Neurological disorders and nutrition

- General considerations, e.g., dysphagia

- Main topics and optional Canadian websites:
  - STROKES
    - www.heartandstroke.ca
  - EPILEPSY
    - www.epilepsy.ca
  - PARKINSON’S
    - www.parkinson.ca
  - ALZHEIMER’S
    - www.alzheimer.ca

- Nutritional causes: overnutrition or undernutrition
  - chronic low intake of nutrients
    - examples: vitamins, energy-yielding nutrients, minerals
      - Wernicke-Korsakoff Syndrome...
      - Pernicious Anemia
      - Peripheral neuropathy...
      - Mental retardation

  - chronic excessive intake of nutrients and non-nutrients
    - examples: vitamins, fats, alcohol and other toxins
      - Strokes
      - Strokes
      - Konzo & Lathyrism...neurotoxic phytochemicals

  - malabsorption or defective transport
    - examples: fat malabsorption, vitamin-binding protein deficiency
      - Vitamin E deficiency syndrome...

- Non-nutritional causes: nutritional implications...

Nutritional and related assessments

- Some general considerations:
  - include comparing past and present rates of chewing, extent of dysphagia, as well as more typical nutrient intakes...getting worse, better, or stable?
  - frequent assessments important especially with neurodegenerative diseases
  - consider also related cognitive function, physical ability to self-feed (prepare food and bring it to the mouth)...may require enteral nutrition until self-feeding resumes, e.g., in stroke, unlikely in neurodegenerative diseases such as Alzheimer’s and Parkinson’s
  - has there been unwanted weight loss of 10% or more? This could be sign of malnutrition or other problem...
**Dysphagia: difficulty with swallowing**

- Oral phase:
- Pharyngeal phase:
- Esophageal phase:

  - **Potential problems and solutions**
    - inadequate nutrient intake/dehydration
    - choking
    - lung infections (aspiration pneumonia)
    - mash or liquify solids
    - thicken liquids (examples of thickeners...)
    - micronutrient supplementation
    - enteral nutrition

**Strokes**

*Some statistics from Canadian HSFoundation*

- 50,000 strokes in Canada each year
- 300,000 Canadians living with effects of stroke (~1 in 5 chance of having another stroke within ~2 years)
- every 10 years, risk of stroke doubles for those aged over 55

- ~85% thromboembolic (atherosclerosis/thrombosis)
  - embolic: plaque travels to brain and blocks vessel
  - thrombotic: local plaque blocks vessel with clot

- ~15% intracranial hemorrhage
  - ruptured blood vessel

**Stroke prevention**

- Control
  - hypertension, obesity, diabetes, atherosclerosis...
  - non-nutritional factors: smoking, lack of exercise, etc., genetics

- Strokes in children usually have other causes, e.g., head trauma, infections, inherited blood clotting disorders...drug/alcohol abuse in teens

**Nutritional management of post-stroke patient**

- Decreased cholesterol, fat, and salt is NOT an immediate priority
- Major task:
  - implement a well-balanced diet to aid recovery
    - manage dysphagia and physical problems
    - enteral nutrition may be needed to avoid deficiencies
Epilepsy

Some statistics from Canadian epilepsy association:
- ~15,000 people diagnosed with epilepsy each year (over half are diagnosed before age of 9, and over 80% by 18)
- 1 in every 200 Canadians has epilepsy (mostly youth; in about half of all cases of childhood epilepsy, seizures disappear by adulthood

- Different types...
- Excessive neural activity (generalized or focal) that leads to seizures

Drug-nutrient interactions in epilepsy

Some anticonvulsants:
- can influence hepatic vitamin D metabolism
- hypovitaminosis D
- folic acid can influence anticonvulsant drug metabolism

Nutritional management of epilepsy

- Ketogenic diet
  - when drug therapy is not very effective
  - create and maintain state of ketosis
  - strict adherence to diet required...can be difficult
  - if effective, medication may be reduced
  - helps some...1 in 3?
  - side effects...

Implementation of ketogenic diet

- period of fasting may be involved
- followed by ~4:1 ratio of [fat]:[protein & carbohydrate]
- limit fluids to avoid excess dilution of ketones
- kcal/day = 75-100% of recommended...activity level, etc
- protein = 1.0-1.3 g/kg/day to maintain growth in children (~ 5 kcal/kg/d........1.25 g = 5 kcal)
- if vitamin/mineral supplements used, check sugar content
- MCT oils (medium chain triglycerides) can facilitate use of ketogenic diet.....MCT’s are rapidly absorbed & metabolized for energy; rapid & efficient ketosis
example of ketogenic diet

- 1 yr old child with a weight of 10 kg

- energy
  - 100 kcal/kg/day = 1000 kcal/day

- 9 : 1 kcal nutrient ratio
  - 10 parts total \[\frac{1000}{10} = 100\]
  - 900 kcal fat : 100 kcal prot & carb
  - 5 kcal/kg protein x 10 kg = 50 kcal
  - 1000 kcal – 950 kcal of fat and protein = 50 kcal carb

- 900 kcal fat, 50 kcal protein, 50 kcal carbohydrate
  = about 13 g prot, 13 g carb, 100 g fat

Parkinson's disease

Some statistics from Parkinson Society of Canada:
- ~100,000 people in Canada have Parkinson's disease
- ~1 in 50 people over age 70 have Parkinson's
- when diagnosed, about 80% of dopaminergic neurons have already lost normal function

- Onset age is often 50-60 yrs
- Common neurological disease in Canada (neurodegenerate...)
- Progressive loss of neurons (dopaminergic)
- Leads to movement disorders
  - tremors, rigidity, bradykinesia

- Cause(s) of dopaminergic cell loss unknown...some research topics:
  - neurotoxins, mitochondrial dysfunction, oxidative damage...
  - Does antioxidant deficiency/supplement affect progression?
  - misfolding/aggregation of proteins

- Treatment to control symptoms (not cure)
  - L-dopa: crosses blood-brain barrier...converted to dopamine
Drug-nutrient interactions

• some amino acids (e.g., F, W, I)
  – compete for L-dopa absorption

• high vitamin B6 sources
  – may decrease L-dopa’s availability to the brain

Nutritional management of Parkinson’s

• Minimize daytime protein (?)
  – e.g., ~90% of total daily protein requirements consumed during dinner and evening snack

• Advanced Parkinson’s:
  – Compromised self-feeding ability

Alzheimer’s disease

Some statistics from the Canadian Alzheimer Society:
~100,000 cases of dementia diagnosed each year
~450,000 people over age 65 have ARD
  ‘Alzheimer’s & Related Dementias’
~1 in 6 over age 75 has ARD

• Degeneration of cortical neurons
• Most common form of dementia
• Causes of dementia?
  - genetic & environmental factors
  - amyloid…

Nutritional consequences of Alzheimer’s

• Increased dependency on others for feeding
• Decreased response to thirst, hunger, satiety
• Gradual weight loss is common (weight gain in some)
• Dysphagia
• Abnormal eating behaviour….
  – Food/drink not recognized as such
  – Increased distraction/decreased attention during meals
  – Increased paranoia, anger, violence
Nutritional Recommendations for Alzheimer's

• Nutrient dense foods
• Frequent snacks
• Nutrient supplements...?
• -Antioxidants ? -Omega-3 ? -Phytochemicals ?...more evidence needed

• Frequent nutritional assessments