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Nutritional Press Release: Lutéine & Cognition.

La lutéine, la méso-zéaxanthine, les pigments de la macula, sont aussi présents dans le cerveau : cortex occipital, cortex frontal, cortex cérébelleux.

Nutr Neurosci. 2015 Mar 9. [Epub ahead of print]

Macular pigment carotenoids in the retina and occipital cortex are related in humans.
Vishwanathan R, Schalch W, Johnson EJ.

Abstract:
Objectives Lutein and zeaxanthin are dietary carotenoids that preferentially accumulate in the macular region of the retina. Together with meso-zeaxanthin, a conversion product of lutein in the macula, they form the macular pigment. Lutein is also the predominant carotenoid in human brain
tissue and lutein status is associated with cognitive function in adults. The study objective was to evaluate the relationship between retinal and brain lutein and zeaxanthin in humans. Methods Donated brain tissue (occipital cortex and hippocampus) and matched retina were obtained from the National Disease Research Interchange, a national human tissue resource center which adheres to strict consent and confidentiality procedures. Decedents were men and women aged >50 years who either had normal cognitive function or Alzheimer's disease. Tissues were analyzed using standard lipid extractions followed by analysis on reverse-phase high performance liquid chromatography (HPLC) and normal-phase HPLC (for meso-zeaxanthin). Results Macular pigment carotenoids
(lutein, meso-zeaxanthin, and zeaxanthin combined) in the retina were significantly related to the combined concentrations of lutein and zeaxanthin in the occipital cortex. When analyzed separately, only retinal lutein (plus meso-zeaxanthin), not zeaxanthin, was significantly related to lutein in the occipital cortex. No correlations were observed with lutein and zeaxanthin in the hippocampus. Discussion Total macular pigment density measured via non-invasive, psychophysical techniques can be used as a biomarker to ascertain brain lutein and zeaxanthin status in clinical studies.

Nutr Neurosci. 2013 Jan;16(1):21-9. doi: 10.1179/1476830512Y.0000000024. Epub 2012 Jul 9.

Macular lutein and zeaxanthin are related to brain lutein and zeaxanthin in primates
Vishwanathan R1, Neuringer M, Snodderly DM, Schalch W, Johnson EJ.

RESULTS:
Lutein in the macula and annulus was significantly related to lutein levels in the cerebellum, occipital cortex, and pons, both in bivariate analysis and after adjusting for age, sex and n-3 fatty acid status. In the frontal cortex the relationship was marginally significant. Macular zeaxanthin was significantly related to zeaxanthin in the cerebellum and frontal cortex, while the relationship was marginally significant in the occipital cortex and pons in a bivariate model.

Nutritional Press Release: Lutéine & Cognition.

