Learning Outcomes

On successful completion you will be able to:

• Explain the main physiological processes of pregnancy and lactation.
• Identify common pathologies affecting pregnant women and infants.
• Outline how nutritional therapy can help to support healthy pregnancy.
• Explain different options surrounding childbirth.
• Explain the nutritional needs of infants and appropriate weaning and food introduction protocols.
• Outline how nutritional therapy can support healthy infancy.
• Show awareness of the importance of referral with ‘Red Flag’ symptoms.
Maintaining a Healthy Pregnancy
Antenatal Checks

• Throughout a normal pregnancy, the NHS provides antenatal care and checks. The guidelines for this are laid down by the National Institute for Clinical Healthcare and Excellence (NICE), that advises on clinical best practice based on evidence. Every pregnant woman has a right to this care in the UK.

• The full document can be acquired here: [http://guidance.nice.org.uk/CG62](http://guidance.nice.org.uk/CG62)
Foetal growth is divided into three stages:

1. Two-week **blastogenesis stage**: Where the fertilised ovum divides and implants itself in the uterus.
2. Critical **embryonic stage**: Where all the rudiments for the principal organs and membranes develop. This is the most critical window in which drugs, alcohol, nutrients excess and deficiency can cause problems in development.
3. The **foetal stage** (from the 3rd month until term) is the most rapid period of growth.

Pregnancy is often divided into trimesters (13 week periods).
Body Composition in Pregnancy

- Weight gain in the first trimester is minimal.

- After that, weight gain is between 350-400g per week.

- A normal weight gain in pregnancy is between 11-15kg. Foetus, placenta, blood volume, adipose tissue, protein, increase in uterus and breasts and water retention all add in to the weight gain.
Weight Gain in Pregnancy

• Guidelines for weight gain during pregnancy are as follows:
  – Underweight women (BMI <18.5) should gain 28-40 pounds (12 - 18kg).
  – Normal-weight women (BMI, 18.5-24.9) should gain 25-35 pounds (11 - 16kg).
  – Overweight women (BMI, 25-29.9) should gain 15-25 pounds (7 - 11kg).
  – Obese women (BMI, 30 or higher) should gain 11-20 pounds (5 - 9kg).

Maternal Obesity

• Neural tubal defects and other developmental anomalies are more common in infants born to obese women, especially in those with diabetes mellitus and poor glycaemic control.

• Studies of women with impaired glucose tolerance show that replacing refined carbohydrates and saturated fats with complex, low-glycaemic carbohydrates and polyunsaturated fatty acids improved metabolic homeostasis and pregnancy outcomes.

Maternal Obesity

- Interventions directed toward weight loss and prevention of excessive weight gain must begin **preconception**.
- Maternal obesity is a well-established risk factor for the development of **preeclampsia**.
- Maternal obesity also increases the risk of **gestational diabetes**.
- This trend to increasing obesity has led to substantial increases in the number of women entering pregnancy with type 2 diabetes mellitus.

Eating Disorders and Pregnancy

• In a recent trial, 22% of women had a verified relapse in their eating disorders during pregnancy.

• Compared with control groups, women with past or current eating disorders were at increased risk of hyperemesis and delivery of an infant with lower birth weight and smaller head circumference.

• Lower birth weight, prematurity, and higher miscarriage rates are also reported in women with eating disorders. Maternal eating disorders can improve during pregnancy but often worsen postpartum.

Birth Weight

• Birth weight is considered the best indicators of overall nutritional status of the infant.

• A normal birth weight range is between 2500 - 4200gms (5.5lbs – 9.3lbs).

• Above and below this range increases the risk of stillbirth, disease in the first year of life and now chronic diseases.
Calorific Requirements in Pregnancy

• Throughout the pregnancy, an additional 60 000 kcal are required to cover the increase in growth of foetal and maternal tissues.

• This normally equates to 100-300 kcal extra a day in the foetal growth period.

• There is an extra protein requirement of 6-10g a day to account for foetal and maternal tissue.
Symptoms of Pregnancy

• It is normal to feel cramping pains in the early stages of pregnancy.

• Cramping that is different from previous pregnancies, worsening cramping, or cramping associated with any vaginal bleeding may be a sign of ectopic pregnancy, threatened abortion, or missed abortion.
Symptoms of Pregnancy

• Other physical effects that are normal during pregnancy, and not necessarily signs of disease, include:
  – Nausea, vomiting, increase in abdominal girth, changes in bowel habits, increased urinary frequency, palpitations or more rapid heartbeat, upheaving of the chest (particularly with breathing), heart murmurs, swelling of the ankles, fatigue and shortness of breath.
Food in Pregnancy
Reducing Risk of Food Poisoning

• Don't eat foods containing raw or partially cooked eggs, such as homemade mayonnaise, and some mousses and sauces. Only eat eggs if they’re cooked until both the white and the yolk are solid.

• Don't eat unpasteurised dairy products.

• Don't drink from a contaminated water supply.

• Cook all meat and poultry thoroughly. Take extra care with products made from minced meat, such as sausages and burgers. Make sure they’re cooked until piping hot all the way through and no pink meat is left.

NHS choices (2013) Which foods should I avoid in pregnancy?
http://www.nhs.uk/chq/Pages/917.aspx?CategoryId=54&SubCategoryId=130
Reducing Risk of Food Poisoning

• Take extra care with meat at barbeques, parties and buffets. Bacteria breed quickly on food that’s left uncovered in a warm place.

• Make sure that raw meat doesn’t come into contact with other food (for example, in the fridge), particularly food that’s already cooked, or food that will be eaten raw.

• Always remember to wash your hands after handling or touching raw meat, or if you come into contact with animals.

NHS choices (2013) Which foods should I avoid in pregnancy?
http://www.nhs.uk/chq/Pages/917.aspx?CategoryId=54&SubCategoryId=130
Toxoplasmosis

• Toxoplasmosis is an infection caused by a parasite found in cat faeces. It can also be present in:
  – Raw or undercooked meat, and
  – Soil left on unwashed fruit and vegetables.

• Although rare, toxoplasmosis can be passed to the unborn baby, which can cause serious problems.

NHS choices (2013) Which foods should I avoid in pregnancy?
http://www.nhs.uk/chq/Pages/917.aspx?CategoryId=54&SubCategoryId=130
Toxoplasmosis

• To reduce the risk of toxoplasmosis, don't eat the following foods:
  – Unwashed raw fruit and vegetables.
  – Raw or undercooked meat.
  – Cured meats, such as parma ham and salami.
  – Unpasteurised goats' milk or goats' cheese.
  – Avoid contact with soil or faeces that might contain the toxoplasmosis parasite.
    Always wear gloves if you’re gardening or changing a cat litter tray. If possible, ask someone else to do it for you.
Vitamin A and Pregnancy

• High levels of Vitamin A in pregnancy may be harmful to the foetus.

• The non-pregnancy RDA is 700 mcg, the pregnancy RDA is 770 mcg, lactation RDA is 1300 mcg.

• Well-balanced diets provide the RDA for women who are pregnant or lactating; therefore, routine supplementation is not recommended.

• Doses exceeding 15,000 IU/d, often used to treat acne, are associated with an increased risk of birth defects and should not be used in pregnancy; however, alpha-carotene, a vitamin A precursor, is not teratogenic.
Folate and Neural Tube Defects

- Folic acid, a water-soluble B-complex vitamin, is important for DNA synthesis and cell replication.
- Deficiency in pregnancy has been linked with maternal megaloblastic anaemia and foetal neural tube defects.
- The RDA is 400mcg. The pregnancy RDA is 600mcg the RDA decreases to 500mcg in lactation.
- Folate supplements should be administered 3 months prior to conception and throughout the first trimester.
- If the mother has a prior child affected by a neural tube defect, supplementation in the subsequent pregnancy should be increased to 4mg.
Folic Acid Supplementation and Risk of Asthma?

