
# La dieta della fertilità: cibi pro gravidanza

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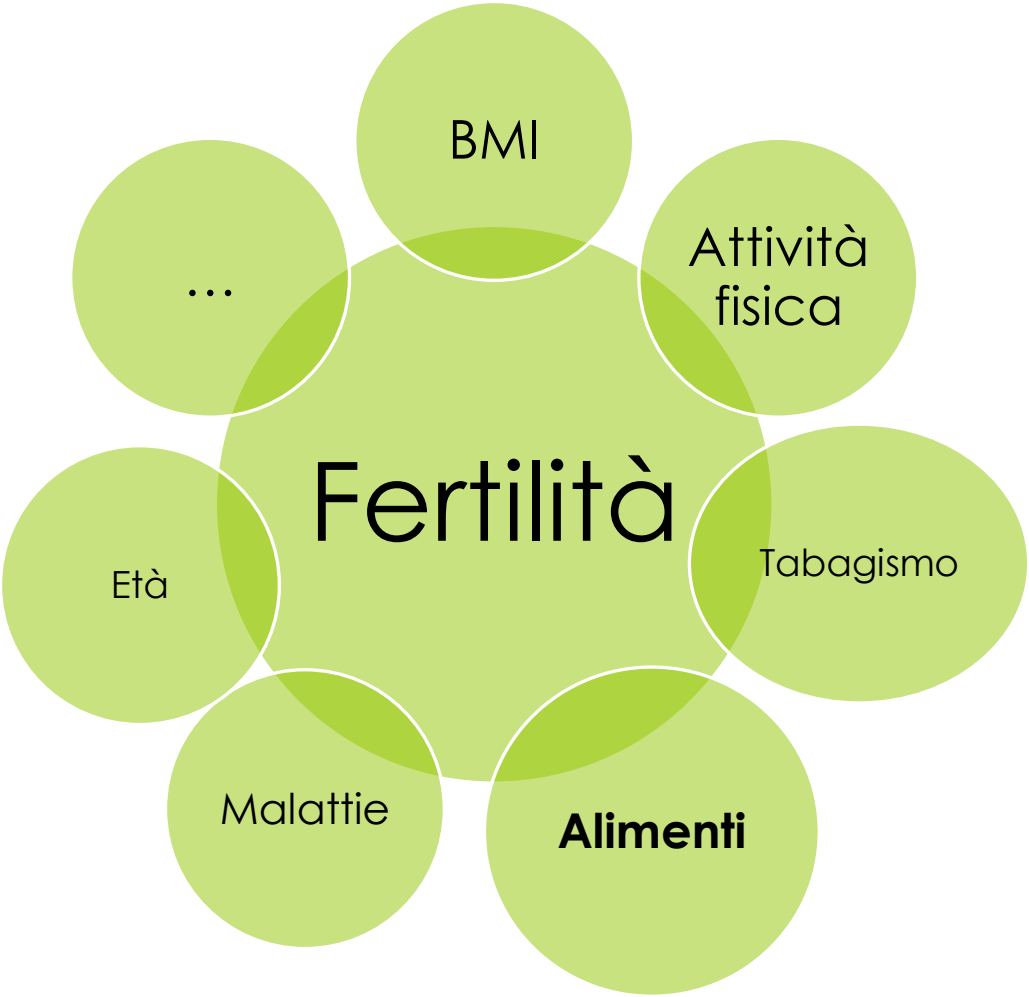
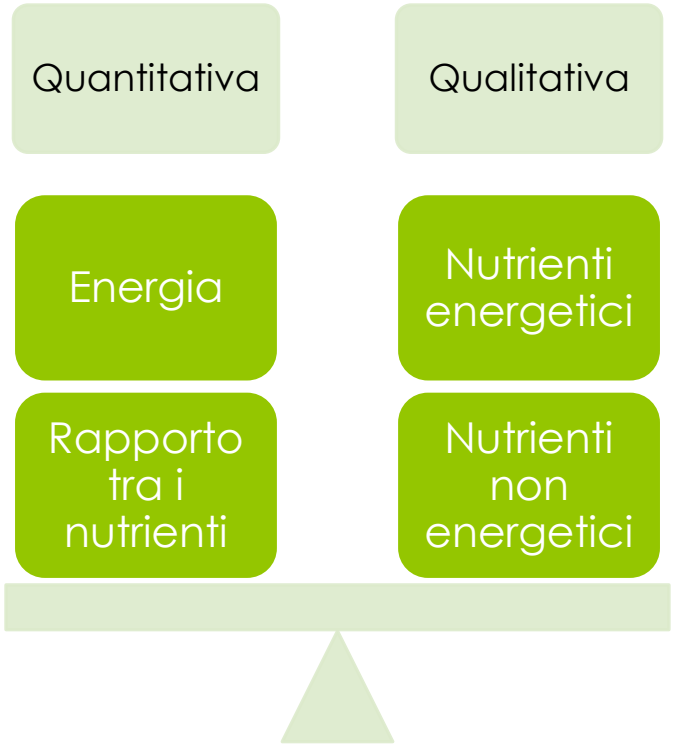
# Fattori che influenzano la fertilità



