Porcine-derived materials in urology: Practical ethical guidance for caring for Muslim and Jewish patients

Mohammad Zohab Khan[1], Asmaa Ismail[2], Ahmed Kotb[2]
[1]California University of Science and Medicine, Colton, CA, United States; [2]University of Alberta, Grande Prairie, AB, Canada

Cite as: Khan MZ, Ismail A, Kotb A. Porcine-derived materials in urology: Practical ethical guidance for caring for Muslim and Jewish patients. *Can Urol Assoc J* 2026 May 4; Epub ahead of print. http://dx.doi.org/10.5489/cuaj.9582

Published online May 4, 2026

Corresponding author: Dr. Ahmed Kotb, [2]University of Alberta, Grande Prairie, AB, Canada; drahmedfali@gmail.com

***

ABSTRACT

Introduction: Porcine-derived materials are used widely in urology, including hemostatic agents, acellular dermal matrices, sutures, bulking agents, and several anticoagulant medications. Although clinically effective, their animal origin is rarely discussed during preoperative counseling or routine prescribing. For many patients whose religious or ethical values influence medical decision-making, this information is meaningful even when use is permitted. Islamic jurisprudence (Fiqh) and Jewish law (Halakhah) generally allow porcine-derived medical products when medically necessary, but many patients prefer transparent disclosure and the opportunity to consider alternatives when they exist. The central issue is supporting patient autonomy through clear, value-neutral communication.

Methods: We conducted a narrative review of porcine-derived devices and medications commonly used in urologic practice and summarized relevant ethical considerations from

KEY MESSAGES

- Porcine-derived materials are commonly used in urologic surgery and medication formulations, yet their animal origin is often undisclosed during routine counseling.
- Muslim and Jewish patients generally permit these products when medically necessary, but many prefer transparent disclosure and the opportunity to consider alternatives when available.
- Clear, value-neutral counseling strengthens informed consent and supports shared decision-making when product origin is relevant to patient values.

Islamic and Jewish perspectives, with a focus on practical implications for informed consent and shared decision-making.
Results: Across urologic practice, porcine collagen and gelatin are most frequently encountered in hemostatic sealants, acellular dermal matrices, biologic slings, absorbable sutures, and select pharmaceutical excipients. Clinically viable non-porcine or synthetic alternatives are available in many, but not all, settings. Product origin is inconsistently disclosed in labeling, often requiring verification through manufacturer documentation or pharmacy resources when disclosure is relevant to patient preferences.
Conclusions: Transparent, value-neutral counseling regarding porcine-derived materials supports patient autonomy, reduces moral distress, and may mitigate medicolegal risk when product origin is important to patients. Routine awareness of commonly used porcine-derived products, coupled with reliable verification of material composition and discussion of alternatives when feasible, allows urologists to provide care that is both clinically effective and aligned with diverse patient values.

INTRODUCTION

Porcine-derived biomaterials are used widely in urology, including in hemostatic agents, biologic grafts, slings for stress urinary incontinence, and tissue matrices used in pelvic or urethral reconstruction frequently rely on collagen or gelatin extracts sourced from porcine tissue.[1,2] Several pharmaceuticals and device coatings also incorporate porcine-sourced excipients.[3] Despite their routine use, the animal origin of these products is rarely discussed during preoperative counseling or documented in informed consent.

This gap becomes relevant when caring for patients whose religious traditions restrict pork-derived substances, particularly Muslim and Jewish patients.[4] Although both Islamic (fiqh) and Jewish (halakhic) frameworks generally permit the use of prohibited materials when medically necessary and when no suitable alternative exists, many patients still prefer transparent disclosure and the opportunity to choose among available options.[5] Although this review focuses on Muslim and Jewish patients, similar considerations apply to patients with strict vegan or ethical objections to animal-derived medical products. Lack of discussion can unintentionally erode trust, create moral discomfort, or limit patient participation in decision-making.

This review does not argue against porcine-derived products or attempt to define religious rulings. Its aim is to: (1) outline the porcine-derived materials most frequently encountered in urologic care; (2) summarize clinically relevant Islamic and Jewish perspectives on the medical use of prohibited animal-derived substances; and (3) provide practical guidance for integrating brief, culturally sensitive disclosure into routine counseling. Increased awareness of these considerations can strengthen clinician–patient rapport, support informed consent, and align urologic practice with established principles of autonomy and shared decision-making.[6]

OVERVIEW OF PORCINE-DERIVED PRODUCTS IN UROLOGY

Porcine-derived biomaterials are common in urology, supporting hemostasis, tissue reinforcement, pelvic floor reconstruction, and urinary tract repair.[7–11] Their usefulness comes from the mechanical and biological advantages of porcine collagen and gelatin, which offer strength, elasticity, and biocompatibility. These components appear in hemostatic sealants, acellular dermal matrices, biologic slings, absorbable sutures, and select pharmaceutical excipients. Although there are synthetic or human-derived alternatives, the source of these materials is not always clear. This emphasizes the importance of clinician awareness and the need for culturally sensitive counseling during treatment planning.