• A recent epidemiological study has shown that there may be an increased risk in asthma with women using folic acid supplements in late pregnancy.

• “We believe that this is the first published study in humans to demonstrate that increasing consumption of folic acid, and specifically supplemental folate during late pregnancy, significantly increases the risk of physician-diagnosed asthma in the child at 3.5 years, persistent asthma (at 3.5 and 5.5 years), and possibly asthma at 5.5 years,” write the authors, led by associate professor Michael Davies of the Research Centre for the Early Origins of Health and Disease at the University of Adelaide in Australia.

Folic Acid Supplementation and Risk of Asthma?

• The Royal College of Paediatrics and Child Health suggest that folic acid is still necessary prenatally and up to 12 weeks of pregnancy their comment was;
  – “The study published this week suggesting a link between folic acid in pregnancy and subsequent increased risk of childhood asthma is not a randomised trial. It relied on a postal questionnaire with a 76% response rate. The increased risk, if there is any, is only just statistically significant. Asthma is treatable whereas spina bifida is a serious and lifelong condition.”

http://www.guardian.co.uk/science/2009/nov/04/asthma-folic-acid-pregnancy-research
Iron

- In pregnancy, 500 mg of additional iron is needed to expand maternal red cell mass.

- Another 500 mg is needed to supply foetal and placental tissues.

- Iron deficiency anaemia is one of the most common pregnancy complications.

- The RDA is 30mg daily in pregnancy.

- Remember that iron competes with zinc at absorption sites.

Fish to Limit:

- Fish intake should be limited in pregnancy because it contains pollutants, such as dioxins, PCBs and methyl mercury.

- Pregnant women should eat no more than two portions of oily or large fish a week.
  - Fresh tuna (not canned tuna, which doesn't count as oily fish).
  - Mackerel
  - Sardines
  - Trout shark
  - Swordfish
  - Marlin
Fish to Limit:

- Tuna contains a high level of mercury.

- Don't eat more than two fresh tuna steaks or four medium-sized cans (about 140g per can) of tuna a week. This is about six rounds of tuna sandwiches or three tuna salads.
Fish Oil and Asthma Prevention

• The aim of this study was to examine whether increasing maternal intake of n3 PUFAs in pregnancy may affect offspring risk of asthma.

• Dose was 4g of fish oil daily.

• Follow-up 16 years after the rate of asthma was reduced by 63%.

Olsen SF (2008) Fish oil intake compared with olive oil intake in late pregnancy and asthma in the offspring: 16 y of registry-based follow-up from a randomized controlled trial Am J Clin Nutr 2008;88:167–75
DHA and Pregnancy

• Essential fatty acids, especially DHA, are needed in pregnancy for foetal and infant central nervous system (CNS) growth and development.

• DHA concentration is high in retinal and brain membrane phospholipids, and it is involved in visual and neural function and neurotransmitter metabolism.

• During the last trimester, the foetus accrues about 50 to 70 mg of DHA.
DHA and Pregnancy

- Studies have shown increased visual acuity, increased birth weight, improved mental function and longer gestational times in babies whose mothers took DHA.

- Studies suggest that intake of omega-3 fatty acids should be 1.4 g of omega-3 fatty acids as linolenic acid and 650 mg omega-3 fatty acids as EPA and DHA, of which 300 mg are from DHA.

Vitamin D3

• Vitamin D deficiency during pregnancy not only is linked to maternal skeletal preservation and foetal skeletal formation but also is vital to the foetal “imprinting” that may affect chronic disease susceptibility later in life as well as soon after birth.

• To increase nutritional vitamin D to meaningful concentrations, dietary intakes of ≥2000 IU/d may be required.

Iodine

- Low thyroid function during pregnancy can have devastating effects on infant development.

- Various studies have shown low thyroid function in women during their last trimester, due to low iodine intake.

- A recent study in the Lancet showed that mothers that had less than 150mcg/day of iodine intake had a greater risk of infant lower IQ, and has put out a call to action for the UK².

- Kelp tablets should be avoided as the iodine levels fluctuate in tablets which makes overdose possible.

Calcium is a major component of bone; therefore, large quantities of calcium are required in pregnancy for construction of foetal tissues, especially in the third trimester.

Hormonal adaptations and increased intestinal absorption protect maternal bone while meeting foetal calcium requirements.

The RDA is 1000mcg and supplementation is not recommended unless someone has a diet in which they are at risk of deficiency.

Zinc

- Prenatal and early postnatal zinc deficiency impairs learning and memory and these deficits persist into adulthood.

- Maternal zinc deficiency reduces NMDA receptor expression in neonatal rat brain, which persists into early adulthood.

- NMDA is the molecule that is responsible for creating plasticity changes in the brain, which in turn supports normal developmental learning.

Magnesium

• Magnesium plays a role in regulating body temperature, protein synthesis, and nerve and muscle function.

• In laboratory rats, magnesium deficiency was associated with higher systolic blood pressure and elevated plasma nitrite, suggesting that magnesium may play a role in controlling blood pressure, though the specific mechanism is unknown.

• Magnesium supplementation during pregnancy has been associated with a reduced risk of foetal growth retardation, pre-eclampsia, and increased birth weight.

Sodium

- Sodium is present in large quantities in the average American diet.

- The RDA is 1.5 mg during pregnancy, lactation, and the non-pregnancy state.

- Whether pregnant or not, sodium should neither be restricted nor used excessively. Well-balanced diets "salted to taste" satisfy sodium requirements and obviate any need for supplementation. Pregnant women should remember that most processed and pre-prepared foods are high in sodium.

Vegetarian and Vegan Diets in Pregnancy

• Well-balanced vegetarian diets that include dairy products provide adequate energy and nutrient intake so do not require special supplementation.

• A vegan diet, even if well balanced in all other respects, may be deficient in vitamins D3, Zinc, Iron and B-12. It may also be extremely low in fat, making satisfaction of energy requirements a challenge. Protein requirements may also not be met. Pregnant women who follow vegan diets require supplementation of Vitamin B12, Vitamin D3 and possibly Iron. They may have to supplement their diet with extra protein sources.

Lifestyle Guidelines and Minimising Risks
Exercise

• Moderate exercise is fine to start or continue during pregnancy. Swimming, walking, pregnancy yoga or pregnancy Pilates are all great options.

• Contact sports or sports in which heavy blows or falls to the stomach can occur are not recommend.

• Scuba diving should be avoided as the change in oxygen levels can cause developmental defects.
Alcohol Intake in Pregnancy

• Alcohol intake is pregnancy is not recommended. Risks that can ensue are foetal alcohol syndrome, developmental delays and poor birth outcomes.

• FAS has four criteria: maternal drinking during pregnancy, a characteristic pattern of facial abnormalities, growth retardation, and brain damage (often manifested by intellectual difficulties or behavioural problems).

• As surveillance and research have progressed, it has become clear that FAS is but a rare example of a wide array of defects that can occur from exposure to alcohol in utero.

• At least 1 in 10 women will continue to consume alcohol during pregnancy, putting their foetuses at risk for the effects of alcohol exposure.
Alcohol Intake in Pregnancy

• The Department of Health advises that pregnant women, and women who are trying to conceive, should not drink alcohol and should not get drunk.

• RCOG advises that if a woman falls pregnant, she should abstain from alcohol. However, if she would like to have a drink, the current evidence shows that one or two units, once or twice a week, is acceptable after 12 weeks of pregnancy.

