RED MEAT IN NUTRITION AND HEALTH

Supplementary Chapter: Red Meat in Pregnancy and Lactation

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Communicating current science about red meat as part of a healthy South African diet

SUPPLEMENTARY CHAPTER
RED MEAT IN PREGNANCY & LACTATION

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RED MEAT
IN PREGNANCY & LACTATION

WHY IS THIS IMPORTANT

- √ Pregnancy and breastfeeding are probably the most nutritionally demanding periods of any woman's life
- √ The nutritional status of women even before conception and in the early weeks of pregnancy, when most women are unaware that they are pregnant, can influence critical developmental processes
- √ Adequate nutrition before, during and after birth significantly influences both the health and future well-being of the mother, and of the child
- √ Maternal nutrition is considered a modifiable risk factor which can lower health-care costs, improve birth outcomes and improve the health of the nation

CHAPTER AT A GLANCE

- √ Nutrition before and during early pregnancy is very important
- √ Vital nutrients during pregnancy include protein, iron, folate, B vitamins and certain essential fatty acids
- √ The inclusion of foods from animal sources, such as lean red meat, promotes the ingestion of many essential nutrients while simultaneously reducing the glycaemic load (GL) of the diet

INTRODUCTION

Pregnancy and breastfeeding are probably the most nutritionally demanding periods of any woman's life (Ohio State University, 2009). Adequate nutrition before, during and after giving birth influences not only the health and future well-being of the mother, but also of the offspring and thus of future generations. It is also likely that no other time of life can make a more positive contribution to the general health of a nation than the nutrient care given to pregnant and breastfeeding women. Pregnancy therefore affords a unique opportunity to improve the nutrition and health of women and their children. Health professionals also need to keep in mind that maternal nutrition is a modifiable risk factor which can lower health-care costs, improve birth outcomes and improve the health of the nation (Abu-Saad & Fraser, 2010).

Sub-Saharan Africa, which includes South Africa, is lagging behind in respect of the attainment of United Nations Millennium Development Goals (MDG) for 2015, particularly Goals 4 and 5, to 'Reduce child mortality' and 'Improve maternal health'. A report published in 2013 noted that in Sub-Saharan Africa, which has the highest under-five mortality rate of all regions, one in nine children die before the age of five, which is more than 16 times the average for developed regions. The report also points out that while maternal mortality has declined since 1990, it still falls short of the MDG target particularly in this region of the globe (UN, 2013).

Adequate maternal nutrition during pregnancy and breastfeeding is a vital factor in achieving the MDG, by ensuring that women of childbearing age obtain adequate supplies of energy, protein, and the micronutrients iron, zinc, B vitamins including riboflavin, folate and vitamin B12, and vitamin A, which are found in food derived from animals such as red meat and offal (liver, kidneys, and other edible organs).

NUTRITION BEFORE AND DURING EARLY PREGNANCY IS PIVOTAL

Ramakrishnan and co-workers (2012), point out that the majority of studies regarding nutrition and pregnancy have concentrated on the second and third trimesters of pregnancy, whereas the nutritional status of women even before conception and in the early weeks of pregnancy (<12 weeks gestation), *when most women are unaware that they are pregnant*, can influence critical developmental processes which will in turn influence pregnancy outcomes. Animal studies have indicated that peri-conceptual undernutrition may influence the hypothalamic-pituitary-adrenal axis which influences pregnancy outcomes such as preeclampsia and pre-term delivery. In addition, the placenta and its function which governs the well-being of the foetus throughout pregnancy, is also determined in early pregnancy.

The nutrition of women who are capable of bearing children, therefore, deserves the attention of healthcare workers of all disciplines and requires additional investigation.

