

授課講師學經歷

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課程名稱(主題)	懷孕前後營養需求與補充
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授課內容摘要

懷孕前後的營養對授精、受精卵、受精卵分裂、在子宮著床、進入子宮內膜層開始吸取子宮內膜細胞的營養做為成長發育；胎兒的養分需求增加，由胎盤提來供胎兒養分的工作。不同時期的營養需求，均影響胎兒的營養，供給胎兒發育所需要的營養素與胎兒的周邊附屬器官，如胎盤、卵膜、臍帶、羊水等生成所必需的營養素。另外子宮、乳腺等器官的增大和血液量的增加等亦需提供較多的營養素；而貯存脂肪等營養素以供哺乳期使用。懷孕期，若母體所攝取的營養素無法滿足胎兒的需求時，會以母體本身組織內的營養來供給胎兒，因而引起母體營養失調的情形發生。懷孕期間增加 11 公斤的體重時，必須先考慮胎兒、胎盤等及母體相關器官的體積體成分等所增加的熱量和基礎代謝量，依據衛生署所訂的國人膳食營養素參考攝取量中建議，懷孕婦女可分為一、二、三期，懷孕第一期因目前國人所攝取的熱量已明顯改善、足夠，因此僅在懷孕第二、三期增加 300 大卡的熱量即可。同時總熱量之脂肪攝取量維持於總熱量的 25~30%。懷孕中的蛋白質蓄積量，如胎兒、胎盤的形成約占母體體重 1 公斤左右，而其餘的蛋白質蓄積則是準備提供於懷孕末期胎兒的快速發育期所必需蛋白質量。孕婦如果在懷孕前的營養狀況良好，則在懷孕的第一期不需要特別增加蛋白質的攝取量。但在懷孕的第二、三期，因為胎兒快速成長、胎盤、子宮變大、羊水與血液量增加，故需增加 10 公克的蛋白質攝取量。蛋白質的來源，最好一半以上是來自高生理價值的動物性蛋白質，例如蛋、牛奶、肉類、魚類等，植物性蛋白質可增加豆漿、豆腐等黃豆製品的攝取量。營養師應對準備懷孕、懷孕、哺乳婦實施飲食指導，同時教予具體的飲食菜單，依其平常的飲食再附加應多攝取的食物和指示，來幫助她們渡過人生做重要的生命期。

產前產後營養需求

台北醫學大學附設醫院

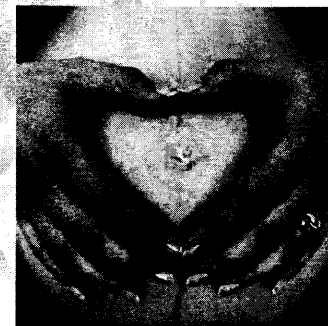
營養室主任

蘇秀悅營養師

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懷孕期的營養



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母體營養

- 由卵巢排出的卵子經受精後於子宮內著床、發育、成熟的過程稱為懷孕期。
- 懷孕期間可由最後月經期的第一天開始計算，約280天，受精卵可發育成成熟胎兒。
- 生產後，母體懷孕或分娩所造成生殖器官和周邊組織及臟器的變化，需要復原，此時期稱為產褥期，約6~8週之間(坐月子)。
- 由母體哺餵母乳，稱之為哺乳期，時間約為半年至一年左右，但因現代職業婦女比例增加，餵母乳的比率下降，時間長短亦不一定。

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Preconception

- Utero nutrition
- "Fetal origins hypothesis" emerges as one potential source for adult disease
 - Preconceptional nutrition has a major role in optimizing a successful outcome. Miles, 2005
- Advances in assisted reproductive technology (ART) making the preconceptional nutrition assessment and intervention a domain of unprecedented magnitude.
 - Appropriate folate supplementation on a woman's part to protect against the incidence of neural tube defects (NTDs)
 - Optimum dietary or supplemental antioxidant protection to ensure healthy sperm on the man's part

Greco et al., 2005; Wong et al., 2002

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Woman's preconception body size impacts the ability to conceive

- Women with less than 17% body fat often do not menstruate
- Women with less than 22% often do not ovulate

Stevens-Simon, 1997

- Some overweight women ($>120\%$ ideal body weight [IBW]) have fertility issues
 - the ratio of testosterone to estrogen is altered

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Medications used for ovulation

