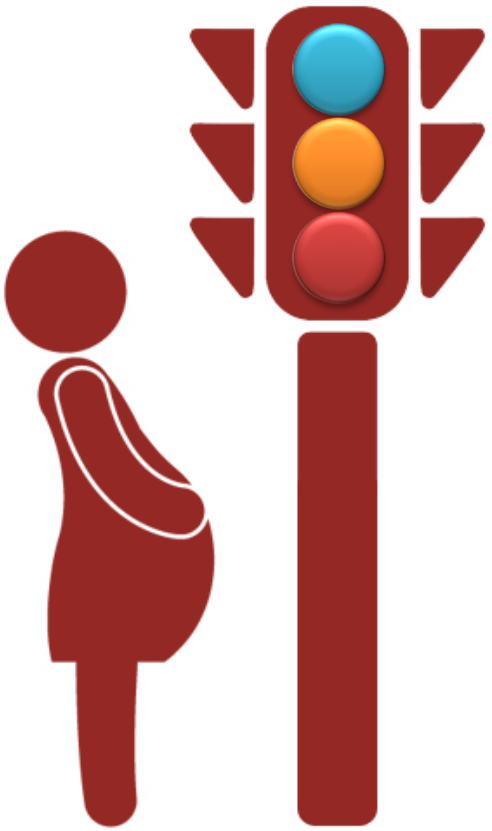
A Decalogue on Nutrition and Food Safety during Pregnancy

10 simple rules to reduce exposure



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Introduction

Pregnancy involves two distinct organisms: one is dependent on the other (eating and breathing through the other);

the unborn child is a dynamic, mutating organism, thus more vulnerable:

A "TEMPORARY ERROR" (eg., a deficiency) **MAY CAUSE A PERMANENT DAMAGE**

the organism grows in its own deficit

The European Recommendations for the primary prevention of congenital anomalies (CA)

The European recommendations[1] have been formulated with the decisive contribution of italian experts, focusing on **risk and protective factors associated with nutrition, lifestyles and environment**.

The European recommendations have been **translated** and discussed in italian in: Granata O, Carbone P, Mantovani A, Taruscio D (Ed.). Prevenzione primaria delle malformazioni congenite: attività del Network Italiano Promozione Acido Folico. ISS; 2013, Rapporti ISTISAN2 13/28

1.www.iss.it/binary/inte/cont/Eurocat_Reco_PrimaryPrevention.pdf

2. http://www.iss.it/binary/publ/cont/13_28web.pdf

Why do we start from CA?

- ✓ Because, taken as a whole, CAs are not so uncommon (total incidence of 3% on births, World Health Organization, 2012[3]) because CAs are events with serious and often disabling consequences ("White Book on civil disability in Italy").
- ✓ Because CAs are the tip of the iceberg: the same factors that increase the risk of malformations also increase the risk of other adverse outcomes: delays of growth and development, prematurity, spontaneous abortions.
- ✓ Because most of these can be prevented by a healthy living and working environment, by an intelligent and cautious use of drugs and (last but first)

by an healthy and balanced diet

3. www.who.int/mediacentre/factsheets/fs370/en/

From EU Recommendations to Decalogue

The Recommendations are complex and are addressed to health authorities and doctors as well as to citizens, including actions at a different level:

- Government (e.g., regulation, risk communication)
- Local health services (e.g., controls, health intervention)
- woman at fertile age (empowerment toward appropriate behaviours: school, society, media, individual)

How to give a consistent, understandable and usable message?

