Haber and Bosch: world pop from 1.6 bn (1900) to 6 bn (2000) - Hydrogen & nitrogen are combined by high temp/ pressure = Ammonia (fertiliser): biological accessible to plants, ended war, sustains 40% pop. **People hungry?** Natural disasters, no money to buy; food, seeds, tools, etc. Low education, poor gov, health care, infrastructure, natural resources. **Who hungry?** Developing countries, rural, farmers, women (60%), orphans. **How much increase in food by 2050?** Increase from 70-100% - How? Wastage of food (30-40%), increase yields with existing techno, reduce neg externalities, better agro practices management of waste in livestock prodn, precision agri, changing diets **Diets change to benefit environment?** More protein less carbs, livestock contributes 40% of greenhouse gases **Green revolution techniques produced?** Increase in crops but need lots h20, fossil fuels, machinery, pesti, ferti, uses 10% of worlds oil. Examples technology changes: farm machinery, fishing equipment, ferti, pesti, irrigation, GE foods, feedlots, fish farms. **Effects of global warming?** Reduce crop yield, temp highest in last 11,000 years within 1 deg of max of past million years, temp will increase 2/3 deg by 2100, ocean rise 25-35m, mount glaciers gone: critical resource (alps, Andes, Himalayas, Africa), rivers seasonal = wheat/rice plummet, **2050** 4.4 bn of wrlds 10 bn suffer chronic h20 shortages, h20 takeover oil as war cause in middle east, fresh h20 < 3% of global h20. **Irrigation** = 70% fresh h20 use, when farmers tap fossil acquires, they are mining a non-renewable resource, pumping deep well takes lots of energy. **Water shortages** = between 1950-2000 world h20 use tripled, 70% is for irrigation, aquifer depletion = water tables fall, wells dry, 175 mn Indians, 130 mn Chinese fed grain produced by overpumping. **Agriculture** = 25% plant surface devoted to food prodn, 1kg beef = 15, 500L of h20, global meat prodn increased more than 5x between 1950-2002. **Why does food require energy?** Growth, processing, packaging, transport, currently supplied by fossil fuels. **Highest rate of death?** Blood pressure. **Global problems** = food/fuel security, 161tn L crude oil reserves, 3.8 tnL per usage, 25 mn enviro refugees, poor fam spend 50-70% income on food. **Food prices** = mid 2006–mid 2008: world grain/soybean tripled, poor most affected, Hungry/poor depend on natural resources = enviro degradation, threatened livelihood, poverty eradicated & sustainable management of planet go hand in hand, potential food crisis in poor countries - cause gov collapse. **Body changes in evolution?** Aus woman increase 2 sizes dress since 1966, height increase 161cm-163cm. **Food promotion?** 1930: avoid deficiencies, 1980: reduce bad foods, 2006 increase good foods. **Atherosclerosis?** Too much fat, arteries narrow, prevent smooth bloodflow, close fully =heart attack. **Importance of fat?** Insulation, essential vitamins (A,D,E,K), physiological importance: myelin sheaths, reproductive vesicles, warmth, padding. **Too much fat** = hypervitaminosis, dilution factor: hitting wall, positive energy balance- weight gain. **Too much protein** = decreased food variety, eat foods higher in fat content, renal dysfunction, increased risk of heart disease and cancers. **Functional foods?** Foods that have health benefits in addition to providing traditional nutrients such as protein, carbs, vitamins and minerals e.g. Yakult. Benefits: certain pop group: dietary needs, allergies, creative solution to food supply, improves convenience food supply. **Mechanisms heat loss**: evaporation, convection, conduction, radiation, respiration. **4 Macronutrients?** Carbs, fat, protein, fibre. **Starch/Glucose** digest to maltose, sucrose, lactose. **Metabolic syndrome?** Insulin resistance, obesity, dyslipidaemia, hypertension. **Strategies: enhance fatigue resistance?** Training: physical, technical, mental. Nutrition: carbs, fluid, protein. Heat acclimatisation/cooling. Drugs, supplements, gene doping. **Sprint success?** Muscle mass, fast twitch fibres, neuromuscular recruitment, fatigue resistance, ability to generate/tolerate lactic acid (buffer capacity), fast reaction time. **Endurance success?** High VO2 max (>70ml.kg), ability to maintain high %VO2 max, high power output at lactate threshold, fatigue resistance, efficient/economical technique, ability to oxidise fat at high power outputs. **Issues sports nutrition:** studies; not done on athletes, don't mimic life, unable to detect worthwhile changes. **Ingesting carbs improve performance**? Prevents fall in blood glucose, maintains muscle CHO oxidation and brain glucose supply, reduces fatigue, increases exercise time to fatigue. **Assess prehydration status?** Body mass, urine colour, gravity & osmolality. **Benefits fluid ingestion:** increase blood/stroke volume & cardiac output, exercise performance decrease heart rate, core temp, plasma and osmolality, muscle glycogen use. **Issues sports nutrition**: energy balance, sufficient dietary CHO intake & CHO supplementation, h2o & salt loss, protein, vitamin supplements **Malnutrition:** inadequate calories/protein for growth, maintenance or unable to fully utilise food they eat due to illness, also can be if they consume too many calories. **Aus spending:** $21bn, $6.5bn overweight, $15.5bn obesity. **Obese medical**: heart disease/stoke, cancer, diabetes, immobility/joint dysfunction, mental health. **Factors affecting energy input?** Energy density, portion size, eating frequency, absorption of nutrients. Excessive insulin? Increase testosterone/cholesterol, excessive glucose stored as fat, reduces energy, increased risk of diabetes, reduced fat burning. **How aid assists developing countries?** New crop cultivators, irrigation, fertilisers, pesticides, mechanisation. **2050:** pop 9bn, urbanisation/wealth = 4x increase, animal protein demands = 2-8x more grain, biofuel take over farmland = 20%, global consumption of h2o by agri = 60-70%, temp rise by 2 deg. **Thomas Malthus:** 1766-1834, doomsday, increase productivity stimulate further pop growth.