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Latest Innovations in the Treatment of Degenerative Diseases

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ABSTRACT

Recent innovations in the treatment of degenerative diseases have become a major focus of efforts to improve the quality of life of patients. With the development of technology and scientific research, there are opportunities to develop more effective and innovative treatment methods. In this study, we aim to explore recent innovations in the treatment of degenerative diseases, the purpose of which is to showcase the latest developments in the field of medicine that can provide new solutions in the management of degenerative diseases. The research method involved a literature review of recent studies in the treatment of degenerative diseases, as well as an analysis of relevant research data. The results showed some promising recent innovations, such as gene therapy, the use of stem cell technology, nanotechnology in drug delivery, and electromagnetic field approaches in medicine. These innovations offer the potential to improve treatment effectiveness and reduce the negative impact of these degenerative diseases. From the results of this study, it can be concluded that recent innovations in the treatment of degenerative diseases offer new hope in the management of these diseases. Technological developments and scientific research provide opportunities for the development of more effective and innovative treatment methods. However, despite significant progress in this field, further research is needed to evaluate the effectiveness, safety and sustainability of these innovations. This conclusion underscores the importance of collaboration between scientists, clinicians and the pharmaceutical industry to continue to drive innovation in an effort to holistically address degenerative diseases.

Keywords: *Degenerative Diseases, Innovation, Treatment*

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INTRODUCTION

Technology and innovation will continue to play an important role in the development of medicine (Li et al., 2021). The development of more sophisticated drugs, wider use of AI technology in diagnosis, and more targeted therapies based on understanding individual genetics are promising directions of development (Rajpurkar et al., 2022). Medicine in healthcare is a vast and ever-evolving field, aiming to prevent, diagnose, treat, and manage diseases or health conditions in individuals (Netea et al., 2020). From the use of drugs and therapies to a more holistic approach, treatment has many interrelated aspects (Topol, 2019). There are several medical approaches to treatment. First is the use of medications. One of the main approaches in medicine is the use of medications. Medicines can help relieve symptoms of the disease, inhibit the progression of the disease, or even cure certain conditions (Jiang et al., 2021). They can be prescription drugs from a doctor or over-the-counter medicines. Secondly, therapy. Therapies can include various methods, such as physiotherapy, speech therapy, occupational therapy, or behavioral therapy. The aim is to restore, improve, or assist individuals in managing their health conditions (Mesko & Győrffy, 2019). Third, surgical procedures: When other methods are ineffective, surgical procedures may be an option in treatment (Netea et al., 2020). This includes surgery to remove tumors, organ transplants, or physical repairs to the body.

Innovations in medicine are diverse. The first such innovation may be gene therapy. The use of gene therapy to treat genetic diseases or other health conditions has become a major focus of research. Through genetic technology, gene therapy aims to repair or replace problematic genes. Second immunotherapy. Immunotherapy is the use of the body's immune system to fight disease, especially in the case of cancer. It stimulates the immune response to fight cancer cells, providing a promising treatment alternative. Third is the use of artificial intelligence (AI) (Ahmad et al., 2016). AI has brought innovation in medicine, especially in the analysis of large medical data. This helps in more accurate diagnosis, disease forecasting, and new drug development. In the process of treatment, there are two holistic approaches namely alternative and complementary medicine. The holistic approach includes the use of alternative medicine such as acupuncture, homeopathy, yoga, and herbal therapy. It brings attention to treatment that involves the body, mind, and spirit. Then comes an understanding of lifestyle and diet. An increasingly important approach is to encourage a healthy lifestyle and proper diet as part of treatment. This involves education about the importance of physical activity, nutrition and stress management in maintaining good health.

