

# POSTERIOR SUBCAPSULAR CATARACT: AN OCCUPATIONAL DISEASE

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FEDRIS





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## OCCUPATIONAL DISEASES: BELGIAN LEGISLATION AND THE FUND OF OCCUPATIONAL DISEASES / FEDRIS

- Occupational disease legislation originates from workplace injury legislation, which in its turn is founded on principles of common law
- Occupational disease: caused by occupational activities
- Occupational diseases legislation:

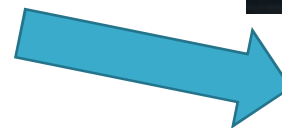
*Coordinated law of June 3rd 1970: “Laws concerning the prevention of occupational diseases and the compensation of damages arising from said diseases”*



## OCCUPATIONAL DISEASES: BELGIAN LEGISLATION AND THE FUND OF OCCUPATIONAL DISEASES / FEDRIS

- Fund of Occupational Diseases (FOD - FBZ - FMP)
- Federal Institute of Social Security (OISZ - IPSC)
- Sterrenkundelaan 1,  
B-1210 St.-Joost-Ten-Node
- - Workers in the private sector  
- Civil servants municipalities &  
provinces  
- (Civil servants regional & federal)
- January 2017:

FBZ/FMP + FAOFAT



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## OCCUPATIONAL DISEASES: BELGIAN LEGISLATION AND THE FUND OF OCCUPATIONAL DISEASES / FEDRIS

- Occupational diseases: some important concepts
  1. List of occupational diseases (art. 30)  
as opposed to
  2. Open System/Système Ouvert (art. 30bis)





# OCCUPATIONAL DISEASES: BELGIAN LEGISLATION AND THE FUND OF OCCUPATIONAL DISEASES / FEDRIS

The Belgian list of Occupational diseases

<https://www.fedris.be/nl/professional/lijsten-van-ziekten>



| Code<br>Code<br>Kode | Benaming  | Dénomination   | Benennung   |
|----------------------|---|--|---|
| 1.1                  | Beroepsziekten veroorzaakt door de volgende chemische agentia | Maladies professionnelles provoquées par les agents chimiques suivants | Berufskrankheiten verursacht durch chemische Stoffe |
| 1.101                | Arsenicum of -verbindingen                                    | Arsenic ou ses composés  | Arsen oder seine Verbindungen                       |
| 1.102                | Beryllium of -verbindingen                                    | Beryllium (glucinium) ou ses composés                                  | Beryllium oder seine Verbindungen                   |
| 1.103.01             | Koolmonoxyde  | Oxyde de carbone   | Kohlenmonoxid                                       |
| 1.103.02             | Koolstofoxychloride   | Oxychlorure de carbone   | Carbonylchlorid (Kohlenoxidchlorid)                 |
| 1.103.03             | Cyaaanwaterstofzuur   | Acide cyanhydrique   | Cyanwasserstoffsäure (Blausäure)                    |
| 1.103.04             | Cyaniden  | Cyanures   | Cyaniden  |
| 1.103.05             | Cyanogeenverbindingen   | Composés du cyanogène  | Cyanogene Verbindungen                              |
| 1.103.06             | Isocyanaten   | Isocyanates  | Isocyanate  |
| 1.104                | Cadmium of -verbindingen                                      | Cadmium ou ses composés  | Cadmium oder seine Verbindungen                     |
| 1.105                | Chroom of -verbindingen                                       | Chrome ou ses composés   | Chrom oder seine Verbindungen                       |
| 1.106                | Kwik of -verbindingen   | Mercuré ou ses composés  | Quecksilber oder seine Verbindungen                 |
| 1.107                | Mangaan of -verbindingen                                      | Manganèse ou ses composés  | Mangan oder seine Verbindungen                      |
| 1.108.01             | Salpeterzuur  | Acide nitrique   | Salpetersäure                                       |
| 1.108.02             | Stikstofoxyden  | Oxydes d'azote   | Stickstoffoxide                                     |
| 1.108.03             | Ammoniak  | Ammoniaque   | Ammoniak  |
| 1.109                | Nikkel of -verbindingen                                       | Nickel ou ses composés   | Nickel oder seine Verbindungen                      |
| 1.110                | Fosfoor of -verbindingen                                      | Phosphore ou ses composés  | Phosphor oder seine Verbindungen                    |
| 1.111                | Lood of -verbindingen   | Plomb ou ses composés  | Blei oder seine Verbindungen                        |
| [1.112.01]           | Zwaveligzuur  | Anhydride sulfureux  | Schwefligsäure                                      |
|                      |   | <i>vervangen door :</i>  | <i>remplacé par :</i>                               |
| 1.112.01             | Zwaveloxyden  | Oxydes de soufre   | Schwefligsäureanhydrid (Schwefelox                  |
| 1.112.02             | Zwavelzuur  | Acide sulfurique   | Schwefelsäure                                       |
| 1.112.03             | Zwavelwaterstof   | Hydrogène sulfuré  | Schwefelwasserstoff                                 |
| 1.112.04             | Zwavelkoolstof  | Sulfure de carbone   | Schwefelkohlenstoff                                 |
| 1.113                | Thallium of -verbindingen                                     | Thallium ou ses composés   | Thallium oder seine Verbindungen                    |