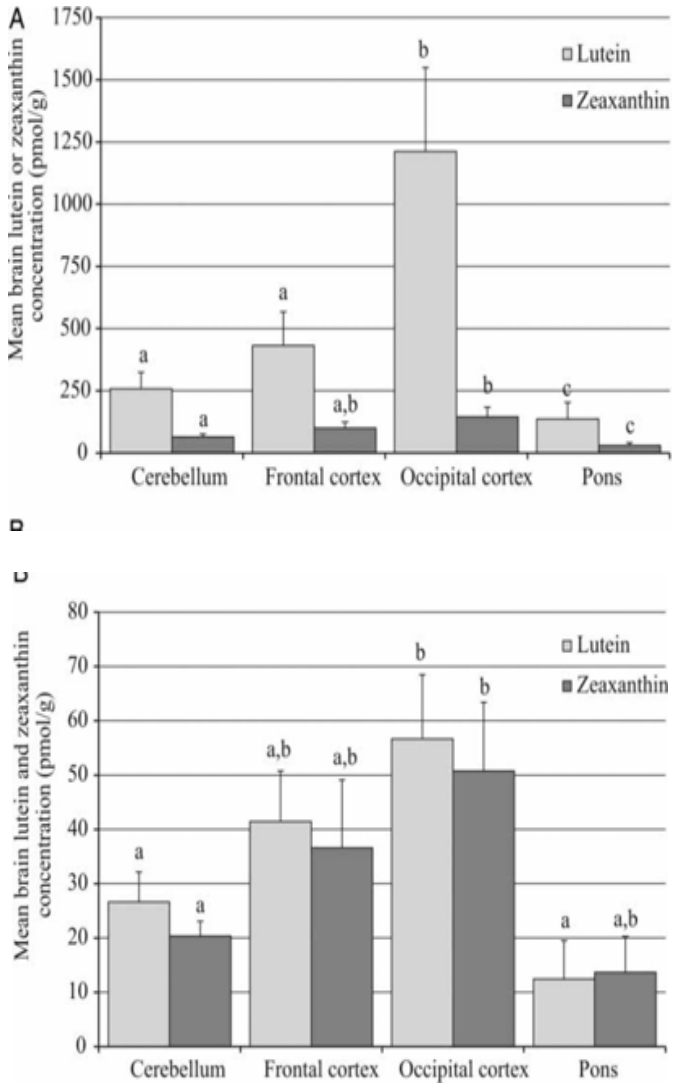


Figure 1 Mean (±SEM) concentrations of lutein and zeaxanthin in the cerebellum, frontal cortex, occipital cortex, and pons. Columns labeled with different letters (a, b, or c) represent means that are significantly different at P < 0.05, while those labeled with the same letters represent means that are not significantly different from one another (evaluated independently for lutein and zeaxanthin). (A) Xanthophyll-free monkeys fed pure lutein or pure zeaxanthin. Lutein was detected in the brain tissue of the lutein-fed monkeys only, and zeaxanthin was detected in the brain tissue of the zeaxanthin-fed monkeys only. (B) Monkeys fed stock diet. Note that the y-axis scale is different from Fig. 1A; lutein and zeaxanthin concentrations are 10–20 times lower for stock diet-fed monkeys.

J Pediatr Gastroenterol Nutr. 2014 Nov;59(5):659-65. doi: 10.1097/MPG.0000000000000389.

Lutein and preterm infants with decreased concentrations of brain carotenoids.

Vishwanathan R1, Kuchan MJ, Sen S, Johnson EJ.

Abstract:

OBJECTIVES:

Lutein and zeaxanthin are dietary carotenoids that may influence visual and cognitive development. The objective of this study was to provide the first data on distribution of carotenoids in the infant brain and compare concentrations in preterm and term infants.

RESULTS:

Lutein, zeaxanthin, cryptoxanthin, and β-carotene were the major carotenoids found in the infant brain tissues. Lutein was the predominant carotenoid accounting for 59% of total carotenoids. Preterm infants (n = 8) had significantly lower concentrations of lutein, zeaxanthin, and cryptoxanthin in their brain compared with term infants (n = 22) despite similarity in postmenstrual age. Among formula-fed infants, preterm infants (n = 3) had lower concentrations of lutein and zeaxanthin compared with term infants (n = 5). Brain lutein concentrations were not different between breast milk-fed (n = 3) and formula-fed (n = 5) term decedents. In contrast, term decedents with measurable brain cryptoxanthin, a carotenoid that is inherently low in formula, had higher brain lutein, suggesting that the type of feeding is an important determinant of brain lutein concentrations.

CONCLUSION:

These data reveal preferential accumulation and maintenance of lutein in the infant brain despite underrepresentation in the typical infant diet. Further investigation on the impact of lutein on neural development in preterm infants is warranted.

Nutritional Press Release: Lutéine & Cognition.

La faible teneur en lutéine et zéaxanthine observée dans la DMLA, peut être associée à la perte de la fonction cognitive.

Nutr Rev. 2014 Sep;72(9):605-12.

Role of lutein and zeaxanthin in visual and cognitive function throughout the lifespan.
Johnson EJ[1].

Abstract:

The relationship between lutein and zeaxanthin and visual and cognitive health throughout the lifespan is compel- ling. There is a variety of evidence to support a role for lutein and zeaxanthin in vision. Lutein's role in cognition has only recently been considered. Lutein and its isomer, zeaxanthin, are taken up selec vely into eye ssue. Lutein is the predominant carotenoid in human brain ssue. Lutein and zeaxanthin in neural ssue may have biological effects that include an oxida on, an -inflamma on, and structural ac ons. In addi on, lutein and zeaxanthin may be protec ve against eye disease because they absorb damaging blue light that enters the eye. In pediatric brains, the rela ve contribu on of lutein to the total carotenoids is twice that found in adults, ac-coun ng for more than half the concentra on of total carotenoids. The greater propor on of lutein in the pediat-ric brain suggests a need for lutein during neural development as well. In adults, higher lutein status is related to be er cogni ve performance, and lutein supplementa on improves cogni on. The evidence to date warrants further inves ga on into the role of lutein and zeaxanthin in visual and cogni ve health throughout the lifespan

Neurobiol Aging. 2014 Jul;35(7):1695-9.