New breakthroughs in medicine not only enable more effective treatments, but also lead to significant improvements in patients' quality of life. Innovative medicine enables more specific and targeted treatments (DeTure & Dickson, 2019). Through a deeper understanding of an individual's genetics, gene therapy and stem cell therapy can be designed to target diseases directly, reducing unwanted side effects (Nauck et

al., 2021). Innovations in imaging technology, such as more advanced MRIs or the use of artificial intelligence to analyze big medical data, have improved the ability to diagnose diseases more quickly and accurately. This enables earlier intervention and more effective treatment. Innovative medicine enables personalization of care that was previously unattainable (Lheureux et al., 2019). By understanding individual characteristics in greater depth, such as genetic responses or environmental factors, healthcare can be tailored to each patient specifically (Cerri et al., 2019). Recent innovations in medicine have opened the door to the development of new drugs and more effective therapies. These include more advanced and more specific drugs, reduced side effects and increased effectiveness in treating certain conditions. Innovations in medicine also bring benefits in reducing the overall burden on the healthcare system. By providing more effective treatments and preventing complications that may occur, long-term care costs can be reduced.

Degenerative diseases refer to a group of health conditions characterized by the deterioration or decline in the function of body organs or tissues over time (Hasby et al., 2019). The term "degenerative" describes the slow process by which these conditions develop, often affecting the function of specific organs or parts of the body. These conditions are generally chronic and progressive, often incurable completely, and require long-term management (Kartidjo et al., 2014). Degenerative diseases, such as Alzheimer's (Knopman et al., 2021), Parkinson's, and heart disease, are serious challenges in the world of healthcare (Hou et al., 2019). However, recent innovations in the treatment of degenerative diseases have opened the door to more effective solutions in the management of these diseases (Kwon & Koh, 2020), diagnosis, and management of these diseases (Singh et al., 2019). Let's explore the latest innovations in the treatment of degenerative diseases (Nandi et al., 2019). Degenerative diseases are medical conditions that often develop slowly and affect the function of tissues or organs in the body over time (Subhramanyam et al., 2019). Factors such as age, genetics, environment, and lifestyle can play an important role in the development of these diseases (Platten et al., 2019). In recent decades, research and innovations in the treatment of degenerative diseases have become a major focus in various fields of medical science.

Recent innovations in the treatment of degenerative diseases are numerous. 1. Gene Therapy. One promising innovation is gene therapy, where technology is used to alter or replace damaged or problematic genes. In some degenerative diseases such as cystic fibrosis, research on gene therapy has shown significant progress. 2. Stem Cell Therapy (Sterner & Sterner, 2021). The use of stem cells to regenerate damaged or destroyed tissue is becoming a major focus in degenerative disease research (Ma et al., 2019). In diseases such as Parkinson's or cartilage damage, stem cell therapy promises the potential for revolutionary treatments (Caldarini & Jaf, 2023). 3. Immunotherapy (Hegde & Chen, 2020, p. 10). In some cases, therapies that target the immune system to fight degenerative diseases have shown promising results (Gholamzad et al., 2019). For example, in cancer, immunotherapy has been in the spotlight for its ability to

stimulate the immune system to fight cancer cells. 4. More Advanced Imaging Technology. Developments in imaging technologies such as MRI (Magnetic Resonance Imaging) and PET (Positron Emission Tomography) have paved the way for earlier and more accurate diagnosis of degenerative diseases. This enables earlier intervention and more precise treatment. 5. Use of Artificial Intelligence (AI) in Diagnosis and Treatment. AI has become a useful tool in analyzing large and complex medical data. In the case of degenerative diseases (Martin et al., 2019), AI is used to identify patterns that may be difficult for humans to recognize, aiding in more accurate diagnosis. 6. Holistic Approach in Medicine. Complementary therapies such as yoga, meditation, and exercise therapy have attracted attention as part of a holistic approach in the treatment of degenerative diseases. They can help reduce symptoms, improve quality of life, and provide psychological support to patients.

