


 振興醫療財團法人振興醫院
 Cheng Hsin General Hospital


ICU的任務- 代謝平衡及復甦

The role of critical care- metabolic resuscitation

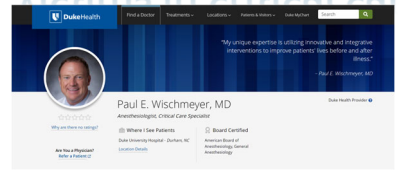
消化系醫療中心 張子明 主任
 Tzu-Ming Chang M.D. Professor of Surgery
 Cheng Hsin General Hospital Taiwan

2022/11/08@北榮

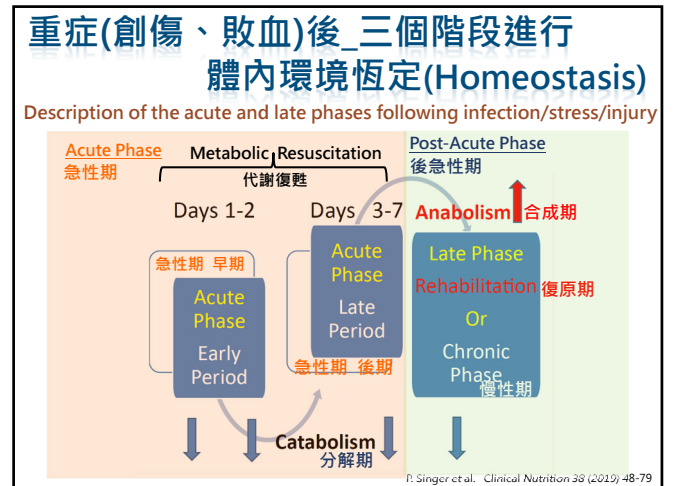
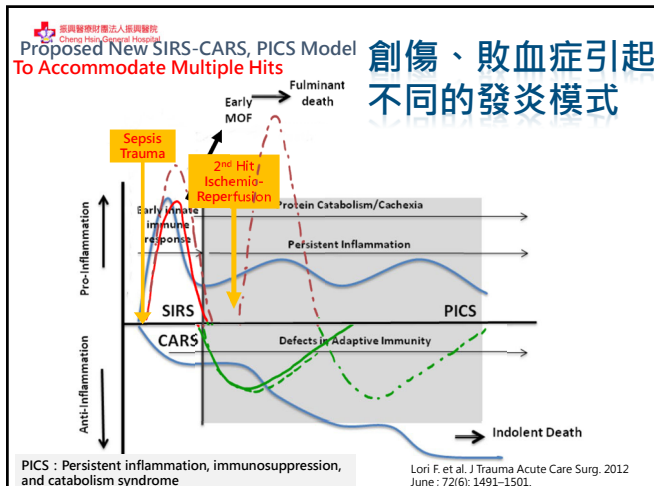



 振興醫療財團法人振興醫院
 Cheng Hsin General Hospital

Are we creating survivors. . .or victims in critical care?



Curr Opin Crit Care. 2016;22(4):279-84.



