Local Metro Adelaide Palliative Care Services

Improving quality of life for people living with cachexia

A resource for health professionals

Government of South Australia
SA Health

Cachexia affects quality of life

For clients living with cachexia, whether it's related to a chronic illness or an illness such as cancer, the severe fatigue associated with cachexia may reduce their ability to perform activities of daily living (ADL). This in turn diminishes quality of life.

The Palliative Care Team at the Adelaide Hills Community Health Service has been using a multi-modal approach to the management of cachexia which combines fish oil supplements, protein supplements and resistance exercise. Feedback from clients trialling this intervention has been very positive, with improvements in quality of life being reported.

The purpose of this resource is to provide information for health professionals about the potential benefits of this intervention and how to implement it. A review of the literature provides some evidence for the effectiveness of each of these approaches in isolation, but no studies that combined all three were identified.

This intervention provides a low risk therapy for clients suffering from cachexia, with the potential to increase a client's capacity to perform ADL and therefore improve their quality of life. However, each case needs to be considered individually in consultation with their attending doctor to assess any contraindications that may exist.

What is cachexia?

Cachexia is a syndrome of progressive weight loss and muscle wasting characterised by fatigue, weakness and anorexia. It severely affects the person's quality of life.

Abnormalities in fat, protein and carbohydrate metabolism result from the body's systemic inflammatory response. It is generally thought not to be reversible in the short term with conventional nutritional supplementation. The syndrome is most often associated with certain types of cancer, but can be seen in other chronic diseases, such as chronic obstructive pulmonary disease (COPD), HIV, rheumatoid and osteoarthritis, chronic liver disease and congestive heart failure.

Progression of cachexia

Systemic inflammatory response

(Response to cellular damage, infection)
Cytokine production ↑
Fat oxidisation ↑
Carbohydrate metabolism ↓
Insulin resistance ↑
Lactate production ↑
↓
Body enters into a futile cycle
Increased energy expenditure
Anorexia
↓
Protein synthesis ↓
Protein breakdown ↑
↓
Negative nitrogen balance
Wasting of skeletal muscle
Reduced mobility
Reduced immunity
↓
Reduced quality of life

(Mahan & Escott-Stump 2004)

Fish oil

What's in fish oil?

Fish oil contains the omega-3 polyunsaturated fatty acids (n-3) eicosapentaenoic acid (EPA), docosahexaenoic acid (DHA), and alpha-linolenic acid (ALA).

ALA is converted to EPA in the body and both of these fatty acids can act as natural anti-inflammatory agents.

Theory behind supplementation with fish oils

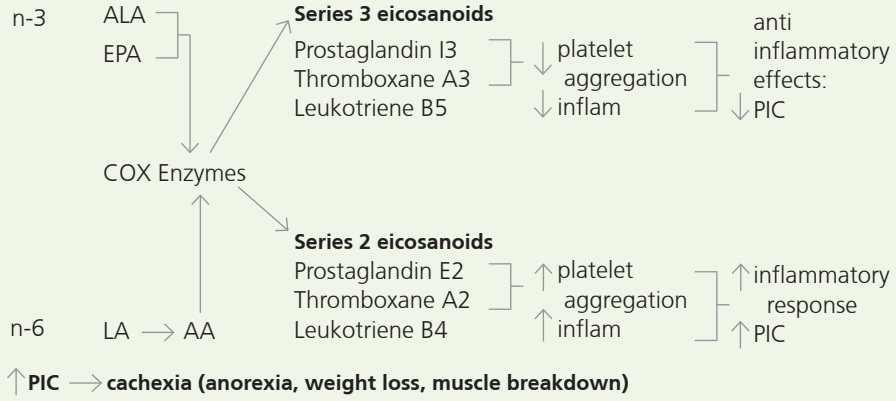
Omega-6 polyunsaturated fatty acids (n-6) (found in vegetable oils, nuts, seeds, and grains) are thought to increase inflammatory responses when there is too much of it and too little n-3 in our diets (Wahlqvist 2002).

Linoleic acid (LA) (n-6) is a precursor to arachidonic acid (AA), which via cyclo-oxygenase (COX) enzymes located in cellular membranes goes on to produce series 2 eicosanoids. These increase production of proinflammatory cytokines (PIC) such as tumour necrosis factor and interleukin 1 and 6 (Babcock 2005).