- Weight gain before conception
- Ovarian hyperstimulation syndrome (OHSS)
 - a situation of ovarian enlargement, bloating and fluid weight gain
- The discomfort associated with OHSS
 - anorexia, nausea, and altered nutrition; most women complain of hyperolfaction with nausea and vomiting

Davis et al., 2002

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Eating problems before pregnancy

- Chronic dieting may lead to amenorrhea, with the obvious consequence of reduced fertility.
 - Deficiencies of specific nutrients may lead to eventual depletion of nutrient stores, adversely affecting the function of many physiologic and biochemical processes, resulting in recurrent pregnancy loss.
- Overeating may lead to excessive deposition of body fat, anovulation, and infertility as a result of increased levels of testosterone relative to estrogen.

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Conception

- Environmental toxins, dioxins, polybrominated biphenyls (PBBs), phthalate esters, and other industrial products have been cited as affecting fertility.
- Both elevated plasma homocysteine and a deficiency in vitamin B12 are associated with infertility and recurrent fetal loss (Nelen et al., 2000; Bennett, 2001).

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Conception

- Maternal caffeine consumption has been linked to spontaneous abortions, but a review of 15 epidemiologic studies found the evidence to be unclear (Signorello and McLaughlin, 2004).
- A cohort study in Denmark of 88,482 pregnant women recruited for a comprehensive interview on coffee consumption and potentially confounding factors in pregnancy found that high levels of coffee consumption were associated with an increased risk of fetal death (Bech et al., 2005).

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Conception

- The major first trimester events involve organogenesis; and subtle insults during this time impact the development of the heart, brain, central nervous system, and kidneys.
- Maternal nutritional status has been evaluated primarily for infant birth weight, risk of neural tube defects (NTDs), and fetal alcohol syndrome. Birth weight is highly correlated with infant mortality and morbidity.

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Conception

- Newborns born small for gestational age (SGA) are at increased risk for long-term health adversity such as hypertension, obesity, glucose intolerance, and cardiovascular disease (see Chapter 43).
- Besides a woman's dietary intake, other factors such as air quality and purity of water can contribute adversely to a pregnancy (Mennes et al, 2005).
- During prolonged periods of poor air quality (i.e., high levels of smog, particulates, and ozone), the rate of premature deliveries increases.

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Effect of Nutritional Status on Pregnancy Outcome

- In the early 1900s it was noted that women with poor nutritional status had adverse pregnancy outcomes and infants with compromised birth weights.
- Malnutrition is a major problem for reproduction, anorexia nervosa and bulimia nervosa which affect up to 5% of women of reproductive age, can cause amenorrhea, infertility and miscarriage (ESHRE Capri Workshop Group, 2006).
- Women with a history of eating disorders should be carefully monitored.

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Weight gain in pregnancy

- In the early 1900s, to discourage weight gain in pregnancy, the rationale being that a smaller infant was easier to deliver vaginally. This philosophy continued into the 1960s.

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Perinatal Mortality and Birth Weight

- Low birth weight (LBW; <2500 g) and especially very low birth weight (VLBW; <1500g) are major factors for perinatal mortality (infant deaths occurring between 28 weeks' gestation and 4 weeks' postpartum)
 - encompasses necrotizing enterocolitis (NEC), respiratory distress syndrome (RDS), intraventricular hemorrhage (IVH), and cerebral palsy (Bernstein et al., 2000).
- Other risks include developmental delays and learning disorders such as attention deficit hyperactive disorder (ADHD). Some congenital defects or perinatal insults are difficult to prevent without genetic screening; but poor nutrition and low maternal weight gain, factors implicated in LBW, can certainly be modified.

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Two indicators of maternal nutritional status have been especially correlated with infant birth weight

- Maternal size (height and prepregnancy weight)
- Pregnancy weight gain

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懷孕生理學

懷孕末期時體重總共增加約11公斤左右
(一般國人是10-15公斤)

項目	重量(公斤)
胎兒	3.4 - 3.9
脂肪與蛋白質儲存	3.4
血液	1.8
組織液	1.2
子宮	0.9
羊水	0.8
胎盤與臍帶	0.7
乳房	0.5
總重量	12.7 - 13.2