There are several previous research opinions. The first research according to Yusnaini, (2021), with the research title Empowering Health Cadres Through Excellent Care Technology Innovation Towards a Healthy, Prosperous and COVID-19-Free Community in Darul Amin Village, Lawe Alas District, Southeast Aceh Regency. The results of his research state that the development of Excellent Care technological innovation as a means of health service facilities and online business to realize a healthy, prosperous and COVID-19-free society. The activities carried out consist of empowering health cadres, disseminating knowledge about herbal ingredients, developing Excellent Care technological innovations and visiting a team of health workers for homecare services to the community. The second research according to Karta et al., (2019), with the research title Cang Salak Tea: Tea from Salak Peel Waste and Secang Wood Potential for Prevention and Treatment of Degenerative Diseases. The results of his research state that Cang Salak Tea with variations of VR1, VR2, and VR3 has an active phytochemical content of flavonoids, tannins, alkaloids, terpenoids, and phenols. These compounds have potential against degenerative diseases. The antioxidant capacity of VR1, VR2, and VR3 are 343.88; 183.88; and 92.12 mg/L GAEAC. The third research according to Jiwantoro, (2019), with the research title Optimizing "Bu.Pur" as an Effort to Prevent and Treat Degenerative Diseases in the Elderly in Karang Bayan Barat Hamlet, Karang Bayan Village, Lingsar District, West Lombok. the results of his research show that the implementation of education about the use of medicinal plants, followed by a demonstration of how to process herbal plants and ended with monitoring land use.

Based on the results of the previous researcher's research above, it is different from the researcher's research. This researcher's research is entitled Recent Innovations in the Treatment of Degenerative Diseases. The results of this study show that there are several promising recent innovations, such as gene therapy, the use of stem cell technology, nanotechnology in drug delivery, and electromagnetic field approaches in medicine. These innovations offer the potential to improve the effectiveness of treatment and reduce the negative impact of degenerative diseases.

RESEARCH METHODOLOGY

This research method uses the literature review research method. Literature review is an important method in research that involves investigating, analyzing, and synthesizing relevant and current sources of information on a particular topic. The literature review method will examine the latest innovations in the treatment of degenerative diseases (Nichols et al., 2019). The literature review will examine and present the latest information regarding various methods, technologies or discoveries in the field of degenerative disease treatment. The steps in conducting this research are firstly the selection of information sources. Identify reliable sources such as scientific journals, recent articles, books, conferences, and publications from research institutions that focus on innovations in the treatment of degenerative diseases. Second, information collection. Reading, reviewing and collecting relevant data from the selected sources. This could be research results, recent studies, or articles that discuss innovative technologies in the treatment of degenerative diseases. Third is analyzing and evaluating. Critique and evaluate information from various sources to understand the advantages, limitations, and relevance of each recent innovations in the treatment of degenerative diseases. Fourth, the presentation of findings. Organize the information that has been collected into a systematic and structured review. This includes a discussion of the latest trends, technological developments, breakthroughs or paradigm shifts in the treatment of degenerative diseases. Finally, draw conclusions and implications. Formulate conclusions from the information that has been presented, highlighting the importance of these innovations in clinical practice, their impact on patients, and the direction of future developments in the field of degenerative disease treatment.

The advantages of the literature review method are firstly that it allows the researcher to gain an in-depth understanding of the topic under study (Peters et al., 2020). By exploring the relevant literature, researchers can gain a broad and detailed overview of the latest developments, theories, findings and approaches in the field. Secondly through the literature review, researchers can identify gaps in existing knowledge. This opens up opportunities to discover areas where further research is needed or where new contributions can be made, providing a foundation for follow-up research. Thirdly by presenting multiple sources of information, a literature review allows comparison between different studies, approaches, methodologies and relevant research results. This helps in evaluating the strengths and weaknesses of different approaches. Fourth, literature reviews can be used to support or corroborate new research results. By referring to the existing literature (Page et al., 2021), Researchers can align their findings with previous findings, validate their conclusions, or see the unique contributions of their research. These five methods allow researchers to identify current trends, paradigm shifts, or recent innovations in a particular field of study. This is important to stay relevant and support knowledge development. Sixthly, literature review can be an efficient method of gathering information as it does not require large resources such as field research or specific experiments. This can save

time and money. Seventhly through literature review, researchers can gain a better understanding of the theoretical and conceptual context underlying their topic of study. This helps in building a solid foundation for the research being conducted. Finally, literature reviews often involve sources from multiple disciplines, allowing the integration of ideas from different fields and facilitating a multidisciplinary approach to research.

