NMDC221 Session 10: HIV/AIDS
Recommended Reading

Topic Summary

Human Immunodeficiency Virus (HIV) & Acquired Immune Deficiency Syndrome (AIDS)
- Nutritional management of HIV and AIDS
- Nutritional support and modulation of quality of life (QoL)
- Adjunctive support for individuals on HAART and treatment side effects
- Relevant nutrient-drug interactions.
Human Immunodeficiency Virus

Human Immunodeficiency Virus (HIV) is a retrovirus that causes a decline in the number of circulating T4 lymphocyte cells.

Transmission can occur via infected body fluids:
- Blood, semen, vaginal secretions, cerebrospinal fluid & breast milk
- Lower concentrations found in tears, urine & saliva
- Increased susceptibility when mucous membranes are damaged i.e. presence of STD’s

(Kumar & Clark, 2009; AVERT, 2010)
Human Immunodeficiency Virus

Transmission

- The virus targets lymphocyte receptor proteins (CD4) of T-helper lymphocytes.

- With infection and alteration of DNA, programmed cell death ensues leading to cell death.

- Remnants are engulfed by other lymphocytes, leading to further infection.

- These cells normally activate and co-ordinate most other cells within the immune system.
Human Immunodeficiency Virus

Symptoms

- Fever, rash, swollen lymph nodes, general discomfort lasting 3-14 days.
- The immune system produces antibodies against the HIV infection and the number of circulating T4 cells recovers nearly to normal.
- Symptoms resolve, and the individual may be largely asymptomatic thereafter for many years, with mild exacerbations occurring periodically.
- Those infected are still highly contagious during this phase

(Tortora & Grabowski, 2003)
Stages of HIV infection, AIDS.gov

1. ACUTE INFECTION:
   During this time, large amounts of the virus are being produced in your body.
   Many, but not all, people develop flu-like symptoms often described as the “worst flu ever.”

2. CLINICAL LATENCY:
   During this stage of the disease, HIV reproduces at very low levels, although it is still active.
   During this period, you may not have symptoms. With proper HIV treatment, people may live with clinical latency for several decades. Without treatment, this period lasts an average of 10 years, but some people may progress through this stage faster.

3. AIDS:
   As your CD4 cells fall below 200 cells/mm³, you are considered to have progressed to AIDS.
   Without treatment, people typically survive 3 years.
Progression of HIV to AIDS
Human Immunodeficiency Virus

Progression

- Over the next 2-10 years, the virus slowly destroys the T4 cell population in lymphatic tissues throughout the body.

- HIV can present for 7-10 years & may never develop into AIDS, dependent on the maintenance of immunity.

- If immune responses weaken, people develop certain indicator diseases that mark the progression from HIV into full-blown Acquired Immune Deficiency Syndrome (AIDS).

(AVERT, 2010; Tortora & Grabowski, 2003)
Acquired Immune Deficiency Syndrome

The onset of Acquired Immune Deficiency Syndrome (AIDS) is marked by a rapid drop in the CD4 lymphocyte count (> 200 cells/microlitre of blood)

Symptoms include:

- Swollen lymph glands, weight loss / wasting, recurrent fever, feeling unwell, fatigue, Candida, anaemia & recurrent diarrhoea
- Dementia, loss of memory & concentration, confusion & poor information processing

(Kumar & Clark, 2009; AVERT, 2010)
AIDS

Conditions that mark AIDS:
- Bacteria: Tuberculosis, Pneumonia
- Yeast: Leukoplakia
- Virus: Cytomegalovirus, Herpes simplex, shingles, multifocal leukoencephalopathy
- Parasite: Toxoplasmosis, gastro-intestinal infections (*Cryptosporidium*)
- Cancers – Kaposi’s sarcoma, Non-Hodgkin’s lymphoma, cervical and rectal cancer

(Kumar & Clark, 2009)
Global Prevalence of HIV

Prevalence of HIV among adults aged 15 to 49, 2016
By WHO region

Prevalence (%) by WHO region

- Eastern Mediterranean: 0.1 [<0.1–0.1]
- Western Pacific: 0.1 (<0.1–0.2)
- South-East Asia: 0.3 [0.2–0.3]
- Europe: 0.4 [0.4–0.4]
- Americas: 0.5 [0.4–0.5]
- Africa: 4.2 [3.7–4.8]

Global prevalence: 0.8% [0.7–0.9]

The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted and dashed lines on maps represent approximate border lines for which there may not be full agreement.

