

Silver Graft

Next generation of antimicrobial
vascular prostheses

Silver Graft

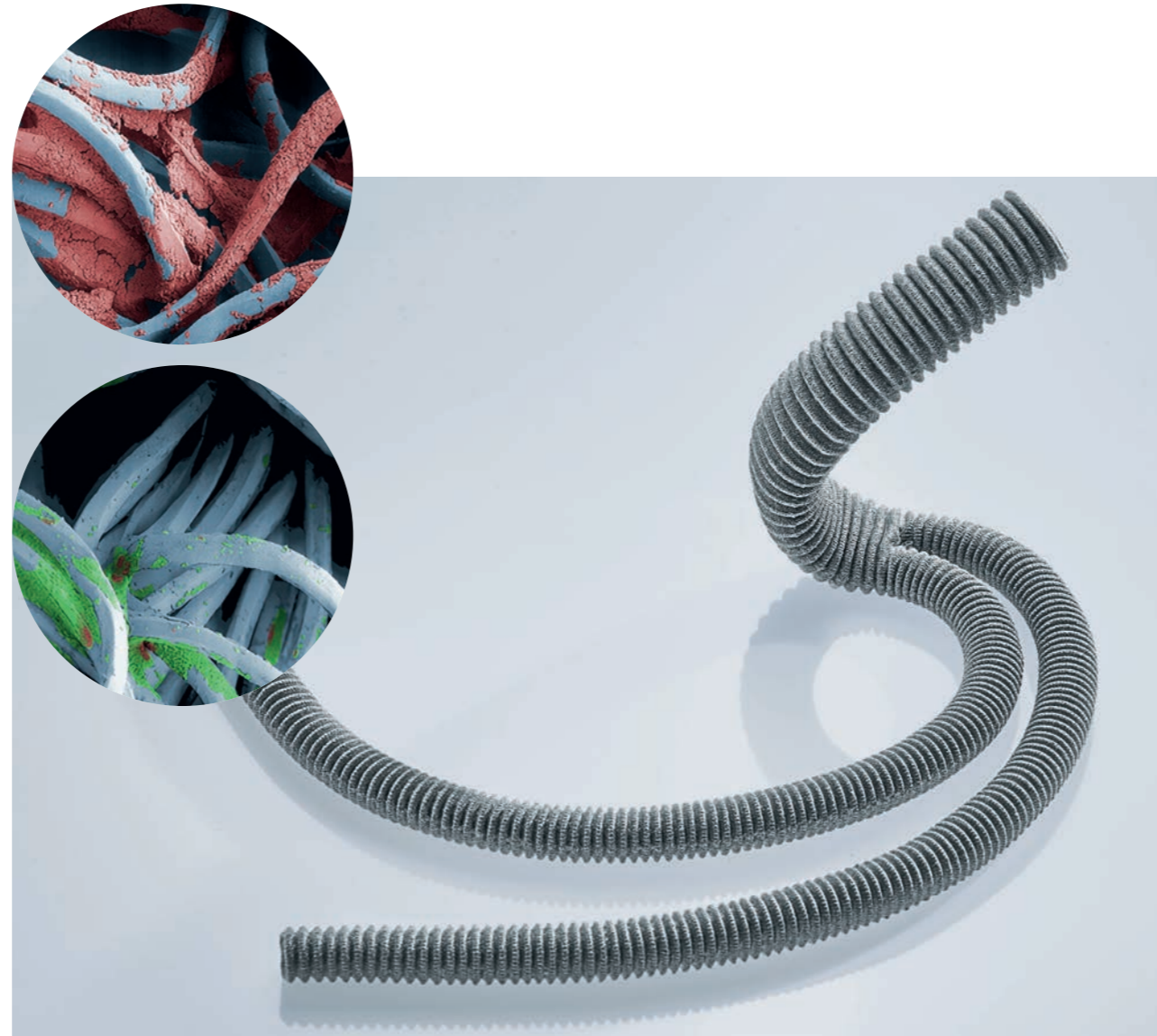
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Vascular graft infection

Despite the use of prophylactic antibiotics in vascular surgery, the infection rate remains 2 - 5%. Many of these vascular graft infections occur at three months or later. If infected the amputation rate lies between 15 - 60% and the mortality rate exceeds 25%. Besides *Staphylococcus spec.* a broad spectrum of microorganisms can cause graft infections.^{1,2} With the approach to prevent bacterial colonization after implantation and to reduce the risk of late infection, Silver Graft was developed.

Why silver?