A systematic review (Ramakrishnan *et al*., 2012) of the evidence of the impact maternal nutrition before and during the first 12 weeks of pregnancy (<12 weeks gestation) has on maternal, neonatal and child health outcomes, produced the following results:

- √ Before conception the provision of folic acid supplements caused a significant reduction in the risk of neural tube defects
- √ The use of micronutrient supplements before conception and in the early weeks of pregnancy reduced the risk of delivering low birthweight or small for gestational age infants and preterm deliveries
- √ Indicators of prepregnancy nutrition status and health such as size, low stature, underweight and overweight or obesity were associated with preterm deliveries and infants that were small for gestational age
- √ Prepregnancy iron stores were also found to predict maternal iron status and the risk of anaemia in later pregnancy

FEMALE NUTRITION REQUIRES CAREFUL ATTENTION

Healthcare planning should take into account every stage of the reproductive cycle, starting before conception, continuing during early pregnancy in the first trimester, through the second and third trimesters to birth and being maintained throughout the breastfeeding period. Nutrient-dense foods which are high in protein, iron, zinc and B vitamins, such as red meat and offal, can make a significant difference to the nutritional status of mothers and their infants at all stages of this cycle.

CONSEQUENCES OF INADEQUATE MATERNAL NUTRITION

- √ The nutritional status of a mother in the period before conception through pregnancy and into lactation should be treated as a continuum (Allen, 2005)
- √ Inadequate maternal nutrition has the direct consequences of:
  - *intrauterine growth restriction*
  - *preterm birth*
  - *maternal and infant morbidity and mortality.*
- √ The goal of nutritional interventions during the preconceptional period and pregnancy is to avoid stillbirths, maternal and neonatal mortality, low birthweight, infants who are small for gestational age (SGA) and preterm deliveries (Ramakrishnan *et al*., 2012)
- √ Poor nutrition of mothers, who start their pregnancies in an undernourished state, generally tends to escalate during pregnancy and breastfeeding (Imhoff-Kunsch and Martorell, 2012)

VITAL NUTRIENTS DURING PREGNANCY AND LACTATION

Many essential nutrients require attention during pregnancy and lactation. The micronutrients that require special attention and should if possible be supplied by whole foods, i.e. those derived from animals such as meat, fish, or eggs, include iron and the B vitamins.

IRON

Iron deficiency

- √ 1,6 billion people globally are affected by iron deficiency
- √ Less developed countries are characterised by a prevalence of 43% compared to 9% in developed countries (Balarajan *et al*., 2011)
- √ In South Africa, 23% of females aged 16-35 years suffer from anaemia, with 10% of women of reproductive age suffering from severe iron deficiency anaemia (Shishana *et al*., 2013)
- √ Women in their reproductive years are at greatest risk

Iron during pregnancy

- √ Anaemia in pregnancy has deleterious consequences including complications during labour and delivery, preterm delivery, low birthweight, low infant iron status, and increased infant and maternal mortality (Young *et al*., 2010)
- √ Adequate iron stores before conception and during pregnancy help to ensure that the risk of preterm delivery is reduced and that preeclampsia occurs less frequently. Low birth weight can furthermore be avoided with iron supplementation from week 20 (Allen, 2005)
- √ Various complications tend to be associated with iron metabolism during gestation. Iron metabolism is of such a nature that once pregnancy has commenced, it is not easy to replenish depleted iron stores
- √ The concept that foetal iron stores are relatively independent of the mother's iron status is gradually being disproved. In an Indonesian study, infants who were born to mothers with anaemia, had a 1.8 times greater risk of developing anaemia by the age of 5 months, than the infants born to non-anaemic mothers (Allen, 2005)
- √ Postpartum iron-depletion also needs attention. In the Women, Infants and Children (WIC) programme in the USA, it was found that up to 27% overall and 48% of non-Hispanic black women were iron depleted after giving birth (Allen, 2005)
- √ It is recommended that women have an adequate iron intake, from predominantly (75%) easily absorbable haem iron food sources. This will have a protective effect before, during and after pregnancy