# OCCUPATIONAL DISEASES: BELGIAN LEGISLATION AND THE FUND OF OCCUPATIONAL DISEASES / FEDRIS

<https://www.fedris.be/nl/professional/lijsten-van-ziekten>

## 1.6 xx.xx: “Diseases caused by physical agents”



| 1.6        | Door fysieke agentia veroorzaakte beroepsziekten   | Maladies professionnelles provoquées par des agents physiques   | Berufskrankheiten verursacht durch physikalische Einwirkungen  |                          |
|------------|--|---|--|--------------------------|
| 1.601      | Ziekten veroorzaakt door ioniserende stralingen  | Maladies provoquées par les radiations ionisantes   | Erkrankungen verursacht durch ionisierende Strahlung   | 01.07.1969               |
| 1.602      | Staar veroorzaakt door warmtestralen   | Cataracte provoquée par le rayonnement thermique  | Star verursacht durch Einwirkung von Wärmestrahlung  | 01.07.1969               |
| 1.603      | Hypocousie of doofheid ten gevolge van het lawaai  | Hypocousie ou surdité provoquée par le bruit  | Durch Lärm verursachte Schwerhörigkeit oder Taubheit   | 01.04.1973               |
| 1.604      | Aandoeningen ten gevolge van compressie of decompressie van de omringende atmosfeer  | Affections provoquées par la compression ou la décompression atmosphérique  | Erkrankungen verursacht durch Kompression oder Dekompression der umringenden Atmosphäre  | 01.07.1969               |
| [1.605.01] | Been- en gewrichtziekten of<br>vervangen door : 1.605.11 en 1.605.12   | Maladies ostéo-articulaires ou<br>remplacé par : 1.605.11 et 1.605.12   | Erkrankungen der Knochen und Gelenken oder<br>ersetzt durch : 1.605.11 und 1.605.12  | 01.01.1974]              |
| 1.606.21   | Aandoeningen door overmatige inspanning van peesscheden, van het weefsel van peesscheden en van inplantingen van spieren en pezen bij de schouwspelartiesten   | Maladies dues au surmenage des gaines tendineuses, du tissu péri-tendineux, des insertions musculaires et tendineuses chez les artistes du spectacle  | Erkrankungen durch Überlastung der Sehenscheiden, des peritendinösen Gewebes, der Muskel- und der Sehnenansätze bei Artisten, Instrumentenspielern und Tänzern der musikalischen und künstlerischen Einrichtungen                      | 17.11.2002<br>15.10.1989 |
| 1.606.22   | Aandoeningen van de pezen, peesscheden en spier- en peesaanhechtingen van de bovenste ledematen veroorzaakt door overbelasting van deze structuren ingevolge krachtige, repeterende bewegingen of ingevolge ongunstige houdingen | Maladies atteignant les tendons, les gaines tendineuses et les insertions musculaires et tendineuses des membres supérieurs dues à une hypersollicitation de ces structures par des mouvements nécessitant de la force et présentant un caractère répétitif, ou par des postures défavorables | Erkrankungen der Sehnen, Sehenscheiden, und der Muskel- und Sehnenansätze der oberen Extremitäten verursacht durch Überlastung von diesen Strukturen infolge kräftigen repetitiven Bewegungen oder infolge ungünstigen Haltungen       | 02.11.2012               |
| 1.606.41   | Afscheuring door overmatige inspanning van doornvormige beenuitsteeksels   | Arrachement par surmenage des apophyses épineuses   | Abriss der Wirbelfortsätze durch Überlastung   | 15.10.1989               |
| [1.606.51] | Zenuwverlamming door druk<br>vervangen door :  | Paralysies de nerfs dues à la pression<br>remplacé par :  | Drucklähmungen der Nerven<br>ersetzt durch :   | 31.08.1991]              |
| 1.606.51   | Aantasting van de zenuwfunctie door druk   | Atteinte de la fonction des nerfs due à la pression   | Schädigung der Nervenfunction durch Druck  | 17.11.2002               |
| 1.607      | Mijnwerkersnystagmus   | Nystagmus des mineurs   | Nystagmus beim Bergarbeiter  | 01.07.1969               |
| 1.608      | Trombose of aneurysma van de arteria ulnaris ter hoogte van de hypothenar, gepaard gaand met angioneurotisch syndroom of ischemie, veroorzaakt door repeterende slagen met of op de hypothenar (hypothenar-hamer-syndroom)       | Thrombose ou anévrisme de l'artère ulnaire au niveau de l'éminence hypothenar, accompagné(e) d'un syndrome angioneurotique ou d'ischémie, provoqué(e) par une percussion répétitive avec ou sur l'éminence hypothenar (syndrome du marteau hypothenar)  | Thrombose oder Aneurysma der Arteria ulnaris im Bereich des Hypothenars, begleitet von einem angioneurotischen Syndrom oder Ischämie, verursacht durch wiederholte Schläge mit dem oder auf den Hypothenar (Hypothenar-Hammer-Syndrom) | 28.01.2013               |