Hemostatic agents (device-class)

Common hemostatic agents such as gelatin-based matrix sealants contain porcine-derived gelatin that forms a scaffold for platelet aggregation and local clot formation. Some formulations incorporate human thrombin to accelerate fibrin generation.[12–15] These products are valued for reliability and ease of use in urologic surgery, yet their porcine origin is rarely part of preoperative discussion, despite potential relevance for patients with religious or ethical concerns.[16]

Biologic grafts and acellular dermal matrices

Porcine acellular dermal matrices (ADMs) are used in pelvic organ prolapse repair, stress urinary incontinence, and urethral or bladder reconstruction. Evidence supports their favorable integration and biocompatibility and suggests lower rates of erosion and dyspareunia compared to some synthetic meshes.[17–19] ADMs are often selected when synthetic mesh is contraindicated due to infection risk, prior complications, or patient preference.

Limitations remain, especially variability in long-term strength and durability, requiring individualized selection.[17,19,20] Because ADMs originate from porcine dermal collagen, disclosure may influence patient comfort or values alignment.[17,21] Incorporating transparent counseling supports patient autonomy without restricting clinical options.[17,21]

Collagen-based injectable bulking agents (legacy use)

Earlier urethral bulking agents such as Contigen (glutaraldehyde cross-linked bovine collagen) represent the historical use of animal-derived injectables for stress urinary incontinence.[22–25] These products demonstrated moderate short-term benefit but limited durability and required allergy testing due to immunogenicity.[23,26]

Contemporary practice in North America and Europe now favors synthetic and non-porcine agents, including polyacrylamide hydrogel, polydimethylsiloxane, calcium hydroxyapatite, and carbon-coated zirconium oxide. These agents have been shown to have improved safety and comparable or superior durability.[27–29] Although collagen-based agents persist in select international settings where synthetic options are limited, global trends continue to shift toward non-animal-derived formulations.[22,30,31]

Medications and perioperative adjuncts with porcine components

Several medications commonly used in urologic and perioperative care contain porcine-derived components. The most prominent examples include heparin-based anticoagulants, topical hemostatic drugs, and pharmaceutical excipients such as gelatin. Because animal origin is rarely disclosed on medication labeling, clinicians may need to verify composition directly with manufacturers or pharmacy services when relevant to patient values or restrictions.

Anticoagulants

Unfractionated heparin and low–molecular-weight heparins used for thromboprophylaxis, and perioperative anticoagulation are produced almost exclusively from porcine intestinal mucosa.[32,33] Their anticoagulant activity results from binding to antithrombin III and inhibition of thrombin and factor Xa.[34] Historically, bovine-derived heparin was available, but safety concerns and variability in composition led to a global transition toward porcine-derived products.[35]

The porcine origin of heparin is generally absent from labeling and is unknown to many clinicians.[36] When patients request non-porcine options, several alternatives are available. Fondaparinux is a fully synthetic factor Xa inhibitor, while argatroban and bivalirudin provide non-animal direct thrombin inhibition.[36] These agents offer effective substitutes when porcine products are contraindicated or conflict with patient preferences, provided that dosing, renal function, and perioperative safety are carefully considered in consultation with pharmacy or hematology.[37]

Hemostatic drugs (non-device class)

Several topical hemostatic agents contain porcine or bovine proteins.[38] Thrombin solutions derived from animal plasma remain in use for local bleeding control and act by converting fibrinogen to fibrin at the applied surface. These formulations are effective but may trigger immunologic reactions, including factor antibodies or rare coagulation disturbances.[39] Recombinant human thrombin provides a non-animal alternative with comparable efficacy.[40] Gelatin-based hemostatic powders also rely on porcine collagen to create a scaffold for platelet aggregation. Although widely used for their versatility, their animal origin may be relevant for some patients.[38] Increasingly, plant-derived or fully synthetic hemostatic agents, such as oxidized cellulose, starch-based powders, and recombinant thrombin combinations, are available and provide effective non-porcine options.[38]