ALA is converted to EPA (both n-3). Both are incorporated in the pathway via COX enzymes to form series 3 eicosanoids. These possess anti-inflammatory properties, by suppressing production of PIC (Babcock 2005).

Cox enzymes are located in the membrane of cells. EPA is easily incorporated into the membranes when adequate amounts are present, therefore displacing AA and reducing the amount of n-6 products (Babcock 2000) (Figure 1).

Figure 1: Pathways involving n-3 and n-6 in-vivo



Benefits of using fish oil

> natural
> non-toxic at recommended doses
> relatively inexpensive
> readily available.

Intake

To achieve the recommended intake of 1.4–2.0 grams of EPA per day (Bauer et al 2005), clients need to consume:

> 8-11 fish oil capsules containing 180 mg EPA/capsule, or
> 8-11 mls (2 tspns) of fish oil that contains 180 mg EPA/ml, or
> 300-400 grams of oily fish per day (salmon, mackerel, sardines), or
> 310-445 ml of a high energy supplement enriched with EPA (0.45g EPA/100 ml), eg Resource Support, Prosure or
> a combination of the above.

*Supplementation for no less than four weeks to see benefits.

Potential risks of using fish oils

> Caution needs to be exercised in clients on anti-coagulant medication as effects may be amplified.
> Large doses may have potential GI symptoms such as diarrhoea, reflux, bad taste, and nausea.
> Cod liver and halibut liver oil are not suitable as they contain a higher level of vitamin A, which could lead to toxicity.
> Fish oils are not a major source of mercury (Bauer et al 2005).
> Mercury can accumulate in fresh fish. Shark (flake), billfish (swordfish/broadbill and marlin) should be limited to once per week and no other fish that week (FSANZ 2011).

Protein

Glutamine is an amino acid that is predominantly stored in the muscles. When muscle proteins are broken down, glutamine is released into the blood. In cachexia this process is accelerated, creating a higher than normal plasma concentration of glutamine.

The excess glutamine is then free to be used by macrophages as an energy source to produce eicosanoids. If there is not enough EPA in the diet then series 2 eicosanoids are produced, thus promoting tumour growth and inflammation (Wahlqvist 2002).

If extra protein can be incorporated into the diet, and there is adequate amounts of EPA, then more series 3 eiconsanoids may be produced. When resistance exercise is added to the equation the anti-inflammatory effect is magnified, with the potential to slow the cachexia cascade and divert the extra dietary protein to build muscle.

Therefore, inadequate dietary n-3 diverts protein to provide energy for the macrophages thus upregulating production of series 2 eicosanoids. By redressing the balance of n3-n6 with adequate dietary intake of n-3 combined with increased protein and resistance exercise this process may be slowed down.

There is some suggestion that the timing of protein supplementation in relation to resistance exercise may be an important factor. Although there is no evidence in muscle wasting populations at this stage, studies with healthy men found significant increased muscle fibre when the protein supplement was taken immediately after resistance exercise training whereas supplement consumption two hours post exercise did not lead to the same increases (Little and Phillips 2009).

*Care needs to be taken in clients with conditions where protein restrictions are required (eg: renal disease).

Whey protein

Whey protein may be beneficial because of the following reasons, however, there is no evidence to suggest it must be used. Whey protein:

- is easily absorbed
- is also high in branched chain amino acids (BCAA), which are essential to stimulate protein synthesis
- is high in cysteine, which is a precursor to glutathione. Glutathione is a primary regulator of immune function. Increased glutathione may improve immune response.

Protein requirements

Recommendations for cachexia are 1.2–2.0g/kg/day (Arends et al 2006) [normal requirements 0.75–1.07g/kg/day (NHMRC 2006)] eg 60kg person: 60 x (1.2–2.0) = 72–120gms protein/day.

Sources of protein

Foods that contain protein	Serve size	Grams of protein
Red meat/chicken (cooked)	150g	40
Fish (fresh cooked or canned)	100g	18–26
Nuts	1/2 cup	14
Skim milk – fresh	250ml	10
Full cream milk – fresh	250ml	8
Lentils, beans (cooked)	1 cup	6–8
Bread	2 slices	6–8
Egg – whole	1 large	6
Cheese	1 slice – 20g	5
Rice, brown or white (cooked)	1 cup	5
Egg – white only	1 large	3
Supplements		
Sustagen (Hospital Formula) – added to skim milk*	60g 250ml	14 24
Novartis Resource Support Abbott Prosure	237ml 240ml	21 16
Skim milk powder – added to skim milk*	30g 250ml	11 21
Whey powder – added to skim milk*	60g 250ml	8 18
* Using full cream milk will provide extra kilojoules, but slightly less protein.		

