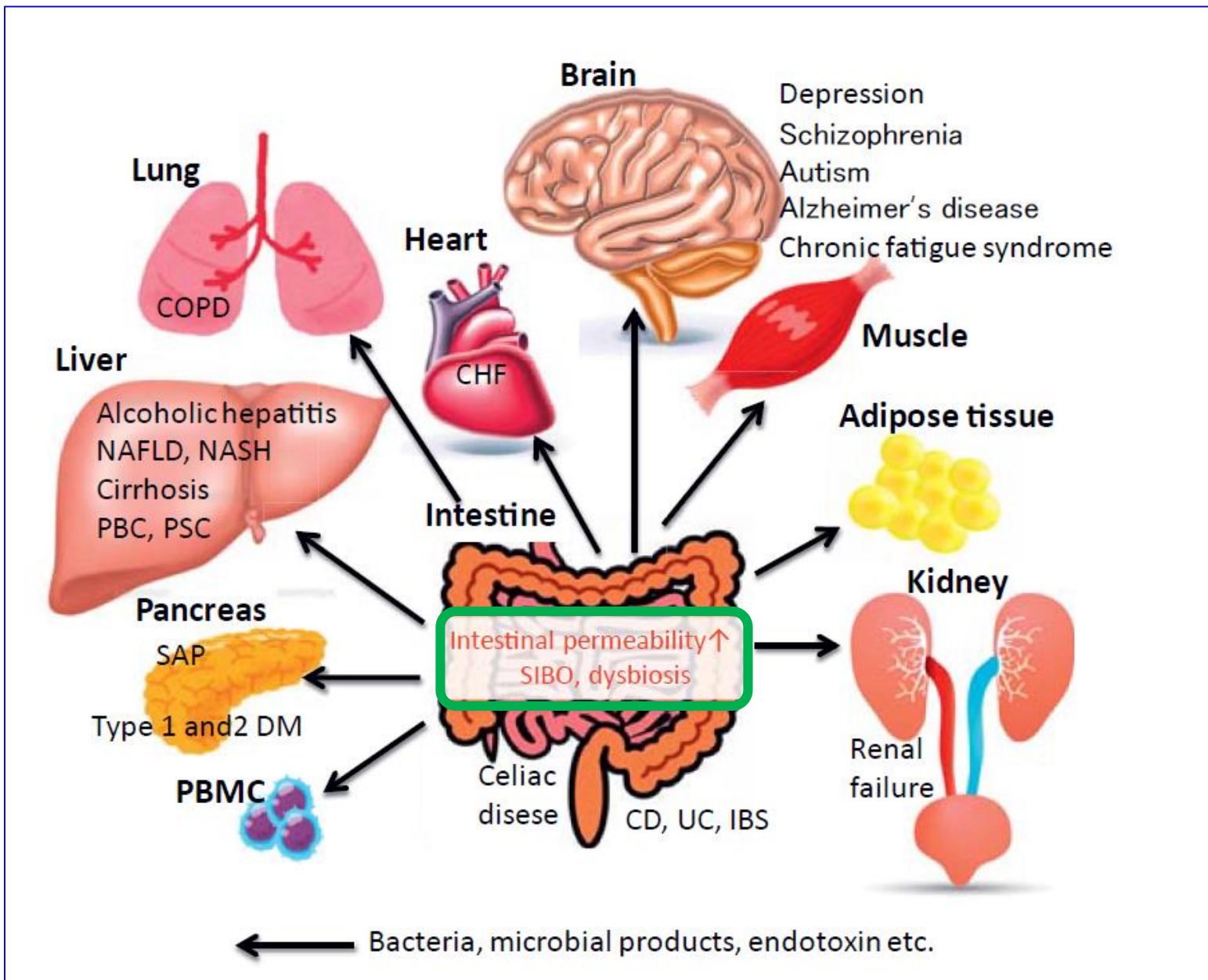


C: LPS 3 hours → medium 24 hours

***In Vitro* Prevention of *Salmonella*
Lipopolysaccharide-Induced Damages in Epithelial
Barrier Function by Various *Lactobacillus* Strains**

(Gastroenterology Research and Practice, 2013)

Chun-Yan Yeung,^{1,2,3,4} Jen-Shiu Chiang Chiau,⁵ Wai-Tao Chan,^{1,2,3} Chun-Bin Jiang,^{1,2}
Mei-Lien Cheng,⁵ Hsuan-Liang Liu,³ and Hung-Chang Lee^{6,7}



Frederick J. Angulo, Section Editor

Clinical Infectious Diseases 2006; 42:996–1002

2006 by the Infectious Diseases Society of America.