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懷孕建議增加體重

體重狀況 (公斤)/(公尺) ²	增加總體重 (公斤)	第一期增加體重 (公斤)	第二、三期增加體重 (公斤)
身體質量指數 <19.8	12.5-18.0	2.3	0.49/星期
身體質量指數 =19.8-26	11.5-16.0	1.6	0.44/星期
身體質量指數 >26-29	7.0-11.5	0.9	0.3/星期
身體質量指數 >29	6.0		

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熱量代謝

- 懷孕中期基礎代謝率上升，單位體重的基礎代謝率隨之升高。
- 生活活動指數於懷孕初期和非懷孕期則無多大差異性，但隨著懷孕期數的增加而呈下降的趨勢，至懷孕末期達到最低值。

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蛋白質代謝

- 懷孕中的蛋白質蓄積量，是準備提供於懷孕末期胎兒的快速發育期所必需蛋白質量。
- 必需的蛋白質的蓄積量，反應出懷孕中蛋白質的攝取是必需要增加的。

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鈣質代謝

- 隨著胎兒的發育其骨質形成需要有鈣質的貯積，一般是在懷孕5個月之後開始蓄積，但也因需要量的增加會促使比平常鈣的吸收利用率高。
- 從懷孕初期鈣的攝取量增多時會有一部分蓄積於母體的骨骼內，至懷孕末期時所蓄積的鈣即可供給胎兒發育利用。
- 在懷孕前期母體的鈣質蓄積量不足以供應後期胎兒所需要的量時，則會從母體的骨骼吸取鈣質。

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鐵質代謝

- 懷孕時期由於胎兒生長、胎盤的形成以及母體內循環血液的增加，均會促使鐵的需要量大增。孕婦的血液量增加，其中水分含有量的增加比紅血球數量增加來得快，很容易有貧血的情形出現。
- 一般剛出生的嬰兒均保有較多量的鐵貯存於肝內，因在產後哺乳期間從乳汁中所能攝取到的鐵量不多，因此可利用貯存於肝內的鐵來補充。
- 懷孕期血紅素量如達到11.0 g/dl以下時即可視之為貧血。

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懷孕期營養需要量

熱量需要量

- 依據衛生署所訂的國人膳食營養素參考攝取量中建議，懷孕婦女可分為一、二、三期
 - 懷孕第一期目前國人所攝取的熱量已明顯改善、足夠
 - 懷孕第二、三期增加 300大卡的熱量
 - 脂肪攝取量應維持於總熱量的25~30%

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懷孕期營養需要量

蛋白質需要量

- 孕婦懷孕前的營養狀況良好，懷孕的第一期不需要特別增加蛋白質的攝取量。
- 懷孕的第二、三期，因為胎兒快速成長、胎盤、子宮變大、羊水與血液量增加，故需增加10公克的蛋白質。
- 蛋白質的來源，最好一半以上是來自高生理價值的動物性蛋白質，例如蛋、牛奶、肉類、魚類等，植物性蛋白質可增加豆漿、豆腐等黃豆製品的攝取量。

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懷孕期營養需要量

維生素需要量

- 維生素A：一般懷孕時維生素A的需要量，與一般非懷孕期建議攝取量並無差異，但每日攝取量不可高於3000ugRE。
- 維生素B1、B2、菸鹼素：需要量是以熱量的需要為基準來計算，一般成年男女熱量需要量中1000大卡約需維生素B1 0.5毫克、維生素B2 0.55毫克、菸鹼素6.6 mgNE(niacin equivalent)。依懷孕時所增加的熱量攝取量換算出其所需的增加量。
- 維生素C：因懷孕時的體重增加及代謝的增進等關係，一般血中維生素C濃度會呈下降的情形，第一、二、三期應增加10毫克/天的攝取量。
- 維生素D：維生素D會促使鈣離子的代謝增加，胎兒的需要量是由母體來供給，第一、二、三期應增加5微克/天。

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懷孕期營養需要量

鈣的需要量

- 懷孕的母體之吸收率約為50%，應足夠供應胎兒所需之量
- 懷孕前鈣質貯存狀態不佳者需要補充鈣質

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懷孕期營養需要量

鐵的需要量

- 第一期並不需要增加
- 第三期每天應增加30毫克的鐵質。
 - 鐵的消化吸收率會因需求量增加，但東方女性對於鐵的吸收率並不是很好，平時即應多攝取含鐵質較多的食物，尤其是長期素食者更應予以注意並補充鐵劑，以防止貧血現象。