# Obbiettivi della dieta per la fertilità:

- Ridurre i fattori di rischio
- Garantire un assetto nutrizionale ottimale
- Aiutare il miglioramento dell'assetto metabolico-ormonale

# Caratteristiche della dieta per la fertilità:




# BMI e fertilità→Femminile

- U-shaped: riduzione della fertilità sia per sovrappeso che per sottopeso.

[Practice Committee of American Society for Reproductive Medicine in collaboration with Society for Reproductive Endocrinology and Infertility. Optimizing Natural Fertility. *Fertil Steril* 2008;90:S1-6]

| Factor | Impact on fertility |
|---|---|
| **Obesity (BMI >35)** | Time to conception increased two-fold |
| **Underweight (BMI <19)** | Time to conception increased four-fold |

Donne sottopeso maggiori difficoltà di concepimento

Fertility Zone (19<BMI<25)

TESSUTO ADIPOSO

Donne obese rischio di infertilità tre volte superiore

**-5/10%** del peso corporeo

Rich-Edwards JW, Goldman MB, Willett WC, et al. Adolescent body mass index and infertility caused by ovulatory disorder. Am J Obstet Gynecol 1994;171:171-7.

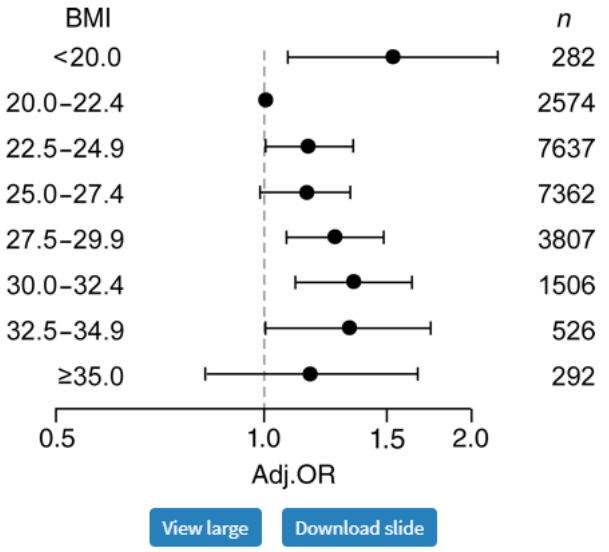

# BMI e fertilità→Maschile

Il rischio di mancata gravidanza aumenta in relazione all'incremento del BMI del maschio.

-Influenza su asse ipotalamo-ipofisi-testicoli

-Insulino-resistenza
-Alterati livelli di testosterone ed estrogeni
-Ipertermia scrotale

Alterazione dei parametri del liquido seminale e scarsa concentrazione di spermatozoi




Adjusted OR, 95% CI and number of men by men's BMI categories among 23 986 men in Norway, 1999–2005.

## Rewiew :

Hum Reprod Update. 2017 Nov 1;23(6):681-705.

## How effective are weight-loss interventions for improving fertility in women and men who are overweight or obese? A systematic review and meta-analysis of the evidence.

Best D, Avenell A, Bhattacharya S

OUTCOMES:

- A total of 40 studies were included, of which 14 were randomised control trials. Primary outcomes were pregnancy, live birth rate and weight change. In women, reduced calorie diets and exercise interventions were more likely than control interventions to result in pregnancy [risk ratio 1.59, 95% CI (1.01, 2.50)], and interventions resulted in weight loss and ovulation improvement, where reported. Miscarriage rates were not reduced by any intervention.

WIDER IMPLICATIONS:

- Overweight and obese persons seeking fertility should be educated on the detrimental effects of fatness and the benefits of weight reduction, including improvement in pregnancy rates. **A combination of a reduced calorie diet, by reducing fat and refined carbohydrate intake, and increased aerobic exercise should form the basis of programmes designed for such individuals**. A lack of randomized studies in men and couples, and studies evaluating barriers to undertaking weight loss in infertile populations is evident, and future research should examine these issues further.