Enterobacter sakazakii: An Emerging Pathogen in Powdered Infant Formula

D. Drudy,¹ N. R. Mullane,¹ T. Quinn,¹ P. G. Wall,² and S. Fanning¹

¹Centre for Food Safety, School of Agriculture, Food Science and Veterinary Medicine, and ²School of Public Health and Population Science, University College Dublin, Ireland

Enterobacter sakazakii represents a significant risk to the health of neonates. This bacterium is an emerging opportunistic pathogen that is associated with rare but life-threatening cases of meningitis, necrotizing enterocolitis, and sepsis in premature and full-term infants. Infants aged <28 days are considered to be most at risk. Feeding with powdered infant formula (PIF) has been epidemiologically implicated in several clinical cases. Infants should be exclusively breast-fed for the first 6 months of life, and those who are not should be provided with a suitable breast-milk substitute. PIF is not a sterile product; to reduce the risk of infection, the reconstitution of powdered formula should be undertaken by caregivers using good hygienic measures and in accordance with the product manufacturer's food safety guidelines.

Cronobacter sakazakii



1. ***Cronobacter*** is the officially recognized bacterial genus name for the organism which before **2007** was named ***Enterobacter sakazakii***.
2. *Cronobacter* has been accepted in the *International Journal of Systematic and Evolutionary Microbiology*, along with the description of the new species.
3. In infants it can cause [bacteremia, meningitis and NEC](#).
4. Most neonatal *C. sakazakii* infections cases have been associated with the use of [powdered infant formula](#) with some strains able to survive in a desiccated state for more than two years.



Preparing formula in care settings

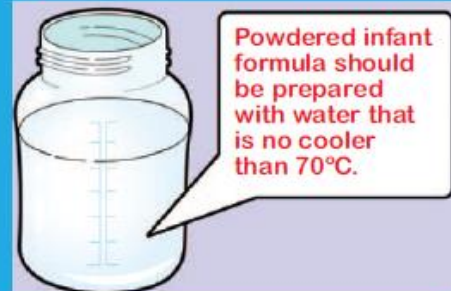
For infants at greatest risk, use sterile liquid infant formula.



Clean & sterilize

Clean and sterilize all feeding and preparation equipment before using it.

Why? Cleaning and sterilizing kills harmful bacteria on equipment that may grow in the feed once it is prepared.



Use water no cooler than 70°C

Use water that is no cooler than 70°C to prepare feeds from powdered infant formula.

Why? This temperature will kill harmful bacteria that may be present in powdered formula.



Cool quickly and feed immediately

Once a feed is prepared, quickly cool to feeding temperature and feed immediately.

Why? The longer a feed is kept after it is prepared, the greater the chance that harmful bacteria will grow in it.