Caffeine and Pregnancy

- Recent studies do indicate a slightly increased chance of experiencing preterm delivery, having an infant that is small for gestational age, and, perhaps, miscarrying in the late first or second trimester.

- Pregnant women should keep caffeine intake below 100 mg/d, especially early in pregnancy.

- RCOG recommend pregnant women in their first trimester should avoid caffeine altogether however after that it may be advised to limit caffeine consumption to no more than 300 milligrams a day.

• There is a direct causal relationship between foetal irradiation and childhood cancer.

• Evidence has also emerged of an association between low maternal folate status and risk of acute lymphoblastic leukaemia (ALL) in offspring.

• Household pesticide use in the postnatal period and prenatally via parental exposures has been found to be associated with risk of ALL, acute myeloid leukaemia and leukaemia overall.

Prenatal Exposure to Toxins in and Risk of Childhood Cancers

- Solvent exposure of the child has been found to increase ALL risk, as has parental occupational and household solvent exposure.

- It is therefore prudent to avoid harsh chemical solvents and pesticide used during pregnancy.

Radiation and Pregnancy

• Primary exposures include diagnostic radiographs, radiopharmaceuticals, workplace exposures, and environmental exposures such as those that occurred after the Three Mile Island and Chernobyl nuclear reactor accidents.

• Documented effects include intrauterine lethality, organ malformation, mental impairment, and later-onset leukaemia and solid tumours.

• Therefore sources of radiation should be avoided or limited in pregnancy.

Chemicals and Pregnancy

• Chemicals thought to have adverse effects on reproduction and pregnancy include heavy metals, endocrine disruptors, organic solvents, and pesticides.

• Approximately 17% of working mothers are exposed to known teratogens in the workplace.

• At least 51 synthetic compounds are ubiquitous in the environment and are also known teratogens.

• All of these chemical exposures should be reduced throughout pregnancy, but also in the PCC workup.

Lead

- Lead is common in the environment and continues to be a risk today. At high levels of exposure, it is associated with stillbirth and abortion.

- Found predominantly:
  - in old lead based paints,
  - in the food chain due to environmental pollution from leaded petrol.
Although mercury can affect the central nervous system at any developmental stage, unfortunate episodes of community-wide poisoning in Japan and Iraq revealed the particular sensitivity of the foetus to toxic effects from mercury exposure.

The 3 types of possible mercury exposure for pregnant women are organic, inorganic, and elemental. Organic mercury compounds, such as methylmercury, are used as fungicides and in some paints. Uses of inorganic mercury include antiseptics, fungicides, electrical equipment, and some illicit skin-lightening creams. Elemental mercury is found in thermometers, dental amalgam, gold mines, and batteries. It is also used as a catalyst for the formation of some chlorine compounds.

Cadmium / Manganese

- Cadmium is found in graphic arts material, paint, ceramics, welding material, solder, fish, and cigarette smoke. Animal research indicates that high cadmium levels can lead to cleft palate, anencephaly, lung problems, and neurologic damage. Research in humans is underway.

- Manganese is found in tea, cloves, and some grains. Some gasoline contains manganese additives. A low level of manganese is required in the diet. High levels of manganese during pregnancy have been associated with an increased incidence of clubfoot and stillbirth.

Arsenic

• Inorganic arsenic is a naturally occurring element found at different concentrations in drinking water supplies in various areas of the world.

• High exposures have been associated with a number of problems including hypertension; vascular disease; skin, lung, and bladder cancer; and diabetes.

• Parenterally administered arsenic induces neural tubal defects in several animal models; however, oral and inhalational exposures to arsenic are not teratogenic in rats.

• Reproductive outcomes have also been reported in human populations, including higher risk of low birth weight, spontaneous abortions, preeclampsia, congenital malformations, and infant mortality.
Solvents

• Manufacturing requires solvents that are frequently used in dry cleaning chemicals, paint, graphics, glue, electronics, chemical research, and chemical production. Of the many solvents, xylene has been linked to caudal regression in humans. Perchloroethylene may be associated with infertility, and styrene may alter menstruation. Toluene, xylene, and perchloroethylene may be associated with increased risk of spontaneous abortion. Recent retrospective research demonstrated increased odds of infertility for women exposed to solvents.
PCB’s and Dioxins

- Polychlorinated biphenyls and dioxins are associated with adverse pregnancy outcome, including pregnancy loss and preterm delivery.
Prescription Drugs

• Drugs are intentionally ingested chemicals that achieve measurable levels in the body and are usually used for therapeutic effects.

• Drugs are far more likely to be measurable in the foetal circulation compared to other chemicals.

• Studies indicate that more than 90% of pregnant women take medication during pregnancy, and many women take more than 4 different drugs during the course of pregnancy.
Drug Safety Categories

• Category A: No foetal risk is observed in human studies.

• Category B: No foetal risk is observed in animal studies. No human risk is observed, although there is some risk in animals.

• Category C: No studies are available. Adverse effects are observed in animals, but no human studies are available.

• Category D: Evidence exists of increased risk to human foetus. The benefits of the drug may outweigh its risks.

• Category X: The drug has a proven risk to humans that outweighs any potential benefit.
NICE guidelines recommend that ‘prescription medicines should be used as little as possible during pregnancy and should be limited to circumstances in which the benefit outweighs the risk’.

And that

‘Pregnant women should be informed that few over-the-counter medicines have been established as being safe to take in pregnancy. Over-the-counter medicines should be used as little as possible during pregnancy.’

• Currently, the only medication offered in normal pregnancy to women over 28 weeks are being offered the whooping cough vaccine and the flu vaccine. The idea is so that it reduces the risk of infant mortality from flu or whooping cough in the first few weeks of life, by passing anti-bodies across the placenta.

• This choice of taking this is up to the mother.
Common Complaints in Pregnancy
Morning Sickness

- Common symptom of early pregnancy.

- In the first trimester, when weight gain is not yet essential to foetal growth, mild hyperemesis is unlikely to affect foetal development.

- The initial therapy is avoidance of large amounts of food, most women feel better if they avoid ‘smelly’ types of food also.
Morning Sickness

• Frequent, small meals and snacks are generally most helpful.

• If this fails, patients may respond to vitamin B6, 25 mg 3 times a day.

• When hyperemesis precludes all oral intake, severe dehydration and ketosis may result, which requires inpatient management and intravenous rehydration with a glucose-containing solution.
Naturopathic Remedies

• Ginger or peppermint tea may be helpful in the first trimester (anti-emetic properties).

• Eating first thing in the morning before putting feet on floor (to help increase blood glucose levels before activity) may be helpful in some cases.

• The homeopathic nux vomica (worse after food) or Ipecacuanha (nausea continues throughout day) may be helpful in some cases.

• Adequate rest and preventing blood sugar drops normally helps to reduce the symptoms.
Heart Burn and Pregnancy

• Hormonal influences of increased progesterone and/or decreased levels of motilin may be more responsible for heartburn than the actual mechanical obstruction in the third trimester.

• Some studies have also shown decreased lower oesophageal sphincter tone, which can lead to an excess of gastric acid in the oesophagus.

Managing Heartburn

• Try to consume small meals often and avoid large meals.

• Bicarb in water to quench symptoms (alkaline to stop acid burn) but this should not be overused, as it contains Na.

• In later pregnancy, propping the head up with an extra pillow may be of help, or raising the mattress at one end.

• Avoiding foods that increase acidity may help too, such as spicy foods, sugary foods and coffee.
Cravings - Pica

- Cravings may happen at any point during the pregnancy, but sometimes unusual cravings can develop, which are known as Pica.