Why haem iron from animal-based foods is regarded as superior to non-haem iron

- √ Provision of iron supplements such as ferrous sulphate during pregnancy is regarded as the general solution to the poor iron status that characterises so many women of childbearing potential, however a food-based approach including haem iron sources of iron seems more effective in ensuring adequate intake and absorption of bio-available iron
- √ Young and co-authors (2010) suggest that the introduction of haem iron from animal source foods such as red meat should be considered to meet the iron requirements of women during pregnancy, particularly in the third trimester

Case-study (Young et al., 2010): *The study compared the relative differences in haem (animal-based) and non-haem (ferrous sulphate) iron utilisation in 18 pregnant and 11 non-pregnant women between the ages of 18 and 27 years. Random assignment of a meat-based haem meal and ferrous sulphate which had both been intrinsically labelled, showed that haem iron derived from the meat-based meal produced significantly greater utilisation of iron than the non-haem iron derived from ferrous sulphate both in the pregnant (47,7 vs 40,4%) and the non-pregnant women (50,1 vs 15,3%). The authors concluded that "iron utilization from an animal-based food [meat] provides a highly bioavailable source of dietary iron for pregnant and non-pregnant women that is not as sensitive to hepcidin concentrations or iron stores compared with ferrous sulphate." Hepcidin is a hormone produced in the liver that has been identified as a key regulator in iron homeostasis. Hepcidin hormone is inversely associated with the absorption of non-haem iron in non-pregnant women and in men.*

Persistent iron deficiency in South Africans

In South Africa staple foods such as maize meal and wheat flour have been fortified with vitamin A and iron, as well as 6 other micronutrients since 2004, but the findings of the National Food Consumption Survey Fortification Baseline (NFCS-FB-I), which was published in 2008, found that one out of four women nationally had a poor vitamin A status, with the women in KwaZulu Natal worst affected (six out of 10 women). One third of women and children were anaemic with moderate and severe anaemia being relatively common. Women in the Gauteng, Mpumalanga and Limpopo Provinces were worst affected and at the national level one out of five women had a poor iron status despite fortification of our staple foods.

According to the most recent data (Shishana *et al*., 2013), 23.1% of females aged 16-35 years suffered from anaemia, with older women (26-35 years of age) exhibiting lower mean HB (haemoglobin) (12.6 g/dl) than younger women with mean Hb of 12.9 g/dl. Combined moderate to severe anaemia was also more prevalent among the older group of women, 12.5% compared to 10.3%. Nearly 10% of women in South Africa of reproductive age were found to have iron deficiency anaemia, particularly younger women and those living in urban formal areas (7.0%). The Gauteng Province had the highest prevalence of iron-deficiency anaemia (Shishana *et al*., 2013).

The provision of foods that supply vitamin A (dark green or yellow vegetables) and haem iron (lean meats and offal) should be considered as strategies to reduce the incidence of vitamin A deficiency and of iron-deficiency anaemia in South African women.

B VITAMINS

Deficiencies of B vitamins, including folate, riboflavin, vitamin B6 and vitamin B12, have all been linked to increased homocysteine (Hcy) levels. Raised Hcy levels (which are associated with heart disease), have been related to negative pregnancy outcomes such as placental abruption, still-births, preeclampsia; very low birthweight and preterm deliveries. Studies in Norwegian and Spanish women have provided proof that the link between increased Hcy levels in maternal and foetal blood can increase the risk of birth complications as much as 4-fold (Allen, 2005).

Suboptimal vitamin B12 levels are common among infants, children and adults worldwide. Populations in Latin America, India, Kenya and Nepal were found to have a prevalence of vitamin B12 deficiency of up to 40% in the case of Latin Americans. Whereas vitamin B12 deficiencies have in the past been regarded as primarily a problem of strict vegetarians or vegans, it is now becoming apparent that even lacto-ovo vegetarians or people who eat very little meat, tend to have low vitamin B12 levels and are exposed to an increased risk of a vitamin B12 deficiency. Allen (2005) points out that 65% of pregnant Nepalese women in one study had low plasma vitamin B12 levels which were associated with higher Hcy and twice the risk of preeclampsia and preterm delivery compared to women with normal vitamin B12 levels.