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懷孕期營養需要量

鈉的需要量

- 懷孕時期體重增加10~14公斤所反映出增加的體液量中，為維持鈉離子的濃度，攝取6公克的鹽是必需的量。
- 攝取過量時很容易導致浮腫、高血壓等妊娠中毒等症狀的增加，應盡量避免。

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Nutritional requirements

DRI: RDA and AI for women in USA

- Metabolism increases by 15% in pregnancy.
- Increase an additional 340-360 kcal/day during the second trimester
- Another 112 kcal/day in the third trimester

IOM, 2002

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Protein

DRI: RDA and AI for women in USA

- The current RDA of 0.66 g/kg/day of protein for pregnant women
- Increase for the second half to 71 g/day
IOM, 2002

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Carbohydrates

- 130-175 g/day is the recommended amount to provide enough calories in the diet to prevent ketosis and maintain appropriate blood glucose during pregnancy.

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Nutritional requirements – Energy and protein DRI: RDA and AI for women in USA vs Taiwan

	14-18 yr	19-50 yr	Pregnant	Lactating
USA Energy(kcal)	2368	2403	+10 1st trimester +340 2nd trimester +452 3rd trimester	+330 1st 6 mo +400 2nd 6 mo
ROC Energy(kcal)	2150	2050	+0 1st trimester +300 2nd trimester +300 3rd trimester	+500 1st 6 mo
USA Protein (g)	46	46	+ 25 = 71	+ 25 = 71
ROC Protein (g)	60-50	50-47	+ 10	+ 15

Fat and Fiber

DRI: RDA and AI for women in USA

- 13 g/day for the amount of n-6 PUFA
- 1.4 g/day for the amount of n-3 PUFA
- The DRI for fiber is 25 g/day for female and during pregnancy is 28 g/day

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Omega-3 fats and pregnancy and lactation

DRI: RDA and AI for women in USA

- The new DRI specify an amount of 1.4 g/day during pregnancy and 1.3 g/day during lactation
IOM, 2002
- The main food source of DHA is fatty cold water fish; and 2-3 fish meals per week of low mercury fish during pregnancy appear to provide adequate amounts of DHA.
- Administration advisory are sardines.

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Vitamins

DRI: RDA and AI for women in USA

- Periconceptional multivitamin supplementation has been documented to reduce the risk of heart defects in infants by 43% if started very early in pregnancy,

Bailey and Berry, 2005

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Folic acid

DRI: RDA and AI for women in USA

- Supplementation with folic acid should be before conception-hence the the CDC's general recommendation to increase folate intake throughout the childbearing years.
- All women of childbearing age should be encouraged to take a folic acid supplement and to include generous amounts of folic acid food sources in their diets.

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Folic acid

DRI: RDA and AI for women in USA

- 600 mcg/day
- Women who smoke, consume moderate-to-heavy alcohol, or use recreational drugs are at risk for marginal folate status, as are those using oral contraceptives, antiseizure medications, and those with malabsorption syndromes.
 - Women using antiseizure medications must be closely monitored when starting folic acid because folic acid supplementation can reduce seizure threshold.

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Nutritional care during pregnancy

DRI: RDA and AI for women in USA

- Energy intake to meet nutritional needs and allow for about a 0.4 kg/wk weight gain during the last 30 weeks of pregnancy.
- Protein intake to meet nutritional needs, about an additional 25 g/day; additional 25 g/day/fetus if more than one fetus.
- Sodium intake that is not excessive but is no less than 2-3g/day.
- Mineral and vitamin intakes to meet the recommended daily allowances.
- Alcohol omitted.
- Caffeine in moderation: less than 200 mg/day - equivalent of 2 cups of coffee.

