

# Project: Summarizing and Analyzing Research Papers

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**Topic:** Medical Science

**Research Paper:** Cancer Vaccines: From the State of the Art to the Most Promising Frontiers in the Treatment of Colorectal Cancer  
<https://www.mdpi.com/1999-4923/15/7/1969>

## Initial Prompt

**Description:** In my initial prompt I attached the research paper pdf and asked the AI to summarize it in 100 words

**Generated Summary:** The AI instead asked me to specify the context of the research paper I would like it to summarize

## Iteration 1

**Description:** I then explained the AI to exclude the references part and describe the research paper by telling me what it is about and giving some key insights into it

**Generated Summary:** This is the summary it provided me – “The research paper reviews the development and potential of cancer vaccines specifically targeting colorectal cancer (CRC), which accounts for 10% of cancer cases and deaths globally. It discusses the limitations of traditional therapies and highlights the promise of immunotherapy, particularly cancer vaccines, in enhancing immune responses against tumour-specific antigens. The paper categorizes vaccines into preventive and therapeutic types, detailing various strategies such as peptide-based, nucleic acid-based, and dendritic cell-based vaccines. It also explores the innovative use of B-cells for vaccine development and emphasizes the need for further clinical trials to improve patient outcomes in CRC treatment.”

## Iteration 2

**Description:** In the next iteration I asked it to tell me more about why exactly the vaccine approach is more effective by highlighting some key points and add those points in my summary

**Generated Summary:** The research paper reviews the development and potential of cancer vaccines specifically targeting colorectal cancer (CRC), which accounts for 10% of cancer cases and deaths globally. It discusses the limitations of traditional therapies and highlights the promise of immunotherapy, particularly cancer vaccines, in enhancing immune responses against tumour-specific antigens. The paper categorizes vaccines into preventive and therapeutic types, detailing various strategies such as peptide-based, nucleic acid-based, and dendritic cell-based vaccines. Key highlights include the targeted immune response that minimizes harm to healthy tissues, the potential for preventing disease progression, and the innovative use of B-cells to enhance specificity. The diverse strategies and the potential for personalized medicine allow for tailored treatments, while generally offering an improved safety profile with fewer side effects compared to conventional therapies. The paper emphasizes the need for further clinical trials to improve patient outcomes in CRC treatment.

## Final Prompt

**Description:** In my final iteration I asked it to add some statistical numbers supporting the efficacy of the vaccine approach

**Generated Summary:** The research paper reviews the development and potential of cancer vaccines specifically targeting colorectal cancer (CRC), which accounts for 10% of cancer cases and deaths globally. According to the WHO, by 2040, there will be a 60% increase in CRC cases, highlighting the urgent need for new therapeutic strategies. The paper discusses the limitations of traditional therapies and highlights the promise of immunotherapy, particularly cancer vaccines, in enhancing immune responses against tumour-specific antigens. It categorizes vaccines into preventive and therapeutic types, detailing various strategies such as peptide-based, nucleic acid-based, and dendritic cell-based vaccines. Key highlights include the targeted immune response that minimizes harm to healthy tissues, the potential for preventing disease progression, and the innovative use of B-cells to enhance specificity. The diverse strategies and the potential for personalized medicine allow for tailored treatments, while generally offering an improved safety profile with fewer side effects compared to conventional therapies. The paper emphasizes the need for further clinical trials, noting that only four out of 87 registered studies have reached Phase 3, to improve patient outcomes in CRC treatment.

## Insights and Applications

**Key Insights:** Key insights extracted from the research paper on cancer vaccines for colorectal cancer (CRC) include:

1. **Rising Incidence:** CRC represents 10% of all new cancer cases and deaths, with projections indicating a 60% increase in cases by 2040, underscoring the urgent need for innovative treatment strategies.
2. **Limitations of Traditional Therapies:** Conventional treatments like surgery, chemotherapy, and radiotherapy often lead to significant side effects and do not effectively target tumour cells, highlighting the necessity for more precise therapies.
3. **Promise of Cancer Vaccines:** Cancer vaccines offer a novel approach by stimulating the immune system to recognize and attack tumour-specific antigens, potentially improving treatment outcomes and quality of life for patients.
4. **Types of Vaccines:** The paper categorizes vaccines into preventive and therapeutic types, with various formulations being explored, including peptide-based, nucleic acid-based, viral vector, bacterial vector, and dendritic cell-based vaccines.
5. **B-cell Utilization:** The innovative use of B-cells as antigen-presenting cells can enhance T-cell activation and specificity, representing a promising avenue for developing effective cell-based vaccines.
6. **Personalized Medicine Potential:** The identification of tumour-specific antigens allows for the development of personalized vaccines tailored to individual patient profiles, increasing the likelihood of an effective immune response.
7. **Safety and Efficacy:** Cancer vaccines generally have a better safety profile with fewer side effects compared to traditional therapies, making them a potentially more tolerable option for patients.
8. **Need for Clinical Trials:** Despite the promise of cancer vaccines, there is a significant gap in clinical trials, with only a few studies reaching advanced phases, indicating a need for increased research and development in this area.