- Some pica include ice, freezer frost, laundry starch, cornstarch, clay dirt, dust and charcoal.

- Dust, charcoal, dirt and ice cravings may indicate an iron deficiency.

- Chalk and plaster cravings may indicate a calcium deficiency.
Pre - Eclampsia

• Pre-eclampsia is a pregnancy-specific syndrome characterised by new-onset hypertension and proteinuria, occurring usually after 20 weeks' gestation.

• Although the aetiology remains unknown, placental hypoperfusion and diffuse endothelial cell injury are considered be the central pathologic events.

• Preeclampsia is classified into mild and severe types and, in its extreme, may lead to liver and renal failure, disseminated intravascular coagulopathy, and central nervous system abnormalities, including seizures.
Pre - Eclampsia

- The only cure for pre-eclampsia is delivery.
- Reducing risk factors such as maternal obesity, and reducing oxidative markers may help – but much of this needs to be done pre-conceptually.
- Magnesium sulphate is given to prevent seizures.
- Women with a **COMT Val108/158Met polymorphism** have been found to be at a higher risk of pre-eclampsia¹.
- Eating a diet rich in fruit and vegetables, and adequate antioxidants and magnesium may help to reduce risk².
Gestational Diabetes

- Is the onset of poor glucose tolerance and an increase in fasting blood glucose levels in pregnancy.

- GD increases the risk of a large birth weight babies, (macrosomia) which increase the risk of complications such as shoulder dystocia, complicated delivery and caesarean section.
Gestational Diabetes

• Increased risks for GD include:
  – BMI of 30 or more.
  – Previous baby who weighed 4.5kg (10lbs) or more at birth.
  – GD in a previous pregnancy.
  – Family history of diabetes.
  – Ethnic origins from South Asian (specifically India, Pakistan or Bangladesh), black Caribbean or Middle Eastern.
• Gestational diabetes is detected by using an oral glucose tolerance test (OGTT), usually at 24-28 weeks. In the UK, OGTT are only offered to women that have any one of the risk factors on the previous slide.

• In America and Australia, OGTT is given to every woman.
Gestational Diabetes - Treatment

• The main treatment for GD is diet and exercise.

• The diet should be low GI/GL, and include regular meals, complex carbohydrates and increased vegetables and fruit, and avoid sugars and refined foods.

• Women will be asked to monitor their fasting BG and their post-prandial blood glucose with a monitor and aim to stay in a healthy range.

• Exercise should be frequently undertaken, but the heart beat should not raise over 140bpm.

Labour and Birth Choices
Preparing for Labour

• Women are recommended to learn a variety of coping techniques because one philosophy may not be what is needed to cope with work required in labour.

• Some of the most popular methods include:
  – Lamaze: http://www.lamaze.org/
  – HypnoBirthing: http://www.hypnobirthing.co.uk/
  – Active Birthing: http://www.activebirthcentre.com/
  – Birthing from Within: http://www.birthingfromwithin.com/
Where to Give Birth

• A women in the UK has the right to choose were she gives birth, it can be at home, in the hospital or birthing unit of her choice, but she must be accompanied by a registered midwife for her safety.

• You can get any information from the:
  – National Childbirth Trust: http://www.nct.org.uk/
  – BirthChoiceUK: http://www.birthchoiceuk.com/
  – The Association for Improvements in the Maternity Services: http://www.aims.org.uk/
Birth Plans

• A birth plan is a document that clearly states the mother’s wish for types of care during the birth. It is an opportunity for the mother (and father!) to think about her preferred options.

• The plan is not fixed, but it does give guidelines to those in the women’s care when she is labour and it helps to communicate these ideas to the people she will be working with.
A Birth Plan Should Include:

- The woman/couple need to think about these different areas, and how they feel about different interventions such as:
  - Different inductions or acceleration of labour.
  - Who will be at the labour and their role.
  - Pain relief options: Birthing pool, TEMs machine, hypnobirthing, gas and air, epidural, pethidine.
  - Heart rate monitoring.
A Birth Plan Should Include:

– Vitamin K injections or orally at birth.
– Feelings about BCG vaccination on birth (dependant on borough).
– Skin to skin contact.
– Who will cut the cord (in an uncomplicated delivery).
– For a hospital birth how long she would like to be in for (even though she may not have a choice on this one).

• Even though things might not go as planned, it is good to begin to think about these things prior to labour starting!
Eating During Labour

• There is differing advice about consuming food during labour.

• Women were often once told to not eat, due to the negative effects if they had to have anaesthesia given.

• A recent review from the Cochrane collaboration has shown that eating before and during labour does not come at an increase of birth complications.
  – “Since the evidence shows no benefits or harms, there is no justification for the restriction of fluids and food in labour for women at low risk of complications,” the review authors concluded.

Eating During Labour

• Much energy is required during labour, so eating may be required.

• Try to pre-prepare light snacks with fairly simple carbohydrates to give quick energy without making the digestive system work very hard.

• Fruit juices, smoothies and frozen fruit may all be helpful for the quick energy, and can often be soothing to the mouth that becomes dry from breathing.

• Water with honey, lemon and a pinch of salt may also help hydration.
Lactation and Postnatal Care
Lactation

- Breast milk is the best form of nutrition for infants.

- The properties of human milk facilitate the transition of life from in utero to ex utero.

- Breast milk provides a diverse array of bioactive substances to the developing infant during critical periods of brain, immune, and gut development.

- Lactation is stimulated by prolactin and oxytocin, and inhibited by dopamine.

- Direct suckling by the infant produces oxytocin.
Lactation

- Milk synthesis remains remarkably constant at approximately 800 mL/d.

- However, the actual volume of milk secreted may be adjusted to the requirement of the infant by feedback inhibitor of lactation, a local factor secreted into the milk; therefore, the rate of milk synthesis is related to the degree of breast emptiness or fullness. The emptier breast produces milk faster than the fuller one.
Biochemistry of Breastmilk

- The processing and packaging of nutrients within human milk changes over time as the infant matures.

- Early milk or colostrum has lower concentrations of fat than mature milk but higher concentrations of protein and minerals.

- This relationship reverses as the infant matures.
Stress and Lactation

• Milk production is responsive to maternal states of well-being. Thus, stress and fatigue adversely affect a woman's milk supply. The mechanism for this effect is the down-regulation of milk synthesis with increased levels of dopamine, norepinephrine, or both, which inhibit PRL synthesis. Relaxation is key for successful lactation.
In addition to the changes from colostrum to mature milk that mirror the needs of the developing neonate, variation exists within a given breastfeeding session.

The milk first ingested by the infant (fore milk) has a lower fat content. As the infant continues to breastfeed over the next several minutes, the fat content increases. This hind milk is thought to facilitate satiety in the infant. Finally, the diurnal variations in breast milk reflect maternal diet and daily hormonal fluctuations.
Breast Milk Contains

- **Proteins (0.8%-0.9%):** Primarily alpha-lactalbumin and whey.
- **Carbohydrates (6.9%-7.2%):** Lactose
- **Fats (3-5%):** Cholesterol, triglycerides, short-chain fatty acids, and long-chain polyunsaturated (LCP) fatty acids.
  - The LCP fatty acids (18- to 22-carbon length) are needed for brain and retinal development. Large amounts of omega-6 and omega-3 LCP fatty acids, predominately the 20-carbon arachidonic acid (AA) and the 22-carbon docosahexaenoic acids (DHA), are deposited in the developing brain and retina during prenatal and early postnatal growth.
- **Enzymes:** Specific for the digestion of proteins, fats and carbs. Certain enzymes also serve as transport moieties for other substances, such as zinc, selenium, and magnesium.