Within the events organized by the Italian Health Ministry for Expo 2015 we elaborated a proposal for a Pregnancy Decalogue

Please note that the Decalogue

- ✓ targets the **general population and main subgroups**. Special indiviual needs (e.g., targeted supplementation, avoidance of certain foods) should managed by dialogue with physicians
- ✓ is adapted to the **Italian scenario** (e.g., the widespread presence of subclinical iodine deficiency)
- ✓ aims at reducing the risk of CA first, but **also of other adverse pregnancy outcomes**, including long-term effects on development, because many risk/protective factors are shared with CA

A decalogue on nutrition and food safety during Pregnancy

1. control body weight and glycemia
2. folates in your diet, and periconceptional folic acid, at right doses and times, reduce severe CNS defects
3. vitamin B12 is needed to utilize folic acid and folates
4. iodine is needed for fetal growth and brain development
5. supplements, enriched foods: only and when you need, but avoid excess
6. prevent toxoplasmosis and listeriosis
7. avoid alcohol consumption in pregnancy
8. eat fish in a wise way, take into account EFSA recommendations
9. watch cookware and cooking: may be sources of contaminants
10. Reduce the intake of beverages containing caffeine

Check your body weight and blood sugar

Prevent **obesity** and check **maternal diabetes,** both are important (and sometimes underestimated) risk factors for CA: diet helps achieving optimal glycaemic control

Prevent overweight since it can pave the way

but prevent also underweight. Fat is an important metabolic tissue, needed for reproduction, not an aesthetic sin.

Weight should be appropriate for height, body structure, muscle mass, physical activity, rather than for adherence to changing models

Prevention is the cultural model of **Mediterranean Diet :**

- ✓ eat food (and not calories, vitamins, etc.), **mainly of vegetable origin**
- ✓ **respect the nutrients** within ingredients with simple preparations
- ✓ eat **what is necessary and enjoy** it together with other people

Folates and Folic acid

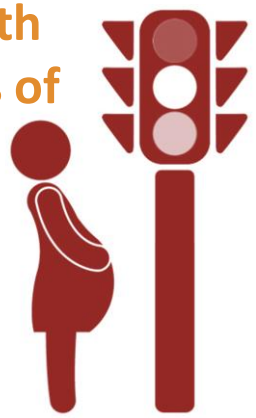
What the EU recommendations say

to **improve folate status through periconceptional FA supplementation, promotion of the consumption of foods rich in natural folates, and the appropriate use of fortified foods**

The Italian National Center on Rare Diseses:

Women of childbearing age that do not exclude pregnancy should take **0.4 mg/day FA**.

If you plan pregnancy **the assumption of FA should start at least one month before the conception and should continue during the first three months of pregnancy**



RIGHT TIMING AND DOSING ARE ALL-IMPORTANT

Folates and Folic Acid

Why we do not support mandatory fortification?

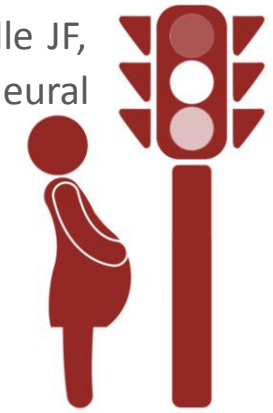
Mandatory food (flour) fortification not supported in EU, with full support of Italy, because there is no full evidence that is safe: uncertainties about adverse effects of high (>1 mg/day ?) FA in non-target population groups (increased cancer promotion in the aging population ?): (EFSA, 2009: a dose-response for tumour-promoting effect of FA cannot be established) (EFSA 2014: Dietary Reference Values for folate, but NOT updated assessment of safety)

Vitamin B12

Vitamin B12-deficiency during pregnancy is common. (Rogne T, Tielemans MJ, Chong MF, et al. Associations of Maternal Vitamin B12 Concentration in Pregnancy With the Risks of Preterm Birth and Low Birth Weight: A Systematic Review and Meta-Analysis of Individual Participant Data. Am J Epidemiol. 2017;185:212-223.)