- Effective in low concentration: Inactivates DNA replication, protein biosynthesis and membrane potential of microorganisms³
- Broad spectrum of efficacy
- No documented silver resistance of pathogenic microorganisms³
- Efficacy against increasingly detected methicillin-resistant *Staphylococcus aureus* (MRSA)^{4,4a}

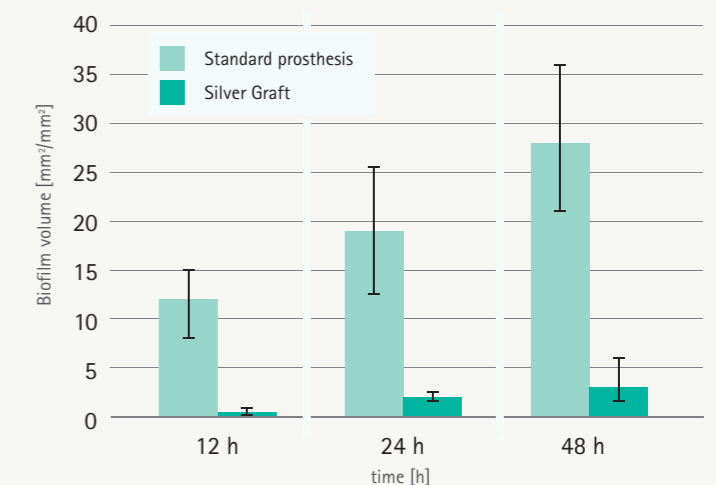


Reduction of bacterial growth

Silver Graft significantly reduces bacterial growth in vitro and in vivo

Both the extent of biofilm formation and the proportion of viable biofilm cells were significantly diminished on the surface of Silver Graft^{4,5}

Incubation with staphylococcus aureus⁴



¹ Inui, Tazo; Bandyk, Dennis F. (2015): Vascular surgical site infection: risk factors and preventive measures. In: *Seminars in vascular surgery* 28 (3-4), S. 201-207.

² Zühlke, Helmut; Halloul, Zuhir; Zippel, Roland (Hg.) (2019): *Septische Gefäßmedizin*. Stuttgart, New York, Stuttgart: Georg Thieme Verlag; Thieme.

³ Silver S. Bacterial silver resistance: molecular biology and uses and misuses of silver compounds. *FEMS Microbiol Rev.* 2003 Jun;27(2-3):341-53.

⁴ Strathmann M, Wingender J. 2004. Use of an oxonol dye in combination with confocal laser scanning microscopy to monitor damage to *Staphylococcus aureus* cells during colonization of silver-coated vascular grafts. *Intern J Antimicrob Agents*, 24: 234-240.

^{4a} Wilson, Walter R.; Bower, Thomas C.; Creager, Mark A.; Amin-Hanjani, Sepideh; O'Gara, Patrick T.; Lockhart, Peter B. et al. (2016): Vascular Graft Infections, Mycotic Aneurysms, and Endovascular Infections: A Scientific Statement From the American Heart Association. In: *Circulation* 134 (20), e412-e460.