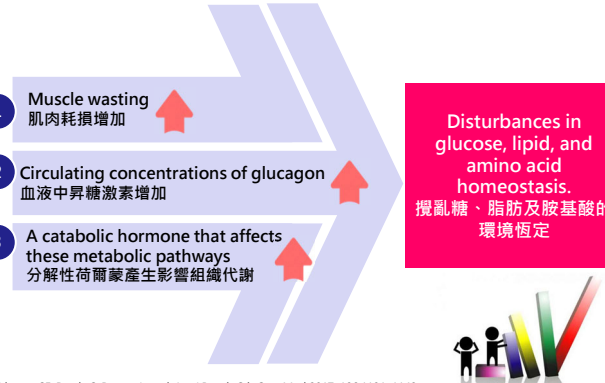

 振興醫療財團法人振興醫院
 Cheng Hsin General Hospital

The Mission of ICU 加護病房的任務

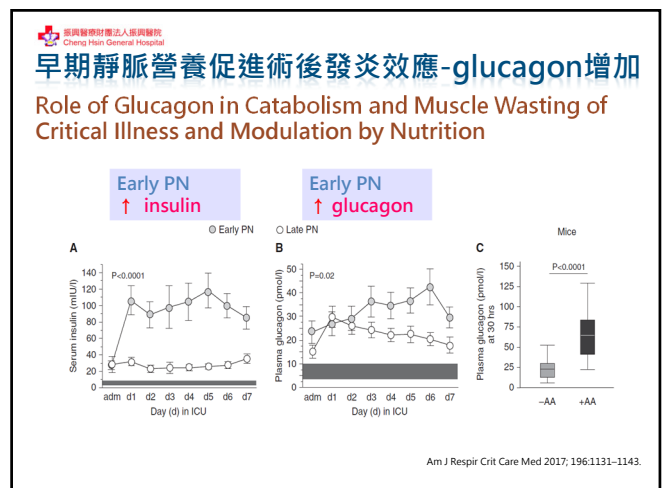
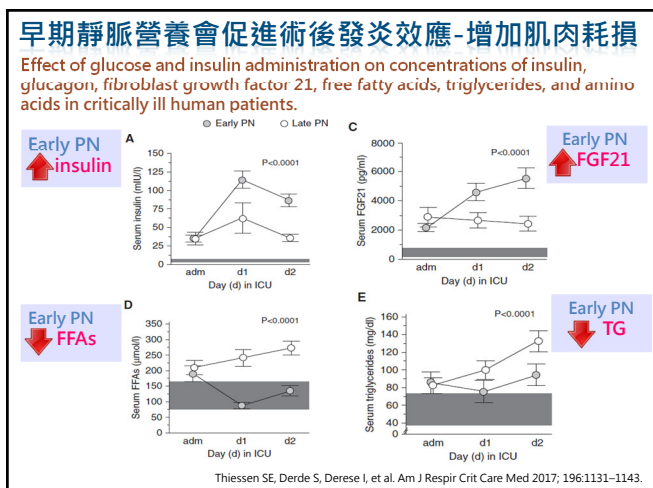
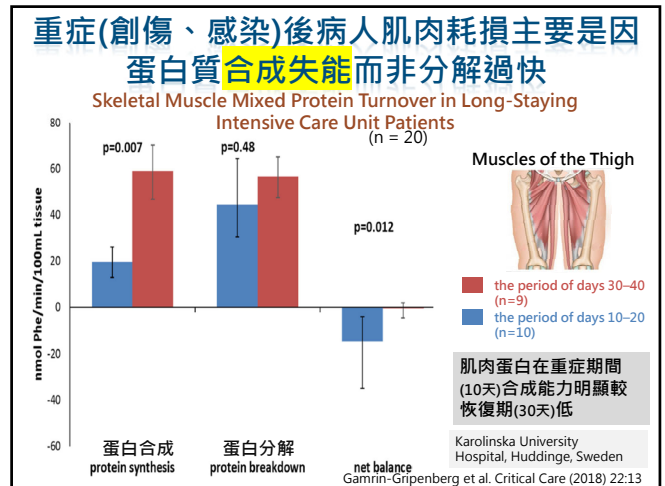
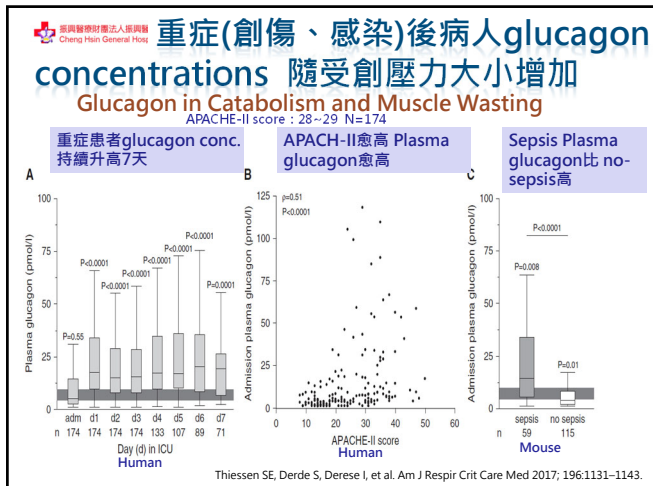
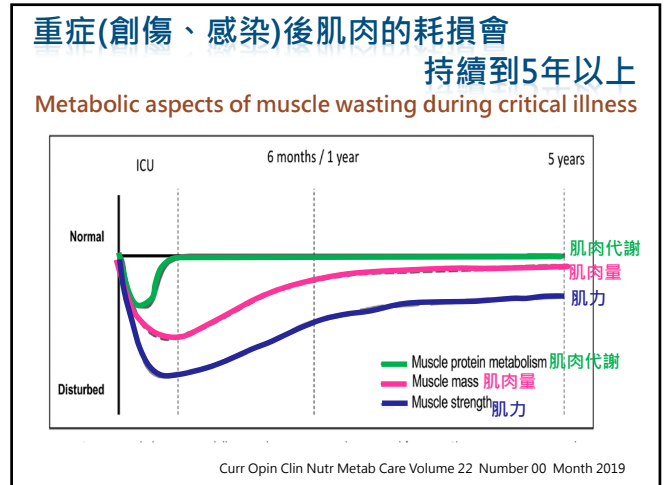
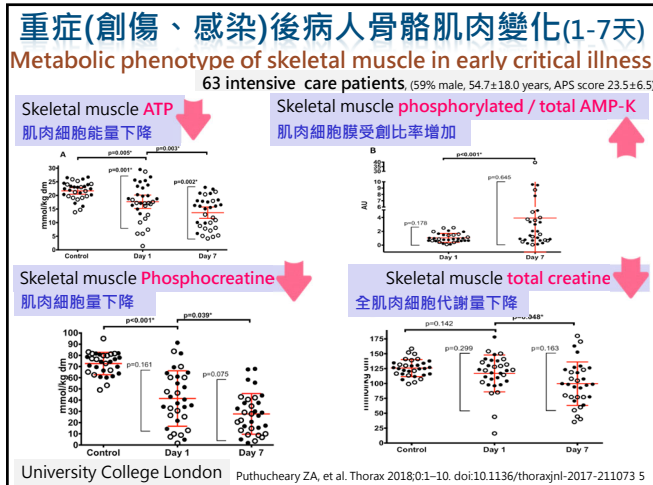