Because regulatory classification varies by region, these agents may be listed as drugs or devices, and their animal sourcing is inconsistently disclosed. Verification may be necessary when treating patients for whom porcine material presents ethical or religious concerns.[38]

Pharmaceutical excipients and stabilizers

Porcine-derived gelatin is commonly used in capsule shells, biologic formulations, and injectable medications due to its stabilizing properties. Gelatin source—porcine, bovine, or fish—is rarely

specified on labels, and excipient lists may be incomplete or inconsistent across formularies.[41–43] Analyses of commercial products have shown that even when gelatin is listed, the animal origin may not be disclosed, and occasional cross-contamination has been documented.[41,43–46]

Because excipient origin is difficult to confirm through standard labeling, direct manufacturer or pharmacy inquiry is often required when patient preferences hinge on avoiding porcine-derived materials.[47] Although recombinant and plant-based gelatin substitutes are emerging, they are not yet widely used in routine pharmaceutical manufacturing.

Other medications and adjuncts

Legacy formulations of tissue adhesives, ointment bases, and hormonal preparations often incorporated porcine-derived components such as glycerin or enzyme extracts.[48] Most modern equivalents have transitioned to synthetic or plant-derived compounds, though animal-derived products still appear in select compounded or international formulations.[49] These older examples reflect the longstanding reliance on animal-derived materials in pharmaceutical manufacturing and the gradual global shift toward recombinant or synthetic alternatives.[50]

RELIGIOUS PERSPECTIVES RELEVANT TO MEDICAL USE

Islamic jurisprudence (Fiqh)

In Islamic jurisprudence, porcine-derived substances are generally prohibited; however, a long-standing legal principle permits their use when medically necessary and when no suitable alternative exists.[51–54] Contemporary rulings consistently affirm that treatments needed to preserve life or prevent significant harm may involve porcine-derived materials.[53–55]

For clinical practice, the key consideration is not determining permissibility but ensuring transparent disclosure. Many Muslim patients prefer to know when products contain porcine components and to consider alternatives when available. Brief, neutral counseling supports informed decision-making and helps avoid moral distress, particularly in elective procedures.[54,56]

Jewish law (Halakhah)

Jewish law similarly restricts pork consumption but allows prohibited substances when required for health, under the principle of pikuach nefesh. Non-oral medical use such as implants, injectables, or excipients is generally not regarded as dietary ingestion and is permissible when clinically indicated.[5,40,54,57,58]

As with Muslim patients, Jewish patients typically appreciate being informed about product origin when alternatives exist. Providing this information in a neutral, routine manner enhances patient autonomy and aligns with standard informed-consent practices.[4,47,56,59]

Shared ethical principle

Across both traditions, the practical guidance is consistent:
Porcine-derived materials may be used when medically necessary, but patients value the opportunity to be informed and to choose alternatives when feasible.

Although this review focuses on Muslim and Jewish patients, similar considerations apply to patients with strict vegan or other ethical objections to animal-derived medical products, for whom disclosure of material origin may likewise influence treatment preferences.

Thus, the central issue for clinicians is not religious adjudication but respectful, patient-centered disclosure within shared decision-making.

ETHICAL AND LEGAL IMPLICATIONS OF DISCLOSURE

Ethical duties in informed consent

Core ethical principles such as transparency, respect for autonomy, and sensitivity to individual values, require clinicians to disclose information that may influence a patient's decision-making. These expectations are codified in major professional frameworks, including the American Medical Association (AMA) Code of Medical Ethics and the Canadian Medical Association (CMA) Code of Ethics and Professionalism, both of which affirm the physician's duty to provide information material to patient consent.[60,61]

Porcine-derived devices, grafts, or medications fall under this category when cultural, religious, or ethical beliefs make it reasonably foreseeable that product origin may affect treatment acceptance.[62–64] Clinicians are not expected to anticipate every possible objection, but when patient values are known, brief neutral disclosure is ethically appropriate. Documenting these discussions, including alternatives considered and the rationale for the final choice, reinforces patient-centered care and aligns with ethical best practices.[63,64]

Legal considerations and liability

Informed consent law in both the U.S. and Canada is based on materiality: clinicians must disclose information a reasonable patient would consider important when deciding on treatment.[65] A medicolegal issue could arise if a patient with clear religious objections later discovers the intraoperative use of a porcine-derived material, even if the clinical outcome was appropriate.[66]

Although no case specifically addresses this scenario, a claim could theoretically allege inadequate disclosure or emotional distress.[67] The defensibility of such a claim depends on materiality, foreseeability, and documentation. Courts typically judge whether the clinician acted reasonably, not flawlessly, under the circumstances.