## OCCUPATIONAL DISEASES: BELGIAN LEGISLATION AND THE FUND OF OCCUPATIONAL DISEASES / FEDRIS

- Occupational diseases: some important concepts
  - List of occupational diseases (art. 30) as opposed to Open System/Systeme Ouvert (art. 30bis)







## OCCUPATIONAL DISEASES: BELGIAN LEGISLATION AND THE FUND OF OCCUPATIONAL DISEASES / FEDRIS

- Occupational diseases: some important concepts
  - List of occupational diseases (art. 30) as opposed to Open Systeem/Système Ouvert (art. 30bis)
  - Notion of “*Exposure to an occupational risk*” (art. 32)
    - Exposure to a damaging agent
    - Inherently associated with occupational activities
    - Far higher than the exposure of the population in general
    - The exposure is the main cause of the disease in groups of exposed individuals



## OCCUPATIONAL DISEASES: BELGIAN LEGISLATION AND THE FUND OF OCCUPATIONAL DISEASES / FEDRIS

- Occupational diseases: some important concepts
  - List:  
Irrefutable legal presumption of causal relation
  - Open System/Système ouvert:  
The disease must be a direct and determinant consequence of the occupational activities
  - Compensation (in addition to basic health insurance, RIZIV/INAMI):
    - Temporary incapacity to work
    - Permanent incapacity to work
    - Medical/pharmaceutical costs (remgelden)
    - Death
    - Preventive action: stop the exposure to the damaging agent