**Potential Applications:** The research findings on cancer vaccines for colorectal cancer (CRC) suggest several potential applications and implications:

1. **Development of Novel Vaccines:** The insights can lead to the creation of new cancer vaccines that specifically target CRC, utilizing various platforms such as peptide-based, nucleic acid-based, and dendritic cell-based vaccines to enhance immune responses.
2. **Personalized Cancer Treatment:** The identification of tumour-specific antigens allows for the development of personalized vaccines tailored to individual patient profiles, potentially improving treatment efficacy and minimizing adverse effects.
3. **Combination Therapies:** The findings support the exploration of combining cancer vaccines with existing therapies, such as

chemotherapy or immunotherapy, to enhance overall treatment effectiveness and patient outcomes.

4. **Preventive Strategies:** Preventive cancer vaccines could be developed to target high-risk populations, potentially reducing the incidence of CRC by eliciting immune responses before tumour development.
5. **Improved Patient Quality of Life:** By offering a treatment option with a better safety profile and fewer side effects compared to traditional therapies, cancer vaccines could significantly enhance the quality of life for CRC patients.
6. **Enhanced Understanding of Tumour Immunology:** The research contributes to a deeper understanding of tumour immunology and the mechanisms by which the immune system can be harnessed to fight cancer, informing future research directions.
7. **Increased Focus on B-cell Immunotherapy:** The innovative use of B-cells as antigen-presenting cells opens new avenues for research and development in immunotherapy, potentially leading to more effective cell-based vaccines.
8. **Policy and Funding Implications:** The urgent need for more clinical trials and research in the field of cancer vaccines may influence funding priorities and healthcare policies, promoting investment in vaccine research and development.
9. **Global Health Impact:** Given the rising incidence of CRC, effective cancer vaccines could have a significant impact on public health by reducing cancer-related morbidity and mortality rates.
10. **Educational Initiatives:** The findings can inform educational programs for healthcare professionals and patients about the potential benefits and mechanisms of cancer vaccines, fostering greater awareness and acceptance of immunotherapy approaches.

## Evaluation

**Clarity:** The final summary and insights are generally clear, presenting the key points of the research paper concisely. The language is straightforward and avoids excessive jargon, making it accessible to a broad audience. However, the integration of statistics and specific vaccine strategies could be more seamlessly woven into the narrative for better flow.

**Accuracy:** The summary accurately captures the essence of the research paper, including the discussion of cancer vaccines, their potential benefits, and the need for further clinical trials. The inclusion of statistical data and specific details about vaccine strategies enhances the accuracy, though some points could benefit from deeper elaboration.

**Relevance:** The insights and applications are highly relevant to the field of colorectal cancer treatment. They align with the paper's focus on innovative approaches to immunotherapy and highlight practical implications, such as the development of personalized vaccines and the potential for improved patient outcomes. These points effectively translate the research into real-world applications.

## Reflection

This assignment, as a part of my generative AI course on Skillible, provided a hands-on opportunity to engage with AI-driven content creation. Working through this task allowed me to experience both the potential and limitations of generative AI in summarizing and analysing complex research papers. One of the key challenges I faced was guiding the AI to produce a summary that not only captured the essence of the paper but also included specific, detailed insights relevant to my objectives. This required multiple iterations and adjustments, highlighting the importance of clear prompts and context when working with AI.

I learned that while AI can effectively generate content, human oversight remains crucial to ensure accuracy, clarity, and relevance. The exercise reinforced my understanding of how to critically evaluate AI outputs, making necessary refinements to align the results with academic and professional standards. It also deepened my appreciation for the iterative nature of working with AI tools, where feedback and fine-tuning are essential for achieving the desired outcome.

This assignment has contributed significantly to my learning experience in the generative AI course, offering practical insights into the application of AI in summarizing and evaluating scientific literature. It has also underscored the importance of combining AI capabilities with human expertise to produce high-quality, contextually appropriate content.