# *Quali alimenti deve allora contemplare una dieta pro-gravidanza?*

Am J Public Health. 2016 September; 106(9): 1669–1676.
Published online 2016 September. doi: 10.2105/AJPH.2016.303350

PMCID: PMC4981818
PMID: 27459445

## Contributions of the Nurses' Health Studies to Reproductive Health Research

Jorge E. Chavarro, MD, ScD,✉ Janet W. Rich-Edwards, ScD, Audrey J. Gaskins, ScD, Leslie V. Farland, ScD, Kathryn L. Terry, ScD, Cuilin Zhang, MD, PhD, and Stacey A. Missmer, ScD

# Infertilità anovulatoria

-*acidi grassi trans*

-Low-fat dairy

-Proteine di origine animale

-Soft drinks

-Dieta ad alto carico glicemico

-High-fat dairy

-Non eme ferro

-Proteine di orgine vegetale

-Elevato intake di acido folico

combination of these dietary factors into a single dietary pattern was related to a 66% lower risk of anovulatory infertility (top vs bottom quintile comparison) as well as a 28% lower risk of all other causes of infertility.30 Furthermore, the combination of diet, weight control, and physical activity was found to explain nearly two thirds of the incidence of anovulatory infertility in this cohort30 suggesting that the majority of cases of infertility caused by anovulation may be preventable through diet and lifestyle interventions. Overlapping dietary patterns have been related to lower risk of infertility in other cohorts by independent investigators.3 More recently, NHS investigators have focused their efforts on environmental

# The «Fertility Diet»

| | |
|---|---|
| **The 10 recommendations for ovulation related infertility:** | **Avoid trans fats.** Trans fats are found in fried foods (like french fries) and in baked good (like cookies and cakes). |
| | **Consume more unsaturated vegetable oils.** Monounsaturated and polyunsaturated . |
| | **Get more protein from vegetables.** Instead of a serving of steak, consider a serving of lentils. |
| | **Eat slow carbs.** Choose whole grains, oatmeal and vegetables, which are are not highly refined, |
| | **Make it whole milk.** If you're trying to get pregnant, whole-fat diary is the best choice. Opt for whole milk over skim, and enjoy a small dish of ice cream each day. |
| | **Take a multi-vitamin.** Folic acid (400 mcg) and vitamin B are essential. |
| | **Don't neglect iron intake.** Get plenty of iron, but not from red meat. Eat vegetables high in iron, like spinach, and consider taking an iron supplement. |
| | **Drink water.** Skip the soda. Everything else (coffee, alcohol) in moderation. |
| | **Get to a "fertility zone" weight.** Being in the "fertility zone" means achieving a BMI of 20 to 24. Weighing too much or too little can affect your menstrual cycle. |
| | **Be active.** If you don't exercising regularly, starting could help your fertility. If you're already active, be careful not to overdo it. According to Resolve, low body fat can affect ovulation and fertility. |

# Evitare gli ac. grassi trans….

Quantitativo MASSIMO: **1 g/die** (2.2g su 2000 kcal/die)

| Alimento | Grassi trans su 100g | |
|---|---|---|
| Margarina | 14,89 | g |
| Margarina spalmabile | 4,422 | g |
| McDONALD'S, McFLURRY with OREO cookies | 0.565 | g |
| Torta di mele (McDonald's) | 6,126 | g |
| Burro | 3,278 | g |
| Torta al cioccolato | 1,318 | g |
| Doppio Cheeseburger (McDonald's) | 0,857 | g |
| Wurstel di tacchino | 0,789 | g |
| Pie, chocolate creme, commercially prepared | 2.490 | g |

1.904 g

2.988 g

*1% in natura*:

- Prodotti lattiero-caseari
- Carne di ruminanti (nella misura del 5 – 8% rispetto al quantitativo totale di grassi.)