Data Source: World Health Organization
Map Production: Information Evidence and Research (IER)
World Health Organization

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Prevalence and Incidence in Australia

- A total of 1,025 cases of HIV infection was newly diagnosed in Australia in 2015, which has remained relatively stable over the past three years in Australia (AFAO 2017).
- An estimated 25,708 people were living with diagnosed HIV infection in Australia at the end of 2012.
- HIV continued to be transmitted primarily through sexual contact between men.
Prevalence and Incidence in Australia

- The *per capita* rate of HIV diagnosis in the Aboriginal and Torres Strait Islander is similar to non-indigenous population, however a substantially greater proportion are attributed to injecting drug use. Proportion attributed to injecting drug use (13% compared with 2%).

- Of 1,364 cases of HIV infection newly diagnosed in 2008 – 2012, for which exposure to HIV was attributed to heterosexual contact, 58% were in people from high prevalence countries or their partners (Kirby Institute 2013)
Trends in HIV infection

Figure 1: Newly diagnosed HIV infection in Australia by year
HIV Management
HIV & AIDS

- The therapeutic treatment objectives for HIV and AIDS will obviously differ.

- Current drug regimes are successful at keeping the viral load at undetectable levels. Therefore the primary treatment objectives for clients with HIV during the period of clinical latency are:
  - Address nutrient deficiencies
  - Reduce oxidative stress
  - Reduce inflammation and correct lipid metabolism
  - Optimise intestinal health and digestive function
  - Optimise lymphocyte development and function
  - Improve resistance to infections
  - Support nervous system – stress adaptation and mental health
AIDS

- The aim of treatment when an individual moves from clinical latency into AIDS involves three primary areas:
  - Opportunistic infections
  - Nervous system – cognitive and peripheral neuropathy
  - Intensive nutritional support – dietary (protein) and supplemental nutrients
- The specific diet and nutrients required will depend upon the individuals symptom picture.
Dietary Management

- Total diet recommendations are consistent with NHMRC dietary guidelines with emphasis in increasing intake of plant based whole foods and minimisation of added sugars, sodium, saturated fats and trans fats.

- It is recommended that asymptomatic people living with HIV will benefit from a 10% increase in energy intake and people with symptoms and opportunistic infections may benefit from increases up to 30% additional energy intake (Raiten DF et al 2011).
Dietary Management

- Although there is no consensus with regard to an increased intake of protein for people living with HIV this is considered to be an area of high priority research (Raiten DF et al 2011).

- Notwithstanding in the absence of evidence supporting an increased protein requirement for all individuals the question warrants consideration on a person by person basis.
Dietary Management

Nutritional Considerations

Mediterranean Diet

- The Mediterranean diet has a high intake of MUFA and PUFA traditionally from olive oil. This diet has been found to reduce LDL-cholesterol and triglycerides while increasing HDL-cholesterol in HIV clients.
- Dyslipidaemia and cardio-vascular problems are a common side effect of anti-retroviral usage.
Dietary Management

Nutritional Considerations

- Diet and exercise should be considered a routine part of HIV care.
- Evidence suggests both a preventative role in central fat accumulation as well as a therapeutic effect on central adiposity and some metabolic parameters.

(Moyle et al, 2010)
HIV & AIDS

Nutritional Considerations

Body Composition

- In the HIV-infected population, weight loss is associated with lower CD4+ cell counts and is an independent predictor of mortality. (Hendricks et al, 2009)

- Malnutrition and cachexia are common in HIV and both states increase the progression of HIV infection via alterations to immune system response.
HIV & AIDS

Nutrient Deficiencies

- Nutrient deficiencies are associated with increased opportunistic infections, disease progression, and an increase in HIV-related mortality.