Clear documentation of clinical need, discussion of available alternatives, and good-faith communication substantially reduce legal risk.[65] Institutional resources such as accessible product composition lists or formulary notes further support timely disclosure. Overall, concise, proactive communication remains the most effective safeguard against ethical or legal challenge.[68]

PRACTICAL CLINICAL GUIDANCE FOR UROLOGISTS

When to address product composition

Clinicians should consider discussing biomaterial origin when:

- Selecting grafts or slings for stress urinary incontinence or pelvic organ prolapse repair
- Using hemostatic sealants during reconstructive or oncologic surgery
- Choosing biologic tissue scaffolds during urethral or bladder reconstruction
- Prescribing medications that may contain gelatin capsules if the patient has expressed concern

Decision-making algorithm

1. Identify whether the planned product is porcine-derived.
2. Determine if a clinically equivalent synthetic or non-porcine alternative exists.
3. Ask whether the patient would like to review material options.
4. Discuss benefits, limitations, and outcomes of each option neutrally.
5. Document the patient's preference in the operative or clinic note.
6. Use the material that best aligns with both clinical and patient priorities.

When no alternative exists

If the porcine-derived product is clinically superior or necessary:

- Clearly explain the clinical rationale.
- If the patient raises a religious concern, clinicians may note that many religious scholars in both Islamic and Jewish traditions permit the use of otherwise restricted materials when medically necessary.
- Document that the patient understood and consented.

LIMITATIONS

Availability of non-porcine alternatives varies across institutions and regions, and cost or formulary constraints may limit the ability to offer multiple material options. Product composition is inconsistently disclosed in labeling, often requiring manufacturer verification, which may be impractical during time-sensitive surgical planning.

Empirical data on patient perspectives in urology are limited; most guidance derives from broader surgical ethics and religious scholarship rather than urology-specific research. The impact of disclosure on treatment selection, trust, or postoperative satisfaction remains largely unstudied.

Future work should include patient and clinician surveys, evaluation of disclosure practices, and prospective studies comparing outcomes when alternative materials are presented. Strengthening this evidence base will help refine shared decision-making in cases involving porcine-derived products.

CONCLUSIONS

Porcine-derived materials remain integral to urologic practice, including hemostatic agents, grafts, sutures, bulking agents, and anticoagulants. Although clinically effective, their animal origin can be meaningful for patients whose religious, ethical, or cultural values shape medical decisions. Islamic jurisprudence and Jewish law generally permit these products when medically necessary but emphasize respectful disclosure and patient involvement when alternatives exist. Transparent, value-neutral counseling supports patient autonomy, reduces moral distress, and minimizes medicolegal risk when patients later encounter undisclosed material information. Routine verification of product composition through manufacturer documentation, pharmacy services, or institutional resources can help clinicians provide accurate information and discuss available alternatives when appropriate. By combining clear disclosure with reliable verification, urologists can uphold ethical responsibilities while delivering care that is both clinically effective and aligned with diverse patient values.