重症(創傷、感染)後的組織代謝改變

Tissue Metabolic Change in Critical illness



Thiessen SE, Derde S, Derese I, et al. Am J Respir Crit Care Med 2017; 196:1131-1143.



重症創傷病人早期全靜脈營養死亡率高

Energy Supplement is not Necessary in Early Post-operative Period

Mortality Rate Between Received TPN vs. No-TPN in the SICU

	Death/TPN Patients (%)	Death/No-TPN Patients (%)	p (χ^2)
Total deaths	47/461 (10.2)	395/2,484 (15.9)	0.58
Deaths >24 h	47/461 (10.2)	307/2,396 (12.8)	0.12
Deaths >48 h	47/461 (10.2)	171/2,260 (7.6)	0.058
Deaths >72 h	47/461 (10.2)	119/2,208 (5.4)	0.001
Deaths >96 h	46/460 (10.0)	85/2,174 (3.9)	<0.001
Deaths >120 h	46/460 (10.0)	69/2,158 (3.2)	<0.001
Deaths >144 h	45/459 (9.8)	61/2,150 (2.8)	<0.001
Deaths >168 h	44/458 (9.6)	48/2,137 (2.2)	<0.001

Mortality Rate
>

J Trauma. 2007;63:1215-1222.

敗血症患者早期接受物理治療可保護肌肉流失

Impact of Very Early Physical Therapy During Septic Shock on Skeletal Muscle: A Randomized Controlled Trial

Control Group

underwent a daily physiotherapy session through manual passive/active limbs mobilization (5/7 d).

Intervention Group

Two physiotherapy sessions per day (7/7 d) including 30 minutes (1 hr/d) of continuous passive/active leg chair/bed cycling followed by manual passive/active limbs mobilization

Fiber Type	Control Group (n = 9), Mean \pm so		Intervention Group (n = 8), Mean \pm so		p ^b
	Day 1	Day 7	Day 1	Day 7	
All fibers types (μm^2)	3,603 \pm 1,284	2,629 \pm 1,174*	3,448 \pm 1,993	3,770 \pm 1,473	0.01
Type I fibers (μm^2)	4,236 \pm 1,379	3,135 \pm 1,103*	4,250 \pm 1,977	4,678 \pm 1,189	0.02
Type-IIa fibers (μm^2)	3,949 \pm 1,447	2,744 \pm 1,260*	2,574 \pm 856	2,920 \pm 745	0.003
Type-IIb fibers (μm^2)	2,624 \pm 1,243	2,006 \pm 1,286*	2,082 \pm 1,083	2,576 \pm 948	0.04

*Day1 VS. Day7 <0.05

Hickmann CE, Castaneres-Zapatero D, Deldicque L, et al. Crit Care Med 2018; 46:1436-1443.

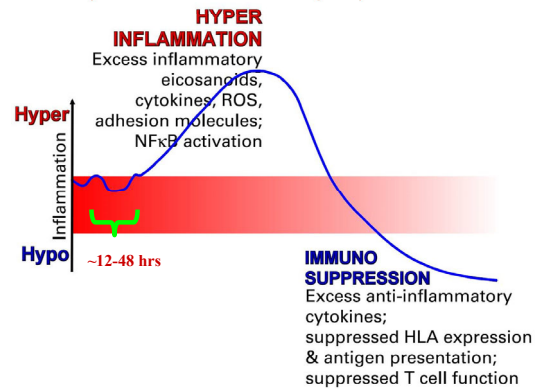
Summary I

The role of critical care- metabolic resuscitation

1. 重症造成的代謝生理變化，形成不同型態的發炎模式。
2. 重症患者的組織細胞代謝改變主要在肌肉，而內分泌 (glucagon) 主要主導其代謝變化。
3. 重症病人的肌肉耗損主要是蛋白質的合成失能，而非分解過快。
4. 重症病人早期靜脈營養促發發炎反應，增加glucagon，增加肌肉耗損。
5. 患者的肌肉復原即早物理治療介入，可促進重症患者的肌肉復原。