Breast Milk Contains

• Immunoglobulins: Breastmilk contains all of the different antibodies (M, A, D, G, E), but secretory immunoglobulin A (sIgA) is the most abundant.
  – Milk-derived sIgA is a significant source of passively acquired immunity for the infant during the weeks before the endogenous production of sIgA occurs.
  – During this time of reduced neonatal gut immune function, the infant has limited defence against ingested pathogens. Therefore, sIgA is an important protective factor against infection.

Breast Milk Contains

- Factors that can affect the intestinal microflora of the baby such as:
  - **Lactoferrin**: Which binds to iron, thus making it unavailable to pathogenic bacteria.
  - **Lysozyme**: Enhances sIgA bactericidal activity against gram-negative organisms.
  - **Oligosaccharides**: Intercept bacteria and form harmless compounds that the baby excretes.
  - **Milk lipids**: Damage membranes of enveloped viruses.
  - **Mucins**: Adhere to bacteria and viruses and help eliminate them from the body.
  - **Interferon and fibronectin** have antiviral activities and enhance lytic properties of milk leukocytes.
Breast Milk Contains

• **Macrophages** comprise 40-60% of the cells in colostrum, with the remainder of cells primarily consisting of lymphocytes and polymorphonucleocytes.

• By 7-10 days postpartum, with the transition from colostrum to mature milk, the percentage of macrophages then increases to 80-90% at a concentration of $10^4$ - $10^5$ human milk macrophages per millilitre of milk. Milk leukocytes can tolerate extremes in pH, temperature, and osmolality.
Breast Milk Contains

- Human milk also contains growth modulators, such as epidermal growth factor (EGF), nerve growth factor (NGF), insulin like growth factors (IGFs), and interleukins. Transforming growth factor (TGF)–alpha, TGF-beta, and granulocyte colony-stimulating factor (G-CSF) are also identified in human milk.

- These appear to influence neonatal gut maturation and growth through their transfer of developmental information to the newborn.

Benefits of Breastfeeding

- Breastfed babies (for at least 6 months) may be at reduced risk for many acute and chronic diseases, including gastrointestinal tract infection, urinary tract infections, otitis media and allergic reactions (like atopic dermatitis and asthma).

- Infants who were fully breastfed for 6 months or more seem to have higher mental development when compared with infants who were never breastfed.

- Some studies show that the effects of breastfeeding may carry over and protect young children and adolescents from becoming overweight.

Benefits of Breastfeeding

• Around 6 months of age, the baby's intestines mature and become less open to proteins that may harm the body as allergenic proteins (allergens). Giving only human milk until the intestines mature is the best way to keep potentially allergy-causing proteins out of baby's blood.

• The WHO recommends breastfeeding should be exclusive up to 6 months of age, and continued up until 2 years of age or more.

World Health Organization (WHO) 2013 Breast feeding
http://www.who.int/topics/breastfeeding/en/
Common Breastfeeding Problems

• Mammary vascular engorgement:
  – Treatment involves frequent breastfeeding around the clock, the application of cabbage leaves, and manual or electric pumping.

• Sore nipples:
  – This problem is commonly associated with improper latch-on. Help the mother with positioning and encourage her to insert the areola and nipple into the infant's open mouth.

Common Breastfeeding Problems

• **Cracked nipples:**
  – The mother should begin the breastfeeding session on the less-affected side.
  – Placing a drop of milk on each nipple and allowing this to air dry after breastfeeding may help.
  – The use of high-grade lanolin or nipple shields should be considered if bleeding occurs.
  – Correcting the cause of the cracked nipple, such as incorrect positioning/latch or contact of the nipple with coarse fabric or use of a bra with a seam (as opposed to a nursing bra), is essential.

Common Breastfeeding Problems

• **Mastitis:**
  - If diagnosed with mastitis, the mother should continue to breastfeed while taking antibiotics.
  - Frequent emptying of the breast is essential for relief and recovery. Mastitis can present with flulike symptoms, with fever, malaise, and chills.
  - Cabbage leaf topically may help to relieve some symptoms.

Common Breastfeeding Problems

• **Yeast infection of the breast: *Candida albicans***
  
  – Causes oral thrush in infants, may infect the nipple and intraductal system.
  – Complaints of the mother include pain during breastfeeding or a diminution of her milk supply.
  – Dx is via culture samples obtained from the skin.
  – Treatment may begin with topical nystatin, but systematic therapy may be required for eradication.

Galactagogues

- Galactagogues are herbs that increase breast milk production.

- Probably the best known is fenugreek. It can be taken as a tea (2-3 cups of tea per day) or as a capsule (two 500-mg capsules 3 times daily for a total of 6 caps per day).

- Milk production should increase within 48-72 hours.

- Other herbal remedies include fennel seeds brewed as a tea (1 tsp boiled in water and steeped for 10 min, served 12-3 times per day), milk thistle, and goat's rue.
Vitamin D Deficiency

• The American Academy of Paediatrics (2008) recommends universal vitamin D supplementation (400 IU/d) starting a few days after delivery.

• This recommendation follows in the wake of widespread vitamin D deficiency in the United States and other countries in all age groups.

• The reason that breastfed infants are deficient in vitamin D is not because human milk is deficient in vitamin D per se but because mothers who are deficient in vitamin D have vitamin D–deficient milk, which leads to vitamin D deficiency in the infant.

Vitamin D Deficiency

- The National Institute for Health and Clinical Excellence (NICE) recommends that pregnant and lactating women take a vitamin D supplement of 10 micrograms (or 400 units) daily.

- Healthy breastfed babies born to mothers who have followed this recommendation should receive a vitamin D supplement from six months of age (as part of a multivitamin supplement). However, if the mother’s vitamin D status in pregnancy is uncertain, or if she falls into one of the risk groups, vitamin D supplements for mother and baby should be started soon after birth.

Postpartum Depression

• Most women will experience postpartum affective instability including rapidly fluctuating mood, tearfulness, irritability, and anxiety.

• Symptoms peak on the fourth or fifth day after delivery and last for several days, but they are generally time-limited and remit within the first 2 weeks.

• Symptoms do not interfere with a mother's ability to function and to care for her child.

• Women with more severe symptoms or symptoms persisting longer than 2 weeks should be screened for postpartum depression.
Postpartum Depression

- The Edinburgh Postnatal Depression Scales (EPDS) is a 10-item self-rated questionnaire used extensively for detection of postpartum depression. A score of 12 or more on EPDS or an affirmative answer on question 10 (presence of suicidal thoughts) requires more thorough evaluation.

- The EPDS may be included in routine paediatric visits.

- PND increases the risk of mother/infant mortality and may prevent the mother from bonding to her child.
Postpartum Depression

- Thyroid function and anaemia can often cause similar depressive symptoms so should be screened for if there is mood instability.

- Medical treatment can either be therapeutic interventions or medications.

- Medications may be secreted into breast milk in varying amounts, and the long term effects of this are not known.

Nonacs RM (2009) Postpartum Depression, e-medicine, medscape
Self-Care for the Mother

• Mobilise a community of support, it takes a village to raise a child.
• Try and get as much sleep as possible; nap when the baby naps.
• Try to integrate the baby into everyday life- using pouches or slings may help to keep hands free and get out a bit more and have contact with people.
• Take a shower and get dressed every day.
• Try doing some gentle exercise with the baby.
• Speak to others- parenting does not come easily to a lot of people.
Nutritional Therapy

• A post-natal **multivitamin with iron** may be indicated to diminish deficiencies.