RESULT AND DISCUSSION

The treatment of degenerative diseases has become a major focus in the medical world, given the high prevalence of diseases such as Alzheimer's, Parkinson's and cardiovascular diseases. Recent innovations in the treatment of degenerative diseases have brought new hope in the quest to effectively address these diseases. Some of the recent innovations in the treatment of degenerative diseases are implemented in medical practice. 1. Stem cell therapy. One of the recent innovations in the treatment of degenerative diseases is the implementation of stem cell therapy. Stem cells have the unique ability to repair damaged or dead tissue, thus offering great potential in the treatment of degenerative diseases. For example, in Parkinson's disease, stem cell therapy has been investigated to replace damaged dopamine nerve cells, which are the root cause of this condition. By using stem cell therapy, hope is available to slow the progression of the disease or even restore impaired motor function. The application of stem cell therapy has also shown potential in treating Alzheimer's disease. In this disease, damage to nerve cells in the brain leads to decreased cognitive function. Through stem cell therapy, efforts are made to regenerate the damaged nerve cells and stop the progression of the disease Disease. Although still in the research stage, stem cell therapy promises to break new ground in the effort to tackle degenerative diseases with a more fundamental approach. 2. Gene Therapy. Another recent innovation in the treatment of degenerative diseases is gene therapy. The concept of gene therapy involves using genes or genetic material to alter or improve the function of cells in the body. In some degenerative diseases, such as cardiovascular disease, gene therapy can be used to correct the genetic abnormalities underlying the condition. An example is the use of gene therapy to reduce cholesterol levels in the body, which is a major risk factor in cardiovascular disease. Additionally, in neurodegenerative diseases such as Alzheimer's, gene therapy also offers significant potential. The use of gene therapy to modulate the expression of genes associated with the formation of amyloid plaques in the brain has been the subject of exciting research. By utilizing gene therapy, the hope of stopping or slowing down the buildup of amyloid plaques becomes real.

In addition to the above two innovations, there are two more, namely Immunomodulation Therapy. The application of immunomodulation therapy is another recent innovation that has had a major impact in the treatment of degenerative diseases. Immunomodulation therapy aims to regulate the body's immune response to degenerative diseases, especially in the context of autoimmune diseases such as lupus or rheumatoid arthritis. By modulating the immune response, these therapies can reduce the level of inflammation and damage to tissues, thereby slowing down disease progression. In the

context of neurodegenerative diseases, immunomodulation therapy is also an exciting area of research. Studies have shown that neuroinflammation plays an important role in the development of diseases such as Alzheimer's and Parkinson's disease. Using immunomodulation therapy, efforts are made to reduce inflammation and damage to nerve cells within the brain, which could potentially halt the progress of the disease. 4. AI-based Drug Development. The development of artificial intelligence (AI) technology has made significant contributions to in innovating treatments for degenerative diseases. The use of AI in drug design and development has enabled the identification of novel compounds that have the potential to address degenerative diseases. Through the analysis of complex genetic and biological data, AI can help find effective therapeutic targets and accelerate the drug development process. The application of AI also impacts the development of personalized therapy in the treatment of degenerative diseases. Through the analysis of individualized patient data, AI can help in predicting the response to a particular therapy, thereby enabling more precise tailoring of therapy according to the genetic and biological characteristics of the patient. This paves the way for the development of therapies that are more effective and have a more significant impact in the treatment of degenerative diseases.