- Possible mechanisms increased intracellular oxidative stress enhanced viral replication, and a reduction in the number of circulating CD4 lymphocytes due to the nutrient deficiencies.

(Kaiser et al, 2006)
HIV & AIDS

Therapeutic Actions

Vitamin A

- Vitamin A is essential for normal immune function, the maintenance of mucosal surfaces, and haematopoiesis. Also, vitamin A supplementation is recognised for its ability to decrease morbidity and mortality rates for some infectious diseases. However while these actions suggest benefits, there is conflicting evidence for Vitamin A and HIV / AIDS.
HIV & AIDS

Therapeutic Actions

Vitamin A

- Vitamin A supplementation results in a delayed progression from HIV to AIDS, and reduced mortality. Found to support both humoral and cell mediated activity. Restores mucous membrane integrity
  
  (Braun & Cohen, 2010; Shils, 2006)

Beta-carotene

- β-carotene increases WBC counts, including CD4+. It is associated with decreased mortality. Anti-oxidant activity that inhibits lipid peroxidation

  (Shils, 2006; Pizzorno & Murray, 2006)
HIV & AIDS

Therapeutic Actions

Vitamin B1
- B1 repletion is associated with delayed progression and reduced mortality

Vitamin B6
- B6 has been found to be a cognition enhancer due to reduction in homocysteine levels, supports T-helper and T-lymphocyte production

Vitamin B12
- B12 can reduce AIDS dementia, aids cellular immunity. Shown to be low in early asymptomatic stages of AIDS
  (Braun & Cohen, 2010; Shils, 2006)
HIV & AIDS

Therapeutic Actions

Vitamin C

- Vitamin C supports both cell mediated and humoral activity of the immune system.
- Vitamin E and C together reduces oxidative stress and viral load
  
  (Shils, 2006; Pizzorno & Murray, 2006)
- Patients supplemented for three months on ascorbic acid-containing supplement showed reduced viral load and improved haematological parameters.
  
  (Oguntibeju et al, 2006)
HIV & AIDS

Therapeutic Actions
Vitamin E

- Antioxidant that normalizes the immune system (cell medicated and humoral) and is linked to reduced mortality.
  (Shils, 2006; Pizzorno & Murray, 2006; Kashou et al, 2011)
- Reduces viral replication and inhibits cell death.
- Clinical trials have shown that those HIV-infected decreased the risk of progression of AIDS by doubling their vitamin E intake
  (Kaio Daniella et al, 2011)
Antioxidants - Vitamin C and E

- Highly Active Anti-Retroviral Treatment (HAART) therapy over time can result in the overproduction of ROS and the reduction of antioxidant defences, and consequently mitochondrial dysfunction.

- 49 HIV-positive patients were randomised to receive supplements of both DL-alpha-tocopherol acetate (800 IU daily) and vitamin C (1000 mg daily), or matched placebo, for 3 months. Plasma antioxidant micronutrient status, breath pentane output, plasma lipid peroxides, malondialdehyde and viral load were measured at baseline and at 3 months. New or recurrent infections for the 6-month period after study entry were also recorded.

( Kaio D et al 2014)
Antioxidants - Vitamin C and E

- RESULTS: The vitamin group (n = 26) had an increase in plasma concentrations of alpha-tocopherol (P < 0.0005) and vitamin C (P < 0.005) and a reduction in lipid peroxidation measured by breath pentane (P < 0.025), plasma lipid peroxides (P < 0.01) and malondialdehyde (P < 0.0005) when compared with controls (n = 23). There was also a trend towards a reduction in viral load (mean +/- SD changes over 3 months, -0.45 +/- 0.39 versus +0.50 +/- 0.40 log10 copies/ml; P = 0.1; 95% confidence interval, -0.21 to -2.14). The number of infections reported was nine in the vitamin group and seven in the placebo group (Allard JP et al 1998).
HIV & AIDS

Therapeutic Actions

Vitamin D

- Vitamin D aids appropriate macrophage and cytokine production (Braun & Cohen, 2010)
  (Dao et al, 2011)

