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Utilization of Nanoparticles for Treating Age-related Macular Degeneration: A Literature Review

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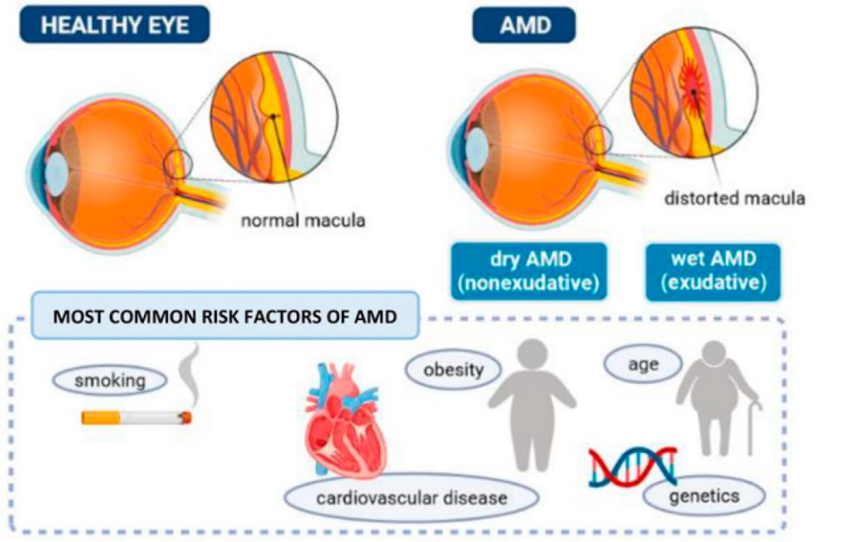
1. Background-Aim

- Age-related macular degeneration (**AMD**) remains a **leading cause of vision loss worldwide.**

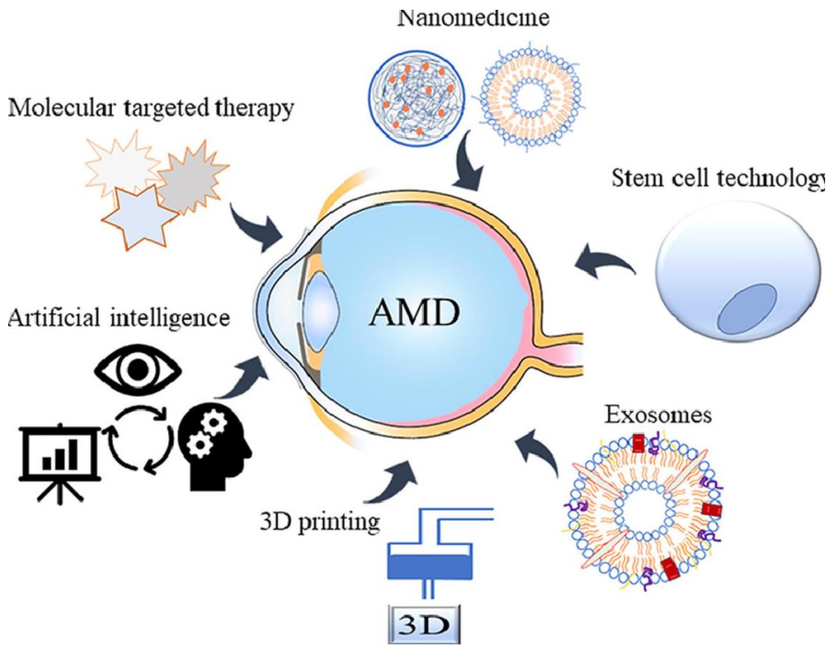
- **Traditional treatments** like anti-VEGF therapy provide **limited improvements.**



- Nanomedicine offers promising potential to transform the treatment paradigm for AMD.

- Nanoparticle-based drug delivery systems enhance treatment efficiency.