Example of what 72 grams of protein looks like over one day

> 3/4 cup milk (on cereal)
> + 1 tin of salmon (95g)
> + 2 slices of bread
> + 60g whey powder added to 1 cup of milk
> + 50 grams meat/chicken.

Progressive resistance exercise

The role of physical activity in relation to health and the reduced risk of developing cancers is well documented. Exercise increases insulin sensitivity and the rate of protein synthesis. According to Ardies (2002) exercise exerts a positive effect on the body's immune response and in addition attenuates the inflammatory response, which triggers the cachexia cascade.

This resource will focus on the role of progressive resistance training. Progressive resistance training has a positive effect on lean tissue mass, muscular strength and function and has been found useful in counteracting some of the negative consequences of muscle wasting in a variety of populations (Little and Phillips 2009).

Research suggests negative psychological effects stem from fatigue and the inability to perform ADL, which leads to reduced quality of life. For those clients who are motivated and well enough, increasing muscle mass reduces fatigue, which directly affects their ability to perform ADL and therefore has the potential to increase their quality of life (Oldervoll et al 2006).

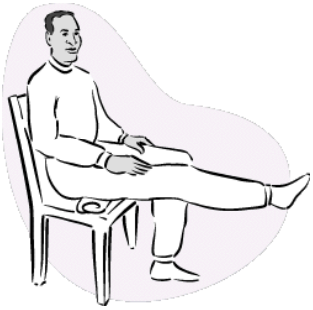
Exercise prescription

The exercise component will comprise six resistance exercises training the major muscle groups. These are progressed as appropriate. Not everyone will be able to perform all six exercises.

The physiotherapist will advise on which exercises are suitable, how many sets and the number of repetitions. There is also an option for bed bound clients. For more information on both exercise programs we refer the reader to the physiotherapist linked with their local palliative care service (refer to the back page for contact details).

Knee strength

This exercise helps to strengthen the muscles around your knees, which can help with mobility.



- Sit in chair, with both feet on the floor.
- Take three seconds to lift one foot off floor, by straightening your knee as much as possible.
- Hold one – two seconds, then slowly bend your knee to lower your foot.
- Repeat with other leg.

Side hip raise

This helps to strengthen the muscles at the side of your hips (important for walking and balance).

- Stand behind a tall chair and hold for balance.
- Take three seconds to slowly lift one leg out to the side taking care not to tilt your body. Keep your foot pointing forward as it lifts to the side.
- Pause, then slowly lower the leg again, taking three seconds.
- Repeat with other leg.

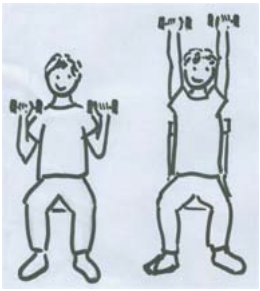
Toe raises

This exercise helps to strengthen your ankles and calf muscles. It can help you with walking.

- Stand behind a chair with your hands holding the back.
- Slowly lift both heels as high as possible, until standing on your tippy-toes.
- Hold position one – two seconds, then slowly lower onto your heels.

Overhead arm raise

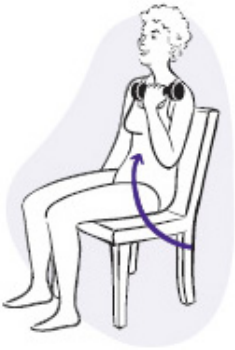
This exercise helps to strengthen your shoulders and upper arms. It can help you with overhead activities.



- Sit or stand with arms bent at elbows, palms at shoulder height facing out and holding your starting weight.
- Slowly, taking three seconds, push your hands upwards towards the ceiling, straightening both elbows. Remember to keep the neck relaxed.
- Take three seconds to slowly bend the elbows and bring the hands back to shoulder height.

Biceps curl

This simple exercise helps to strengthen your upper arm muscles.