- Observational studies have noted very high rates of low 25(OH)D levels in HIV-infected patients affecting up to 70% HIV infected persons (Villamor E. 2006 May;64(5 Pt 1):226–33.)
HIV & AIDS

Therapeutic Actions

Folate

- Folate aids in synthesis of neurotransmitters supporting normal brain activity & aids in reducing high homocysteine levels

(Braun & Cohen, 2010)
HIV & AIDS

Therapeutic Actions

Copper
- Copper has potent biocidal properties and has been found to inactivate HIV-1 infectivity. (Borkow G et al, 2008)

Selenium
- Supplementation elevates the serum selenium level and suppresses the progression in HIV-1 viral load. (Hurwitz et al, 2007)

Zinc
- Zinc supplementation shown to delay immunological failure and reduce the incidence of diarrhoea in HIV. (Baum et al, 2010)
Zinc – level II evidence

- RCT of zinc supplementation to prevent immunological failure in HIV-infected adults (Baum MK et al 2010)
- 231 HIV-infected adults with low plasma zinc levels. Zinc supplementation of 12mg/day for 18 months reduced 4-fold the likelihood of immunological failure (CD4(+) cell count <200), (relative rate, 0.24; 95% confidence interval, 0.10-0.56; P<.002).
- Viral load indicated poor control with antiretroviral therapy but was not affected by zinc supplementation.
- Zinc supplementation also reduced the rate of diarrhoea by more than half (odds ratio, 0.4; 95% confidence interval, 0.183-0.981; P=.019), compared with placebo.
Omega 3 – level I evidence

- Hypertriglyceridemia – a recognised metabolic abnormality in HIV-infected people, increasing in severity in people treated with HAART

- A double-blind RCT in participants on stable HAART with fasting triglycerides of >3.5 mm to 10.0 mm using 9 g of omega-3 fatty acids versus placebo (olive oil) after a 6-week lead in on dietary therapy.

- RESULTS: Using the random effects model, a statistically significant effect on triglycerides of omega-3 fatty acid versus placebo was found (chi(2) = 6.04, P = 0.0487). The estimated difference between groups for change in mean triglycerides over 8 weeks was -2.32 mm (95% CI -4.52, -0.12 mm).
Omega 3 – level I evidence

- Effect of a dietary intervention and n-3 fatty acid supplementation on measures of serum lipid and insulin sensitivity in person with HIV (Woods et al, 2009).
- 6gm of omega 3 daily demonstrated decreased in triglycerides, inflammatory markers, and improved insulin sensitivity.
HIV & AIDS

**Therapeutic Nutrients to also consider:**

Glutathione / Glutamine
- Glutathione is implicated in reducing disease progression and mortality.
- Glutamine heals and repairs GIT mucous membranes, integral in phase II liver clearance and boosts antioxidant defense in the lungs

(Shils, 2006; Braun & Cohen, 2010)

N-acetyl-cysteine
- Reduces oxidants and mutations in cancer cell lines in glutathione deficient states (i.e. HIV)

(De Flora et al. 1991)
HIV & AIDS

Therapeutic Actions

Tea
- Epigallocatechin gallate (EGCG) from green tea inhibits HIV replication & a number of opportunistic infections
- Theaflavins from black tea inhibits HIV’s ability to enter target cells

(Braun & Cohen, 2010;)

Shitake and Reishi
- Immunomodulator and antiviral activity found to significantly increased the CD4+ T-lymphocyte counts in HIV patients. (Lindequist et al. 2005; Adotey et al, 2011)
HIV & AIDS

Therapeutic Actions

Colostrum

- Colostrum has been found to be beneficial in some forms of infective diarrhoea

Prebiotics & Probiotics

- Probiotics aid infectious diarrhoea & inhibit the overgrowth of pathogenic bacteria
- Specific probiotic strains may potentially ameliorate HIV-induced changes to the mucosa and immune system.
- Prebiotics may reverse HIV induced intestinal changes.

(Braun & Cohen, 2010; Hummelen et al, 2010)
HIV & AIDS

Therapeutic Actions

Ginger

- Ginger is anti-inflammatory and in in-vitro studies to reduce yeast and fungal overgrowth. Stimulates saliva, bile production and has anti-ulcer and anti-nausea actions. Improves insulin sensitivity.