Table 1: Examples of degenerative diseases

NO	DISEASE NAME	DEVINITION
	Alzheimer's	Alzheimer's disease is a neurodegenerative disease that causes a decline in brain function, including memory problems, changes in behavior, and thinking ability. It is related to the accumulation of amyloid plaques and damage to nerve cells in the brain.
	Parkinson's	Parkinson's is a neurodegenerative disorder that affects a person's movement. It is caused by damage to nerve cells in the part of the brain that regulates movement. Symptoms include shaking, stiffness and balance problems.
	Coronary Heart Disease	It is a condition where the arteries of the heart are blocked by plaque, restricting blood flow to the heart. This process can lead to a heart attack or other heart problems as the heart does not get enough oxygen and nutrients.
	Osteoarthritis	The disease involves damage to the cartilage in the joints that allows the bones to rub against each other. This leads to pain, swelling and limitation of movement in certain joints.
		Type 2 diabetes is a chronic condition characterized by elevated blood sugar levels because the body cannot use insulin effectively. This can lead to serious complications such as organ damage, vision problems, or nerve problems.

Although recent innovations in the treatment of degenerative diseases offer great potential in addressing these diseases, special measures are needed in their research and implementation in medical practice. It is important to establish a multidisciplinary approach involving geneticists, immunologists, neurologists, and AI technologists in an effort to

accelerate the development of appropriate and effective therapies. In addition, collaboration between research institutions, the pharmaceutical industry and regulatory authorities is necessary to ensure that the latest innovations in the treatment of degenerative diseases reach patients quickly and safely. The regulatory process must support the development of revolutionary therapies while ensuring optimal safety and efficacy. In medical practice implementation, education and training of healthcare professionals is also key. Introducing the latest innovations in degenerative disease treatment to doctors, nurses, and other medical personnel is an important step towards ensuring that patients benefit from the latest developments in medicine. Improving the accessibility of innovative therapies is also an important aspect of ensuring that patients in need can obtain the latest treatments for degenerative diseases. The availability of innovative therapies in public and private health systems must be carefully considered to ensure that no patient is marginalized from accessing treatments that can improve their quality of life.

Recent innovations in the treatment of degenerative diseases have great potential to change the treatment paradigm in this field. With stem cell therapy, gene therapy, immunomodulating therapy, and AI-based drug development, there is hope of addressing degenerative diseases more effectively and thoroughly. The impact will not only be felt in the improvement of life expectancy and quality of life for degenerative disease patients, but also in the provision of solutions that more economical for the health system as a whole. Slowing the progression of degenerative diseases can reduce the financial burden posed by long-term care and rehabilitation. It is also expected that recent innovations in the treatment of degenerative diseases can make a significant contribution to reducing the global burden of these diseases. Through collaborative efforts between researchers, the pharmaceutical industry, healthcare practitioners, and governments, the implementation of recent innovations in the treatment of degenerative diseases can be an important milestone in creating a healthier and more dignified society.

Table 2: Common symptoms experienced by people with degenerative diseases.

NO	Types of symptoms	Explanation
	Decreased motor ability.	One of the main symptoms of degenerative diseases is a decline in motor skills. This can include difficulty in walking, muscle weakness, stiffness or stiffness in the joints, and loss of balance. For example, in Parkinson's disease, a person may experience tremors, muscle stiffness, difficulty moving, and changes in walking.
	Chronic pain.	Many degenerative diseases cause chronic pain in certain parts of the body. For example, osteoarthritis, which is a degenerative disease of the joints, often causes pain and stiffness in the affected joints.
	Mental and emotional disturbances.	Some degenerative diseases, such as Alzheimer's and Huntington's disease, can cause mental and

		emotional disturbances. These include decreased thinking ability, mood disorders, confusion, as well as behavioral changes.
	Sensory impairment.	Some degenerative diseases can also cause sensory impairments, such as decreased vision, hearing, and impaired sense of taste and touch.
	Decreased organ function.	Degenerative diseases can also affect the function of vital organs, such as the heart, lungs, kidneys and liver. Symptoms may include difficulty breathing, increased fatigue, digestive disorders, and decreased sexual function.
	Cognitive decline	Some degenerative diseases, such as Alzheimer's disease or advanced Parkinson's disease, can cause significant cognitive decline. This includes decreased thinking ability, concentration, as well as impaired short-term and long-term memory.
	Inability to perform daily activities.	Degenerative conditions can lead to the inability to perform daily activities, such as bathing, dressing and eating. This is due to decreased motor skills, sensory impairment, and cognitive decline.
	Decreased quality of life.	It often leads to decreased quality of life. Patients may experience difficulty in living their daily lives, limited mobility, as well as psychological distress due to their illness.