REFERENCES

1. Sangster P, Morley R. Biomaterials in urinary incontinence and treatment of their complications. *Indian J Urol* 2010;26:221-9. https://doi.org/10.4103/0970-1591.65394
2. Baum J, Baum G, Cox C, et al. Use and efficacy of porcine urinary bladder matrix for tissue regeneration: A review. *Wounds* 2023;35:E339-75. https://doi.org/10.25270/wnds/23024
3. Kim H, Lee SH, Wentworth A, et al. Biodegradable ring-shaped implantable device for intravesical therapy of bladder disorders. *Biomaterials* 2022;288:121703. https://doi.org/10.1016/j.biomaterials.2022.121703
4. Bokek-Cohen Y, Tarabeih M. The use of porcine-derived materials for medical purposes: What do Muslim and Jewish individuals know and opine about it?*J Bioeth Inq* 2022;19:599-612. https://doi.org/10.1007/s11673-022-10203-w
5. Easterbrook C, Maddern G. Porcine and bovine surgical products: Jewish, Muslim, and Hindu perspectives. *Arch Surg* 2008;143:366-70. https://doi.org/10.1001/archsurg.143.4.366
6. Varkey B. Principles of clinical ethics and their application to practice. *Med Princ Pract* 2021;30:17-28. https://doi.org/10.1159/000509119
7. Davis NF, Cunnane EM, Quinlan MR, et al. Biomaterials and regenerative medicine in urology. *Adv Exp Med Biol* 2018;1107:189-98. https://doi.org/10.1007/5584_2017_139
8. Davis NF, McGuire BB, Callanan A, et al. Xenogenic extracellular matrices as potential biomaterials for interposition grafting in urological surgery. *J Urol* 2010;184:2246-53. https://doi.org/10.1016/j.juro.2010.07.038
9. Liu L, Li D, Wang Y, et al. Evaluation of the biocompatibility and mechanical properties of xenogeneic (porcine) extracellular matrix (ECM) scaffold for pelvic reconstruction. *Int Urogynecol J* 2011;22:221-7. https://doi.org/10.1007/s00192-010-1288-9
10. Mantovani F, Trinchieri A, Castelnuovo C, et al. Reconstructive urethroplasty using porcine acellular matrix. *Eur Urol* 2003;44:600-2. https://doi.org/10.1016/s0302-2838(03)00212-4
11. Lin H-K, Godiwalla SY, Palmer B, et al. Understanding roles of porcine small intestinal submucosa in urinary bladder regeneration: Identification of variable regenerative characteristics of small intestinal submucosa. *Tissue Eng Part B Rev* 2014;20:73-83. https://doi.org/10.1089/ten.TEB.2013.0126
12. MacDonald MH, Zhang G, Tasse L, et al. Hemostatic efficacy of two topical adjunctive hemostats in a porcine spleen biopsy punch model of moderate bleeding. *J Mater Sci Mater Med* 2021;32:127. https://doi.org/10.1007/s10856-021-06586-8
13. Gill IS, Ramani AP, Spaliviero M, et al. Improved hemostasis during laparoscopic partial nephrectomy using gelatin matrix thrombin sealant. *Urology* 2005;65:463-6. https://doi.org/10.1016/j.urology.2004.10.030
14. Nasso G, Piancone F, Bonifazi R, et al. Prospective, randomized clinical trial of the FloSeal matrix sealant in cardiac surgery. *Ann Thorac Surg* 2009;88:1520-6. https://doi.org/10.1016/j.athoracsur.2009.07.014
15. Topical Hemostatic Agents at Time of Obstetric and Gynecologic Surgery.
16. Donnelly P, Soares R, Eynon A, et al. Animal products in neurosurgery - navigating informed consent. *Br J Neurosurg* 2025;39:409-12. https://doi.org/10.1080/02688697.2023.2256875

17. Skowronek K, Łabuś W, Stojko R, et al. Application of acellular dermal matrix in gynaecology-a current review. *J Clin Med* 2022;11:4030. https://doi.org/10.3390/jcm11144030
18. Sadłocha M, Skowronek K, Łabuś W, et al. Acellular dermal matrices as an new alternative for treatment in reproductive organ static disorders: *A pilot study. J Clin Med* 2024;13:1550. https://doi.org/10.3390/jcm13061550
19. Ross JW. Porcine dermal hammock for repair of anterior and posterior vaginal wall prolapse: 5-Year outcome. *J Minim Invasive Gynecol* 2008;15:459-65. https://doi.org/10.1016/j.jmig.2008.04.009
20. Davis NF, McGuire BB, Callanan A, et al. Xenogenic extracellular matrices as potential biomaterials for interposition grafting in urological surgery. *J Urol* 2010;184:2246-53. https://doi.org/10.1016/j.juro.2010.07.038
21. Wang H, Sun WQ. Comparative proteomic analysis of regenerative acellular matrices: The effects of tissue source and processing method. *J Biomed Mater Res B Appl Biomater* 2023;111:2002-12. https://doi.org/10.1002/jbm.b.35300
22. Davis NF, Kheradmand F, Creagh T. Injectable biomaterials for the treatment of stress urinary incontinence: Their potential and pitfalls as urethral bulking agents. *Int Urogynecol J* 2013;24:913-9. https://doi.org/10.1007/s00192-012-2011-9
23. Dmochowski RR, Appell RA. Injectable agents in the treatment of stress urinary incontinence in women: where are we now? *Urology* 2000;56:32-40. https://doi.org/10.1016/s0090-4295(00)01019-0
24. Zoorob D, Karram M. Bulking agents: a urogynecology perspective. *Urol Clin North Am* 2012;39:273-7. https://doi.org/10.1016/j.ucl.2012.06.012
25. Bent AE, Foote J, Siegel S, et al. Collagen implant for treating stress urinary incontinence in women with urethral hypermobility. *J Urol* 2001;166:1354-7. https://doi.org/10.1016/S0022-5347(05)65768-0
26. Gorton E, Stanton S, Monga A, et al. Periurethral collagen injection: A long-term follow-up study. *BJU Int* 1999;84:966-71. https://doi.org/10.1046/j.1464-410x.1999.00321.x
27. Updates to surgical treatment of female stress urinary incontinence (SUI): AUA/SUFU Guideline. Journal of Urology 2023. https://www.auajournals.org/doi/10.1097/JU.0000000000003435?url_ver=Z39.88-2003&rfr_id=ori%3Arid%3Acrossref.org&rfr_dat=cr_pub++0pubmed
28. Hoe V, Haller B, Yao HH, et al. Urethral bulking agents for the treatment of stress urinary incontinence in women: A systematic review. *Neurourol Urodyn* 2021;40:1349-88. https://doi.org/10.1002/nau.24696
29. Hussain SM, Bray R. Urethral bulking agents for female stress urinary incontinence. *Neurourol Urodyn* 2019;38:887-92. https://doi.org/10.1002/nau.23924
30. Hillary CJ, Roman S, MacNeil S, et al. Regenerative medicine and injection therapies in stress urinary incontinence. 2020;17:151-61. https://doi.org/10.1038/s41585-019-0273-4
31. Wang Y, Duan M, Rahman M, et al. Use of bioactive extracellular matrix fragments as a urethral bulking agent to treat stress urinary incontinence. *Acta Biomater* 2020;117:156-66. https://doi.org/10.1016/j.actbio.2020.09.049
32. Baytas SN, Linhardt RJ. Advances in the preparation and synthesis of heparin and related products. *Drug Discov Today* 2020;25:2095-109. https://doi.org/10.1016/j.drudis.2020.09.011