- Prospects include precision therapy and reducing side effects



2. Materials & Methods

This narrative literature review evaluates the current state of nanomedicine in the therapeutic management of AMD.

Data from databases including

- PubMed
- ScienceDirect
- Google Scholar

→final 32 articles (screening of 516)

criteria: English language, updated, citations, original research

Literature search: Up to April 2024

→ How do various nanomaterials and delivery strategies could enhance AMD treatment?

2005-2009
→ Liposome advancements for targeted drug delivery

2010 - 2014
→Gold nanoparticles for theranostics
→ Gene therapy trials for inherited retinal disorders

2015-2019
→ Integration of CRISPR-Cas9 in precision nanomedicine
→ Gene therapy for inherited retinal diseases

2020-April 2024
→AI-assisted imaging and nanoparticle-based sustained-release treatments

3. Results

Significant advancements in the use of diverse nanocarriers

- Liposomes
- Lipid nanoparticles
- Nanocapsules
- Nanoceria
- Nanofibers
- Nanoemulsions
- Magnetic nanoparticles
- Quantum dots
- Dendrimers

in various forms such as

- Intravitreal therapies
- Drops
- Gels

Applications

→Deliver treatments such as VEGF siRNA and steroid-loaded formulations

→Gene therapy, utilizing non-viral vectors

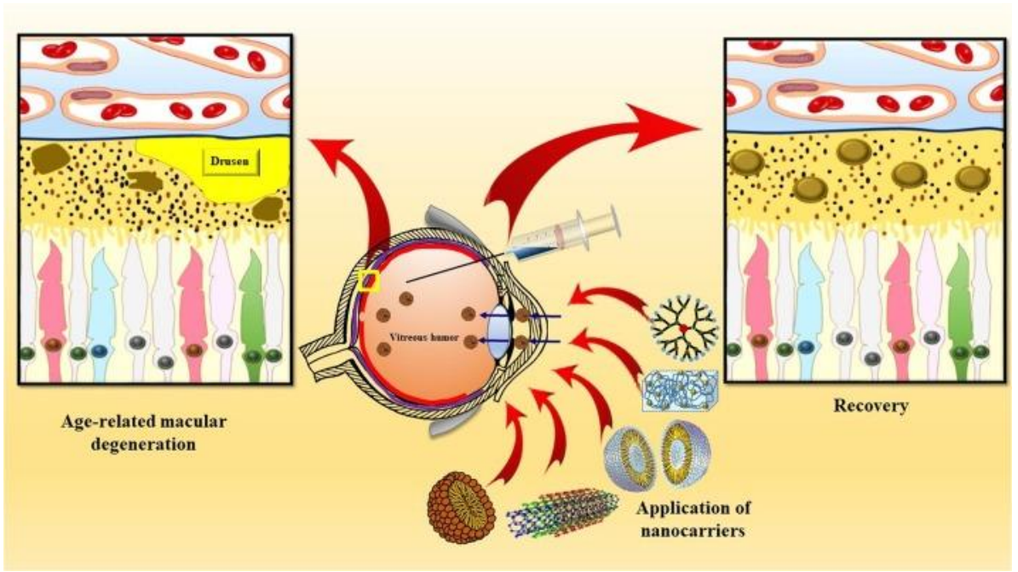
→Photodynamic therapy, radiosurgery enhanced by nanophotonics for treating neovascular AMD

→Light-responsive nanoparticles for controlled drug release

4. Conclusions

Nanotechnology-based therapies offer potential for

- ✓ more targeted
- ✓ efficient
- ✓ minimally invasive treatments for AMD
- ✓ potentially improving visual outcomes
- ✓ patient's quality of life



→ Despite **promising preclinical results**, **the <u>clinical translation</u>** of these nanomedicine strategies remains limited.

→ Continued research and well-designed clinical trials are essential to fully realize the potential of these advanced nanotechnologies in clinical practice.

5. References (indicative)

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