高溫98度 節約90度 沖泡牛奶70度

【日本製】TIGER 虎牌3.0L微電腦電熱水瓶 (PDR-S30R)_e

8H急速配

建議售價 \$6,500

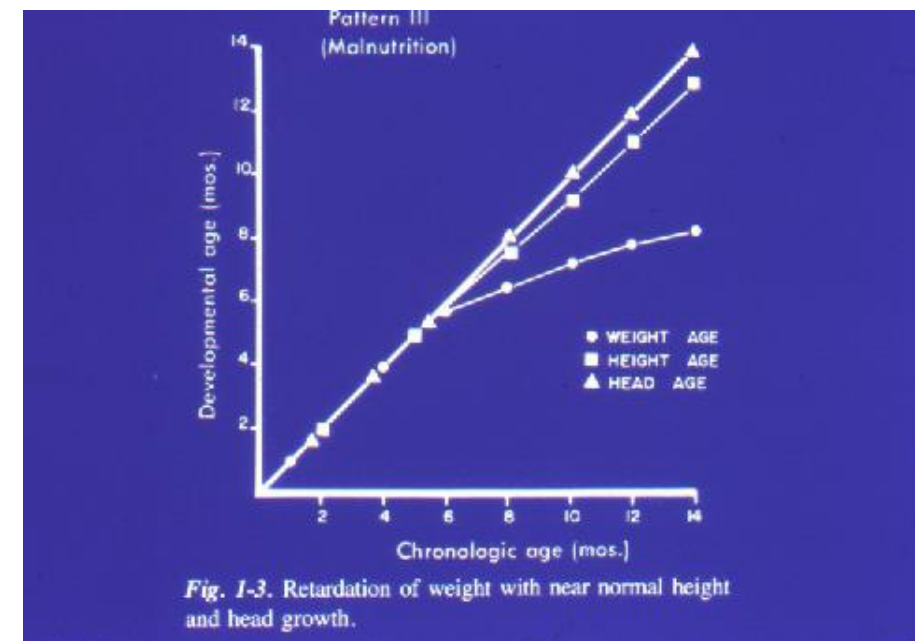
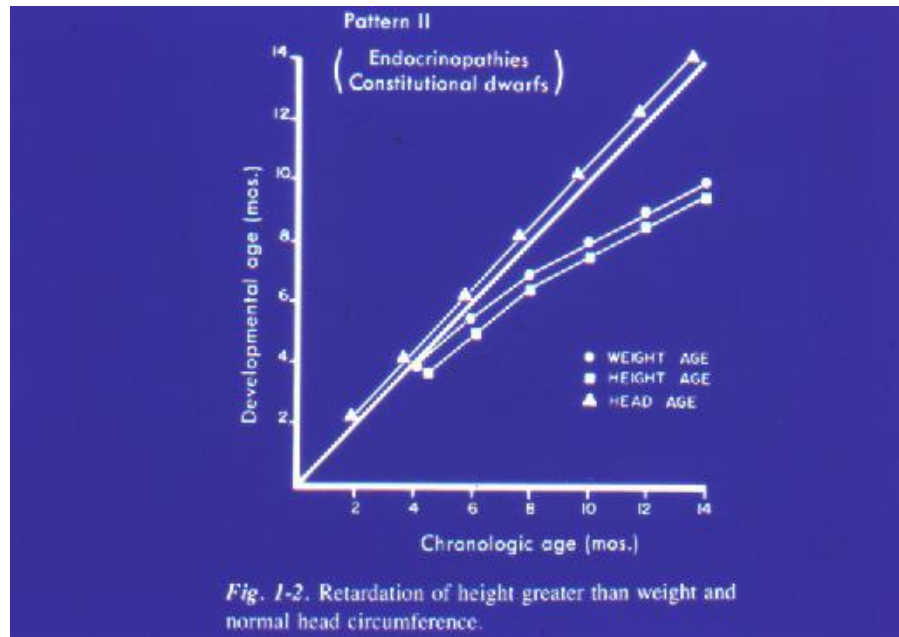
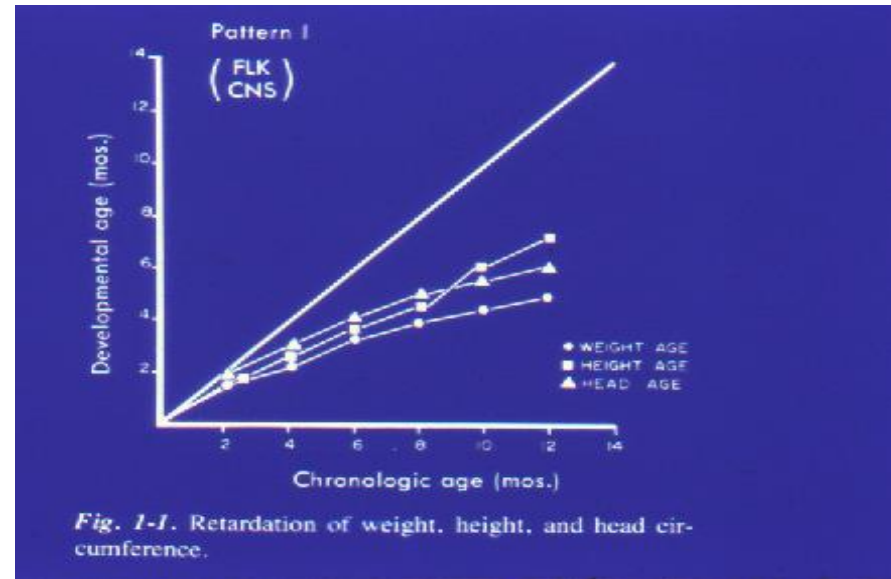
\$2,990 (滿1件出貨)