33. Douaisi M, Paskaleva EE, Fu L, et al. Synthesis of bioengineered heparin chemically and biologically similar to porcine-derived products and convertible to low MW heparin. *Proc Natl Acad Sci U S A* 2024;121:e2315586121. https://doi.org/10.1073/pnas.2315586121
34. Tovar AMF, Santos GRC, Capillé NV, et al. Structural and haemostatic features of pharmaceutical heparins from different animal sources: challenges to define thresholds separating distinct drugs. *Sci Rep* 2016;6:35619. https://doi.org/10.1038/srep35619
35. Fu L, Li G, Yang B, et al. Structural characterization of pharmaceutical heparins prepared from different animal tissues. *J Pharm Sci* 2013;102:1447-57. https://doi.org/10.1002/jps.23501
36. Douaisi M, Paskaleva EE, Fu L, et al. Synthesis of bioengineered heparin chemically and biologically similar to porcine-derived products and convertible to low MW heparin. *Proc Natl Acad Sci U S A* 2024;121:e2315586121. https://doi.org/10.1073/pnas.2315586121
37. Bokek-Cohen Y. The need to adjust the informed consent for Jewish patients for treatments involving porcine medical constituents. *J Immigr Minor Health* 2023;25:142-50. https://doi.org/10.1007/s10903-022-01383-z
38. Hong YM, Loughlin KR. The use of hemostatic agents and sealants in urology. *J Urol* 2006;176:2367-74. https://doi.org/10.1016/j.juro.2006.07.128
39. Evans LA, Morey AF. Hemostatic agents and tissue glues in urologic injuries and wound healing. *Urol Clin North Am* 2006;33:1-12, v. https://doi.org/10.1016/j.ucl.2005.10.004
40. Rosner F. Medical confidentiality and patient privacy: the Jewish perspective. *Cancer Invest* 2006;24:113-5. https://doi.org/10.1080/07357900500449660
41. Hassan M, Hussain D, Kanwal T, et al. Methods for detection and quantification of gelatin from different sources. *Food Chem* 2024;438:137970. https://doi.org/10.1016/j.foodchem.2023.137970
42. Ali E, Sultana S, Hamid SBA, et al. Gelatin controversies in food, pharmaceuticals, and personal care products: Authentication methods, current status, and future challenges. *Crit Rev Food Sci Nutr* 2018;58:1495-511. https://doi.org/10.1080/10408398.2016.1264361
43. Yap BK, Gam L-H. Differentiation of bovine from porcine gelatin capsules using gel electrophoresis method. *Food Chem* 2019;274:16-9. https://doi.org/10.1016/j.foodchem.2018.08.111
44. Kwon J, Shin D, Park GW, et al. A comprehensive quantitative LC-MS/MS method for rapid gelatin source identification in food products: Comparison with PCR. *Food Res Int* 2025;201:115611. https://doi.org/10.1016/j.foodres.2024.115611
45. Mohamad NA, Mustafa S, Khairil Mokhtar NF, et al. Molecular beacon-based real-time PCR method for detection of porcine DNA in gelatin and gelatin capsules. *J Sci Food Agric* 2018;98:4570-7. https://doi.org/10.1002/jsfa.8985
46. Garcia-Vaquero M, Mirzapour-Kouhdasht A. A review on proteomic and genomic biomarkers for gelatin source authentication: Challenges and future outlook. *Heliyon* 2023;9:e16621. https://doi.org/10.1016/j.heliyon.2023.e16621
47. Lababidi H, Bobier C, Rodger D. Animal-derived ingredients in medicines: A framework for ethical prescribing practices. *Front Pharmacol* 2025;16:1693059. https://doi.org/10.3389/fphar.2025.1693059

