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### Fractal analysis unlocks new potential in xenopericardia for percutaneous aortic valve engineering

The growing demand for percutaneous aortic valves raises concerns about durability, which is limited by tissue degeneration and/or leaflet calcification, particularly in younger patients. To address this limitation, previous studies demonstrated the possible benefits of using donkey or kangaroo pericardia due to their mechanical characteristics. With the ultimate goal of outlasting patient lifespan, donkey and kangaroo xenopericardia are studied through a multidimensional analysis to provide insights into potential histological and biotribological benefits. At a macroscopic scale, kangaroo and donkey pericardia appeared smoother on the serous side while their fibrous side demonstrated a more dispersed organization. From a microstructural perspective, the results indicate that both xenopericardia showed suitable laminar distribution with layered collagen bundles and minimum interstitial cells. Both fiber organizations displayed collagen fibers sinusoidally crimped with periodicity equivalent to bovine collagen crimp period. Using fractal and texture analysis, both tissue species exhibited optimal biotribological responses with potential controlled friction, minimal wear, and lubricant retention capacity. Results suggested that both kangaroo and donkey could be used in cardiovascular implantology which could benefit from their biotribological capacity and laminar organization. It is anticipated that these findings will draw attention to these xenopericardia as potential manufacturing materials and provide interest for additional testing regarding fatigue resistance and crimping resistance. Preference should however be granted to farmed animals.

#### Biography

Robert Guidoin PhD is professor of surgery (biomaterials) at Laval University, Québec, QC (Canada). He studied chemistry at the University of Nantes, France, from 1967-1970. After spending a post-doctoral year at the FAU Erlangen-Nürnberg, Germany, he came to Laval University in 1971 to investigate the blood compatibility of medical devices, such as membrane oxygenators and dialyzers. Further to a specific training in bioengineering at Strathclyde University, Glasgow, Scotland, he was appointed assistant professor of surgery (biomaterials) at Laval University in 1976 before becoming a full professor in 1986. He was appointed as a member of the International College of Fellows of Biomaterials Science and Engineering in 1996, and Fellow of the American Institute for Medical and Biological Engineering in 1998. He was a member of the Sciences Council of Canada (1987-1992). He became Honorary Faculty at Chongqing University, China, the Medical University of Varna, Bulgaria, the University of Sichuan, China, and the Donghua University, China, in 1994, 2001, 2010, and 2013, respectively. He became International Honorary Faculty of the Society of Endovascular and Chinese medical Doctor Association in 2015. He entered the Canadian Who is Who in 1992. He has made important contributions in the field of vascular and endovascular grafts, heart valves, mechanical hearts, membrane oxygenators, auditor ossicles, breast implants and intra-uterine devices. He has trained many students (35 MSc, 21 PhD, 11 post-doc), and 12 visiting professors on sabbatical leave at his research facilities. During the last decade, he has actively participated in the 111 Program of the Chinese Ministry of Education at Donghua University, Shanghai, China. He was the founder and the first scientific director of the Quebec Biomedical Institute (1992-2000). He has published more than 300 scientific papers, 24 book chapters, 2 books as co-editor, and has presented his research at numerous meetings worldwide. Robert Guidoin is an internationally leading expert in cardiovascular devices, especially those used for percutaneous techniques.