

George Weston Foods



Lutein in Lupins

An eye for health

12th Annual Lupin Conference 2008

Presented by Sherry Duckworth



Business Overview



Cereals

Milling
Flour & Animal
Feed

Cereform
Baking
Ingredients

Baking
Bread, Cakes &
Baked Snacks

Meat

Meat & Dairy
Fresh &
Processed Meat

**Cleaning &
Hygiene**

Jasol
Specialty
Chemicals

George Weston Technologies

Business Overview



Cereals

Milling
Flour & Animal
Feed

Cereform
Baking
Ingredients

Baking
Bread, Cakes &
Baked Snacks

Meat

Meat & Dairy
Fresh &
Processed Meat

**Cleaning &
Hygiene**

Jasol
Specialty
Chemicals

George Weston Technologies
innovation, research,
analytical & technical services,
regulatory & consumer affairs

Business Overview



CEREALS

MEAT

**CLEANING
& HYGIENE**

**Milling
Flour &
Animal Feed**

**Cereform
Baking
Ingredients**

**Baking
Bread, Cakes &
Baked Snacks**

**Meat & Dairy
Fresh &
Processed Meat**

**Jasol
Specialty
Chemicals**

George Weston Technologies

innovation, research, analytical & technical services, regulatory & consumer affairs

George Weston Foods



Major processor and producer of primary and branded food products in Australia and New Zealand



Australasian Lupin Processing

Lupin Dehulling Plant

joint venture

CBH and GWF






 **WESTON MILLING**

FROM N. I. LOVE, JR. COMPANY

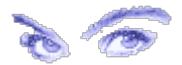


 WESTON MILLING

N. FLOVE

Lutein an eye for health

- Age-related macular degeneration
- Description
- Types – wet and dry
- Risk factors
- Treatment
- Dietary intervention
- Role of Lutein
- Recommendations for further work

