

Equine Collagen – A promising alternative to collagen from other animal sources

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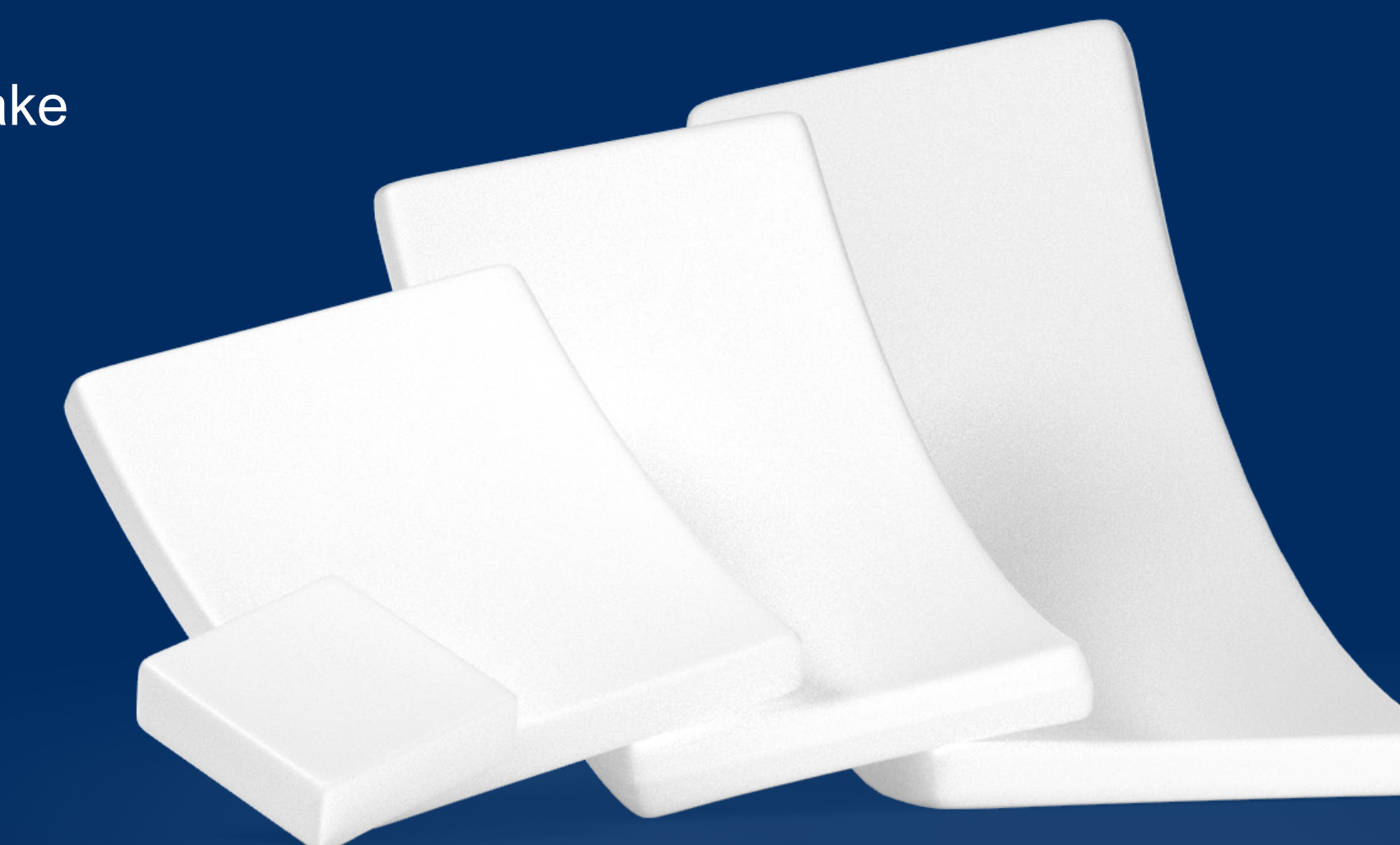
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Introduction

Collagens are a family of 29 proteins and are the most abundant proteins in the body. Fibrillar collagen is characterised by their triple helical structure and third residue glycine repeat. They make up fibrils and fibers which provide structure and tensile strength to tissues. Collagen makes up around two-thirds of the dry weight of skin with collagen type I being the most abundant¹². Collagen based dermal scaffolds offer a promising technology to aid in the healing of challenging wounds. They are biodegradable and offer a matrix similar to what is naturally present in skin, allowing cells to infiltrate and heal the area. AMS have developed a predominantly type I based collagen dermal tissue matrix manufactured from equine tendon. This provides a collagen that is both safer and more culturally acceptable than alternatives of porcine, bovine and ovine origin^{1,5,6,10}.

Methods

A literature review was carried out to understand the advantages and disadvantages of collagen from common animal sources.



Results

Homology

Collagens are highly conserved throughout evolution and therefore are available from a wide range of animal sources. Collagen from mammals has the highest sequence homology to that of humans with equine showing 96.6% and 93.6% homology in 2 genes responsible for coding collagen type I (Table 1).

Table 1 Sequence homology of collagen genes

Animal	COL1A1	COL1A2
Equine	96.6%	93.6%
Porcine	95.8%	93.8%
Bovine	97.4%	92.9%
Ovine	92.7%	92.9%

Adapted from Gallo N *et al* (2020)¹

Zoonosis risks

When using products of animal origin, the risk of zoonosis needs to be considered. Bovine sources present risks associated with foot and mouth disease and bovine spongiform encephalopathies (BSE) which includes human transmissible TSE (transmissible spongiform encephalopathy). Porcine origin material also carries concern, with swine flu presenting an example of zoonotic disease passed from pigs to humans. However, ovine collagen is perhaps the source most limited in use, by the disease risk posed by scrapie, a fatal disease of the central nervous system^{1,8}. Collagen of equine origin is considered to carry a low risk and is reported as free from zoonosis making it an attractive option in this context of a dermal tissue matrix to aid the healing of challenging wounds⁶.

Allergic reaction

Despite close homology to human collagen, collagen from animal sources can induce an allergic response. This is most prevalent with the use of bovine collagen where around 3% of the population are allergic, leading to routine testing prior to implantation^{4,9}. Allergic reaction to porcine collagen is less prevalent however it has been reported⁴. Equine collagen however has no reported allergic reaction^{1,5,10}.

Cultural concern

Beliefs held by both the Islamic and Jewish faiths make collagen of porcine origin unacceptable for use. The use of collagen of bovine origin is unsuitable for people of Sikh, Hindu or Buddhist faith. No such cultural or religious beliefs restrict the use of equine collagen in this way.

Collagen Source	Zoonosis	Allergic Reaction	Cultural / Religious concern
Equine	Low risk ⁶	Non reported ^{1,5,10}	No
Porcine	Concern ⁴	Reported (Rare) ²	Yes
Bovine	Concern	Reported (3% of people) ³	Yes
Ovine	High concern limits use ¹	Unknown	No

Discussion

Collagens are not merely a structural molecule, they have an important role in cell differentiation, migration and the synthesis of proteins⁷. Collagen based dermal scaffolds can support the healing of chronic and difficult to heal wounds by increasing fibroblast production, and providing a structure for cell infiltration and migration to help with the deposition of new collagen⁷. In addition to this collagen scaffolds can act as a sacrificial protein to reduce the effects of the proteolytic environment often associated with hard to heal wounds¹¹.

Equine collagen offers an attractive alternative to the more frequently used bovine or porcine collagen due to a lower risk of zoonosis, less reported allergic reaction and absence of religious constraints.

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