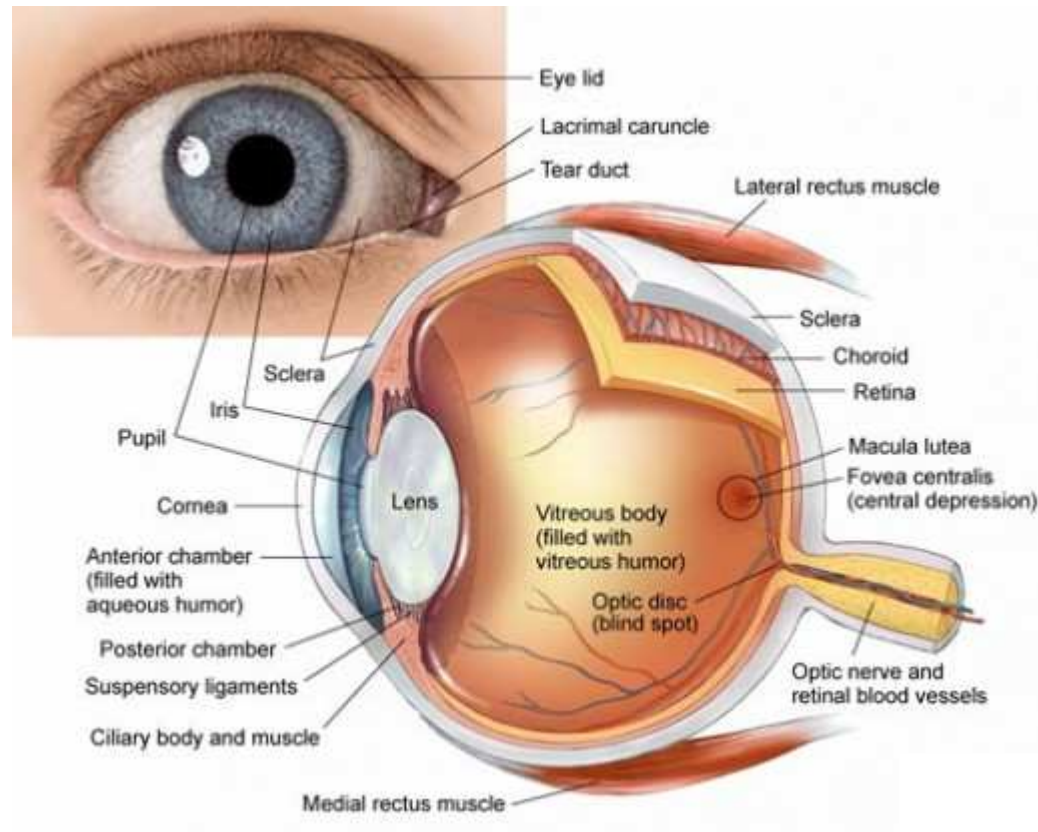
## OCCUPATIONAL DISEASE 1.601

- 1.601 “*Diseases caused by ionising radiation*”
- 1.601 “*Ziekten veroorzaakt door ioniserende stralen*”
- 1.601 “*Maladies provoquées par les radiations ionisantes*”
  
- Historically:
  - Skin cancers
  - Leukemia
  - Bone cancers
  - (- ...)
  
- From may 15th 2014: Posterior subcapsular cataract (PSC) in interventionist cardiologists and assisting medical personnel