(Braun & Cohen, 2010)
Summary of Potential Nutrients and Dosages
# HIV & AIDS

## Therapeutic Actions

<table>
<thead>
<tr>
<th>Culinary Herb Examples</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ginger</td>
<td>Anti-ulcer and anti-nausea, improves insulin sensitivity, antifungal</td>
</tr>
<tr>
<td>Rosemary</td>
<td>Antibacterial, antifungal, antiviral, antioxidant, analgesic, anti-inflammatory properties.</td>
</tr>
<tr>
<td>Turmeric</td>
<td>Anti-inflammatory, antioxidant, antimicrobial and cytotoxic.</td>
</tr>
<tr>
<td>Oregano</td>
<td>Antiviral, antibacterial, antifungal, and anti-parasitic (Braun &amp; Cohen, 2010)</td>
</tr>
</tbody>
</table>
## Summary of nutrients

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Dosage</th>
<th>Therapeutic Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vitamin A</td>
<td>1000-10,000 iu</td>
<td>Delays progression HIV to AIDS. Reduces mortality. Supports humoral &amp; cell mediated activity. Restores mucous membrane integrity</td>
</tr>
<tr>
<td>β-carotene</td>
<td>60-120mg</td>
<td>Increases WBC counts, including CD4+. Decreases mortality. Anti-oxidant activity that inhibits lipid peroxidation</td>
</tr>
<tr>
<td>Folate</td>
<td>400-5000mcg</td>
<td>Aids in synthesis of neurotransmitters &amp; reduces high homocysteine levels. Commonly deficient</td>
</tr>
<tr>
<td>Vitamin B1</td>
<td>50mg</td>
<td>B1 repletion associated with delayed progression &amp; reduced mortality</td>
</tr>
<tr>
<td>Vitamin B6</td>
<td>50mg</td>
<td>Cognition enhancer as reduces homocysteine, supports T-helper and T-lymphocyte production. Commonly deficient</td>
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### Summary of nutrients

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<td>Vitamin B12</td>
<td>1000mcg</td>
<td>Reduce AIDS dementia, increase cellular immunity. Shown to be low in early asymptomatic stages of AIDS. Commonly deficient</td>
</tr>
<tr>
<td>Vitamin C</td>
<td>1000-5000mg</td>
<td>Supports both cell mediated and humoral activity of the immune system. Vitamin E and C together reduces oxidative stress and viral load. Commonly deficient</td>
</tr>
<tr>
<td>Vitamin D</td>
<td>2000-5000 iu</td>
<td>Insufficiency or deficiency affecting &gt;70% of HIV-infected persons</td>
</tr>
<tr>
<td>Vitamin E</td>
<td>100-1000iu</td>
<td>Decreases lipid oxidation, normalizes the immune system (cell mediated and humoral) and reduces mortality. Commonly deficient</td>
</tr>
</tbody>
</table>

## Summary of nutrients

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<tr>
<th>Nutrient</th>
<th>Dosage</th>
<th>Therapeutic Actions</th>
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<tbody>
<tr>
<td>Copper</td>
<td>2mg</td>
<td>May reduce viral replication</td>
</tr>
<tr>
<td>Selenium</td>
<td>400mcg</td>
<td>Selenium slows HIV proliferation. Commonly deficient</td>
</tr>
<tr>
<td>Zinc</td>
<td>20-100mg</td>
<td>Decreases the risk of opportunistic infections. Important in the normal production of cell mediated and humoral immunity. Commonly deficient</td>
</tr>
<tr>
<td>Glutamine</td>
<td>1000 – 3000mg</td>
<td>Maintain intestinal integrity, anxiolytic, lymphocyte function</td>
</tr>
<tr>
<td>N-acetyl-cysteine</td>
<td>500mg-1500mg</td>
<td>Reduces mutations in cancer cell lines in glutathione deficient states (i.e. HIV)</td>
</tr>
</tbody>
</table>

Optimal treatment supported by evidence

- Glutamine 1000-3000 mg daily
- Probiotics
- Omega 3 fatty acids – up to 9 grams daily
- B complex vitamins
- Vitamin C & E 1000mg & 800 ius daily respectively
- Vitamin D 1000-2000 ius daily
- Zinc 12-20mg daily

**REMEMBER:** Treatment is continuous therefore lower maintenance doses are recommended to sustain wellness
Activity

- ACON building our communities health and wellbeing

- ACON have a vitamin service where people with HIV can purchase significantly discounted practitioner only products.