Low vitamin B12 during pregnancy is associated with higher maternal obesity, insulin resistance (IR), and gestational diabetes mellitus. B12 is a key cofactor in one-carbon metabolism (Adaikalakoteswari A, Vatish M, Alam MT, Ott S, Kumar S, Saravanan P. Low Vitamin B12 in Pregnancy Is Associated With Adipose-Derived Circulating miRs Targeting PPARγ and Insulin Resistance. J Clin Endocrinol Metab. 2017;102:4200-4209.)

Deficient or inadequate maternal vitamin B12 status is associated with a significantly increased risk for neural tube defects (Molloy AM, Kirke PN, Troendle JF, et al. Maternal vitamin B12 status and risk of neural tube defects in a population with high neural tube defect prevalence and no folic Acid fortification. Pediatrics. 2009;123:917-23.)



Vitamin B12

Vitamin B12 is required to maintain folate body store and to support the pivotal role of folate in the regulation of DNA synthesis: deficiency of Vitamin B12 may reduce the benefis of dietary folates and folic acid intake

- ✓ just a little amount of Vitamin B12 is needed
- ✓ it is found essentially in **foods of animal origin**: fish, eggs, dairy, meat
- ✓ Vegan women: a predominantly plant-based diet is low in B12, but also other nutrients, such as vitamin D and zinc; **check the folate status and, if required, take vitamin B12 supplements or Vit.B12 enriched food** (soy milk, etc.)

Iodine

ISS data indicate that **subclinical iodine deficiency is a mass problem**, especially in the inland areas of Italy : 18% of population

Subclinical, but the mother has to supply iodine also to the embryo and fetus because thyroid is not functioning until late pregnancy

The embryo/fetus is the most vulnerable life-stage to deficiency and to the effects of deficiency

- ✓ Balanced intake of I-rich foods (milk/dairy, seafood, eggs, caution with algae because they are very high in iodine: excess should also be avoided)
- ✓ use a little bit of iodized salt (5 g day, with 30 g I/kg salt) and promote its use in food industries (bread), restaurants and canteens

The risk to exceed the upper tolerable level of iodine (0.5 mg/day, 2002) is negligible

Food Supplements, Novel Foods

EU Recommendations state "**to promote effective information on diet and nutrition in women at childbearing age, minimizing the risks of deficiency and/or overdosing of vitamins and essential trace elements**"

"Self-made" or internet-based diets **may lead to excess of some nutrients that are toxic at high doses** (Selenium, etc.) or of substances that have no established usefulness (vanadium, plant supplements: Marcoccia et al J Ethnopharmacol. 2014, Smeriglio et al., Anticancer Agents Med Chem. 2014)

In particular **preformed vitamin A**:

- ✓ excess is teratogenic in humans (0.6 mg/day recommended for women; do not exceed 3 mg/day).
- ✓ no risk of deficiency in Europe (so why supplements?)
- ✓ avoid completely supplements, and avoid frequent liver consumption (the richest food source of Vit. A)
- ✓ no risk form carotenoid provitamins in carrots, etc. (different metabolism)

Food Supplements, Novel Foods

Overall, communicate to women (and men) that:

- ✓ Nutrients should be better taken through foods rather than through pills

Unless

- ✓ at population level there are **specific recommendations by public health authorities** (iodine, folic acid)
- ✓ Or, at individudual levels there are **specific needs supported by medial evidence** (B12 for vegans, etc.)

Toxoplasmosis and Listeriosis

a) **TOXOPLASMOSIS**: a protozoan infection during pregnancy in a mother not immune: negligible for mother, **serious for the fetus**.

Intracellular parasite found in many pets and livestock (not just the cat - which is not always the main culprit especially now that you can do simple diagnostic tests!)

oral contact with feces or with meat, **risk situations regard contact with raw foods**:

- ✓ Raw vegetables unwashed (potentially contaminated with animal feces)
- ✓ Raw meat (unless frozen for a few days), and also slightly seasoned sausages and smoked meats
- ✓ Contact (mouth, hand-mouth) with these foods and unwashed utensils used to prepare:
- ✓ Wash your hands with soap and water after handling these foods and wash utensils after use

Toxoplasmosis and Listeriosis

b) **LISTERIOSIS:** high risk bacterial infection (fetal death, abortion, premature birth). The bacterium is widespread in the environment (soil, water, plants, feces of many animal species).