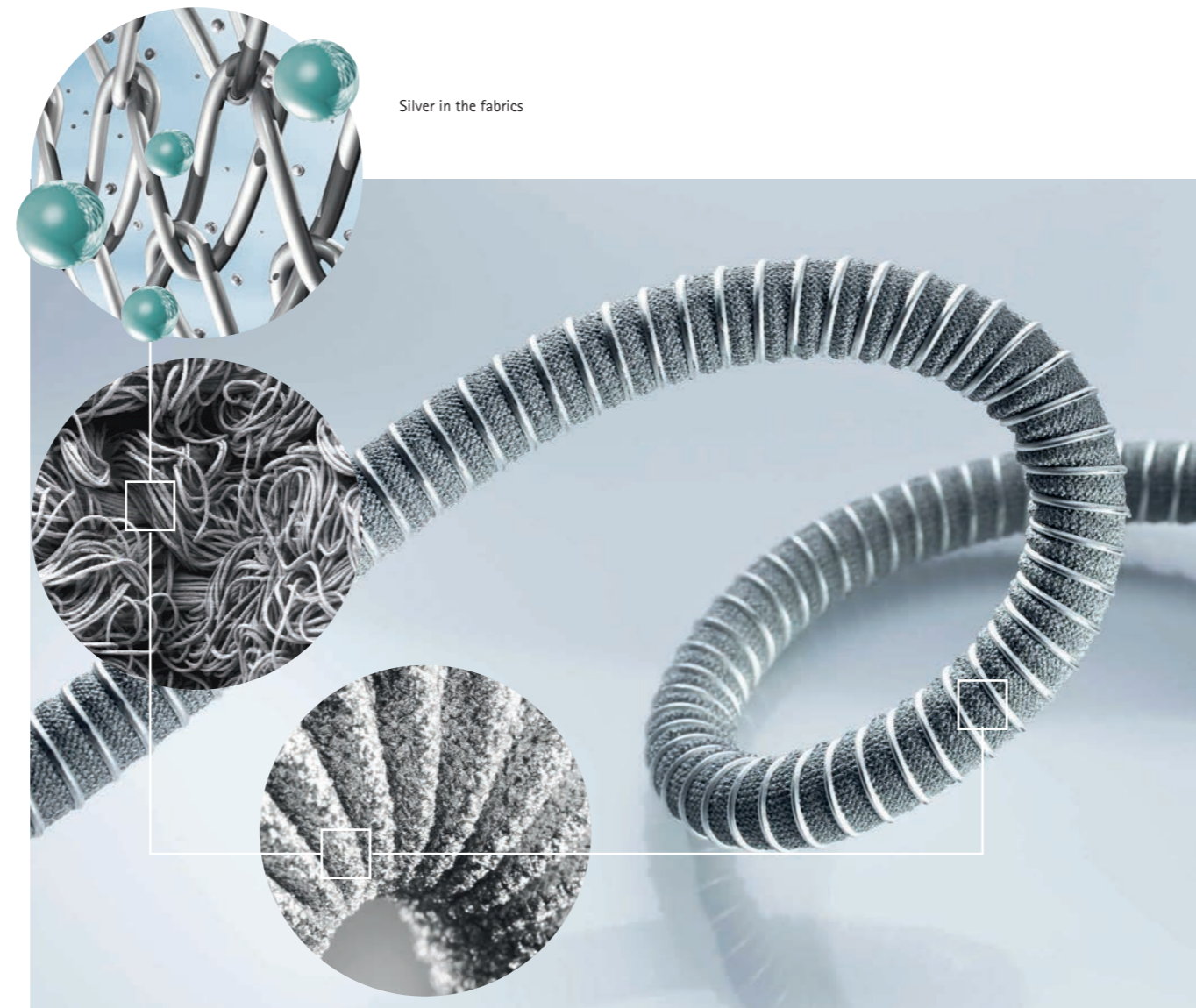
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Silver in coating is gold in protection

Why Silver Graft?

- Facilitates long term inhibition of bacterial colonization due to direct embedding of silver in the textile fabrics⁴
- Significantly reduces the adhesion of microorganisms *in vitro* and *in vivo*⁵
- Supports gentle and natural healing⁵



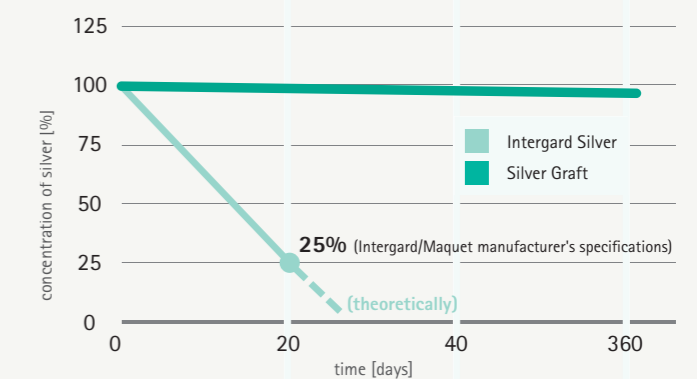
Designed for prophylactic long term protection against vascular graft infections.

⁴ Ueberrueck T, Zippel R, Tautenhahn J, Gastinger I, Lippert H, Wahlers T. 2005. Vascular graft infections: *in vitro* and *in vivo* investigations of a new vascular graft with longterm protection. *J Biomed Mater Res B Appl Biomater*, 74(1):601-607.