# THE EYE, THE LENS AND THE DIFFERENT TYPES OF CATARACT

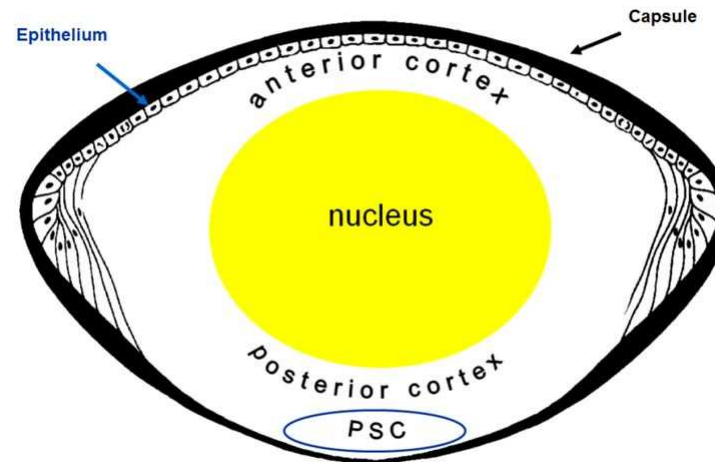
- The eye





# THE EYE, THE LENS AND THE DIFFERENT TYPES OF CATARACT

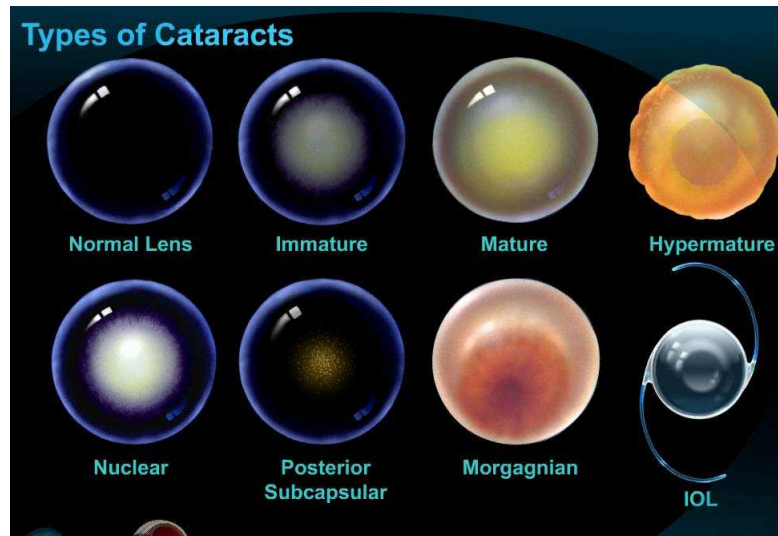
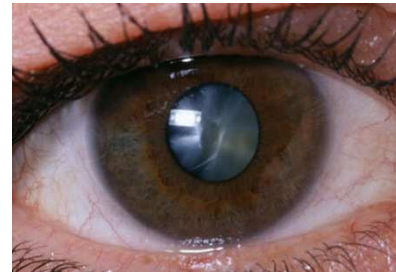
- The lens





# THE EYE, THE LENS AND THE DIFFERENT TYPES OF CATARACT

- Cataract

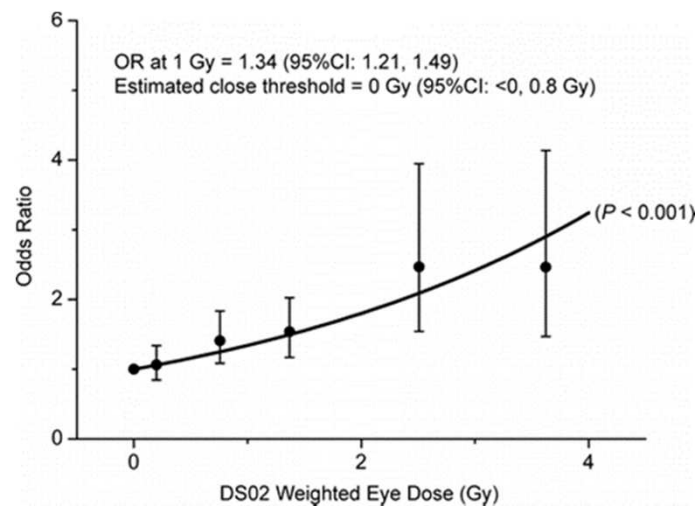




# EPIDEMIOLOGICAL EVIDENCE FOR X-RAYS AS A CAUSE OF POSTERIOR SUBCAPSULAR CATARACT

(Based on the work of prof. Hubert Thierens from the Dpt of Basic Medical Sciences, research group Medical Physics, at the University of Ghent, presented to the Scientific Council of the FOD on May 15th 2014)

1. Atomic bomb survivors Hiroshima & Nagasaki
  - PSC and to a lesser extent cortical cataract 55 y after exposure is significantly and dose-dependently associated with exposure
  - Number of lens extractions vs radiation dose:





# EPIDEMIOLOGICAL EVIDENCE FOR X-RAYS AS A CAUSE OF POSTERIOR SUBCAPSULAR CATARACT

## 2. Medical X-ray radiation

- Radiation for haemangioma (at 5 months) and PSC cataract > 30 y later:

OR 1 Gy: 1,49 (p<0,05)

- Beaver Dam Eye Study (diagnostical X-ray exposure):

PSC cataract: OR 1,45 (p<0,05) for a history of CT-scan of the head







## EPIDEMIOLOGICAL EVIDENCE FOR X-RAYS AS A CAUSE OF POSTERIOR SUBCAPSULAR CATARACT

### 3. Chernobyl liquidators

- Cohort study of 8600 workers seen 12 to 14 years after cleaning work in Chernobyl in 1986

PSC cataract: OR 1 Gy: 1,70 ( $p < 0,05$ )

### 4. Astronauts

- PSC cataract: RR lensdosis  $> 8$  mSv: 5,8 ( $p < 0,05$ )
- PSC cataract: OR for NASA astronauts vs ground personel: 2,23 ( $p < 0,05$ )





## EPIDEMIOLOGICAL EVIDENCE FOR X-RAYS AS A CAUSE OF POSTERIOR SUBCAPSULAR CATARACT

### 5. Interventionist cardiologists and assisting personnel

- 2 case-control studies in 2010 found a significant increase in prevalence of PSC in cardiologist and RX personnel versus the control groups
- 1 large cohort study in the US (1983-2004) in 35700 radiologists found a RR of 3 per 1 Gy lensdosis (no distinction between the different cataract subtypes)





## EPIDEMIOLOGICAL EVIDENCE FOR X-RAYS AS A CAUSE OF POSTERIOR SUBCAPSULAR CATARACT

### 5. Interventionist cardiologists and assisting personnel

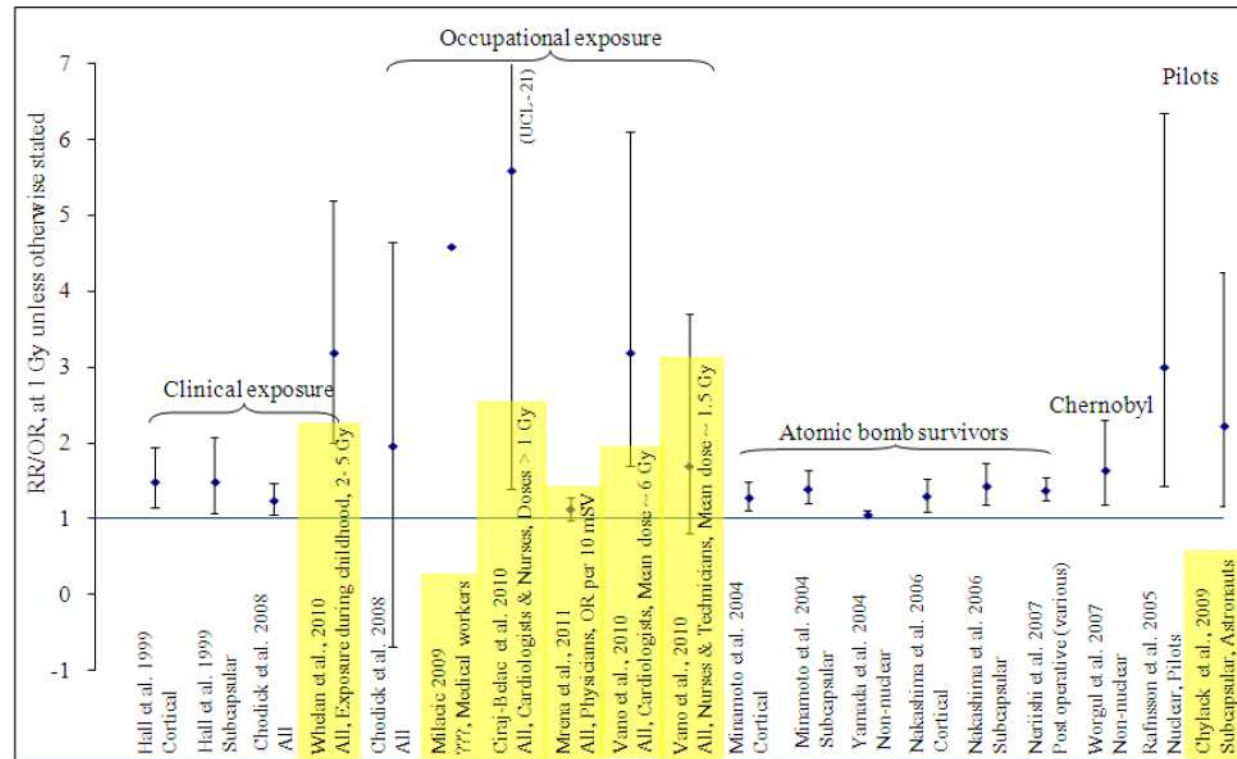
- O'CLOC cross-sectional study in France in 106 cardiologists vs 99 controls, published in 2013
  - Nuclear and cortical cataract: no difference
  - PSC cataract: OR 3,85 ( $p < 0,05$ )
  - Dose-dependency:
    - <17y: OR = 1,88
    - 17-25y: OR = 3,92
    - >25y: OR = 5,94