Relationships between macular pigment optical density and cognitive function in unimpaired and mildly cognitively impaired older adults.
Renzi LM[1], Dengler MJ[2], Puente A[3], Miller LS[3], Hammond BR Jr[4].

Abstract :

Low carotenoid status (especially of the xanthophylls, lutein [L], and zeaxanthin [Z]) is common in older adults and has been associated with a number of degenerative diseases of the central nervous system ranging from retina (e.g., macular degenera- tion) to brain (e.g., Alzheimer's disease). In this study, we tested whether retinal measures of L + Z (macular pigment optical density [MPOD]), used as a surrogate for brain L + Z levels, were related to cognitive function when comparing healthy older adults with mildly cognitively impaired older adults. Twenty-four subjects with mild cognitive impairment were compared with 24 matched controls. Subjects were matched with respect to age, body mass index, ethnicity, sex, and smoking status. Degree of cognitive impairment and cognitive ability was determined via structured clinical interview. MPOD was measured psychophysi-cally. In healthy older adults, MPOD was only related to visual-spatial and constructional abilities ($p = 0.04$). For subjects with mild cognitive impairment (MCI), however, MPOD was broadly related to cognition including the composite score on the mini-mental state examination ($p = 0.02$), visual-spatial and constructional abilities ($p = 0.04$), language ability ($p = 0.05$), attention ($p = 0.03$), and the total scale on the Repeatable Battery for the Assessment of Neuropsychological Status ($p = 0.03$). It is possible that L/Z status may be more strongly related to cognition when individuals are considered with established onset of cognitive decline.

Nutritional Press Release: Lutéine & Cognition.

.J Gerontol A Biol Sci Med Sci. 2015 Aug 18.

Plasma Carotenoids Are Inversely Associated With Dementia Risk in an Elderly French Cohort.

Feart C1, Letenneur L2, Helmer C3, Samieri C2, Schalch W4, Etheve S4, Delcourt C2, Dartigues JF2, Barberger-Gateau P2.

Abstract:

BACKGROUND:

Although intake of fruits and vegetables has been associated with a decreased risk of dementia, studies focusing on nutrients underlying this association are lacking. Our objective was to analyze the relation between plasma carotenoids and the risk of dementia and Alzheimer's disease (AD) in French elderly community dwellers.

METHODS:

The study population consisted of 1,092 nondemented older participants, from the Three-City-Bordeaux cohort followed for up to 10 years (range: 1.8-10.8 years, median: 9.5 years). Dementia and AD were diagnosed by a committee of neurologists. The concentration of plasma carotenoids (beta-carotene, alpha-carotene, lycopene, lutein, zeaxanthin, and beta-cryptoxanthin) was determined at baseline. Longitudinal analyses of the association between each plasma carotenoid, either crude or expressed as a ratio to plasma lipids (total cholesterol + triglycerides), and the risk of dementia or AD were performed by multivariate Cox models.

RESULTS:

During follow-up, 199 dementia cases, including 132 AD, occurred. After adjustment for sociodemographic data, diet quality, and clinical variables, including baseline cognitive performances, only higher lutein concentration, considered as a function of plasma lipids, was consistently significantly associated with a decreased risk of all-cause dementia and AD (hazard ratio = 0.808, 95% confidence interval = 0.671-0.973, p = .024 and hazard ratio = 0.759, 95% confidence interval = 0.600-0.960, p = .021, respectively for +1 SD).

CONCLUSION:

This large cohort of older participants suggests that maintaining higher concentrations of lutein in respect to plasma lipids may moderately decrease the risk of dementia and AD.

J Alzheimers Dis. 2014;40(2):399-408.

Plasma levels of HDL and carotenoids are lower in dementia patients with vascular comorbidities.

Dias IH1, Polidori MC2, Li L1, Weber D3, Stahl WNelles GGrune TGriffiths HR.