Facilitation of long term prevention

To enable an effective long term protection the silver coating is directly embedded in the textile fabric of the prosthesis. Silver Graft retains approx. 98% of its silver load after one year under laboratory conditions.⁶

Elution of silver over time⁶

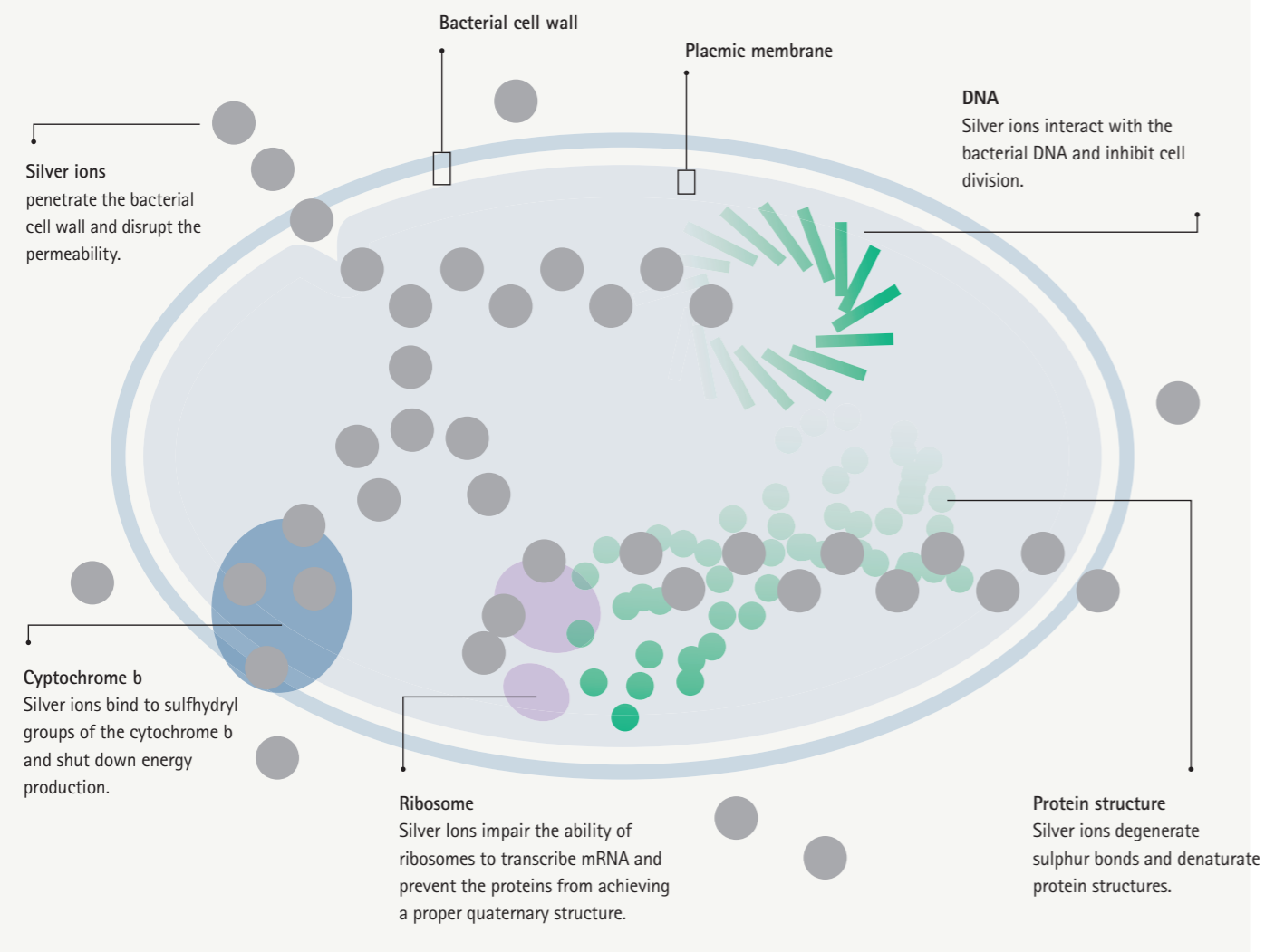


⁶ Ueberrueck T, Meyer L, Zippel R, Nestler G, Wahlers T, Gastinger I. 2005. Healing Characteristics of a New Silver-Coated, Gelatine Impregnated Vascular Prosthesis in the Porcine Model. *Zentralbl Chir*, 130:71-76.

Innovations for vascular surgery

Designed for Prophylactic long term protection

Impact van zilver ionen op bacteriën ⁷



- Reduces the adhesion of bacteria in vitro / in vivo. ^{4,5}
- Protects against microorganisms in vitro / in vivo. ^{4,5}
- Designed for long-term inhibition of vascular graft infection.
- Can implanted prophylactically as protection against vascular graft infection.
- Additional soaking in antibiotics (e.g. Rifampicin) is possible.
- Exhibits excellent biocompatibility. ⁶
- Supports complication free healing. ⁶
- MRI compatible.