It has been suggested that the negative consequences of Hcy in pregnancy caused by vitamin B deficiencies, are due, among other effects, to increased oxygen free radical concentrations and reduced nitrous oxide levels which cause endothelial dysfunction, oxidative stress and ischaemia of the placenta, as well as inflammatory responses which may result in endothelial cell damage combined with altered gene expression due to hypomethylation (Allen, 2005).

COMMON STRATEGIES FOR PROVIDING MICRONUTRIENTS TO PREGNANT AND LACTATING WOMEN

According to Allen (2005) there are three main strategies for providing micronutrients to pregnant and lactating women, namely:

1. Improving the quality and quantity of the diet. In many cases this entails increasing the intake of animal source foods, vegetables and fruits
2. Provision of nutrition education to improve the maternal diet has proved successful in improving pregnancy outcomes
3. Provision of micronutrient supplements. In many cases, micronutrients supplements are only provided as of the second or the third trimester of pregnancy. In addition, only one micronutrient is often given, which might limit the success of the intervention. Multiple supplements are often recommended due to the risk of multiple micronutrient deficiencies

THE RISK OF MULTIPLE MICRONUTRIENT DEFICIENCIES

It is important to keep in mind that while some micronutrients like iron and folate have been given a great deal of attention, multiple micronutrient deficiencies often occur simultaneously during pregnancy and lactation if the mother has a poor diet, a fact that has not received sufficient attention.

Abu-Saad and Fraser (2010) emphasise that women in populations with low-socioeconomic status, generally suffer from multiple rather than single deficiencies. The use of a food-based strategy to address multiple deficiencies therefore requires the inclusion of a nutrient-dense food such as red meat, even if only in small quantities, on a daily basis or in larger portions a few times a week.

Common nutrient deficiencies which can cause negative pregnancy outcomes include deficiency of vitamin B (which can cause homocysteinemia), antioxidants, vitamin D and iodine. During breastfeeding the mother's intake of B vitamins, vitamin A, selenium and iodine, plays a controlling role in the amounts of these nutrients that are excreted in maternal milk and are thus available to the infant. Allen (2005) cites an "inadequate intake of animal source foods" as the prime cause of poor quality diets which in turn lead to multiple micronutrient deficiencies during pregnancy and lactation.

Case study (Radhika et al,. 2012): *Research conducted in India indicated that the lack of vitamin A in the staple diet of pregnant women living under poor conditions also affects the absorption of non-haem iron. The study, conducted on pregnant women in the third trimester who had received iron supplements through pregnancy, but had low retinol levels, showed that these pregnant women also suffered from anaemia. Vitamin A is known to be essential for non-haem iron absorption, and the researchers suggests that no matter how much non-haem iron was taken by the women during their pregnancies, their low retinol levels may have made a positive contribution to limiting iron utilisation and exacerbating iron-deficiency anaemia of pregnancy. Such evidence related to the interactions between multiple micronutrient deficiencies highlights the importance of food-based interventions in addition to single-dosage supplementation.*

PREVENTING OBESITY THROUGH MATERNAL NUTRITION

Obesity is a world-wide epidemic, but particular concern has been expressed in relation to the incidence of obesity in developing countries. In South Africa, for example, the recently conducted South African National Health and Nutrition Examination Survey (SANHANES-I) has revealed that 39.2% of South African women are obese and the number of children who are overweight has increased from 10% in 2003 to 18% in 2012 (Battersby & McLachlan, 2013). A meta-review of prenatal dietary intake, showed that inadequate intakes of energy, protein and micronutrients, were associated with an increased risk of adult obesity in the offspring of those mothers who had a deficient diet (Yang & Huffman, 2010).