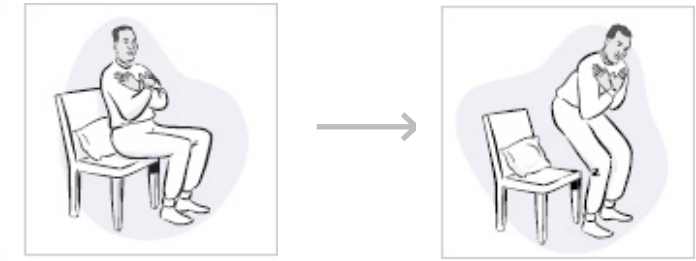


- Sit in a chair, holding a weight in each hand and palms facing upwards.
- Slowly lift the weight by bending at the elbow.
- Hold one – two seconds, then slowly lower the weight.
- Repeat on the other side, or do both arms at the same time.

Chair stand

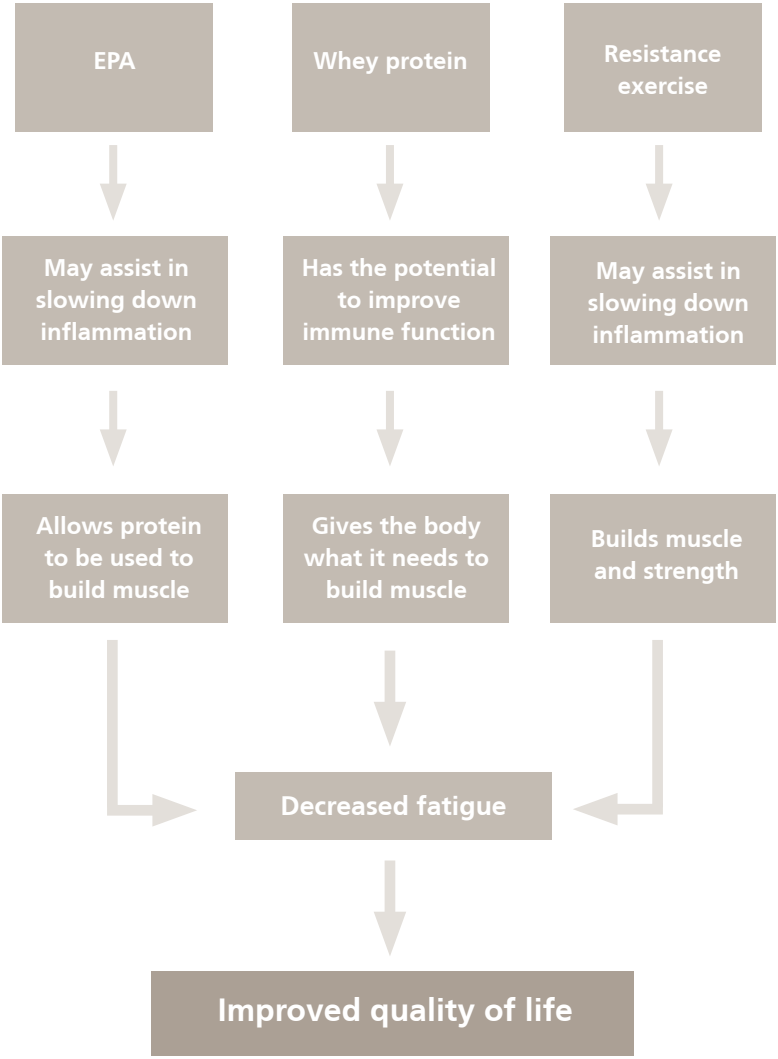
This exercise strengthens your legs to help you safely get into and **out of chairs.**

- Start in seated position with your knees bent and feet flat on the floor.
- Move your bottom forwards on the chair seat.
- Bring your feet back towards the chair legs.
- Move your shoulders forwards over your knees and push through your legs to stand up in slow motion (take three seconds). You may use your arms if you need to.
- Feel the chair on the back of your knees, and reach back for the armrest.
- Slowly lower back into the chair, taking three seconds to sit down.



Images courtesy of National Institute of Ageing 2006

How EPA, protein and resistance exercise can slow the progression of cachexia



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If you do not speak English, request an interpreter from SA Health and the Department will make every effort to provide you with an interpreter in your language.

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