*99% per idrogenazione, raffinazione e cottura*:

- olii per fritti per uso industriale
- la margarina utilizzata in pasticceria
- i prodotti da forno preconfezionati, torte, glasse, farcie
- i cibi fritti

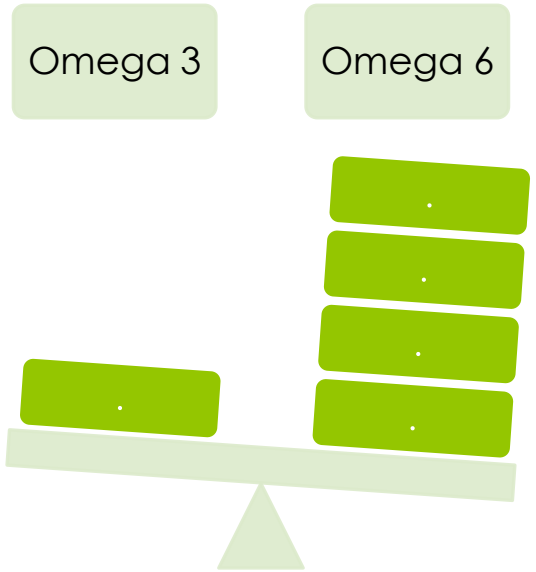
# …preferendo ac. grassi mono e poliinsaturi

- MONO: Olio extravergine d'oliva !

- PUFA: 5-10% En

  - PUFA n-6: 4-8%
  - PUFA n-3: 0,5-2%

  - EPA-DHA: 250 mg




ALTERAZIONI dell'RAPPORTO→
variazioni nel **numero** e nella **dimensione dei follicoli**, nell'**ovulazione**, nella **produzione di progesterone** da parte del corpo luteo

18:3 ALA-Alfa Linolenico

| **Rapporto ω6/ω3 in alcuni oli vegetali** | |
|---|---|
| Olio di semi di lino | 1:4 |
| Olio di colza | 2:1 |
| Olio di canapa | 3:1 |
| Olio di oliva | 9:1 |
| Olio di girasole | 71:1 |

2-3 porzioni di pesce alla settimana

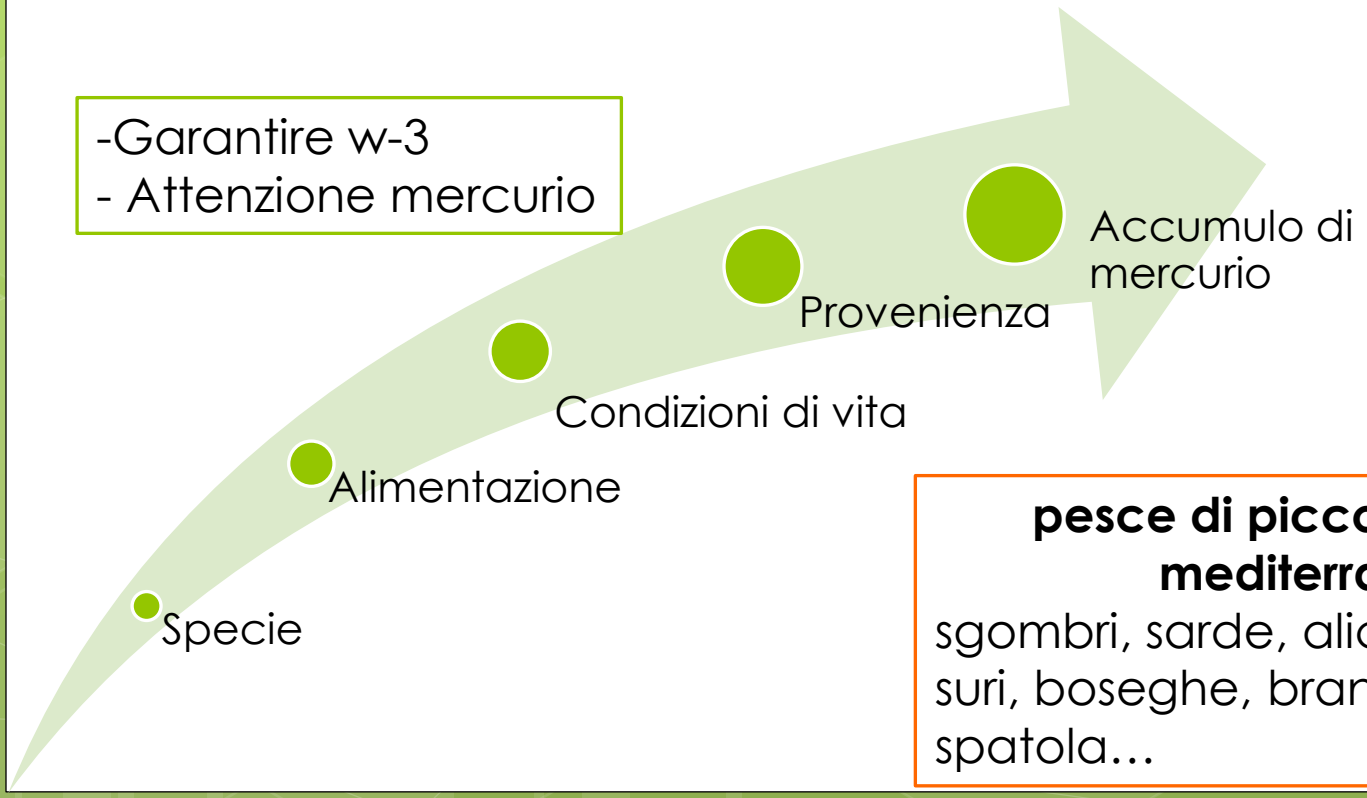
| Pesce | EPA* | DHA* | EPA+DHA | Mercurio* |
|---|---|---|---|---|
| Sardina | 1,4 | 1,1 | **2,5** | **0,016** |
| Sgombro reale | 1 | 1,2 | **2,2** | **0,730** |
| Aringa | 0,7 | 0,9 | **1,6** | **0,044** |
| Trota | 0,5 | 1,1 | **1,6** | **0,072** |
| Acciuga | 0,5 | 0,9 | **1,4** | **0,043** |
| Tonno pinna gialla (in scatola) | 0,3 | 1 | **1,3** | **0,353** |
| Salmone atlantico fresco | 0,3 | 0,9 | **1,2** | **0,014** |