Yang and Huffman (2010) suggest that the following interventions could reduce the risk of obesity in later life in developing countries:

- √ Improving the nutritional status of mothers during pregnancy to ensure that newborns have an adequate birthweight
- √ Enhancing breastfeeding which includes improving the maternal diet during lactation
- √ Introducing high-quality complementary foods which contain micronutrients and essential fats (e.g. foods from animals such as lean meat) to infants at the right time

The meta-analysis conducted by Yang and Huffman (201) showed that "low- energy intake, very low-protein intake or inadequate micronutrient intakes in pregnancy were associated with greater risk of obesity among offspring." In addition infants with low birthweight, appear to have a great fat mass in adulthood.

PREVENTING GESTATIONAL DIABETES

Gestational diabetes mellitus (GDM) is defined as glucose intolerance which starts or is first identified during pregnancy. GDM occurs relatively commonly during gestation with up to 14% of all pregnancies being affected. As is to be expected, GDM is related to short-term and long-term negative health effects in mothers and their children, including increased perinatal morbidity, development of full-blown type 2 diabetes mellitus, birth complications, and weight gain (Zhang & Ning, 2011).

It is of concern that the incidence of GMD is increasing in step with the obesity epidemic throughout the world. In turn GMD is contributing to obesity as the offspring of women with GMD are more likely to be obese and develop impaired glucose tolerance and diabetes in childhood and early adulthood.

Risk factors for GDM include:

- √ overweight or obesity
- √ advanced maternal age
- √ family history of type 2 diabetes
- √ prior history of GDM
- √ Asian, Hispanic and Native American ancestry
- √ short maternal stature
- √ polycystic ovary disease
- √ high blood pressure during pregnancy
- √ previous stillbirths
- √ multiple pregnancies
- √ dietary factors

THE PERFECT MATERNAL DIET - LOW GI THE ANSWER?

The search for the "Perfect Maternal Diet" to combat overnutrition, undernutrition and unbalanced nutrition globally to counteract obesity, type 2 diabetes mellitus and metabolic syndrome in children, indicates that a pregnancy diet with a low glycaemic index (GI) may qualify as such an ideal (Tzanetakou *et al*, 2011). The inclusion of foods from animal sources, including lean, red meat, is known to lower the GI and the glycaemic load (GL) of the diet both in pregnant women and their offspring to make a positive contribution to alleviating the above mentioned health burdens.

1000 DAYS

The 1 000 days between a woman's pregnancy and her child's 2nd birthday offer a unique window of opportunity to shape healthier and more prosperous futures. The right nutrition during this 1 000 day window can have a profound impact on a child's ability to grow, learn, and rise out of poverty. It can also shape a society's long-term health, stability and prosperity.

√ During pregnancy, undernutrition can have a devastating impact on the healthy growth and development of a child

√ Babies who are malnourished in the womb have a higher risk of dying in infancy and are more likely to face lifelong cognitive and physical deficits and chronic health problems

√ For children under the age of two, undernutrition can weaken a child's immune system and make him or her more susceptible to dying from common illnesses such as pneumonia, diarrhoea and malaria

Evidence shows that the right nutrition during the 1 000 day window can:

√ save more than one million lives each year

√ significantly reduce the human and economic burden of diseases such as tuberculosis, malaria and HIV/AIDS

√ reduce the risk for developing various non-communicable diseases such as diabetes, and other chronic conditions later in life

√ improve an individual's educational achievement and earning potential

√ increase a country's GDP by at least 2-3% annually

As a result, leading scientists, economists and health experts agree that improving nutrition during the critical 1 000 day window is one of the best investments we can make to achieve lasting progress in global health and development. Solutions to improve nutrition in the 1 000 day window are readily available, affordable and cost-effective. They include:

1. Ensuring that mothers and young children get the necessary vitamins and minerals they need
2. Promoting good nutritional practices, including breastfeeding and appropriate, healthy foods for infants
3. Treating malnourished children with special, therapeutic foods

More information is available at **www.thousanddays.org**

CONTROVERSIES RELATING TO RED MEAT INTAKE DURING PREGNANCY

In recent years a number of controversies have arisen about the healthiness of eating red meat and it has been suggested that the human population should limit their consumption. National surveys in developed countries such as the United Kingdom (UK) have, however, shown that a high percentage of the population consume diets that are inadequate in respect to those nutrients that are typically found in red meat, namely vitamin B2 (riboflavin), vitamin D, iron, magnesium, zinc, selenium and potassium. The groups most likely to be deficient in these nutrients are UK citizens with low incomes, teenagers and women (Ruxton *et al*., 2012).