- Review the list of available supplements on the next slide and consider any additional supplements that you would like to be made available.
## ACON Vitamin Service


While the products below are available for sale without restriction in retail outlets, holding a current script confirms your eligibility to the ACON Vitamin Service.

<table>
<thead>
<tr>
<th>Vitamins</th>
<th>Price (GST incl)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Super Zinc – Golden Glow 100 tabs</td>
<td>$10.00</td>
</tr>
<tr>
<td>C-Complex Sustained Release – Golden Glow 100 Tabs</td>
<td>$14.00</td>
</tr>
<tr>
<td>Milk Thistle – Golden Glow 100 tabs</td>
<td>$14.00</td>
</tr>
</tbody>
</table>

### Practitioner Range Only – Script Required

We are unable to sell you the products listed below unless you provide a script signed by a practitioner.

<table>
<thead>
<tr>
<th>Prescription</th>
<th>Price (GST incl)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lipoec 400 - Bioceuticals 60 cps</td>
<td>$15.00</td>
</tr>
<tr>
<td>B12 Liquid - Bioceuticals 50ml spray</td>
<td>$12.50</td>
</tr>
<tr>
<td>Co Q10 100mg - Bioceuticals 90 caps</td>
<td>$28.50</td>
</tr>
<tr>
<td>Energy X - Metagenics 200g powder</td>
<td>$25.50</td>
</tr>
<tr>
<td>Femme Essentials - Metagenics 60 caps</td>
<td>$26.00</td>
</tr>
<tr>
<td>Meta B Complex - Metagenics 50 tabs</td>
<td>$16.50</td>
</tr>
<tr>
<td>MetaPure - Metagenics 120 Caps (fish oil)</td>
<td>$33.00</td>
</tr>
<tr>
<td>Ultra Flora Restore DF - Metagenics 60 caps</td>
<td>$30.00</td>
</tr>
<tr>
<td>Ultra Potent-C - Bioceuticals 200gms</td>
<td>$22.00</td>
</tr>
<tr>
<td>Ultra Probioplex - Metagenics 80 caps</td>
<td>$27.00</td>
</tr>
<tr>
<td>Vitamin E 500 Tocopherols plus Selenium - Metagenics 60 caps</td>
<td>$25.00</td>
</tr>
<tr>
<td>Vitamin D3 Drops Forte 1000 20ML - Bioceuticals</td>
<td>$17.50</td>
</tr>
<tr>
<td>CalMx - Metagenics 540G Powder</td>
<td>$48.60</td>
</tr>
<tr>
<td>NeuroCalm - Metagenics 60 Tabs</td>
<td>$26.60</td>
</tr>
</tbody>
</table>

### Residential Area:

- CBD
- Inner west
- West
- East
- North
- South
- Illawarra
- Central Coast
- Other

### Sex:

- Female
- Male
- Other

### Age Range:

- 18 - 30
- 31 - 40
- 41 - 50
- 51 - 60
- 61+

### Practitioners details/stamp

<table>
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<tr>
<th>ACON USE</th>
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<tr>
<td>Client Code</td>
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<tr>
<td>2013</td>
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Medical Management
HAART

- Thirty years after the discovery of HIV infection, there are numerous antiretroviral drugs that control the disease when administered in a potent combination referred to as Highly Active Antiretroviral Therapy (HAART).

- This therapy reduces the viral load and improves immune system reconstitution, leading to a significant reduction of HIV-related morbidity and mortality.

- HAART does not completely eliminate HIV, so treatment must continue throughout the patient's life.

