Junior Science Communications
Faculty of Applied Sciences, UiTM Shah Alam
https://journal.uitm.edu.my/ojs/index.php/JSC

E-ISSN 2637-0689
Vol 64 2026

Colloquium on Applied Sciences 1 2026
19-22 January 2026, Faculty of Applied Sciences, UiTM Shah Alam, Malaysia

Cultured Meat Production Methods: A Comparative Systematic Review

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Structured Abstract

Background: The global demand for animal meat is expected to increase dramatically by mid-century, yet conventional livestock production is limited by environmental, health and ethical concerns. Cultured meat is one of the promising solutions which could offer as an alternative wayto obtain meat without killing the animals. This strategy is based on the in *vitro* culture of edible muscle cells followed by their proliferation and differentiation. Nevertheless, it remains uncertain whether mass production of cultured meat is scalable from laboratory-scale to industrial scale, because cultivated meat performance depends on several biological, engineering and biochemical factors.

Methods: In this review, PRISMA guidelines were employed to select and assess studies on the topic of cultured meat production. A total 179 articles were retrieved from three databases: ScienceDirect, Scopus, and Web of Science. Full-text articles were screened for relevance, and a total of 29 studies were finally selected for review.

Results: This study shows that myogenic cells are important for the formation of muscle fiber and deliver texture and firmness in cultured meat production. Adipose-derived stem cells also act as a major factor in fat deposition, which contributes to the marbling and flavour. Mesenchymal stem cell (MSCs) contributes to the formation of extracellular matrix (ECM) and maintain structure. Scaffolding materials such as synthetic and natural support the growing cells, while programmable and bioactive scaffolds even promote tissue shaping, texture, and flavour making the meat more realistic.

Conclusion: In conclusion, cultured meat has potential to solve environmental and ethical issues, but scalability, cost and taste remain barriers. It is important to optimize bioreactors, develop scaffolds, and investigate serum free media. Further research is required to optimise production techniques and make sure that cultured meat is an economically viable product and acceptable for consumers. Furthermore, progress in cellular differentiation and tissue maturation is also required to achieve a realistic texture and taste. Lastly, regulatory guidance and consumer education will be instrumental for enabling the commercialization and broad acceptance of the cultured meat.

Keywords: Cultured meat, meat culture, muscle cell, stem cell, proliferation.

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