■ 省電4段保溫選擇：98度.90度.80度.70度

Failure to thrive

生長遲滯

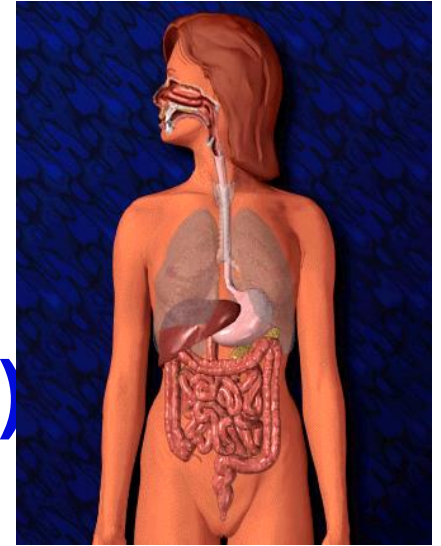


Vomiting (GI origin)

* **Non-bilious**

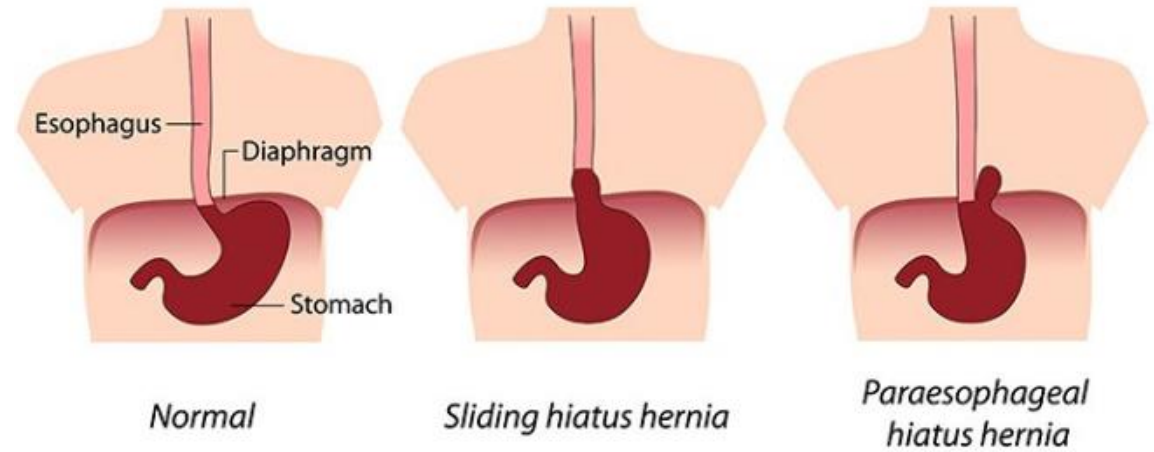
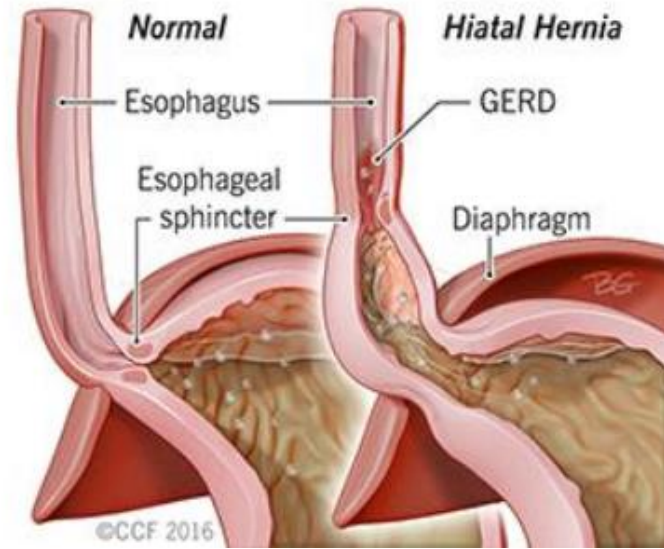
1. Gastroesophageal reflux
(GER ,GERD, GORD ,Chalasia)
2. Hiatal hernia
3. Infantile hypertrophic pyloric stenosis