創傷患者兩階段發炎反應現象

Hypothetical Biphasic Immuno-Inflammatory Response to a Traumatic Insult

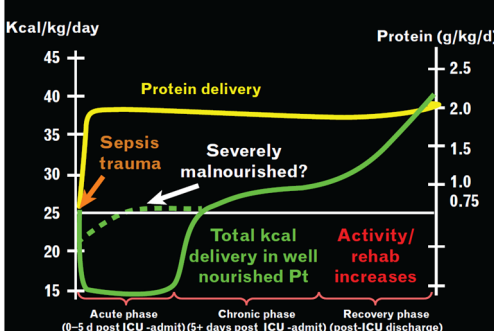


British Journal of Nutrition (2007), 98, Suppl. 1, S133-S139

低卡路里高蛋白的發炎代謝需求

Tailoring Nutrition Therapy for Critical illness

Proposal for targeted nutrition delivery in critical illness



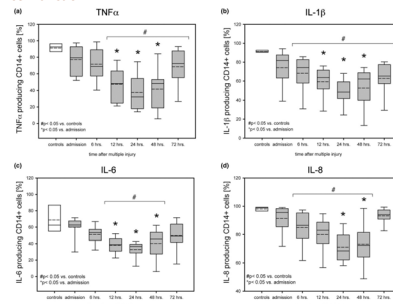
Curr Opin Crit Care. 2016;22(4):279-84.

重症初期自我降低免疫反應

Early down-regulation of the pro-inflammatory potential of monocytes is correlated to organ dysfunction in patients after severe multiple injury: a cohort study

Chlodwig Kirchhoff¹, Peter Biberthaler², Wolf E Mutschler², Eugen Faist³, Marianne Jochum⁴ and Siegfried Zedler³

An immediate hyperactivation of circulating monocytes is rapidly followed by a substantial paralysis of cell function

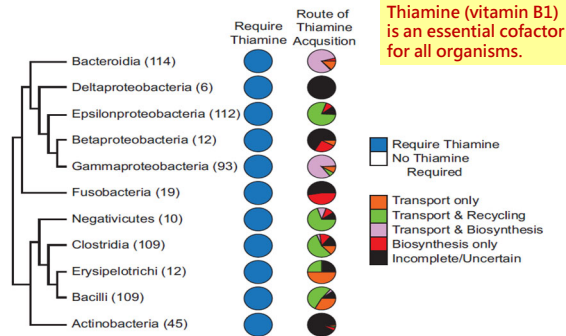


Severe multiple injury results in a rapid decline of intracellular cytokine synthesis by monocytes within the first 24 hours after trauma

Critical Care 2009, 13:R88

維他命B1是各種腸菌代謝及細胞結構所需

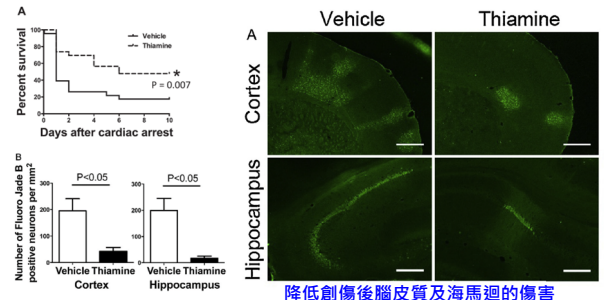
Thiamine Acquisition Strategies Impact Metabolism and Competition in the Gut Microbe *Bacteroides thetaiotaomicron*



Zachary A. et al. Costilow and Degnan. September/October 2017 Volume 2 Issue 5 e00116-17

維他命B1具神經保護功能

Thiamine as a neuroprotective agent after cardiac arrest



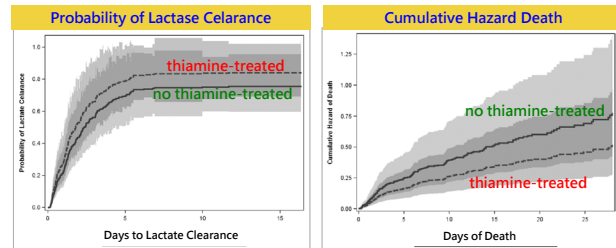
Anesthesia Center for Critical Care Research, Massachusetts General Hospital, USA

Kohei Ikeda et al. Resuscitation 105 (2016) 138-144

敗血性休克病人維他命B1促進乳酸排除及降低死亡率

Effect of Thiamine Administration on Lactate Clearance and Mortality in Patients With Septic Shock

123 thiamine-treated 246 no thiamine-treated



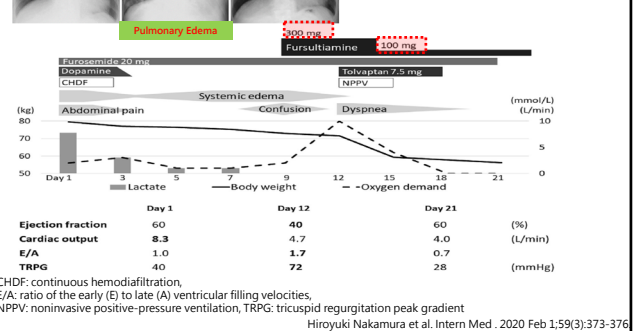
University of Kentucky College of Medicine, Lexington
High-dose thiamine (500 mg), administered for a median of 3 days.