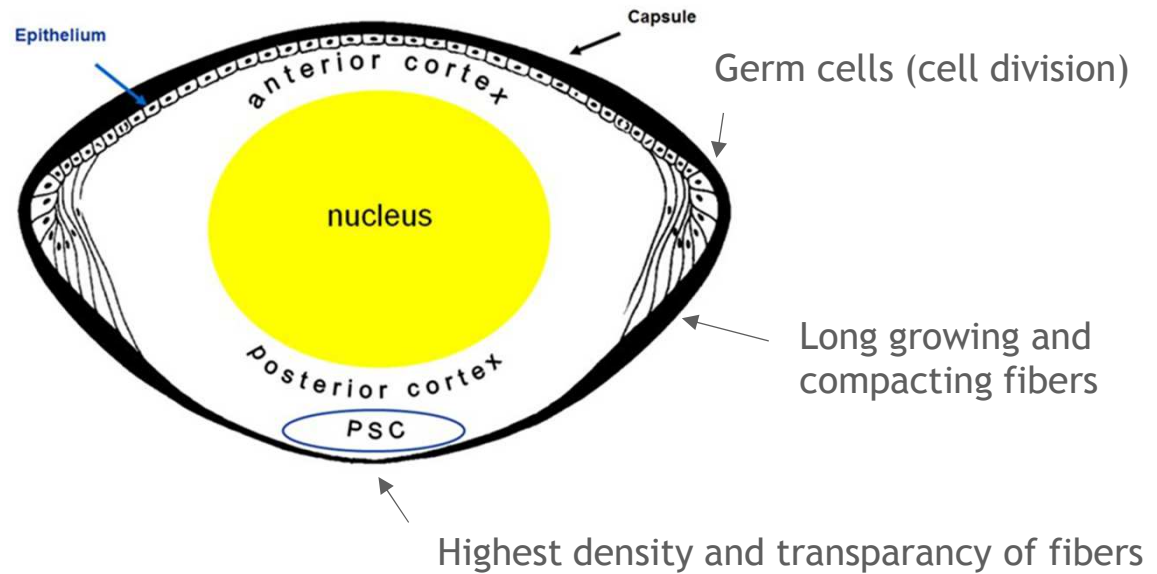
# EPIDEMIOLOGICAL EVIDENCE FOR X-RAYS AS A CAUSE OF POSTERIOR SUBCAPSULAR CATARACT

## 6. In summary





## BIOPHYSICS OF RADIATION-INDUCED CATARACT



- DNA damage due to ionising radiation is involved in the generation of PSC: higher susceptibility to PSC of people carrying DNA repair deficient genotypes (*Atm*, *Rad9* and *Brca1* deficiencies)



## DIAGNOSTICAL AND EXPOSURE CRITERIA FOR THE RECOGNITION OF POSTERIOR SUBCAPSULAR CATARACT AS AN OCCUPATIONAL DISEASE (MAY 2014)



- Posterior SubCapsular (PSC) cataract
- Interventionist cardiologists (coronary angiography and PTCA) and assisting medical personel
- At least 10 years full-time activity





Thank you for your attention

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