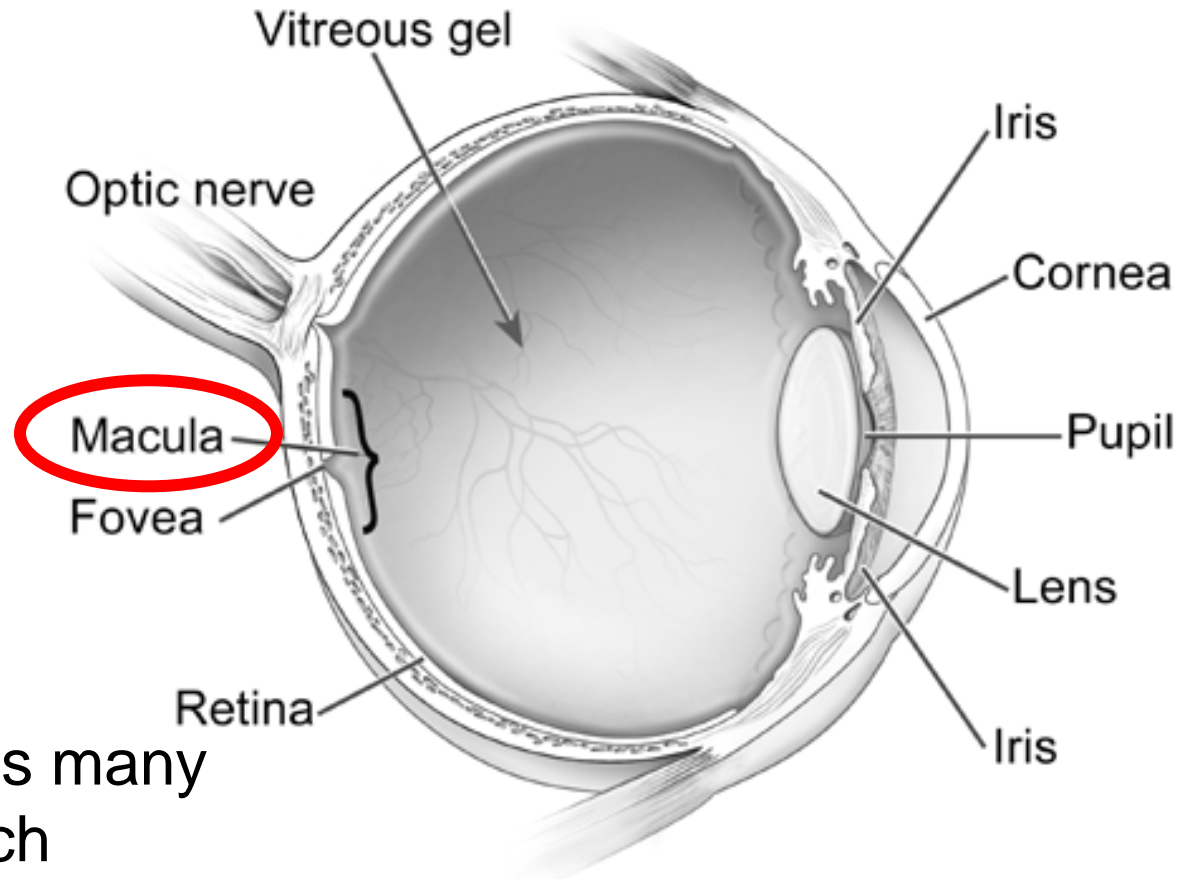


Introduction

- Age-related macular degeneration (AMD) leads to loss of central vision
- Aging population increases incidence
- Over 55 years at risk
- Leading cause of blindness in Australia
- Cost to Australia now \$2.6 billion



Location of the macula



The macula contains many photoreceptors which enable us to see **colours** and fine detail

Source: National Eye Institute

Description AMD

Early stages of AMD

- Blurred vision with close work
- Seeing straight lines as wavy
- Diminishing colour vision
- Holes or black spots (scotoma) in vision
- Extreme light sensitivity
- Poor light to dark adaption