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產褥期營養

- 產褥期的營養可依懷孕後半期的營養攝取量指標，參考DRIs的建議攝取量。
 - 注意鐵離子的攝取，因在生產時候的出血，產後出血均會造成鐵離子的損失情形，需增加攝取，與懷孕末期相同約為30毫克左右。

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民間坐月子習俗

- 產後的飲食方面注重營養均衡、補充足夠的蛋白質、維生素與礦物質，並且多休息，即是最好的坐月子飲食。
- 民間中醫對於「坐月子」則普遍認為，產婦在生產過程中因創傷、出血及身體變化，消耗母體的「元氣」，使其體質虛寒，建議飲食上宜清淡，避免油膩、忌食生冷食物。
- 剖腹產者在產後數天易有脹氣情形，可能會使傷口疼痛，故因避免食用產氣食物
 - 豆類、洋蔥、蕃薯、蘋果、香蕉等

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哺乳期營養供給

- 哺乳期可維持約一年左右，但乳汁實際能提供的營養大約只有6個月的時期，須添加其他的副食品來補足。
- 哺乳期的母親如不是以母乳而是以嬰兒配方哺餵時，營養供給不需增加，還應將懷孕時期所蓄積在體內多餘的營養素，由調節飲食生活與運動消耗多餘的貯存熱量，以恢復懷孕前的體重。

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母乳哺育與人工哺育的比較

- 嬰兒奶粉是無法與母乳成分完全一致。
- 母乳內含有的免疫球蛋白對於乳幼兒的腸管局部免疫具有相當的防禦能力，同時以母乳哺育的乳幼兒腸內Bifidobacterium增殖正常，可預防腸內感染和抑制不正常的發酵情形。
- 哺育母乳使母親與小孩有肌膚直接接觸。
- 母乳是呈無菌狀態下哺育。
- 母體可利用哺乳的機會使體重盡快恢復至非懷孕時體重。

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離乳的必要性

- 一般是出生後5個月開始實施，到完全離乳的適當時期約為出生後滿一年左右。
- 離乳的理由
 - 嬰兒期的前半年以母乳哺育提供充分的營養，但之後因母乳中所含有的鐵及其他礦物質、維生素C、D等量有不足情形，必須由外界增加補充。
 - 嬰兒隨成長而熱量、蛋白質等需要量增加，僅以乳汁哺育會導致營養供應不足現象。
 - 僅以乳汁供給會呈排斥現象，嬰兒對固型食物的慾求增加。

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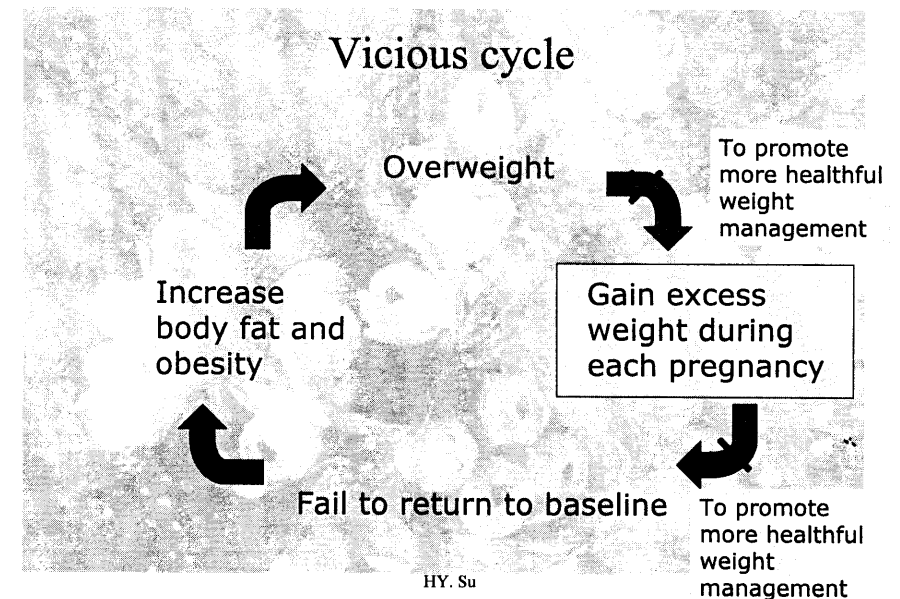
Obesity rates in young women

- The greatest increase in the incidence of obesity occurred in young women 18 to 29 years old.
JAMA, 1999,282:1519-1522
- In the latest Pregnancy Nutrition Surveillance data (2004), approximately 40% to 50% of women were overweight when they became pregnant.
- Women who are overweight before pregnancy are most vulnerable to excessive gestational weight gain

