

## ***Alzheimer's disease***

Alzheimer's disease is a neurodegenerative disease [1], the most common form of acquired dementia can cause 60–70% of cases [2].

Every 3 seconds, someone in the world develops dementia. In 2015, there were an estimated 46.8 million people with dementia worldwide, and in 2017 this figure is close to 50 million, with almost 60% living in low- and middle-income countries. About 10 million new cases appear every year [3].

The main risk factor for Alzheimer's disease in the 65-year-old age group. China, India, South Asia and the Western Pacific have the fastest growing ageing populations [4].

Unfortunately, to date, the reasons that cause the development of Alzheimer's disease are poorly understood, but there are hypotheses of occurrence, these include:

1. cholinergic hypothesis, caused by a reduced process of binding of the neurotransmitter [5] acetylcholine [6]. This hypothesis is currently considered unlikely.
2. amyloid hypothesis, caused by deposition of beta-amyloid [7] in the brain.
3. tau hypothesis, caused by abnormalities in the structure of the tau protein [8]
4. infectious hypothesis, caused by the pathogen *Porphyromonas gingivalis* [9], which colonizes in the brain and increases the production of beta-amyloid.
5. mitochondrial cascade hypothesis, caused by a decrease in mitochondrial [10] function and stimulates the phenotypes [11] of aging.
6. calcium homeostasis [12] hypothesis, caused by calcineurin [13], which triggers reactive inflammatory processes in astrocytes [14].
7. neurovascular hypothesis, caused by pathology or changes in cerebrovascular [15] function.
8. inflammatory hypothesis, caused by an inflammatory response in microglia [16] and astrocytes
9. the metal ion hypothesis, caused by a change in iron metabolism in the brain.
10. the lymphatic system hypothesis, caused by abnormality of brains waste removal, which leads to accumulation of beta-amyloid in the brain [17] [18].

Alzheimer's disease begins many years before symptoms develop. Through evolving biomarker research and significant discoveries, it has become possible to identify Alzheimer's disease before the first clinical symptoms appear. This makes it possible to affect Alzheimer's disease at an early stage and to have the best chances for therapeutic success [19].

According to research, one of the best means to prevent the development of pathological processes in the body is curcumin [20].

Curcumin is the main curcuminoid [21] found in turmeric root [22].

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Curcumin is one of the most widely tested natural compounds. Laboratory studies have shown that curcumin is a therapeutically useful tool for preventing or correcting Alzheimer's disease [23] [24]. During research, Kurkumin has demonstrated its ability to cross the blood-brain barrier [25], exert a protective effect on neurons and mitochondria, and inhibit the accumulation of amyloid beta and toxins [26] [27] [28] [29] [30].

In addition, curcumin has multiple pharmacological properties, including antioxidant, anti-inflammatory, anticarcinogenic, cardioprotective, hepatoprotective, antidepressant, immune strengthening and many others [31].

Unfortunately, these encouraging initial findings were not supported in human clinical trials due to very low bioavailability of curcumin, which averaged no more than 0.1% [32]. This low bioavailability prevents curcumin from showing its therapeutic potential when taken as a powder or extract.

It is also worth noting that laboratory studies with curcumin have greatly increased the interest in it all over the world, and this was especially evident in the segment of biologically active additives. On almost every supplement website, you can purchase preparations made from powder or turmeric extract and find information about pharmacological effect of curcumin on dozens of diseases. This method of presenting information is a substitution of concepts when laboratory findings issued as clinical results. Neither turmeric extract nor powder, is able to provide the pharmacological action that curcumin has shown in laboratory studies.

Increasing the bioavailability of curcumin has been the topic of many research teams for several decades [33]. Several technologies have already been developed to increase the bioavailability of curcumin. The most advanced technology for the delivery of active substances into the blood is liposomal [34].

Liposomal curcumin delivery technology allows to achieve the desired pharmacological effect in humans and animals, which has been demonstrated in thousands of laboratory studies [35] [36] [37].

## Alzheimer's disease

### References:

- 1 <https://en.wikipedia.org/wiki/Neurodegeneration>
- 2 <https://en.wikipedia.org/wiki/Dementia>
- 3 <https://www.who.int/news-room/fact-sheets/detail/dementia>
- 4 [https://en.wikipedia.org/wiki/Alzheimer%27s\\_disease](https://en.wikipedia.org/wiki/Alzheimer%27s_disease)
- 5 <https://en.wikipedia.org/wiki/Neurotransmitter>
- 6 <https://en.wikipedia.org/wiki/Acetylcholine>
- 7 [https://en.wikipedia.org/wiki/Amyloid\\_beta](https://en.wikipedia.org/wiki/Amyloid_beta)
- 8 [https://en.wikipedia.org/wiki/Tau\\_protein](https://en.wikipedia.org/wiki/Tau_protein)
- 9 [https://en.wikipedia.org/wiki/Porphyromonas\\_gingivalis](https://en.wikipedia.org/wiki/Porphyromonas_gingivalis)
- 10 <https://en.wikipedia.org/wiki/Mitochondrion>
- 11 <https://en.wikipedia.org/wiki/Phenotype>
- 12 <https://en.wikipedia.org/wiki/Homeostasis>
- 13 <https://en.wikipedia.org/wiki/Calcineurin>
- 14 <https://en.wikipedia.org/wiki/Astrocyte>
- 15 [https://en.wikipedia.org/wiki/Cerebrovascular\\_disease](https://en.wikipedia.org/wiki/Cerebrovascular_disease)
- 16 <https://en.wikipedia.org/wiki/Microglia>
- 17 <https://www.nature.com/articles/s41392-019-0063-8>
- 18 <https://advances.sciencemag.org/content/5/1/eaau3333>
- 19 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6417794/>
- 20 <https://en.wikipedia.org/wiki/Curcumin>
- 21 <https://en.wikipedia.org/wiki/Curcuminoid>
- 22 <https://en.wikipedia.org/wiki/Turmeric>
- 23 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3271601/>
- 24 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2929771/>
- 25 [https://en.wikipedia.org/wiki/Blood%E2%80%93brain\\_barrier](https://en.wikipedia.org/wiki/Blood%E2%80%93brain_barrier)
- 26 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5796761/>
- 27 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6320958/>
- 28 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5256118/>
- 29 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5516023/>
- 30 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5949055/>
- 31 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5664031/>
- 32 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6770259/>
- 33 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3918523/>
- 34 <https://en.wikipedia.org/wiki/Liposome>
- 35 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3519006/>
- 36 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5557698/>
- 37 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5077137/>