Food = **main vehicle of infection**: raw fish, meat and vegetables, unpasteurized milk and dairy products (soft cheeses, butter) and also prepared foods (ready to eat): cold meats, ready-made salads, sandwiches: attention to contact with raw foods (as for Toxoplasmosis) and moreover

- ✓ keep raw food separate from cooked food
- ✓ avoid soft cheeses, unless they are made with pasteurized milk
- ✓ consume the precooked products, or ready for consumption as soon as possible, and in any case never beyond the expiration date
- ✓ refrigerate food at a temperature below 5 ° C; keep the refrigerator clean, especially if raw meat is stored there

Alcohol consumption

In Southern and Eastern Europe alcohol (wine and beer) **is a dietary complement rather than a lifestyle**

Continuous and moderate (1, max 2 glasses of wine) alcohol consumption during meals

Alcohol as a lifestyle: peaks of alcohol during weekends, no alcohol during meals) is **associated with Fetal Alcohol Syndrome**

- ✓ Alcohol as a lifestyle is increasing among young women in Southern Europe
- ✓ Alcohol consumption is associated with increased risks of adverse pregnancy outcomes
- ✓ Alcohol pass through placenta, the unborn child has nil or poor alcohol-metabolizing capacity
- ✓ the available data are insufficient to identify a “threshold” for developmental toxicity of alcohol

AVOID ALCOHOL DURING PREGNANCY

Fish Intake

Fish is a specific issue as it is **a source of nutrients** (e.g., iodine, omega-3 fatty acids) important for development and a critical source **bioaccumulating contaminants** (e.g, PCB, PBDE, PCDD/F e DL-PCB,methylmercury impairing prenatal development)

Fatty fish, especially large-sized - salmon, mackerel, eel: greater bioaccumulation of fat-soluble contaminants such as dioxins

Predators even if lean – swordfish, tuna: more vulnerable to the bioaccumulation of methylmercury

Fish intake during pregnancy is, and has been, a risks-to-benefits case-study developed in recent years by EFSA

EFSA 2014: **pregnant women eating 3-4 serving/week of fish get the right amount of omega-3 and this is better for health than not eating fish for fear of methylmercury (**higher intake has no demonstrated benefits)

Fish Intake

EFSA Opinions (2005, 2012, 2014, 2015)

1. fish is animportant as a source of omega3 and methylmercury
2. there are recommended levels of omega3 intake and a maximum tolerable weekly intake of 1.3 µg /kg p.c. of Hg (EFSA 2012)
3. Veterinary services of the NHS check that the fish produced/consumed in Italy does not exceed the maximum levels of Hg (EC Reg. No. 629/2008.12), same for aquaculture feeds for (Dir. 2010/6 / EU28)
4. women of child-bearing age should not exceed the TWI in order to avoid adverse effects of methylmercury on neurological development
5. Choose fish relatively rich in DHA with a low level of methylmercury: small oily fish (mackerel, sardines, anchovies) rather than large fish such as tuna and swordfish, accumulators of contaminants.

Fish Intake

- Consumption of about 1–2 servings of seafood per week and up to 3–4 servings per week during pregnancy has been associated with better functional outcomes of neurodevelopment in children compared to no seafood.
- At a general level in Europe these portions (as average consumption) do not pose a risk data on environmental pollution
- Data do not indicate greater benefits with an higher fish consumption.