* **Bilious**



1. 39-42% of GERD children and adolescents (ages of 6 to 17 years) had either a history of gastro-esophageal reflux (GER) in infancy and/or a strong family history of GER.
2. Moderate **obese** (16%) and extreme **obese** children (32%) are likely to have more GERD comparing to normal weight children
3. Teens with GERD had their diet related to overeating, eating late at night, drinking soda, eating salty, spicy, or greasy foods.





I H P S

- ***Incidence*** : 1 ~ 10 in 500 births
- ***Age , Sex***
- ***Clinical manifestation***
- ***Diagnosis***

Physical examination

Blood gas / Electrolyte

Abdominal sonogram , UGI series

- ***Treatment***



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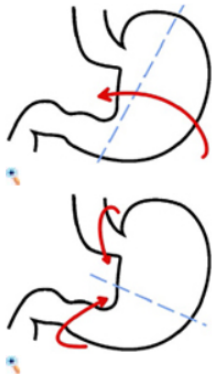
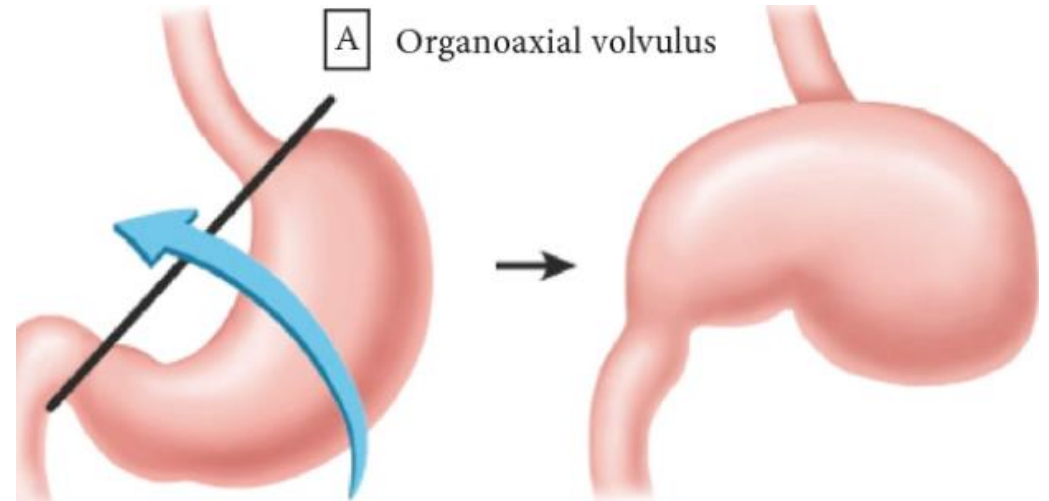


Figure 1 Organoaxial volvulus results from gastric torsion along the axis connecting the cardia and the antrum and results in obstruction at the cardia and/or the pylorus.

Figure 2 Mesenteroaxial volvulus results from gastric torsion along the axis connecting the lesser and greater curvatures.

Note: Obstruction occurs in the antropyloric zone due to cephalad torsion of the antrum (most common) or caudal torsion of the fundus (less common).



1. Gastric volvulus is the abnormal torsion (>180 degrees) of the stomach.
2. Incomplete gastric volvulus (<180 degrees)