48. Dome P, Tombor L, Lazary J, et al. Natural health products, dietary minerals and over-the-counter medications as add-on therapies to antidepressants in the treatment of major depressive disorder: A review. Brain Res Bull 2019;146:51-78. https://doi.org/10.1016/j.brainresbull.2018.12.015
49. Zhang Q-D, Duan Q-Y, Tu J, et al. Thrombin and thrombin-incorporated biomaterials for disease treatments. *Adv Healthc Mater* 2024;13:e2302209. https://doi.org/10.1002/adhm.202302209
50. Almarzouqi F, Rennekampff H-O, Almarzouki M, et al. Porcine-derived biomaterials in tissue engineering and reconstructive surgery: Considerations and alternatives in Muslim patients. *J Tissue Eng Regen Med* 2019;13:253-60. https://doi.org/10.1002/term.2788
51. Almarzouqi F, Rennekampff H-O, Almarzouki M, et al. Porcine-derived biomaterials in tissue engineering and reconstructive surgery: Considerations and alternatives in Muslim patients. *J Tissue Eng Regen Med* 2019;13:253-60. https://doi.org/10.1002/term.2788
52. Porcine and Bovine surgical products: Jewish, Muslim, and Hindu perspectives | Surgery | JAMA Surgery | JAMA Network. https://jamanetwork.com/journals/jamasurgery/fullarticle/599037?utm_source=openevidence&utm_medium=referral. Accessed November 7, 2025.
53. Isa NM. Darurah (Necessity) and its application in Islamic erhical assessment of medical applications: A review on Malaysian fatwa. *Sci Eng Ethics* 2016;22:1319-32. https://doi.org/10.1007/s11948-015-9698-1
54. Koshy RM, Kane EG, Grocock C. A review of the use of biological mesh products in modern UK surgical practice: A religious and cultural perspective. *Ann R Coll Surg Engl* 2020;102:566-70. https://doi.org/10.1308/rcsann.2020.0114
55. Inhorn MC, Serour GI. Islam, medicine, and Arab-Muslim refugee health in America after 9/11. *Lancet* 2011;378:935-43. https://doi.org/10.1016/S0140-6736(11)61041-6
56. Goyal D, Goyal A, Brittberg M. Consideration of religious sentiments while selecting a biological product for knee arthroscopy. *Knee Surg Sports Traumatol Arthrosc* 2013;21:1577-86. https://doi.org/10.1007/s00167-012-2292-z
57. Mathieu R. Jewish ethics and xenotransplantation. *Xenotransplantation* 2016;23:258-68. https://doi.org/10.1111/xen.12247
58. Box Bayes J. What are the attitudes of strictly-orthodox Jews to clinical trials: Are they influenced by Jewish teachings? *J Med Ethics* 2013;39:643-6. https://doi.org/10.1136/medethics-2012-100658
59. Sattar SP, Ahmed MS, Madison J, et al. Patient and physician attitudes to using medications with religiously forbidden ingredients. *Ann Pharmacother* 2004;38:1830-5. https://doi.org/10.1345/aph.1E001
60. Borysowski J, Ehni H-J, Górski A. Ethics codes and medical decision making. *Patient Educ Couns* 2021;104:1312-6. https://doi.org/10.1016/j.pec.2020.10.034
61. Etchells E, Sharpe G, Burgess MM, et al. Bioethics for clinicians: 2. Disclosure. *CMAJ* 1996;155:387-91.
62. Rodger D. Why we should stop using animal-derived products on patients without their consent. *J Med Ethics* 2021;medethics-2021-107371. https://doi.org/10.1136/medethics-2021-107371