20:5 ω3 -EPA-Acido Eicosapentaenoico
e 22:6 ω3 – DHA-Acido Docosaesaenoico

- **Elevati livelli di mercurio** possono essere associati ad un effetto citotossico o genotossico che comporta una **ridotta qualità ovocitaria.**
- Tale studio evidenzia un'associazione tra elevati livelli di mercurio dovuti all'alto consumo di prodotti ittici e fertilità in Cina (Hong Kong)

[Choy CM, Lam, CW, Cheung LT, et al. Infertility, bloood mercury concentrations and dietary seafood consumption: a case-control study. BJOG 2002;109:1121-5.]

-Garantire w-3
- Attenzione mercurio




**pesce di piccola taglia e mediterraneo**:
sgombri, sarde, alici, acciughe, suri, boseghe, branzini, pesce spatola…

# Basso carico glicemico

- Indicazione  per migliorare, la risposta glicemica, insulinemica, e l'insulinoresistenza.

PCOS

Diversi studi evidenziano come obesità e **insulino-resistenza** giochino un ruolo chiave nei problemi di fertilità legati ad **alterazioni del ciclo mestruale**

[Pasquali R, Patton L, Gambineri A. Obesity and infertility. *Curr Opin Endocrinol Diabetes Obes* 2007;14:482-7]

Meccanismo di azione (pcos):

- lenta secrezione di insulina si riflette su produzione ormoni sessuali
- basso carico glicemico aumenta possibilità di concepimento per azione diretta su insulina

# …e indice glicemico?!

- l'indice esprime la *velocità* con cui i glucidi si riversano nel sangue
- il carico prende in considerazione anche la *quantità* di glucidi

Il carico glicemico -e in definitiva
la risposta insulinica- dipendono
dalla **composizione dell'intero pasto.**

↓

**porzione**

- preferibile orientare verso alimenti a basso indice glicemico:

cereali integrali in chicchi (orzo, farro, avena…), cereali minori (quinoa, grano sarac, …), verdura, legumi, frutta intera.

# Fibra Alimentare

The American Journal of CLINICAL NUTRITION

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Am J Clin Nutr. 2009 Oct; 90(4): 1061–1069.
Published online 2009 Aug 19. doi: 10.3945/ajcn.2009.27990

PMCID: PMC2744625
PMID: 19692496

## Effect of daily fiber intake on reproductive function: the BioCycle Study[1,2,3]

Audrey J Gaskins, Sunni L Mumford, Cuilin Zhang, Jean Wactawski-Wende, Kathleen M Hovey, Brian W Whitcomb, Penelope P Howards, Neil J Perkins, Edwina Yeung, and Enrique F Schisterman for the BioCycle Study Group

**Objective:** The objective was to determine if fiber consumption is associated with hormone concentrations and incident anovulation in healthy, regularly menstruating women.

**Design:** The BioCycle Study was a prospective cohort study conducted from 2004 to 2006 that followed 250 women aged 18–44 y for 2 cycles. Dietary fiber consumption was assessed ≤4 times/cycle by using 24-h recall. Outcomes included concentrations of estradiol, progesterone, luteinizing hormone (LH), and follicle-stimulating hormone (FSH), which were measured ≤8 times/cycle, and incident anovulation.