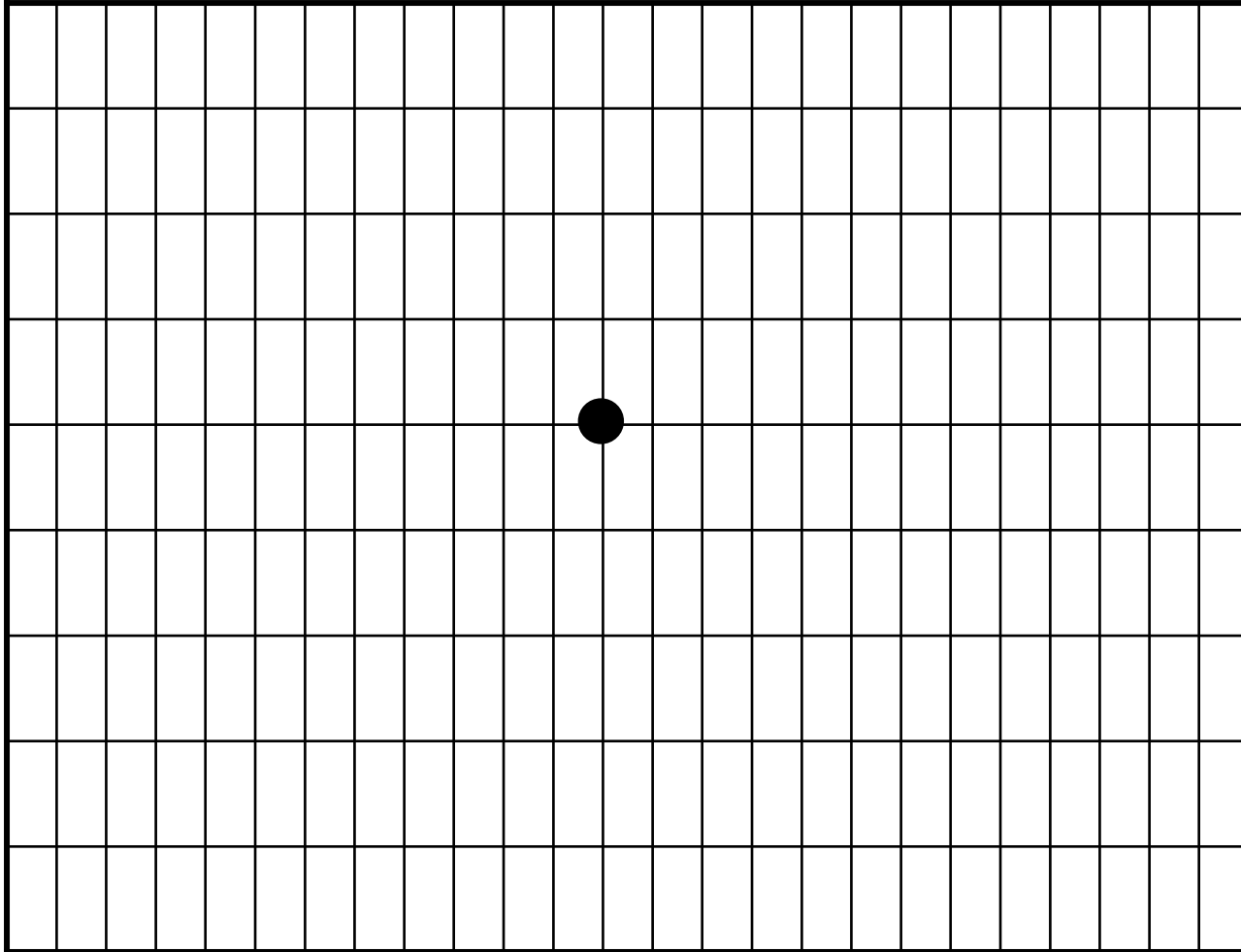


Types of AMD - wet

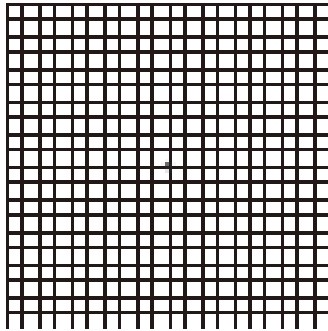
Wet AMD

- Abnormal blood vessels grow under the retina
- Fragile blood vessels leak blood
- Leaking fluid cause damage to macula
- Rapid vision loss
- Lines appear wavy

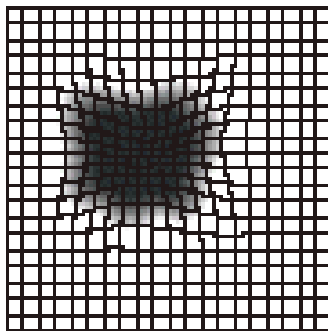
Amsler Grid eye examination



Amsler Grid eye examination



Normal vision



Consult your
eye practitioner
immediately

Directions

1. Do not remove glasses or contact lenses you normally wear for reading.
2. Hold the grid approximately 35cm from your face in a well-lit room.
3. Cover one eye with your hand and focus on the centre dot with your uncovered eye. Repeat with the other eye.
4. If you see wavy, broken or distorted lines, or blurred or missing areas of vision, you may be displaying symptoms of MD and should contact your optometrist or ophthalmologist immediately.

Types of AMD - dry

Dry AMD

- Gradual breakdown of photosensitive cells
- Blurring of the central vision

Risk Factors for AMD

- Age – over 55 years
- Smoking – 3 times the risk and 10 years earlier onset
- Obesity – more rapid progression
- Race – Caucasians (blue, grey or green eyes)
- Family history
- Gender – female
- Low dietary or plasma levels of carotenoids (particularly lutein and zeaxanthin)

Lutein and Zeaxanthin

- High concentrations in macular region
- Antioxidant activity
- Protect against oxidative stress
- Filter short wavelengths of light
- Protect against oxidative effect of blue light



Treatment

No cure

Reduce risk and slow progress

- Lifestyle changes
- Dietary interventions

Treatment

For wet AMD

- Laser surgery
- Photodynamic therapy
- Injections of drugs into the eye

Designed to reduce the impact of
leaking blood vessels



Dietary intervention

- Maintaining the level of Macular Pigment Optical Density (MPOD) in retina and sera
- Lutein plays an important role
- Increased intake does not reverse damage
- Timing of intervention important



Sources of Lutein and Zeaxanthin

Marigold extracts -
supplements



Kale 40mg/100g



Lupin flour
4.4mg/100g



Spinach
11mg/100g



Bioavailability

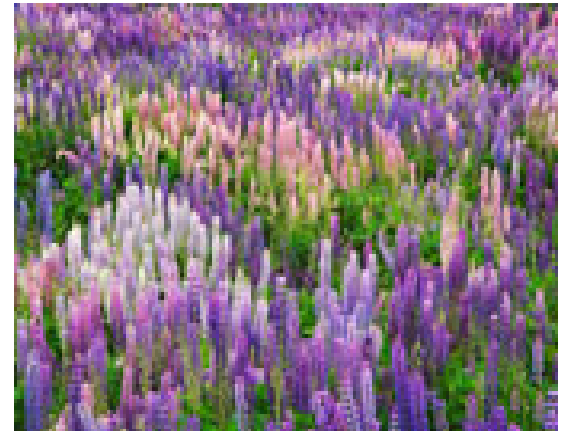
- Affected by matrix
- Lipid matrix optimal for absorption
- Lutein esters (linkage with fat) and lutein solubilised in oil higher serum concentration
- Lutein in esters in lupin – increased bioavailability (?)