But we should be careful: (EFSA 2015): defining recommendations suitable throughout Europe is impossible; we should to take into account:

- environmental patterns (that may be different throughout EU)
- quantity of fish consumed
- type of fish consumed (tuna, swordfish, cod and flatfish

  of large size are the species most at risk for methylHg)

Fish Intake

It is possible that in Countries/regions with environmental emissions and heavy consumption of "large lean fish", **the relationship between the intake of omega3 and methylHg becomes unfavorable** (e.g., it is possible to exceed the TDI of MeHg before reaching the recommended dose of Omega-3)

There are significant differences at Country/region level

In addition to the indispensable monitoring of possible emissions, targeted checks on food based on contamination data and types of fish consumed

Mantovani A, Baldi F, Frazzoli C, Lorenzetti S, Maranghi F (Ed.).
Modelli per la valutazione rischio-beneficio in sicurezza alimentare. Rapporti IstiSan 12/50 (2012)

Fish Intake

Opinion EFSA Risk for animal and human health related to the presence of dioxins and dioxin-like PCBs in feed and food EFSA Journal 2018;16(11):5333[1]

- New TWI for dioxins **lowered at 2 pg/kg pc per week (**adverse effects on fetal reproductive development)
- For adults: il «fatty fish» represents 56% of dioxins exposure
- critical species are farmed salmon and trout
- there is a need for an updated risk-benefit assessment of fish consumption that takes exposure to PCDD/Fs and DL-PCBs into account

While waiting for the new EFSA R/B assessment information to the consumer:

✓ Women child-bearing age and small children (1-3 y.o.) avoid or limit tuna and swordfish intake to maximum 1-2 a week

✓ Avoid or limit to maximum once a week farmed salmon and trout

1. https://www.efsa.europa.eu/en/efsajournal/pub/5333

In the kitchen: Coocking methods and food containers

In the kitchen (at home and at the restaurant/cafeteria) some **erroneous practices can lead to the contamination of food** with toxic substances harmful to the adult and even more to the fetus

- ✓ the over-cooking of foods containing fats, such as grilled steaks and pizza, produces polycyclic aromatic hydrocarbons, (PAHs) carcinogenic and teratogenic
- ✓ incorrect use of plastic containers may lead to the release of endocrine disruptors (EDs, substances that alter the hormonal balance) present as additives in soft PVC (phthalate) and rigid (bisphenols) plastics:

these substances mainly alter the estrogen/androgen balance:

risks for pregnancy and for the reproductive development of the unborn child

http://old.iss.it/inte/index.php?lang=2

In the kitchen: Coocking methods and food containers

Risk communication

Italy: first institutional initiative on EDs (bisphenols, phthalates, PHAs and others) edited by the Italian Ministry of the Environment and the protection of Territory and Sea with the scientific advice of the ISS (2012)

The Decalogue on EDs for the citizen (Knowing, Reducing Preventing EDs)

- ✓ the knowledge of both the sources of exposure to these substances
- ✓ the knowledge of possible alternatives
- ✓ rising the citizen awareness: appropriate decisions = risks mitigation
- ✓ written in a simple language, targeted for general population

http://www.minambiente.it/sites/default/files/archivio/allegati/reach/decalogo_versione_inglese.pdf

Reduce the intake of beverages containing caffeine

Pregnancy is a particularly vulnerable stage of life, excessive caffeine intake could be associated with adverse effects on fetal growth (EFSA Panel Nutrition, Novel Foods and Food Allergens-NDA, Scientific Opinion on the safety of caffeine, 2015).

The safe dose of caffeine (and therefore not only coffee but also coca cola, energy drinks, etc.) in pregnancy is reduced by half (400 mg per day for non-pregnant adults; 200 mg per day by pregnant women)

Reduce the usual intake of caffeine-containg beverages (as recommended by EFSA); these include also cola-based soft drinks and energy drinks, which may actually provide more caffeine than coffee itself

Avoid fetus exposure through to maternal plasma caffeine levels (group most vulnerable to the negative effects of caffeine among the general population.

http://www.efsa.europa.eu/sites/default/files/scientific_output/files/main_documents/4102.pdf

Thanks for the attention

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