**Results:** Dietary fiber consumption was inversely associated with hormone concentrations (estradiol, progesterone, LH, and FSH; $P < 0.05$) and positively associated with the risk of anovulation ($P = 0.003$) by using random-effects models with adjustment for total calories, age, race, and vitamin E intake. Each 5-g/d increase in total fiber intake was associated with a 1.78-fold increased risk (95% CI: 1.11, 2.84) of an anovulatory cycle. The adjusted odds ratio of 5 g fruit fiber/d was 3.05 (95% CI: 1.07, 8.71).

# Menstrual hormones

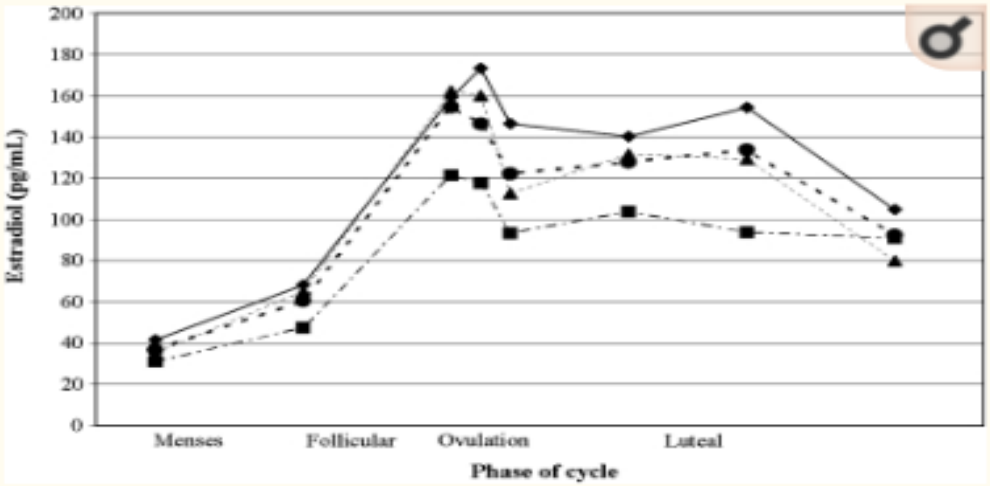


FIGURE 1

Crude concentrations of estradiol across the menstrual cycle according to Dietary Reference Intake categories of fiber consumption: ♦: ≤10 g/d; •: 10.01–16 g/d; ▲: 16.01–21.99 g/d; ▪: ≥22 g/d.

Dietary fiber was stratified into insoluble and soluble components, yielding results similar to those of total dietary fiber. Soluble fiber had a stronger inverse relation with estradiol concentrations ($\beta = -0.222$, $P = 0.01$) than did insoluble fiber ($\beta = -0.057$, $P = 0.02$). Of the 3 sources of fiber, fruit fiber had the strongest association with concentrations of estradiol ($\beta = -0.104$, $P = 0.03$), followed by grain fiber ($\beta = -0.073$, $P = 0.03$), whereas vegetable fiber was not associated ($\beta = -0.027$, $P = 0.40$) with estradiol concentration. Fruit and grain fiber were also associated with statistically significant decreases in concentrations of progesterone ($\beta = -0.242$, $P = 0.02$, for fruit fiber, and $\beta = -0.163$, $P = 0.02$, for grain fiber).

# Anovulation

Results from a nonlinear mixed model adjusting for energy intake, race, age, and vitamin E intake showed that for each 5-g increase in dietary fiber, the adjusted odds ratio (aOR) of anovulation was 1.78 (95% CI: 1.11, 2.84; Table 3). Thus, a 5-g/d increase in dietary fiber intake, equivalent to ≈2 slices whole-grain bread (4.6 g/d) or one large apple (4.7 g/d), would result in a 78% elevation in the risk of anovulation. Analysis of continuous soluble and insoluble fiber intake as linear exposures yielded similar results. Soluble fiber had a stronger, positive association with an elevated risk of anovulation (aOR: 6.73; 95% CI: 1.18, 38.26) than did insoluble fiber (aOR: 2.15; 95% CI: 1.22, 3.77). When analyzed by fiber source, a 5-g/d increase in fruit fiber had the strongest association with probability of anovulation (aOR: 3.05; 95% CI: 1.07, 8.71). Grain and vegetable fiber were not significantly associated with anovulation [5-g grain fiber/d increase (aOR: 1.84; 95% CI: 0.89, 3.78); 5-g/d vegetable fiber increase (aOR: 1.74; 95% CI: 0.87, 3.47)].