Assessment of Lutein

Assessment of Lutein bioavailability depends on:

- Individual dietary response
- storage in the tissues
- presence in the diet
- persistence in the retina



Safety of Lutein

Joint Expert Committee on Food Additives

Acceptable daily intake (ADI)

2mg / kg body weight

Woman	Man
58kg	70kg
116mg	140mg

Observed Safe Level (OSL) 20mg/day

(much higher levels have been tested without adverse effects)

Lutein in Australia

Lutein

- Permitted as a colourant (161b)
- Added as nutritive substance in infant formula products
 - maximum concentration of 250 µg/L in infant formula



Lutein in USA

- Lutein supplement manufacturers Kemin and Cognis have US GRAS status
- Health claims linking lutein intake and the risk of AMD – not approved



Lutein esters

- approved as a colourant
- usage < 500mg/kg food



Stability of Lutein

- Free lutein and lutein esters have the same antioxidant activity
- Free lutein – not stable to heat and UV light
- Lutein attached to fatty acids (as esters) more stable



Lutein in Lupins

Recommended intake:
6 – 10 mg lutein and zeaxanthin per day

Lupin flour or grits can contribute
to recommended lutein intake



Lutein from lupins

Potential for GWF to incorporate lutein
from lupins

opportunities

CAKES



**PIKELETS
CRUMPETS**



Lutein from lupins

opportunities

Tip Top's the One®



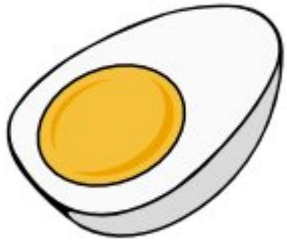
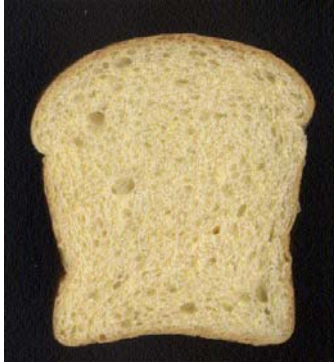
BREAD



Stability of Lutein in food

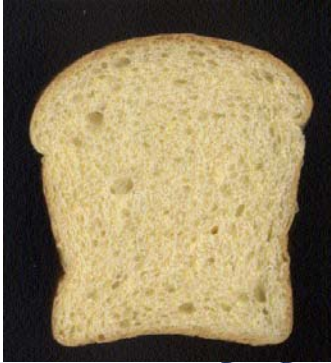
- Losses of lutein can occur by oxidation and processing
- Lutein is more stable
 - in presence of fat
 - as an ester
 - with other carotenoids

Food Combination 1



Lupin bread (4 slices)	1.4mg
Mixed salad containing baby spinach (40g)	4.4mg
Boiled egg (50g)	0.2mg
Total Lutein (+ Zeaxanthin)	6.0mg

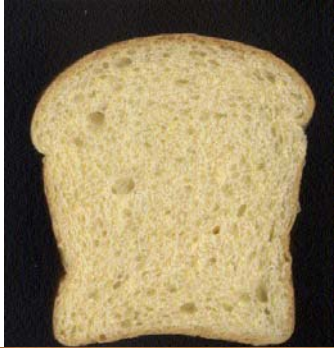
Food Combination 2



Potato and Spinach Frittata

1 Slice Potato and Spinach Frittata	2.4mg
2 slices Lupin bread	0.7mg
Garden salad with Kale (10g) and Spinach leaves (20g)	6.2mg
Total Lutein (+ Zeaxanthin)	9.3mg

Food Combination 3



Kale and pesto pasta (1 serve)	10.0mg
Lupin bread (2 slices)	0.7mg
Garden salad with kale (10g) & spinach leaves (10g)	6.2mg
Total Lutein (+ Zeaxanthin)	16.9mg

Food Combination 4



Kellogs Corn Flakes (45g)	0.2mg
Lupin bread (4 slices)	1.4mg
Avocado (30g), iceberg lettuce (20g), sundried tomato (30g)	0.5mg
Scrambled eggs and parsley (16g)	1.2mg
Vegetable stir fry with corn (30g) peas (30g), beans (30g) broccoli (40g), carrots (30g), coriander (15g)	2.4mg
Pistachio nuts (unsalted) (30g)	0.4mg
Total Lutein (+ Zeaxanthin)	6.9mg

Recommendations for research

- Effect of processing conditions on lutein stability
- Benefits of lutein in combination with other carotenoids
- Protective effect of lutein in food matrices



Conclusion

- AMD progress can be slowed using dietary intervention
- Lutein plays an important role in the protection of the macula
- Lupins are a potential source of lutein
- Further work is needed to confirm the stability of lutein in lupin containing foods





Lupin?