Woolum et al. Crit Care Med 2018;46:1747-52.

維他命B1的補充改善心臟循環衰竭病人神智及肺水腫

Clinical course and echocardiography findings after Thiamine Replenishment

Tomakomai City Hospital, Japan



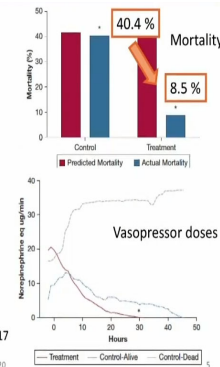
維他命C的雞尾酒療法

Vitamin C Cocktail therapy

Hydrocortisone, Vitamin C, and Thiamine for the Treatment of Severe Sepsis and Septic Shock
A Retrospective Before-After Study

Paul J. Mehta, MD, FCCM, Vikramjit Khanna, MD, Jacques Rivest, PharmD, Michael A. Hopper, MD, and John Gattuso, PhD, FCCP

- Single centre before-after study
- Patients with severe sepsis or septic shock
- Before (47 patients)
 - 60% of patients received hydrocortisone
- After (47 patients)
 - All patients received Vitamin C Cocktail



Marik Chest 2017

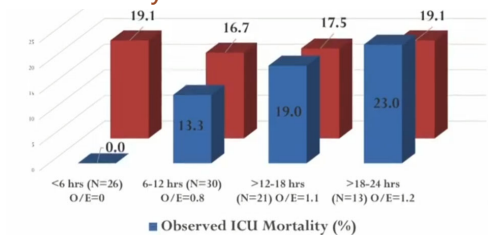
17/01/2019

Critical Care Reviews Meeting 2020



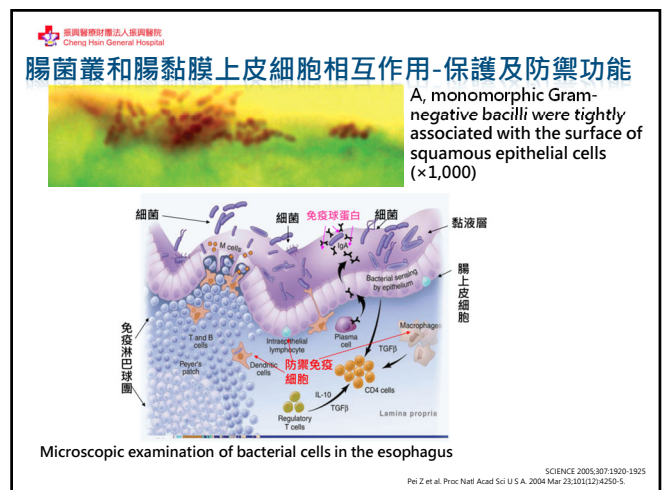
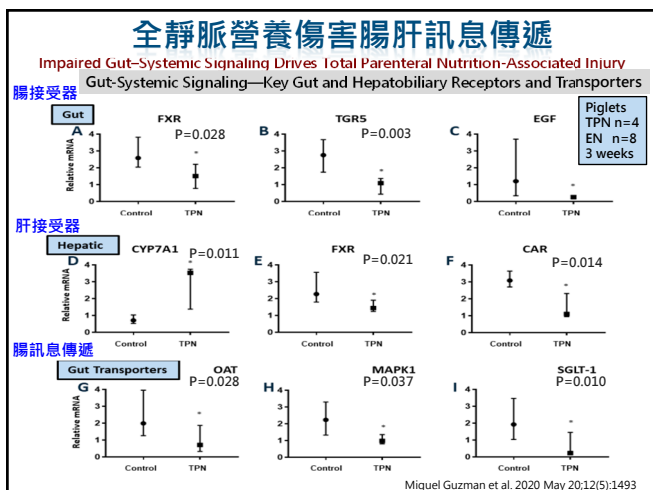
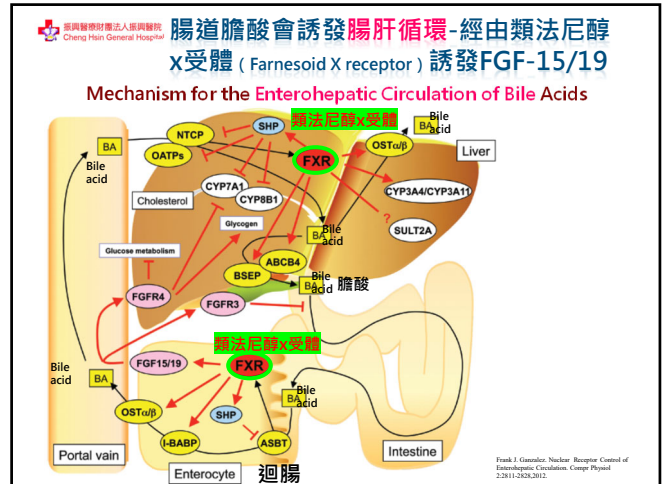
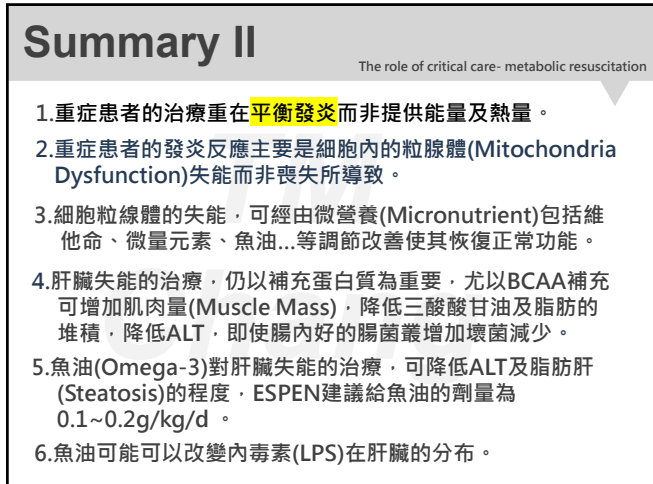
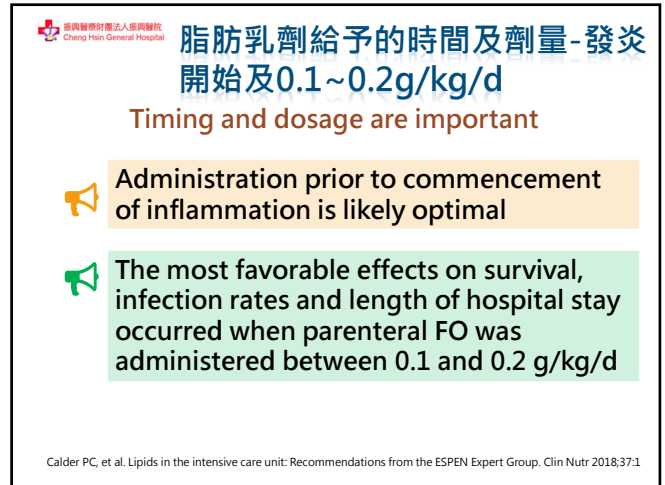
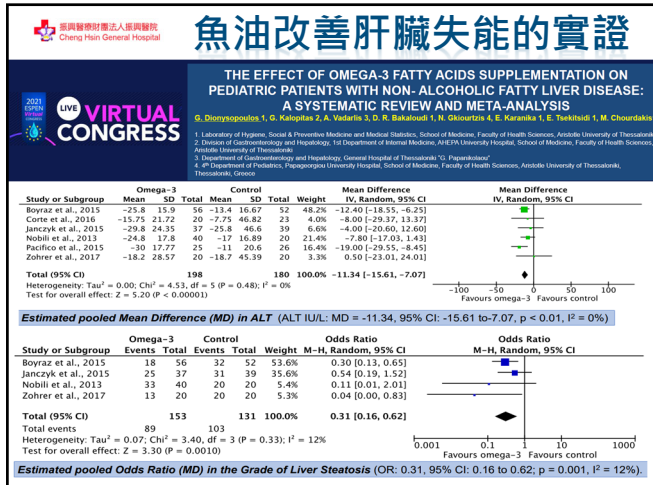
維他命C的雞尾酒療法的即時性 (6~12小時)與死亡率之關係