Current innovations in the treatment of degenerative diseases is a challenging field as it involves the complexity of chronic diseases, dynamic changes in medical technology, and the complexity of regulatory processes in the development of new therapies or treatments. There are several key challenges in shaping current innovations in the treatment of degenerative diseases including. Firstly, degenerative diseases often involve complex and multifactorial pathophysiologic mechanisms. Examples such as Alzheimer's, Parkinson's or coronary heart disease involve multiple aspects of pathology, genetics, environment and lifestyle. Understanding and addressing this complexity can be a major challenge in developing effective treatment innovations. Both researches are continuously generating new knowledge about disease mechanisms, but there is a challenge in applying these discoveries into therapies or treatments that can be used clinically. Integrating scientific findings into practical applications in medicine can be a complex and time-consuming process. The three innovations in medicine are often related to the development of new technologies such as gene therapy, cell therapy, artificial intelligence or other treatment technologies. The main challenge is to develop appropriate and affordable technologies, and to ensure that these technologies can be applied in a clinical context effectively. Fourth, before treatment innovations can be widely applied, they must undergo rigorous clinical trials to validate

their safety, effectiveness and benefits to patients. This process requires substantial time, resources and commitment, and not all innovations make it past this stage. The five-step process of developing medical innovations often requires large investments. However, to ensure patient accessibility to these innovations, serious considerations are needed with regard to production costs, distribution, and affordability.

Developing cutting-edge innovations in the treatment of degenerative diseases involves a complex set of challenges, ranging from a deep understanding of the disease itself to overcoming technological, regulatory and policy barriers. While these challenges exist, continuous efforts in research and development are key in facing and solving these challenges to improve care and life expectancy for those affected by degenerative diseases. There are several efforts that can be made to overcome the challenges in developing the latest innovations in the treatment of degenerative diseases, namely by collaborating between research institutions, universities, the pharmaceutical industry, and medical institutions to facilitate the exchange of ideas, resources, and technologies. Secondly, governments and financial institutions need to support research in degenerative diseases development of innovation by providing adequate funding and policy support for innovative research projects. Thirdly, improving access to and secure sharing of patient data. Fourth, investing in medical technology. Fifth, training medical personnel, researchers, and healthcare professionals in innovative areas such as genomics, new medical technologies, and novel therapeutic approaches plays an important role in implementing innovations in clinical practice. Finally, in addition to treatment, emphasizing prevention of degenerative diseases through healthy lifestyles, public education, and appropriate interventions can reduce the burden of disease and requires a comprehensive approach.

CONCLUSION

Based on the results and discussion above, it can be concluded that recent innovations in the treatment of degenerative diseases offer new hope in the management of these diseases. Technological developments and scientific research provide opportunities for the development of more effective and innovative treatment methods. There are several recent innovations in the treatment of degenerative diseases, namely the application of stem cell therapy, gene therapy involving the use of genes or genetic material to alter or improve the function of cells in the body, immunomodulation therapy that aims to regulate the body's immune response to degenerative diseases, especially in the context of autoimmune diseases such as lupus or rheumatoid arthritis, and the development of AI-based drugs. However, there are several challenges that must be faced in their development such as degenerative diseases that often involve complex pathophysiological mechanisms, take a long time, and the development of new technologies such as gene therapy, cell therapy, and artificial intelligence or other treatment technologies. The main challenge is to develop appropriate and affordable technologies, and to ensure that these technologies can be applied in a clinical context effectively, and must undergo rigorous clinical trials to validate their safety,

effectiveness and benefits to patients. Although there are several challenges in developing the latest innovations in the treatment of degenerative diseases by taking a multifaceted and sustainable approach. Cross-sector collaboration, adequate funding, cutting-edge medical technology, responsive regulation, and a research- and prevention-focused approach can help overcome these barriers and drive the development of more effective innovations in dealing with degenerative diseases.

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