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# The effect of the dietary antioxidant supplements lutein and zeaxanthin on retinal macular pigment optical density

**Submission date**
14/12/2011

**Recruitment status**
No longer recruiting

**Registration date**
10/02/2012

**Overall study status**
Completed

**Last Edited**
08/08/2016

**Condition category**
Eye Diseases

[_] Prospectively registered
[_] Protocol
[_] Statistical analysis plan
[X] Results
[_] Individual participant data

## Plain English summary of protocol

Background and aims
Age-related macular degeneration (AMD) the breakdown of the macular pigment (MP) in the retina of the eye is the most common cause of blindness in the developed world. MP is an accumulation in the retina of two hydroxycarotenoids, lutein (L) and zeaxanthin (Z), which human beings can only derive from their diet. Previous studies suggest that an increase in L/Z decreases AMD risk, and various formulations of L and Z supplement are already being marketed as improving eye health. However, studies investigating the effects of dietary change and supplements on MP density have shown a range of responses, with some subjects MP density increasing up to 40% and others remaining unchanged. The aim of this study was to investigate the effects of a high-dose L and Z supplement on MP levels in twins. By studying identical and non-identical twins, we also hope to determine whether MP change in response to supplementation is genetically passed on.

Who can participate?
Participants were female, aged 16-50, and enrolled on the TwinsUK adult registry we needed to recruit both identical and non-identical twin pairs. We looked for healthy volunteers rather than participants with a certain condition.

What does the study involve?
Macular pigment optical density (the amount of macular pigment) was measured using two methods: heterochromatic flicker photometry (HFP) and two-wavelength fundus autofluorescence (AF).
The HFP measurement was carried out using a compact, portable instrument called a Maculometer. This was placed on a tabletop, and participants were asked to rest their forehead against a guide and look through an opening at a target, which was a flickering light. They were then asked to turn a dial controlling the amount of flicker until the light stopped flickering (or until the amount of flicker was at its lowest). They were given a couple of chances to practise, and the test was then repeated five times. The target then changed to a dim red spot surrounded by a ring of flickering light, and the test was again repeated five times. They were then asked to repeat the entire process using the other eye.

Once they had completed the HFP test, an eye drop (tropicamide 1%) was given to dilate their eyes for the AF test, which took place in a darkened room. They had to wait 20-30 minutes for the tropicamide to take effect before the AF test could begin. The right eye was then scanned twice using a laser ophthalmoscope.
In addition to the two eye tests, particpants were asked to complete two questionnaires, one on their zygosity (whether they are an identical or a non-identical twin) and one on their food consumption over the last three months. We also took a blood sample to measure levels of lutein and zeaxanthin.
Participants were then asked to take a dietary supplement called Macuvite (Springfield®) every day with food for a period of six months. Macuvite contains 18 mg lutein and 2.4 mg zeaxanthin (derived from marigold flowers and microalgae). Their normal diet was continued while taking the supplement.
They were then asked to return to the hospital for two more visits, three months and six months after starting to take the dietary supplement. The HFP and AF tests were repeated on each visit, and another blood sample was taken on their three-month visit. They were asked to bring their Macuvite pills with them on their three- and six-month visits so a pill count could be carried out. All participants received the same treatment.

What are the possible benefits and risks of participating?
It is possible that taking the dietary supplement could lead to an increase in your macular pigment optical density, but we cannot say this for certain until we have completed this and further research studies. There are no known risks to participants.

Where is the study run from?
It was organised by King's College Londons Department of Twin Research, based at the St Thomas Hospital campus, UK.

When is the study starting and how long is it expected to run for?
March 2004 to August 2005

Who is funding the study?
Wellcome Trust (UK)

Who is the main contact?
Professor Chris Hammond
chris.hammond@kcl.ac.uk

# Contact information

### Type(s)
Scientific

### Contact name
Prof Clare Gilbert

### Contact details
London School Of Hygiene and Tropical Medicine
Keppel Street
London
United Kingdom
WC1E 7HT

# Additional identifiers

# Study information

### Scientific Title
Macular pigment response to supplemental lutein and zeaxanthin: a twin heritability study

### Study objectives
Dietary antioxidant supplements have been shown to have a beneficial effect on the clinical course of age-related macular degeneration (AMD), which is the commonest cause of blindness in the developed world. Of the various antioxidants, lutein (L) and zeaxanthin (Z) are of particular interest because of their biochemical, optical and anatomic properties.

The aim is to assess the effect of a high-dose L and Z supplement on the concentration of these nutrients at the target tissue (the macula) in a large group of healthy monozygotic and dizygotic twins and to determine the heritability of MP augmentation/change in response to supplementation.

### Ethics approval required
Old ethics approval format

### Ethics approval(s)
St Thomas' Hospital Research Ethics Committee, 25/06/2002, ref: EC02/102

### Primary study design
Interventional

### Study design
Interventional non-randomised non-placebo-controlled supplement single-centre study

### Study type(s)
Treatment

### Health condition(s) or problem(s) studied
Age-related macular degeneration (AMD)

### Interventions
All participants asked to take daily macular pigment supplement with food, Macuvite (Springfield®), consisting of 18mg lutein (in its free form) and 2.4mg zeaxanthin (derived from marigold flowers and microalgae) for 6 months, whilst continuing normal diet. Supplement taken in pill form. No control group.

### Intervention Type
Supplement

### Primary outcome(s)
Heritability of response to macular pigment supplement, measured using:
1. Reverse phase high performance liquid chromatography to measure serum carotenoid levels at baseline and three months

2. Heterochromatic flicker photometry (HFP) and 2-wavelength fundus autofluorescence (AF) to measure macular pigment optical density (MPOD) at baseline, three months and six months
3. Maximum likelihood modelling using Mx programme to estimate heritability of MP response to supplementation

### Key secondary outcome(s)
1. Relationship between central retinal thickness and MPOD, measured using:
1.1. Optical coherence tomography to measure retinal thickness
1.2. HFP and AF to measure MPOD
2. Heritability of MP in the healthy eye, measured using:
2.1. HFP and AF to measure MPOD
2.2. Maximum likelihood modelling using Mx programme to estimate heritability of MPOD

### Completion date
15/08/2005

## Eligibility

### Key inclusion criteria
1. Healthy female volunteers, aged 16-50
2. Twin pairs enrolled on TwinsUK adult registry held at St Thomas Hospital London (aim to recruit 80 monozygotic and 80 dizygotic pairs)

### Participant type(s)
Healthy volunteer

### Healthy volunteers allowed
No

### Age group
Adult

### Sex
Female

### Key exclusion criteria
1. Ocular pathology
2. Gastrointestinal disease

### Date of first enrolment
07/03/2004

### Date of final enrolment
15/08/2005

## Locations

### Countries of recruitment
United Kingdom

England

**Study participating centre**
**London School of Hygiene and Tropical Medicine**
London
United Kingdom
WC1E 7HT

# Sponsor information

**Organisation**
Guy's & St Thomas' NHS Trust (UK)

**ROR**
https://ror.org/00j161312

# Funder(s)

**Funder type**
Charity

**Funder Name**
Wellcome Trust (UK) ref: 065730

**Alternative Name(s)**

**Funding Body Type**
Private sector organisation

**Funding Body Subtype**
International organizations

**Location**
United Kingdom

# Results and Publications

**Individual participant data (IPD) sharing plan**

## IPD sharing plan summary

Not provided at time of registration

## Study outputs

| Output type | Details | Date created | Date added | Peer reviewed? | Patient-facing? |
|---|---|---|---|---|---|
| Results article | results | 26/07/2012 | | Yes | No |