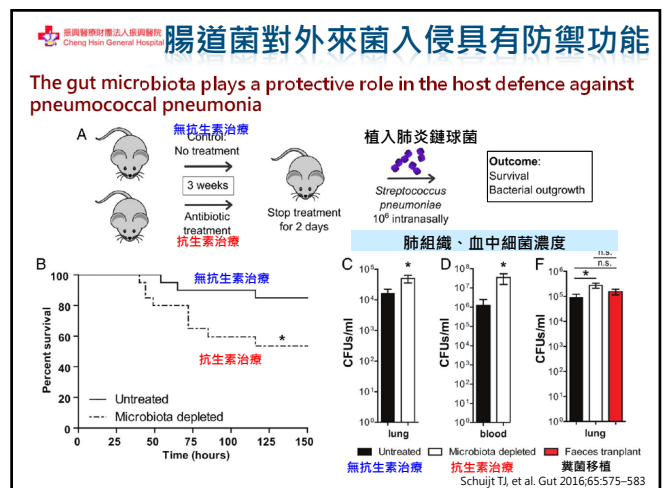
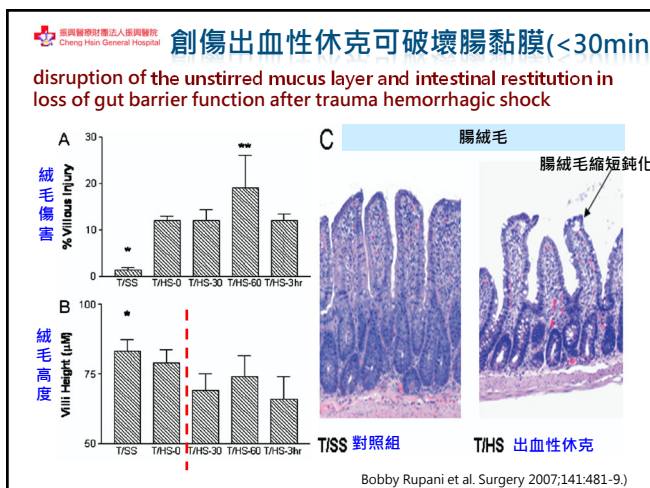
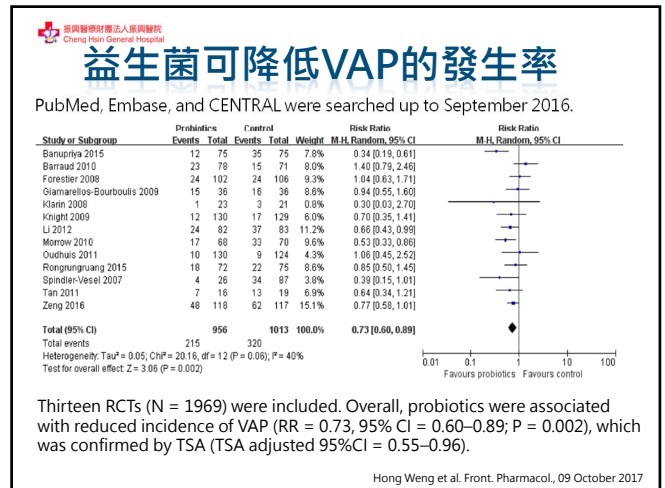
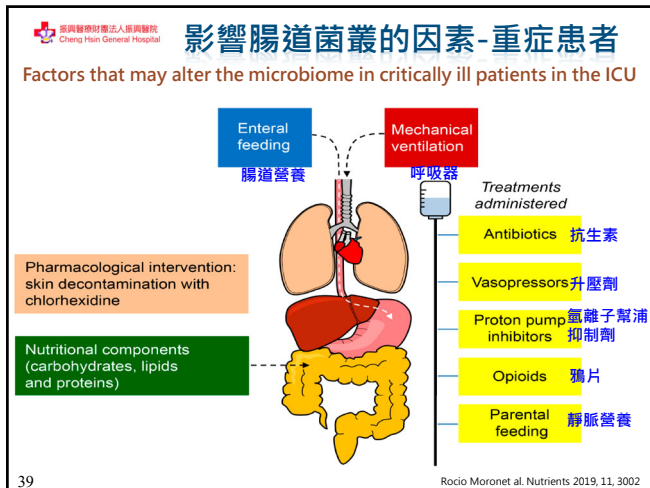
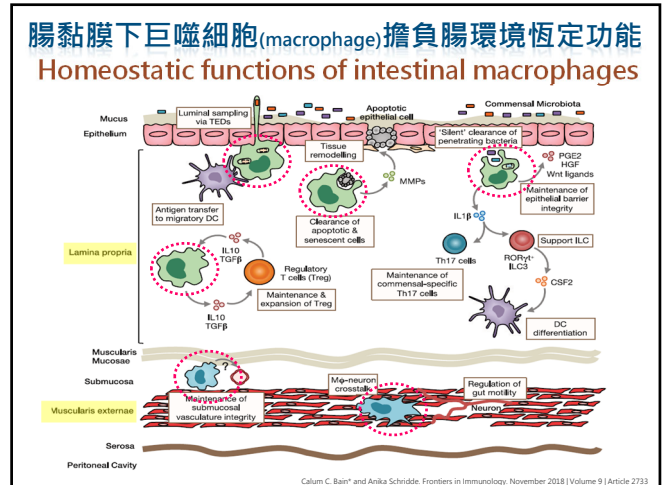
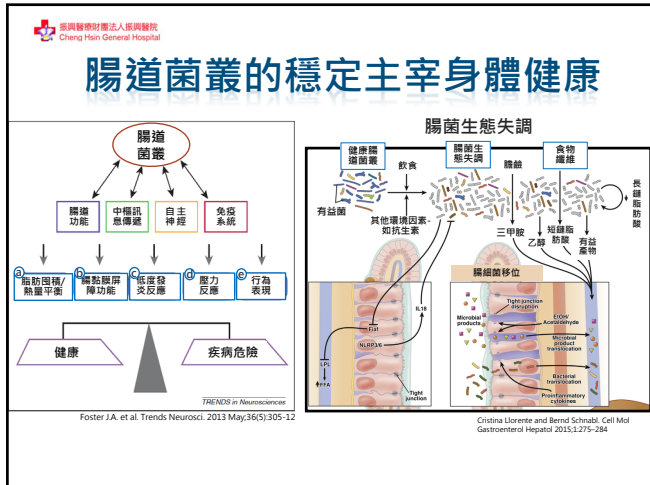
Relationship Between Delays in Administration and ICU Mortality in 90 Patients Treated with iHAT