- In conclusion, we observed that **fiber consumption** at or above the recommended intakes (22g/die)was significantly associated with **decreased reproductive hormone concentrations** and a substantially **elevated probability of anovulatory cycles** in women of reproductive age.

# Prodotti Biologici

- Cereali
- Frutta fresca
- Verdure e ortaggi
- Legumi

# Meno proteine di origine animale e più proteine di origine vegetale
# Più ferro non-eme

- LARN 2014

(rapporto proteine vegetali/animali 3/1)

QUALI PROTEINE VEGETALI?

OXFORD JOURNALS
Human Reproduction (Oxford, England)

Hum Reprod. 2015 Aug; 30(8): 1942–1951.
Published online 2015 Jun 16. doi: 10.1093/humrep/dev133
PMCID: PMC4507331
PMID: 26082480

# Dietary factors and luteal phase deficiency in healthy eumenorrheic women

Mary A. Andrews,[1,2] Karen C. Schliep,[3] Jean Wactawski-Wende,[4] Joseph B. Stanford,[5] Shvetha M. Zarek,[3,6] Rose G. Radin,[3] Lindsey A. Sjaarda,[3] Neil J. Perkins,[3] Robyn A. Kalwerisky,[3] Ahmad O. Hammoud,[7,8] and Sunni L. Mumford[3,*]

- le donne con una fase luteale breve LPD hanno un consumo doppio di **isoflavoni**

Dietary characteristics of women by LPD cycles.[1]

| | Luteal phase duration | | | | |
|---|---|---|---|---|---|
| | <10 days | | ≥10 days | | *P* |
| Number of cycles (*n* [%]) | 41 (8.9) | | 422 (91.1) | | na |
| Diet quality | Mean ± SD | Median (IQR) | Mean ± SD | Median (IQR) | |
| Iron (mg) | 13.6 ± 5.0 | 13.2 (10.1, 15.0) | 12.3 ± 5.1 | 11.1 (9.0, 14.5) | 0.07 |
| Isoflavones (mg) | 7.3 ± 13.1 | 1.1 (0.5, 7.3) | 2.6 ± 6.7 | 0.5 (0.3, 1.4) | 0.05 |

| Alimento | Isoflavoni (totale) (mg/100 g) | mg per porzione media (g) |
|---|---|---|
| Soia semi | 58-380 | 34.8-228.0 (60) |
| Tofu | 8-67 | 10.4-87.1 (130) |
| Soia farina | 83-178 | 16.6-35.6 (20) |
| Soia proteine testurizzate | 71-118 | 28.4-47.2 (40) |
| Soia latte | 3-17 | 3.0-17.0 (100) |
| Miso | 26-89 | 4.7-16.0 (18) |
| Soia formaggio | 3-5 | 1.2-20.0 (40) |
| Tofu yogurt | 15 | 18.0 (120) |
| Soia salsa | 1-7 | 0.1-0.3 (5) |
| Piselli sgranati | 7 | 2.8 (40) |

*Reinli K. And Block G. Nutr Cancer 26:123-148 (1996)*

**In men,a higher intake of soy foods and soy isoflavones (1/2 serving per day, or 4 servings per week) was associated with reduced sperm concentration. The association was stronger for men with a BMI ≥ 25 kg/m2.**

# High fat/ Whole - Dairy

- Latte e latticini sono alimenti ricchi di **calcio** biodisponibile, nonché di proteine, **vitamine** e **antiossidanti.**

- Il consumo di latticini sembra incidere positivamente sulla funzionalità ovarica, in particolare sembra migliorarla in patologie associate a disfunzioni ovulatorie, come l'insulino-resistenza e il diabete di tipo 2.

[Pereira MA, Jacobs DR Jr, Van Horn L, et al. Dairy consumption, obesity and the insulin resistance syndrome in young adults: the cardia study.JAMA 2002;287:2081-9.
Hjollund NHI, Jensen TK, Bonde JPE, et al. Is glycosilated haemoglobin a marker of fertility? A follow-up study of first-pregnancy planners. *Hum Reprod* 1999;14:1478-82.]

Dal Nurses' Health Study II (NHS II)….