Abstract:

Elevated serum cholesterol concentrations in mid-life increase risk for Alzheimer's disease (AD) in later life. However, lower concentrations of cholesterol-carrying high density lipoprotein (HDL) and its principal apolipoprotein A1 (ApoA1) correlate with increased risk for AD. As HDL transports oxocarotenoids, which are scavengers of peroxynitrite, we have investigated the hypothesis that lower HDL and oxocarotenoid concentrations during AD may render HDL susceptible to nitration and oxidation and in turn reduce the efficiency of reverse cholesterol transport (RCT) from lipid-laden cells. Fasting blood samples were obtained from subjects with (1) AD without cardiovascular comorbidities and risk factors (AD); (2) AD with cardiovascular comorbidities and risk factors (AD Plus); (3) normal cognitive function; for carotenoid determination by HPLC, analysis of HDL nitration and oxidation by ELISA, and 3H-cholesterol export to isolated HDL. HDL concentration in the plasma from AD Plus patients was significantly lower compared to AD or control subject HDL levels. Similarly, lutein, lycopene, and zeaxanthin concentrations were significantly lower in AD Plus patients compared to those in control subjects or AD patients, and oxocarotenoid concentrations correlated with Mini-Mental State Examination scores. At equivalent concentrations of ApoA1, HDL isolated from all subjects irrespective of diagnosis was equally effective at mediating RCT. HDL concentration is lower in AD Plus patients' plasma and thus capacity for RCT is compromised. In contrast, HDL from patients with AD-only was not different in concentration, modifications, or function from HDL of healthy age-matched donors. The relative importance of elevating HDL alone compared with elevating carotenoids alone or elevating both to reduce risk for dementia should be investigated in patients with early signs of dementia.

Nutritional Press Release: Lutéine & Cognition.

J Alzheimers Dis. 2014;42(4):1191-202. doi: 10.3233/JAD-140507.

Macular pigment, visual function, and macular disease among subjects with Alzheimer's disease: an exploratory study.
Nolan JM1, Loskutova E1, Howard AN2, Moran R1, Mulcahy R3, Stack J1, Bolger M3, Dennison J1, Akuffo KO1, Owens N1, Thurnham DI4, Beatty S1.

Abstract:

BACKGROUND:
The macula (central retina) contains a yellow pigment, comprising the dietary carotenoids lutein (L), zeaxanthin (Z), and meso-zeaxanthin, known as macular pigment (MP). The concentrations of MP's constituent carotenoids in retina and brain tissue correlate, and there is a biologically-plausible rationale, supported by emerging evidence, that MP's constituent carotenoids are also important for cognitive function.

OBJECTIVE:
To investigate if patients with Alzheimer's disease (AD) are comparable to controls in terms of MP and visual function.

METHODS:
36 patients with moderate AD and 33 controls with the same age range participated. MP was measured using dual-wavelength autofluorescence (Heidelberg Spectralis®); cognitive function was assessed using a battery of cognition tests (including Cambridge Neuropsychological Test Automated Battery). Visual function was recorded by measuring best corrected visual acuity (BCVA) and contrast sensitivity (CS). Serum L and Z concentrations (by HPLC) and age-related macular degeneration (AMD, by retinal examination) status were also assessed.

RESULTS:
In the AD group, central MP (i.e., at 0.23°) and MP volume were significantly lower than the control group ($p < 0.001$ for both), as were measures of BCVA, CS, and serum L and Z concentrations ($p < 0.05$, for all).

CONCLUSION:
AD patients were observed to exhibit significantly less MP, lower serum concentrations of L and Z, poorer vision, and a higher occurrence of AMD when compared to control subjects. A clinical trial in AD patients designed to investigate the impact of macular carotenoid supplementation with respect to MP, visual function, and cognitive function is merited.

J Alzheimers Dis. 2015;44(4):1157-69. doi: 10.3233/JAD-142265.

The impact of supplemental macular carotenoids in Alzheimer's disease: a randomized clinical trial.
Nolan JM1, Loskutova E1, Howard A2, Mulcahy R3, Moran R1, Stack J1, Bolger M3, Coen RF4, Dennison J1, Akuffo KO1, Owens N1, Power R1, Thurnham D5, Beatty S.

Abstract:

BACKGROUND:
Patients with Alzheimer's disease (AD) exhibit significantly less macular pigment (MP) and poorer vision when compared to control subjects.