63. Lababidi H, Bobier C, Rodger D. Animal-derived ingredients in medicines: A framework for ethical prescribing practices. *Front Pharmacol* 2025;16:1693059. https://doi.org/10.3389/fphar.2025.1693059
64. Donnelly P, Soares R, Eynon A, et al. Animal products in neurosurgery - navigating informed consent. *Br J Neurosurg* 2025;39:409-12. https://doi.org/10.1080/02688697.2023.2256875
65. Bal BS, Choma TJ. What to disclose? Revisiting informed consent. *Clin Orthop Relat Res* 2012;470:1346-56. https://doi.org/10.1007/s11999-011-2232-0
66. Dickens BM, Cook RJ. Dimensions of informed consent to treatment. *Int J Gynaecol Obstet* 2004;85:309-14. https://doi.org/10.1016/j.ijgo.2004.03.001
67. Bokek-Cohen Y. The need to adjust the informed consent for Jewish patients for treatments involving porcine medical constituents. *J Immigr Minor Health* 2023;25:142-50. https://doi.org/10.1007/s10903-022-01383-z
68. Giudici-Wach K, Gillois P, Remen T, et al. Learning from informed consent litigation to improve practices: A systematic review. *Patient Educ Couns* 2022;105:1714-21. https://doi.org/10.1016/j.pec.2021.10.009

FIGURES AND TABLES

Table 1. Selected porcine-derived devices and surgical materials in urologic practice and potential alternatives

Device category	Representative examples (brand)	Common urologic use	Porcine-derived component	Potential non-porcine or synthetic alternatives
Acellular dermal matrices (ADMs) / biologic grafts	XenMatrix®, Strattice®, Pelvicol®	Pelvic organ prolapse repair, stress urinary incontinence, urethral and bladder reconstruction	Porcine dermal collagen scaffold produced via decellularization	Synthetic polypropylene mesh, autologous fascia lata, or human ADM
Biologic slings	Institution-specific porcine dermal slings	Female stress urinary incontinence repair	Porcine dermal collagen sling scaffold	Synthetic mid-urethral sling (polypropylene mesh) or autologous fascia sling
Collagen-based injectable bulking agents (legacy)	Contigen®	Urethral bulking for stress urinary incontinence	Collagen derived from bovine/porcine tissue	Synthetic hydrogels such as polyacrylamide hydrogel or calcium hydroxylapatite
Hemostatic agents (device-class)	FloSeal®, Surgiflo®	Local hemostasis during endoscopic, laparoscopic, or open pelvic/renal surgery	Porcine gelatin matrix	Oxidized regenerated cellulose, plant-based starch hemostats, or recombinant human thrombin
Sutures (absorbable)	Plain gut, chromic gut	Soft-tissue approximation and ligation	Porcine or bovine intestinal collagen	Synthetic absorbable sutures
Catheters / device Coatings (legacy)	Coatings (legacy) Gelatin- or collagen-coated catheters	Reduction of urethral friction and mucosal shear	Porcine collagen or gelatin in coating layer	Silicone-, PTFE-, or hydrogel-coated catheters

Table 2. Common medications and perioperative adjuncts with potential porcine origin and suggested alternatives

Category	Porcine source/component	Potential non-porcine or synthetic alternatives	Clinical notes
Anticoagulants (LMWH/UFH) Examples: Heparin (UFH), enoxaparin (Lovenox®), tinzaparin (Innohep®)	Porcine intestinal mucosa (heparin source)	Fondaparinux, Bivalirudin, Argatroban	LMWHs and UFH are porcine-derived globally; synthetic agents are fully non-animal.
Hemostatic drugs (non-device) Examples: topical gelatin powders; recombinant human thrombin (Recothrom®)	Porcine gelatin and/or thrombin	Recombinant human thrombin, plant-based oxidized cellulose agents	Verify composition of topical agents used outside device classifications.
Pharmaceutical excipients/capsules	Porcine or bovine gelatin as capsule shell or stabilizer	HPMC (vegetable) capsules, non-animal stabilizers (recombinant or plant polysaccharides)	Source rarely indicated on labels; confirm with manufacturer for faith-based patients.
Topical dressings/adhesives (containing gelatin)	Porcine gelatin binder	Silicone-, polyurethane-, or cellulose-based dressings	Modern synthetic alternatives have largely replaced porcine adhesives.
Hormonal/biologic preparations (rare in urology)	Porcine enzymes or gelatin stabilizers	Recombinant human hormones or gelatin-free formulations	Include only if relevant to perioperative care or comorbidity management.