Ruxton and co-authors (2012) postulate that as omnivores, human beings require some meat as a source of protein and micronutrients, particularly iron. They suggest that integration of red meat into the diet across the age spectrum, including infancy, pregnancy and lactation "may help to narrow the present gap between micronutrient intakes and recommendations". This advice is probably even more relevant in developing countries where sources of high-quality, nutrient-dense proteins are scarce and staple foods are often lacking in protein and micronutrients.

Another controversy associated with the use of foods derived from animals such as lean red meat, is the current theory that the production of meat and other animal-derived foods, is responsible for boosting greenhouse gas emissions to an unacceptable extent. Millward and Garnett (2010) caution that reducing meat intake to 70 gram per day or less may lead to such a decline in the intake of high-quality protein and micronutrients (Ca, iodine, vitamin B12, Zn and riboflavin), that child growth may be threatened. It may be prudent to concentrate on reducing greenhouse gas emissions from industrial and mining activities rather than the provision of essential foods such as red meat.

THE GAP BETWEEN EDUCATION AND THE APPLICATION OF KNOWLEDGE

Researchers in South Africa and most other parts of the globe have found that women of child-bearing age do not necessarily comply with the plethora of advice and nutrition information they are presented with via the media during their pregnancies and when breastfeeding. Studies conducted in the UK (Inskip *et al*., 2009) and Australia (De Jersey *et al*., 2013) indicated that "only a small proportion of women planning a pregnancy follow the recommendations for nutrition and lifestyle". The Australian study found the following:

√ one third of pregnant women were overweight at the time of conception

√ more than one third of pregnant women gained weight during pregnancy

√ healthy pregnancy recommendations were not met, particularly by the overweight subjects

√ knowledge of dietary recommendations was poor

√ less than 50% of the women received appropriate advice regarding healthy eating and physical activity early in pregnancy

If women in countries such as the UK and Australia do not receive adequate advice regarding nutrition before, during and after pregnancy then women in developing countries are probably also at risk of not knowing what dietary choices can prevent the complications of pregnancy that put their own lives and those of their unborn children at risk. Healthcare workers ranging from medical doctors to clinic support staff should be trained to deliver a uniform message regarding healthy eating at all stage of pregnancy and thereafter.

EXAMPLE OF A HEALTHY PREGNANCY DIET

The following suggestions for a healthy pregnancy diet are based on the revised South African Food-Based Dietary Guidelines (Vorster *et al*, 2013) and an example published by Moreno and co-workers (2012):

√ Eat plenty of vegetables and fruit every day

√ Consume low-fat milk, maas or yoghurt every day. Both mother and baby need calcium for strong bones and teeth, and dairy products are the richest source of calcium

√ Lean chicken or lean meat or fish or eggs can be eaten daily. Lean protein is important for growth at all stages of pregnancy

√ Eat dry beans, split-peas, lentils and soya regularly

√ Make starchy foods part of most meals. Choose whole grains that are high in fibre and/or fortified starches. In South Africa maize meal and wheat flour are fortified with 8 essential nutrients

√ Consume nutrient-rich foods regularly:

- Iron is needed for the production of red blood cells that transport oxygen through the body. During pregnancy iron needs are higher due to an increased demand for oxygen. Good sources of bio-available iron include lean red meat, poultry, and fish
- Folic acid/folate is a B vitamin that prevents neural tube defects (spina bifida). Maize meal and wheat flour are fortified with folic acid to help prevent these defects in unborn children. Other sources include dark-green leafy vegetables and beans
- Consume plenty of vitamin C rich foods such as citrus fruits (oranges, grapefruit, naartjies), pawpaw, broccoli, cabbage, sweet peppers, tomatoes, and marog
- Vitamin D helps to build strong bones and teeth. We can make vitamin D in our bodies if we expose our skins to sunlight. Food sources of vitamin D include fatty fish like salmon and tuna
- Omega-3 fatty acids are essential fatty acids which ensure the normal development of the baby's brain, nervous system and eyes. These essential fats are found in oily fish, certain oils such as flaxseed, canola, walnut, and soy oils, salmon oil or flaxseed oil supplements, and foods with added omega-3 fatty acids such as omega-3 eggs, milk, and bread

MATERNAL NUTRITIONAL REQUIREMENTS DURING PREGNANCY

Selected nutritional requirements for adult women (19-50 years) during pregnancy (Abu-Saad & Fraser, 2010) compared to the nutrient contribution made by 100g cooked lean edible portion of lamb (Schönfeldt, Hall, & Van Heerden, 2012)

Nutrient	Daily Requirement	Comments	Contribution from 100g cooked lean lamb	
			Amount	Percentage
Energy[1]	9 200kJ - 12 200kJ	Depends on maternal Body Mass Index (BMI), age, physiologic appetite, rate of weight gain	715kJ	5.9 - 7.8%
Protein[2]	71g	Based on the intake of complete proteins (containing all 9 essential amino acids) to maintain maternal nitrogen equilibrium, plus protein deposition	25.4g	35.8%
Omega-3 Fatty Acids[3]	1.4g	Vital for development of brain, central nervous system, and formation of new tissues in foetus	0.04g	2.9%
Iron[2]	27mg	Based on the assumption that 75% of iron consumed is derived from haem iron sources, i.e. animal food sources such as meat and eggs	3.1mg	11.5%
Folate[2]	600µg	Vital for cellular reactions including DNA & nucleic acid synthesis, & sustained cell division	10-20µg	1.7 - 3.3%

Source: [1] ADA = American Dietetic Association [2] DRI = Daily Reference Intake
[3] International Society for the Study of Fatty Acids (FAs) and Lipids

CONCLUSIONS

Adequate and balanced nutrition during the pre-conception period, pregnancy and lactation is essential for the well-being of both the mother and child and can play a vital role in ensuring that future generations enjoy better physical and mental health. Recent research has identified that nutrition during the pre-conception period and first trimester of pregnancy is just as important, if not more so when it comes to securing healthy outcomes for the mother and child.

Maternal nutritional requirements include an adequate energy intake, which is sufficient to prevent maternal deprivation, low birthweight or small for gestational age infants and preterm deliveries, but not excessive so that the mother does not gain too much weight during pregnancy and that negative effects linked to maternal overweight such as birth complications, childhood obesity and type 2 diabetes do not occur. The intake of at least 70 gram of protein which contains all the essential amino acids (e.g. lean meat, fish, eggs) is emphasised, to make provision for protein deposition in the growing foetus while maintaining maternal nitrogen balance. Iron intake during pregnancy is important to prevent gestational deficiency anaemia which is linked in many cases to retinol deficiency and postpartum iron-depletion in mothers. Ideally at least 75% of the iron ingested during pregnancy should be haem iron derived from lean meat, fish and eggs.

Lean red meat can make an important contribution to the nutritional adequacy of the diet consumed by the mothers of future generations. The provision of lean red meat to pregnant and lactating women is essential if sub-Saharan Africa is ever to meet the UN Millennium Development Goals for 2015, to 'Reduce child mortality' and 'Improve maternal health'.

In view of the pivotal role played by an adequate diet, women of childbearing age (including teenagers) should receive comprehensive nutrition education so that they are able to select the most appropriate foods to nourish themselves and their unborn infants even if they are economically disadvantaged. The lack of knowledge regarding healthy nutrition before, during and after pregnancy amongst healthcare workers at all levels requires immediate attention so that the window of opportunity opened during pregnancy and lactation can be utilised to its fullest.

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