• **Omega-3 fats** may be of benefit, but research trials have shown mixed results.

• There is a lack of evidence of 5-HTP in pregnancy and lactation in regards to safety.

• **Folate, vitamin B-12, calcium, iron, selenium, zinc, and n-3 fatty acids** have all been shown to improve mood symptoms.

Nutritional Therapy

• Eating a diet rich in complex carbohydrate, lean protein, and adequate fat is important.

• If the mother is breastfeeding, she requires an extra 200 calories a day. If she is not making this calorific requirement it may contribute to lack of energy, fatigue and depression.
Paediatrics
Paediatric Care

- Children can be very enjoyable clients.

- Remember to always see children in the presence of their parent/carer – we are not allowed to see a child under 16 alone, due to child protection issues.

- Address your questions to the child rather than the parent – if you can engage him/her you are more likely to achieve compliance. If the child doesn’t know the answer the parent will step in.
Paediatric Care

• If your patient is an infant or very young child you may not need to see him/her – the parent could come alone and give a case history but visual cues are sometimes invaluable.

• You will probably need only a short consultation time. Children have had only short lives and usually don’t talk very much!
Using Supplements with Children

• It is important to remember that infants and children’s kidneys and liver detoxification is not as developed as an adult, so this means supplementation in large doses or with certain substances is not always safe.

• Herbal medicines or food state supplements should be avoided in infants until they have reached the age in which they are taking all foods, as to not introduce another allergen into their limited diet.
Using Supplements with Children

• Many times, the nutritional advice for children is similar of that to adults, but just with lower doses, plus avoiding any contra-indicated supplements.

• Try not to cut out food groups in children without assessing the risk/benefit ratio first. Always make sure if you cut out a food group you have sound justification, and that you make sure the child’s nutritional needs are being met adequately.
Using Supplements with Children

• Explain your plan to the child and show him/her the supplements you will suggest. If possible, offer a taste otherwise there can be a large block to compliance.

• If you are going to give advice on supplements, make sure that you use powders, liquids, pillules or other forms that can be easily ingested, as most children can not swallow pills.

• Please cross check this lecture with your life-stages lecture, which discuss children's needs for specific nutrients.
Babies

• The immune system begins to form in utero and will not be fully developed until the child is several years old.

• Newborns have no antigenic experience but are born with significant amounts of maternal antibodies. However, these antibodies decrease dramatically over the first month of life, not returning to the previous high level for another 12-20 months.

• Thus, infants are at increased risk of bacterial, viral and fungal infections.
Infant Microbiome and Immunity

- The gut is sterile at birth but rapidly becomes colonised by many species of microorganisms. The process of colonisation can be affected by:
  - The mother’s bacterial balance.
  - The mother’s use of probiotics.
  - Type of birth (vaginal or surgical).
  - Gestational age (full term or premature).
  - Primary source of nutrition (breast or bottle).
  - Perinatal antibiotics.
  - Stress

Vaccinations

• The current NHS vaccination schedule is as follows:
  – **2 months old**: 5-in-1 (DTaP/IPV/Hib) vaccine – diphtheria, tetanus, pertussis (whooping cough), polio and haemophilus influenzae type b, pneumococcal (PCV) vaccine, rotavirus vaccine.
  – **3 months old**: 5-in-1 vaccine - second dose, meningitis C, rotavirus vaccine - second dose.
  – **4 months old**: 5-in-1 - third dose, PCV- second dose.
  – **Between 12 and 13 months**: Hib/Men C booster, Measles, mumps and rubella (MMR) vaccine, PCV third dose.
  – **2 and 3 years**: Flu vaccine (annual).
  – **3 years and 4 months**: MMR second dose, 4-in-1 (DTaP/IPV) pre-school booster.
Vaccinations

• The theory of vaccines is something known as ‘herd theory’, that is, for a disease to be eradicated, it requires the majority of the herd (which is the vector) to have immunity, meaning the disease has nowhere to live anymore.

• There is a vehement debate around the safety of vaccines, with a polarisation in both camps.

• People most at risk of some of the diseases include infants, elderly people, pregnant women and immune compromised individuals.
Vaccinations

• Some of the fear of vaccines is related to a study by Andrew Wakefield in 1998 on 12 children, published in the *The Lancet* that linked the measles, mumps, and rubella (MMR) combination vaccine with intestinal problems that he believed led to autism.

• The following year, a warning was issued about thimerosal, the mercury-containing preservative that was found in most vaccines which can be a neurotoxin.

• Since then, seven large studies in major medical journals have found no association between the MMR vaccine and ASD, but many people quote an epidemiological correlation.
Vaccinations

• So what do you advise parents?
  – To do their own research and make up their own mind!

• Some places to start to look:
  – Statistical information risks of disease vs side effects can be found at the Centre for Disease Control:

    http://www.cdc.gov/vaccines/vac-gen/6mishome.htm#risk

  – Ask Dr Sears.com (or buy his book):

    http://www.askdrsears.com/topics/health-concerns/vaccines

  – The Informed Parent:

    http://www.informedparent.co.uk/
Measles and Vitamin A

- Vitamin A deficiency increases the risk of mortality from measles.

- The World Health Organization recommends vitamin A supplementation for all children diagnosed with measles, regardless of their country of residence, based on their age, as follows:
  - Infants younger than 6 months: 50,000 IU/day for 2 doses.
  - Age 6-11 months: 100,000 IU/day for 2 doses.
  - Older than 1 year: 200,000 IU/day for 2 doses.
  - Children with clinical signs of vitamin A deficiency: The first 2 doses as appropriate for age, then a third age-specific dose given 2-4 weeks later.

WHO (2003) Vitamin A supplementation
http://www.who.int/vaccines/en/vitamina.shtml
• Infants born via caesarean section may have delayed colonisation, as well as a greater acquisition of environmental flora, than do vaginally born infants.

• Normal colonising bacteria communicate with the gut epithelium and underlying lymphoid tissues (bacterial–epithelial crosstalk via toll like receptors) which results in an innate and adaptive mucosal immune phenotype.

• With a lack of appropriate colonisation, there is increased incidence of immune-mediated diseases (e.g. asthma, allergy in general and necrotizing enterocolitis).

Infant Microbiome and Immunity

• Breastfed babies have more bifidobacteria in their stool than bottle-fed babies, and a higher proportion of lactobacillus to e.coli.

• Appropriate colonization is influenced by the prebiotic effect of breast milk oligosaccharides.

• Fortunately, infants with inadequate intestinal colonization can be restored to a bacterial balance with the intake of probiotics.

Weaning

• There is a lot of contention of when is the best time to begin to wean babies with solid food.

• The general consensus is not to introduce food before 4 months of age, and no later than 6 months of age – latest research shows weaning too early or too late both increases the risk of allergies, immune disorders and type 1 diabetes.

• Babies will often show signs of when they are almost ready to wean, by taking interest in their parents food, and trying to put food in to their mouths.

• See your life stages lecture for more information.
Allergies and Intolerances

- Allergies and intolerances are common in children, and they normally manifest as allergic rhinitis, allergic conjunctivitis, asthma, eczema, urticaria and food allergies.

- Breastfeeding and proper colonisation of the gut microbiome is the best agent to protect against allergic conditions.

- 90% of food allergies in children younger than 3 come from milk, eggs, peanuts, soy fish and wheat.
Allergies and Intolerances

• Weaning advice used to be to avoid allergenic foods until later (after 12 months) to prevent the onset of allergies.

• Newer research contradicts these old guidelines. It is best to introduce allergenic foods in a window between 6-7 months, while the baby is also concurrently being breast fed. Even if there is atopy in the family, it is best to introduce allergenic foods in this window.