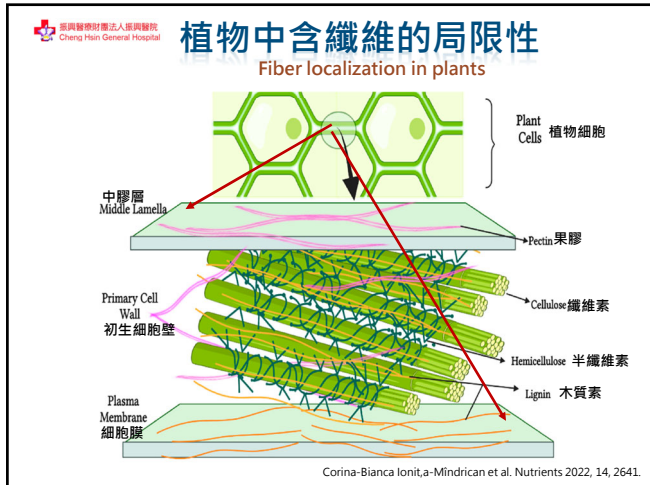


iHAT = intravenous hydrocortisone, ascorbic acid, thiamine Hrs = time from sepsis presentation to iHAT initiation
O/E = observed/expected ICU mortality ratio using APACHE IV scores

Kory P et al. SCCM Abstract 2020, recently accepted by Critical Care and Shock







老年人使用菊糖纖維可改變糞便菌叢
Effects of Lactose or Inulin Administration on Fecal Flora in Elderly Patients
35 female with a mean age of 76.4 y (range: 68-89 y)

Fecal variable	Lactose (n = 15)			Inulin (n = 10)		
	Before administration	20 g/d	40 g/d	Before administration	20 g/d	40 g/d
Total counts	9.3 ± 0.7 ¹	9.7 ± 0.8	9.7 ± 0.7	9.2 ± 0.3	9.5 ± 0.7	9.3 ± 0.8
Bifidobacteria 雙歧桿菌	8.2 ± 0.7	8.6 ± 0.9	8.5 ± 0.9	7.9 ± 0.4	8.8 ± 0.8 ¹	9.2 ± 0.5 ¹
Bacteroides	9.0 ± 1.1	9.3 ± 0.9	9.5 ± 0.7	9.0 ± 0.3	9.2 ± 0.8	8.6 ± 0.9
Clostridia	6.4 ± 1.2	6.0 ± 0.8	5.6 ± 0.8 ¹	6.3 ± 1.4	6.2 ± 1.2	6.4 ± 1.2
Lactobacilli	7.9 ± 0.9	7.1 ± 1.1 ¹	7.0 ± 1.0 ¹	7.6 ± 0.7	7.5 ± 1.2	7.2 ± 0.8
Enterococci 糞腸球菌	7.1 ± 1.1	8.0 ± 0.6 ¹	8.1 ± 1.2 ¹	7.3 ± 1.2	7.1 ± 1.2	6.3 ± 0.6 ¹
Enterobacteria	7.1 ± 1.6	6.8 ± 1.6	6.4 ± 1.2	7.0 ± 1.1	6.8 ± 0.9	6.1 ± 1.5
H ₂ S-forming bacteria	6.9 ± 1.7	6.4 ± 1.7	6.2 ± 1.5	6.9 ± 1.2	6.9 ± 1.1	7.0 ± 1.2
Percentage of dry matter (%)	32.3 ± 6.3	28.4 ± 6.4 ¹	27.3 ± 5.5 ¹	33.8 ± 5.1	27.4 ± 5.1 ¹	31.5 ± 2.3

¹ Bacterial counts expressed as $\bar{x} \pm SD \log_{10}/g$ dry feces. Counts of organism based exclusively on positive cultures.
² Frequency of occurrence in brackets.
^{1,4} Significantly different from before administration: ¹ $P < 0.05$, ⁴ $P < 0.01$.

益菌增加致病菌減少

Conclusion

The role of critical care- metabolic resuscitation

1. 腸黏膜的免疫力控制腸道菌叢的細菌平衡，食物中的營養素，會影響腸菌叢及腸黏膜上的巨噬細胞，控制腸黏膜的免疫力。
2. 各種不同的營養素，如維生素、纖維及維他命，可提供腸菌的營養而產生不同的生理及免疫反應。
3. 對於肝臟的失能，不僅限於脂肪肝、肝炎及肝硬化，重症患者也常會因肝臟蛋白質製造異常，或酸鹼不平衡所引起的代謝失能。
4. 對於肝臟的失能，需透過腸肝循環的維護才能降低其損傷。
5. 要維護腸肝循環，需健全腸的生理功能。而腸功能健全必須依賴腸菌叢穩定。腸菌叢穩定需有健康正確的腸道營養。