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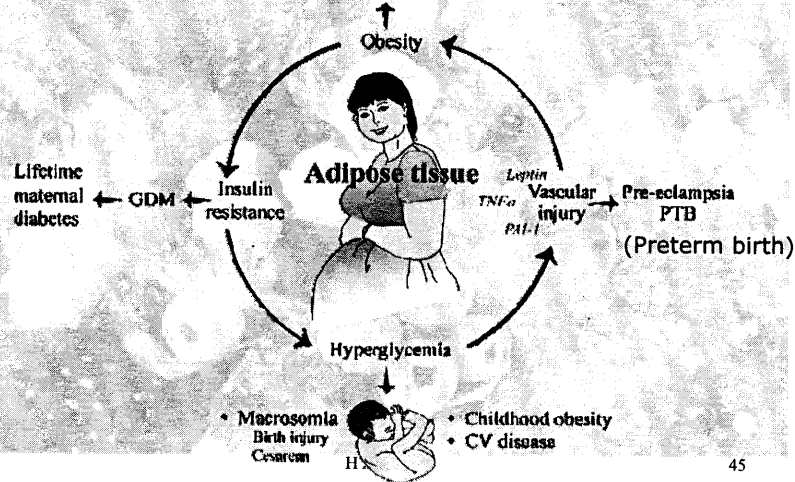
Vicious cycle



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The pathological effects of obesity on pregnancy and fetal outcome

- Lifetime cardiovascular disease
- Future pregnancy complications



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Effect of obesity on pregnancy

- Fetal macrosomia
- Low birthweight
- Preterm birth
- Increased cesarean delivery
- Preeclampsia
- Gestational diabetes

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Pregnancy weight matrices at midgestation (20 weeks)

Prepregnant BMI	Inadequate gain(lb)	Appropriate gain(lb)	Excessive gain(lb)
<18.5 or IBW<85%	<11 (5.0)	11-16 (5.0-7.3)	>16 (7.6)
18.5-24.9 or IBW 100%	<12 (5.4)	12-16 (5.4-7.3)	>16 (7.3)
25-29.9 or IBW 120%	<5 (2.3)	5-8 (2.3-3.6)	>8 (3.6)
>30 or IBW>150%	Weight loss or no gain	Not determined	Not determined

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Erick, 1991⁴⁷

Pregnancy weight matrices at term (40 weeks)

Prepregnant BMI	Inadequate gain(lb)	Appropriate gain(lb)	Excessive gain(lb)
<18.5 or IBW<85%	<28 (12.7)	28-40 (12.7-18.2)	>40 (18.2)
18.5-24.9 or IBW 100%	<25 (11.4)	25-35 (11.4-15.9)	>35 (15.9)
25-29.9 or IBW 120%	<15 (6.8)	15-25 (6.8-11.4)	>25 (11.4)
>30 or IBW>150%	Weight loss or no gain	15 (6.8)	Not determined

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Erick, 1991⁴⁸

懷孕期飲食設計(19-30歲，女性157公分，51公斤)
RDI建議熱量2050大卡，蛋白質50公克
以30-35大卡/公斤計算

	2050	1530	1530+300	1755	1755+300
低脂奶類	2	2	3	2	3
五穀根莖類	14	9	11	12	14
中脂肉類	3	3	3	3	3.5
蔬菜類	3	3	3	3	3
水果類	3	2	2	2	2
油脂類	9	5	6	6	6
蛋白質	68(13%)	58(16%)	70(16%)	64(15%)	80(16%)
脂肪	68(30%)	48(29%)	57(29%)	53(28%)	60(27%)
醣類	294(57%)	204(55%)	246(55%)	249(58%)	291(58%)
熱量	2060	1480	1777	1729	2018

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哺乳期飲食設計(19-30歲，女性157公分，51公斤)
RDI建議熱量2050大卡，蛋白質50公克
以30-35大卡/公斤計算

	2050	1530	1530+500	1755	1755+500
低脂奶類	2	2	3	2	3
五穀根莖類	14	9	13	12	14
中脂肉類	3	3	3.5	3	3.5
蔬菜類	3	3	3	3	3
水果類	3	2	2	2	2
油脂類	9	5	7	6	6
蛋白質	68(13%)	58(16%)	78(16%)	64(15%)	87(16%)
脂肪	68(30%)	48(29%)	65(29%)	53(28%)	67(27%)
醣類	294(57%)	204(55%)	276(55%)	249(58%)	321(57%)
熱量	2060	1480	1995	1729	2235

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Thanks for your attention!

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