J. J. Koplin1,2 and K. J. Allen (2013) Optimal timing for solids introduction – why are the guidelines always changing? Clinical & Experimental Allergy, 43, 826–834
Allergies and Intolerances

- Probiotics have been quite extensively researched for their use in preventing allergic/atopic conditions.

- To date, randomized clinical trials of probiotics in allergic diseases have mostly focused on children with atopic eczema.

- **Lactobacillus rhamnosus GG** is the strain that has been most studied in children. A recent meta-analysis of 10 randomized controlled trials describing the efficacy of probiotics in AD found a modest improvement, almost a statistically significant difference, favouring probiotics compared with placebo.

When Managing Allergies in Children

- Be aware of possible deficiencies when removing any food groups. Supplement if necessary.

- Testing is often too invasive for children and babies, so grand elimination diets are often employed, this takes dedication from the family to adhere to these.
Common Illnesses in Children

• Children will often pick up a range of common illnesses, especially when they start interacting with other children at nurseries or schools.

• These may include:
  – Common colds and other respiratory tract infections
  – Scabies or school sores (impetigo)
  – Chicken pox
  – Tonsillitis
  – Gastrointestinal infections
Common Illnesses in Children

• All of these disease processes are self-limiting, so treatment is rest, symptomatic relief and good nutrition.

• Sometimes, bacterial infections may result from another infection, where antibiotics may be needed.

• The best way to prevent infection is to manage cross contamination (hand washing and toilet hygiene) and to support immunity as much as possible.
Supporting Immunity in Children

- **Zinc:** Studies have shown zinc supplementation (10mg daily for 10 months in 6.5 - 10 y.olds) reduced the incidence of the common cold and the need for administration of antibiotics for bacterial infections (pharyngitis, acute otitis media, sinusitis, pneumonia)$^1$.

- **Lactobacillus rhamnosus GG:** Consumption of GG reduced the occurrence of respiratory illness in children attending day care centres$^2$.

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Supporting Immunity in Children

- **Vitamin A**: Children with Vitamin A deficiency show reduced immunity and more severe illness when with hand foot and mouth disease\(^1\).

- **Echinacea**: Echinacea does not seem to reduce the time of a common cold, but it reduces the incidence of upper RTI’s and common colds in children. Apart from occasional allergic reactions, dose is safe.

- **Propolis**: In a trial with combined propolis and echinacea, the occurrence of RTI’s was reduced in children\(^3\).

Otitis Media – Glue Ear

• Infection of the area between the tympanic membrane and the inner ear, including the Eustachian tube.

• Acute Sx:
  – Earache and irritability, tugging at affected ear
  – Fever
  – Red bulging eardrum
  – Typically follows the course of a cold/flu/bacterial infection

• Chronic infection:
  – Hearing loss, immobile tympanic membrane

Otitis Media – Glue Ear

- Often is an infection with Streptococcus pneumoniae, haemophilus influenzae, moraxella catarrhalis.

- Medical treatment is normally with antibiotics, analgesics and sometimes anti-histamines. In the case of recurrent glue ear, a small surgical procedure is done by putting a tiny plastic tube through the ear drum to drain the fluid from into the throat (grommet).

Otitis Media – Glue Ear

• Common risk factors include exposure to cigarette (or wood stove) smoke, food allergies, day care/nursery attendance, lack of breastfeeding.

• Children with recurrent OM show that 85%-93% have food or inhaled allergies – such as cow’s milk, wheat, egg white, peanut, soy, corn or tomato.

Otitis Media - Treatments

• Remove potential food/ inhaled allergens:
  – Choose either an elimination diet, or a RAST test for allergies:
    • Wheat/Gluten
    • Dairy
    • Citrus Fruits
    • Refined Sugary Snacks

Otitis Media - Treatments

- Vitamin C: To help boost the immune system and deal with any residual infection that may be present.

- Xylitol: Consider switching sugar for xylitol. Usage has shown reduce occurrence of OM (studies used 8g per day).

- Probiotics: Lactobacillus rhamnosus GG compared with placebo has the potential to reduce the incidence of acute otitis media.

- Improve immune in general.

Colic

- Uncontrollable crying in a baby that seems to have no cause.

- Often thought to be caused by bloating/gas/cramping in the infant as a result of not being able to successfully release the gas.

- Baby may look uncomfortable or in pain.

- Baby may lift their head, draw legs up to tummy, become red in the face and pass wind.
Colic

• Nutritional Treatments:
  – Remove any gassy foods from mothers diet.
    • Cruciferous vegetables, onions, garlic
  – Remove any potential food sensitivities from mothers diet.
    • Dairy, gluten, refined foods.
  – Remove cow proteins from the babies diet, preferably used a hydrolyzed formula if the baby is not longer on breast milk.
  – Digestive aid teas.
    • Fennel and chamomile teas may help soothe tummy.
Colic

• Probiotics: Studies with probiotics have either shown good, or no results with infants with colic. Lactobacillus reuteri specifically showed promising results in reducing sx in infants with colic¹.

• Studies have shown that increased support and care to the families seems to reduce the incidence of colic sx. in the baby².

• The use of aromatherapy massage using lavender oil was found to be effective in reducing the symptoms of colic³.

Attention Deficit / Hyperactivity Disorder (ADHD)

- A behavioral and brain disorder that begins in early childhood and lasts throughout early adulthood.

- Sx include disabling inattentiveness, hyperactivity and impulsivity.

- It may also be accompanied by mood disorders or learning disabilities and sleep disorders.

- ADHD encompasses 3 different ADHD forms – attention deficit, hyperactive or combined.
ADHD

- 5% of school aged children are affected in the United states.

- Boys are affected more than girls 2:1.

- Onset often occurs as early as age 3, but dx is often not made until child is in school.

- The signs and symptoms are assessed against normal developmental age.
ADHD – Signs / Symptoms

• Hyperactivity
• Perceptual motor impairment
• Emotional liability
• General coordination deficit
• Short attention span/distractibility
• Listening problems
• Poor concentration

• Impulsiveness
• Disorders of memory and thinking
• Specific learning disabilities
• Lack of perseverance
• Failure to finish projects
• Equivocal neurological signs and electroencephalographic irregularities
ADHD – Medical Treatment

• The child and family may be offered:
  – Medication: Methylphenidate, dexamfetamine or atomoxetine.
  – Therapy: Counselling, CBT or psychotherapy.
  – Behavioural interventions and parent training programs.
ADHD - Causes

• There is a difference in brain structure and function, especially in the frontal lobes of people with ADHD.

• These changes are thought to be a combination of genetic factors which are triggered by environmental and nutritional factors.

• From a neurochemical point of view, dopamine and noradrenaline increasing drugs seem to help with some of the symptoms.

ADHD - Causes

• **Environmental factors:** In utero exposure to cigarette smoke, alcohol, heavy metals, solvents increases the risk of ADHD in the child.

• **Lead:** High levels of lead exposure in young children can increase the risk, as well as the other toxic metals.

• **Pesticides:** Higher levels of organophosphates are found in ADHD children's urine.
ADHD - Causes

• **Food Additive Sensitivities:**
  
  – “The Feingold Hypothesis”: In 1973 Benjamin Feingold MD estimated that 40-50% of hyperactive children are sensitive to artificial food colours/flavours/preservatives as well as naturally occurring salicylates and phenolic compounds.

  – This has been reproduced by research, but has also be disputed by other research (which is only in the US).