## A prospective study of dairy foods intake and anovulatory infertility FREE

J.E. Chavarro ✉, J.W. Rich-Edwards, B. Rosner, W.C. Willett

*Human Reproduction*, Volume 22, Issue 5, 1 May 2007, Pages 1340–1347,
https://doi.org/10.1093/humrep/dem019
**Published:** 28 February 2007 **Article history** ▾

- In summary, we observed a **positive association** between intake of **low-fat dairy foods** (especially yogurt and sherbet/frozen yogurt) **and anovulatory infertility** and an **inverse association** between intake of **high-fat dairy foods** (especially whole milk and ice cream) and this disease. The intake of dairy fat, or a fat-soluble substance present in dairy foods, may partly explain the association between high-fat dairy and anovulatory infertility. Further, our data do not support the hypothesis that, within the observed range of intake, lactose significantly impairs ovulatory function to the point of affecting fertility.

# INFERTILITA' ANOVULATORIA

## High

**>/= 1 porz/die** di latticini interi a confronto con un consumo </= 1 porz/sett

0.73 (0.52-1.01; p 0.01)

- l'effetto benefico di alcuni acidi grassi sulla funzione ovulatoria
- sostanze liposolubili che favoriscano la funzione ovulatoria
- concentrazioni estrogeniche maggiori, che possano abbassare i livelli di IGF-1
- miglioramento della sensibilità insulinica che abbia poi portato a migliore funzione ovulatoria.

LATTE INTERO e GELATO

## Low

**>/= 2 porz/die** di latticini magri a confronto con un consumo </= 1 porz/sett

1.85 (1.24-2.77; p 0.002)

- La presenza di precursori androgenici
- aumento dei livelli di IGF-1
- la diversa composizione del latte magro (con l'aggiunta di proteine quali alfa-lactoalbumina) ha effetti androgenici

YOGURT e FROZEN YOGURT

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J Nutr. 2017 Feb; 147(2): 218–226.
Published online 2016 Nov 23. doi: 10.3945/jn.116.241521

PMCID: PMC5265695
PMID: 27881593

# Dairy Food Intake Is Associated with Reproductive Hormones and Sporadic Anovulation among Healthy Premenopausal Women[1,2,3]

Keewan Kim,[4] Jean Wactawski-Wende,[6] Kara A Michels,[4] Torie C Plowden,[4,5] Ellen N Chaljub,[4] Lindsey A Sjaarda,[4] and Sunni L Mumford[4,*]

- Diminuzione del 4-5% dei livelli sierici di estrogeni per ciascuna porzione di latte e latticini, sia magri che interi; tuttavia, questo fattore non sembra influenzare l'ovulazione.
- Il consumo di **yogurt** (0-2 porz), di panna (0-8 porz) è direttamente associato ad un maggiore rischio di cicli anovulatori
- I latticini ricchi di grassi sono associati ad una maggiore concentrazione di ormone luteinizzante (LH) +2,9%.

# Micronutrienti

- **Ac. Folico** (4 mg)
- Vitamine gruppo B
- Ferro
- Zinco
- ….

MALNUTRIZIONE QUALITATIVA

# Bevande alcoliche e caffeina

## Optimizing natural fertility: a committee opinion

*Practice Committee of the American Society for Reproductive Medicine in collaboration with the Society for Reproductive Endocrinology and Infertility*

The American Society for Reproductive Medicine, Birmingham, Alabama

**Table 1**

Lifestyle factors that affect infertility.

| Factor | Impact on fertility | Study |
|---|---|---|
| Obesity (BMI >35) | Time to conception increased two-fold | Hassan and Killick, 2004 (53 |
| Underweight (BMI <19) | Time to conception increased four-fold | Hassan and Killick, 2004 (53 |
| Smoking | RR of infertility increased 60% | Clark et al., 1998 (38 |
| Alcohol (>2 drinks/day) | RR of infertility increased 60% | Eggert et al., 2004 (50 |
| Caffeine (>250 mg/day) | Fecundability decreased 45% | Wilcox et al., 1998 (58 |
| Illicit drugs | RR of infertility increased 70% | Mueller et al., 1990 (64 |
| Toxins, solvents | RR of infertility increased 40% | Hruska et al., 2000 (67 |

View Table in HTML

*Note:* Table reprinted from the document of the same name, last published in 2008, Fertil Steril 2008;90(Suppl):S1-6. BMI = body mass index; RR = relative risk.

FERTILITY DIET

DIETA
MEDITERRANEA

In a study that compared ART outcomes in patients with various prepregnancy dietary patterns, researchers identified the Mediterranean diet pattern, to be most associated with fertility. The **Mediterranean diet resulted in a 40% greater probability of pregnancy**, possibly because it was associated with higher levels of red blood cell folate and vitamin B6

# GRAZIE PER L'ATTENZIONE!