OBJECTIVE:
To investigate supplementation with the macular carotenoids on MP, vision, and cognitive function in patients with AD versus controls.

METHODS:
A randomized, double-blind clinical trial with placebo and active arms. 31 AD patients and 31 age-similar control subjects were supplemented for six months with either Macushield (10 mg meso-zeaxanthin [MZ]; 10 mg lutein [L]; 2 mg zeaxanthin [Z]) or placebo (sunflower oil). MP was measured using dual-wavelength autofluorescence (Heidelberg Spectralis®). Serum L, Z, and MZ were quantified by high performance liquid chromatography. Visual function was assessed by best corrected visual acuity and contrast sensitivity (CS). Cognitive function was assessed using a battery of cognition tests, including the Cambridge Neuropsychological Test Automated Battery (CANTAB)).

RESULTS:
Subjects on the active supplement (for both AD and non-AD controls) exhibited statistically significant improvement in serum concentrations of L, Z, MZ, and MP ($p < 0.001$, for all) and also CS at ($p = 0.039$). Also, for subjects on the active supplement, paired samples t-tests exhibited four significant results (from five spatial frequencies tested) in the AD group, and two for the non-AD group, and all indicating improvements in CS. We found no significant changes in any of the cognitive function outcome variables measured ($p > 0.05$, for all).

CONCLUSION:
Supplementation with the macular carotenoids (MZ, Z, and L) benefits patients with AD, in terms of clinically meaningful improvements in visual function and in terms of MP augmentation .

Nutritional Press Release: Lutéine & Cognition.

Am J Clin Nutr. 2012 Nov;96(5):1161S-5S. doi: 10.3945/ajcn.112.034611. Epub 2012 Oct 10.

A possible role for lutein and zeaxanthin in cognitive function in the elderly.

Johnson EJ1.

Abstract:

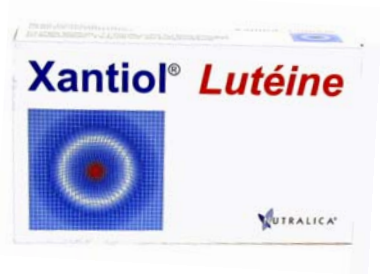
Epidemiologic studies suggest that dietary lutein and zeaxanthin may be of benefit in maintaining cognitive health. Among the carotenoids, lutein and zeaxanthin are the only two that cross the blood-retina barrier to form macular pigment (MP) in the eye. They also preferentially accumulate in the human brain. Lutein and zeaxanthin in macula from nonhuman primates were found to be significantly correlated with their concentrations in matched brain tissue. Therefore, MP can be used as a biomarker of lutein and zeaxanthin in primate brain tissue. This is of interest given that a significant correlation was found between MP density and global cognitive function in healthy older adults.
An examination of a relation between cognition and lutein and zeaxanthin concentrations in the brain tissue of decedents from a population-based study in centenarians found that zeaxanthin concentrations in brain tissue were significantly related to antemortem measures of global cognitive function, memory retention, verbal fluency, and dementia severity after adjustment for age, sex, education, hypertension, and diabetes. In univariate analyses, lutein was related to recall and verbal fluency, but the strength of the associations was attenuated with adjustment for covariates. However, lutein concentrations in the brain were significantly lower in individuals with mild cognitive impairment than in those with normal cognitive function. Last, in a 4-mo, double-blinded, placebo-controlled trial in older women that involved lutein supplementation (12 mg/d), alone or in combination with DHA (800 mg/d), verbal fluency scores improved significantly in the DHA, lutein, and combined-treatment groups. Memory scores and rate of learning improved significantly in the combined-treatment group, who also showed a trend toward more efficient learning. When all of these observations are taken into consideration, the idea that lutein and zeaxanthin can influence cognitive function in older adults warrants further study.