- Prolonged use of HAART has been related to long-term adverse events that can compromise patient health.
Medical Management

- These deleterious effects have been reported for the majority of antiretroviral drugs and are the most common causes for therapy discontinuation. In most of these adverse events, such as diabetes, cardiovascular diseases, neurological disorders and metabolic alterations, oxidative stress and mitochondrial impairment play important roles.

- The HAART regimen typically combines three or more different drugs such as two nucleoside reverse transcriptase inhibitors (NRTIs) and a protease inhibitor (PI), two NRTIs and a non-nucleoside reverse transcriptase inhibitor (NNRTI) or other such combinations.
Medical Management

These HAART regimens have proven to reduce the amount of active virus and in some cases can lower the number of active virus until it is undetectable by current blood testing techniques. HAART provides effective treatment options for treatment-naive and treatment-experienced patients. Six classes of antiretroviral agents currently exist, as follows:

- Nucleoside reverse transcriptase inhibitors (NRTIs)
- Non-nucleoside reverse transcriptase inhibitors (NNRTIs)
- Protease inhibitors (PIs)
- Integrase inhibitors (IIs)
- Fusion inhibitors (FIs)
- Chemokine receptor antagonists (CRAs)
Medical Management

- Each class targets a different step in the viral life cycle as the virus infects a CD4$^+$ T lymphocyte or other target cell. The use of these agents in clinical practice is largely dictated by their ease or complexity of use, side-effect profile, efficacy based on clinical evidence, practice guidelines, and clinician preference.

- Resistance, adverse effects, pregnancy, and co-infection with hepatitis B virus, or hepatitis C virus present important challenges to clinicians when selecting and maintaining therapy.
Medical Management

Drug Treatment Regime

- Antiretroviral treatments work to sustain the client in a HIV state & prolong the progression to AIDS.
- With AIDS opportunistic infections are a principal cause of morbidity and mortality.
- The combination of Anti-retroviral therapy, antibiotics & antifungals work to prevent opportunistic infections.

(International AIDS Society, 2007; Bryant & Knights, 2008; Centre for Disease Control and Prevention, 2009; Kumar & Clark, 2009)
Contra indications or potential nutrient/herb interactions:

- St John’s Wort and Garlic have been shown to reduce the serum concentrations of concomitant ARV drugs and are therefore best avoided.

- Garlic has been shown to significantly reduce therapeutic concentrations of PIs – notably indinavir and saquinavir – when administered concomitantly (Ladenheim et al 2008).
## HIV & AIDS

<table>
<thead>
<tr>
<th>Drug</th>
<th>Action</th>
<th>Side Effects</th>
<th>Interactions</th>
</tr>
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<tbody>
<tr>
<td>Nucleoside Reverse Transcriptase Inhibitors (NRTI)</td>
<td>Inhibit HIV DNA reverse transcriptase which suppresses HIV replication</td>
<td>CNS toxicity, headache, dizziness, fatigue, gastric distress, dry mouth, neuropathy, paraesthesia's, insomnia, depression, skeletal muscle pain.</td>
<td><strong>Carnitine</strong> is depleted with NRTI therapy. Supplementation prevents muscle damage. <strong>Vitamin B1 &amp; B2</strong>: depleted with NRTI use. Supplementation has been found to reverse fatty liver &amp; muscle fatigue as a side effect of NRTI’s. <strong>Vitamin E</strong>: Protects against anti-retroviral induced cardiac damage</td>
</tr>
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</table>

(Braun & Cohen, 2010, p.1102.)
### HIV & AIDS

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<td>Inhibit HIV DNA reverse transcriptase which suppresses HIV replication</td>
<td>NRTI class side effects</td>
<td><strong>Vitamin B12</strong>: drug therapy worsens deficiency states.</td>
</tr>
<tr>
<td>AZT</td>
<td></td>
<td></td>
<td><strong>Vitamin E</strong>: reduces bone marrow toxicity that presents with AZT prescription</td>
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<td></td>
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<td></td>
<td><strong>Aloe</strong>: synergistic anti-viral action when combined with AZT</td>
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<td></td>
<td><strong>Coenzyme Q10</strong>: Concurrent use with AZT minimized oxidative fibre myopathy (AZT side effect)</td>
</tr>
<tr>
<td>NRTI: Zidovudine</td>
<td></td>
<td>NRTI class side effects</td>
<td><strong>Vitamin E</strong> enhances drug effect to inhibit the replication of the HIV virus</td>
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<td></td>
<td><strong>Folic Acid / Vitamin B12</strong>: pre-existing deficiency is exacerbated with zidovudine therapy</td>
</tr>
</tbody>
</table>