  – Most countries (but the US) advise on reducing food additives in the diet.
ADHD - Causes

Hypoglycemia:

- Hypoglycemia can stimulate increased catecholamine secretion.
- OGTT have been performed on ADHD children, with over 74% showing abnormal results.

Langseth & Dowd; Glucose tolerance and hyperkinesis. Food Cosmet. Toxicol. 16:129-33, 1978
ADHD - Causes

Nutrient Deficiencies:

- **EFA’s:** Children with ADHD have lower tissue levels of EPA and DHA. Risk is doubled in formula fed children (lower DHA consumption).

- **Magnesium:** Serum Mg levels have shown to be low in ADHD children.

- **Zinc:** ADHD children have a low serum zinc (alongside low EFAs).

- **Iron:** In a small percentage, iron deficiency anemia is present.

• Food allergies:
  – Children with ADHD often have concurrent symptoms of food allergies (sleep disturbances, gut problems, otitis media etc.).
  – Investigating food allergies may play a large role in reducing symptoms of ADHD.
ADHD – Nutritional Care

• Avoid all additives and preservatives.

• Consider a low salicilate dietary pattern:
  – Fruits: Almonds, apples, apricots, cherries, currants, nectarines, peaches, plums and prunes.
  – Berries: Blackberries, boysenberries, gooseberries, raspberries, strawberries.
  – Grapes/raisins, wine, wine vinegar, wine jellies, fruit juice sweeteners.
  – Oranges (except grapefruit, lemon and lime).
ADHD – Nutritional Care

• **Investigate food allergies** – Casein, gluten other try an elimination dietary pattern or testing.

• **Reduce simple sugar** consumption – Employ a low GL eating pattern.

• **Avoid lead** and other toxic metals in the diet and lifestyle.
  – Check via testing. Check pipes, food sources.
  – Chelate: Vit C (3g/d), pectin (apples), alginate (seaweed), cysteine and cysteine rich foods (beans, eggs, onions, garlic).
ADHD – Nutritional Care

- Consider a high quality multi-vitamin supplement.
- Encourage foods high in calcium, magnesium, iron and zinc.
- Decrease omega-6 fats and increase sources of omega-3, especially EPA and DHA.
- Consider SIBO and dysbiosis – stool test where necessary and treat accordingly.
  - You may wish to investigate specific dietary elimination protocols for SIBO – such as FODMAPS or GAPS (Natasha Mc Bride).

ADHD – Nutritional Care

• Consider supplementation with:
  – Fish oils: 1000-300mg of EPA/DHA daily.
  – Magnesium: 5mg/kg body weight.
  – Iron/Zinc: As needed.
  – Vitamin D3: Test for deficiency.
  – Antioxidants: Vitamin E, pine bark extract or grape seed extract.
  – L-theanine
  – Gingko biloba
The Autistic Spectrum

- Manifests in early childhood, diagnosis is prior to 30 months.

- Characterised by qualitative abnormalities in social interactions, marked aberrant communication skills with slow language development, and restricted repetitive and stereotyped behaviours.

- Autism comes with mental retardation (IQs) of 35-50 (approximate numbers). ¾ of children with autism function in the mentally retarded range.

- Higher functioning IQ’s are grouped into the Asperger’s higher functioning, they normally do not have the delayed language.
Asperger’s Syndrome

- People with Asperger disorder have exhibited outstanding skills in mathematics, music, and computer sciences.

- Many are highly creative, and many prominent individuals demonstrate traits suggesting Asperger syndrome.

- For example, biographers describe Albert Einstein as a person with highly developed mathematical skills who was unaware of social norms and insensitive to the emotional needs of family and friends.
The Autistic Spectrum

- Concurrent seizure disorders are common.

- Movement abnormalities are a prominent feature, which are generally worse at times of stress or excitement - which may involve rocking, self-injurious behaviour, swaying, facial movements, tongue movements.
Pathophysiology

- The causes of autism are unknown.
- Effects boys more than girls (4:1).
- Possible abnormalities of cellular configurations in several regions of the brain, including the frontal and temporal lobes and the cerebellum. Enlargements of the amygdala and the hippocampus are common.
- Elevations of whole blood serotonin occur in one third of patients.
- Hughes (2007) has observed the presence of under connectivity in the brains of children with autism and related condition.
Causes

• Many individuals with autism and related conditions experienced untoward events in the prenatal and neonatal periods and during delivery.

• Association has been found between exposure to dicofol and endosulfan (organochlorine pesticides) in the first trimester of pregnancy in the Central Valley of California and the subsequent development of autism spectrum disorders in the child.
Causes

• Some children developed autism after immunisations, including inoculations for measles, mumps, and rubella.

• However, several population studies have demonstrated no clear association between childhood immunisation and the development of autism and related conditions.
Causes

- An infectious basis for autistic disorder in some individuals is suggested by the large number of children with autistic disorder born to women who were infected in the rubella epidemic.

- A toxic cause of autism has been frequently hypothesised - especially in-utero exposure to heavy metals, toxins and chemicals. There is no clear associations.

- Current research is investigating:
  - Exposure to SSRI medication in pregnancy
  - Multiple pre-natal ultrasounds
Causes

• Methyl-mercury exposure seems to induce neurological complaints similar to autism.

• MTHFR deficiency seems to be common in some autistic children.

• Evidence of the metabolic effects of dysbiosis and intestinal permeability has been shown in the Krebs cycle of children with autism, which may further aggravate brain function.

• Inflammatory entero-colitis is often common in autism.

Loo M (2009) Integrative Medicine for children, Saunders Elsvier, St Louis Missouri
Conventional Treatment

• Early detection is important to begin neurobehavioral treatment as soon as possible.

• Speech therapy, occupational therapy, physical therapy, physical therapy, behavioural and social interventions are common treatments.

• Medications are often given to control aggressive or compulsive behaviour or to reduce seizures.

Loo M (2009) Integrative Medicine for children, Saunders Elsvier, St Louis Missouri
Possible Drivers Of Autism

- Genetic predisposition
- Perinatal factors
- Impaired detoxification
- Gut inflammation
- Yeast overgrowth
- Autistic enterocolitis /encephalitis syndrome
Possible Naturopathic Therapeutic Aims

- Remove dysbiosis
- Reduce intestinal permeability
- Investigate possible food allergens
- Improve immunity and detoxification
- Improve chelating of toxic metals
- Improve methylation pathways
- Remove any trigger allergens
Possible Naturopathic Therapeutic Aims

• Remove dysbiosis:
  – Grapefruit seed extract, nystatin, garlic or sacchromyces boulardii.
  – Re-inoculation with probiotics.

• Repair intestinal permeability:
  – Probiotic support
  – Zinc and the antioxidants

• Investigate possible food allergens:
  – Casein free/ gluten free diets help with some children and decrease symptoms.
  – Testing for allergens may be beneficial (IgE and IgG).

Loo M (2009) Integrative Medicine for children, Saunders Elsvier, St Louis Missouri
Possible Naturopathic Therapeutic Aims

• Improve immunity and detoxification
  – Improving glutathione production and antioxidants.

• Improve chelating of toxic metals
  – Medical chelating agents are possible (EDTA or DMSA) but will remove all metals.
  – Natural chelators include garlic, chlorella, lipoic acid, cilantro.

• Improve methylation pathways
  – B6, B12 folic acid or 5MTHF.

Loo M (2009) Integrative Medicine for children, Saunders Elsvier, St Louis Missouri
Other Measures

- Essential fatty acid supplementation has shown benefit in some cases, but there are no large RCT’s to date.

- Targeted amino-acid therapy improves symptoms in some clients. Testing for urinary excretion of AA’s with a specific supplemental plan may be of benefit in some cases.