Scores at baseline (0 mo) and after supplementation (4 mo) with placebo, lutein (12 mg/d), DHA (800 mg/d), or a combination of DHA and lutein in healthy women aged 60–80 y1

	Placebo (n = 10)		DHA (n = 14)		Lutein (n = 11)		DHA and lutein(n = 14)	
Test	***Baseline***	***Final***	***Baseline***	***Final***	***Baseline***	***Final***	***Baseline***	***Final***
Verbal fluency	12.9 ± 6.2	13.8 ± 3.5	15.0 ± 4.9	17.8 ± 3.1*	11.3 ± 5.1	15.5 ± 5.5*	12.1 ± 2.8	16.9 ± 3.4*
Shopping list memory test								
Trial 1: items recalled (max 10)	6.5 ± 1.2	7.7 ± 1.5	7.2 ± 1.4	7.7 ± 1.7	6.9 ± 1.8	6.5 ± 2.1	7.0 ± 1.4	6.9 ± 1.6
Trials to learn list (max 6)	3.0 ± 0.8	2.8 ± 0.9	3.1 ± 1.3	2.6 ± 1.3	4.2 ± 1.5	3.9 ± 1.4	3.9 ± 1.4	2.9 ± 1.3*
Delayed recall (max 10)	9.5 ± 0.9	9.5 ± 0.7	9.0 ± 0.9	8.7 ± 1.7	8.3 ± 1.9	7.6 ± 3.0	8.6 ± 0.6	8.9 ± 1.4
Word list memory test								
Trial 1: items recalled (max 10)	6.2 ± 1.3	6.6 ± 1.8	6.3 ± 1.7	5.9 ± 1.5	5.8 ± 1.8	5.8 ± 1.8	5.6 ± 1.5	6.2 ± 1.4
Trials to learn list (max 4)	3.1 ± 0.9	2.8 ± 0.9	3.0 ± 1.0	3.0 ± 0.7	3.4 ± 0.7	3.5 ± 0.8	3.6 ± 0.6	3.0 ± 0.9**
Delayed recall (max 10)	8.1 ± 1.1	8.3 ± 1.8	8.1 ± 1.1	8.6 ± 1.3	6.8 ± 2.9	7.6 ± 2.4	7.6 ± 1.6	8.1 ± 2.0
MIR apartment test								
Delayed recall (max 10)	9.3 ± 0.8	9.4 ± 0.7	9.4 ± 0.9	9.4 ± 0.8	8.3 ± 1.6	8.6 ± 2.1	8.3 ± 1.5	9.1 ± 1.2*
Location recall (max 10)	9.7 ± 0.7	9.7 ± 0.7	9.9 ± 0.3	10.0 ± 0	9.5 ± 1.0	9.5 ± 0.8	9.1 ± 0.9	9.4 ± 1.2

Values are means ± SDs. Adapted from reference 55. *P < 0.05, **P ≤ 0.10. max, maximum; MIR, Memory in Reality

Ces études récentes montrent l'intérêt d'une supplémentation en lutéine et zéaxanthine dans les troubles de la cognition corrélés aux maladies dégénératives oculaires.



DHA - Zinc : Pour maintenir une fonction cognitive et cérébrale normale.

DHA - Zinc : Pour maintenir une fonction visuelle normale.

Zinc : Pour contribuer à un métabolisme normal des glucides, des acides gras, de la vitamine A.

Sélénium - Zinc - Vit E : Pour protéger les cellules du stress oxydant.

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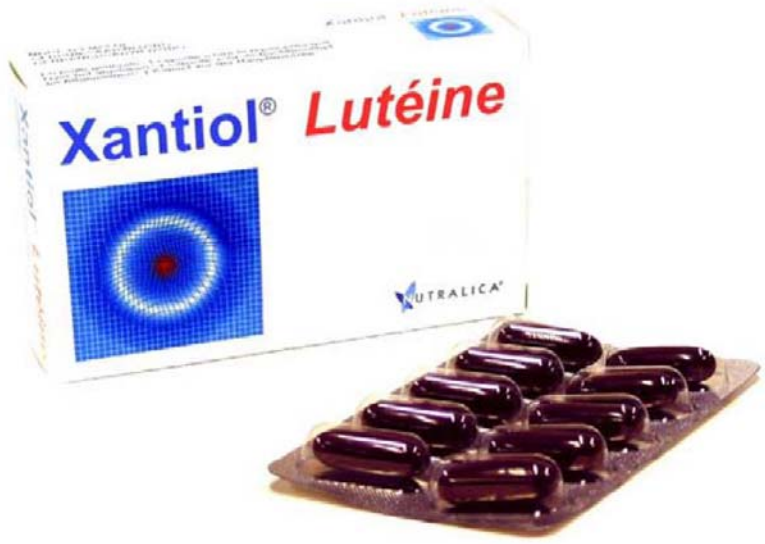

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