(Stargrove et.al. 2008; Kashou et al, 2011)
### HIV & AIDS

<table>
<thead>
<tr>
<th>Drug</th>
<th>Drug Action</th>
<th>Side Effects</th>
<th>Interactions</th>
</tr>
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<tbody>
<tr>
<td>Non-Nucleoside Reverse Transcriptase Inhibitors (Non NRTIs)</td>
<td>Block RNA-dependent and DNA dependent DNA polymerases terminating DNA development</td>
<td>Diarrhoea, weakness, headache, nausea, vomiting, severe skin rash, conjunctivitis, fever, joint pain, muscle aches</td>
<td>None reported</td>
</tr>
</tbody>
</table>

(Rathbun et al. 2009; Bryant & Knights, 2010)
## HIV & AIDS

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</table>
| Protease inhibitors   | Stop the maturation and hence immature HIV cells cannot infect other cells | GIT effects, headache, weakness, parasthesias, taste alterations, allergic reactions, confusion Diabetes, hyperglycaemia and ketoacidosis (less common) | **Garlic** possibly reduces serum levels – avoid concurrent use.  
**Grapefruit juice / Orange juice** Found to enhance the absorption of Protease Inhibitors.  
**Quercetin** Inhibits P-glycoprotein which presents with variable intracellular Saquinavir (Protease Inhibitor) levels.  
**Vitamin E:** Concurrent high doses of vitamin E with Amprenavir & anticoagulant therapy may further reduce blood clotting |

(Bryant & Knights, 2007; Mahan & Escott-Stump, 2008; Rathbun et. al. 2009; Braun & Cohen, 2010, p.1102.)
## HIV & AIDS

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</tr>
</thead>
<tbody>
<tr>
<td><strong>Fusion inhibitors</strong></td>
<td>Disruption of HIV entry at the stage of membrane fusion.</td>
<td>Reaction at injection site &amp; Hypersensitivity</td>
<td>None reported</td>
</tr>
<tr>
<td><strong>Integrase Inhibitors</strong></td>
<td>Inhibit DNA transcription in both HIV-1 &amp; HIV-2</td>
<td>Nausea, diarrhoea, headache Changed liver function &amp; serum lipid profile Myopathy, rhabdomyolysis</td>
<td>None reported</td>
</tr>
<tr>
<td><strong>Chemokine Receptor Antagonists</strong></td>
<td>Blocks virus binding to membrane receptors &amp; entering cells.</td>
<td>Cough, pyrexia, upper resp infections, rash, musculoskeletal symptoms, abdominal pain, dizziness, liver toxicity</td>
<td>None reported</td>
</tr>
</tbody>
</table>

(Bryant & Knights, 2007; Kumar & Clark, 2009; Rathbun et. al. 2009)
# HIV & AIDS

<table>
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</tr>
</thead>
<tbody>
<tr>
<td>Anti-retroviral Drug Class</td>
<td>Sustained release B3 has been found to be useful in supporting dyslipidaemia that presents with Anti-retroviral drug use. Potential for reduced drug side effects so use with caution</td>
</tr>
<tr>
<td></td>
<td>Supplementation has been found to support endogenous glutathione levels &amp; maintain lean muscle mass (combined with arginine &amp; leucine)</td>
</tr>
<tr>
<td></td>
<td>Reishi: Potential for theoretically beneficial effects with concurrent use of anti-retrovirals.</td>
</tr>
</tbody>
</table>

(Stargrove et. al. 2008; Braun & Cohen, 2010)


Code, C., & Due, N. S. (2012). *Vitamins @ ACON 2012 vitamins @ ACON*. Health (San Francisco), (02).


References


References


**INTRODUCTION**


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