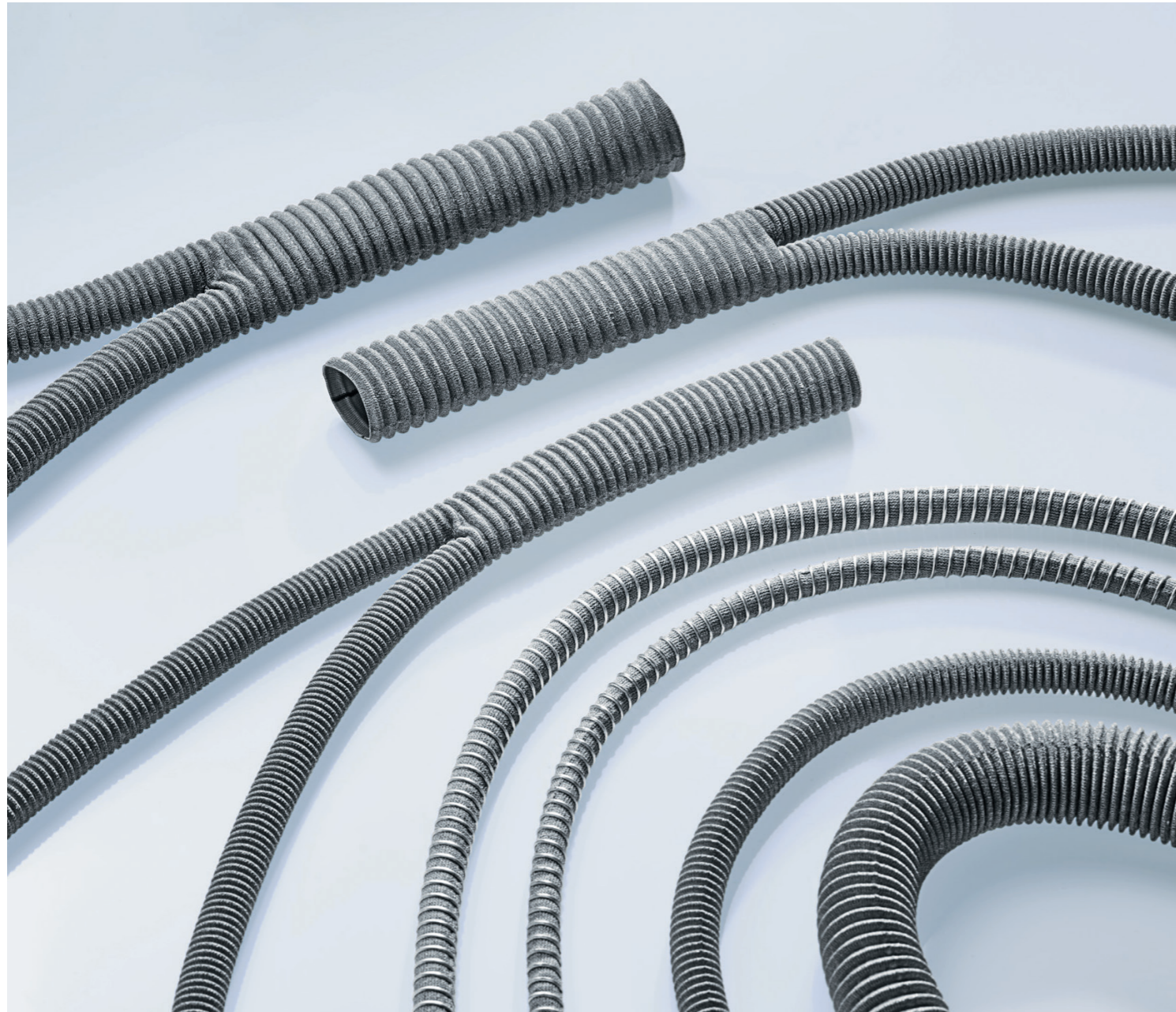


⁷ Kędziora A, Speruda M, Krzyżewska E, Rybka J, Lukowiak A, Bugla-Płoskońska G. Similarities and Differences between Silver Ions and Silver in Nanoforms as Antibacterial Agents. *Int. J. Mol. Sci.* 2018, 19(2), 444.

Silver Graft significantly reduces bacterial growth in vitro and in vivo ^{4,5}

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Straight tubes

| Usable Length (cm) | Diameter (mm) | Product Code |
|--------------------|---------------|--------------|
| 15 | 8 | 1108000 |
| | 10 | 1108030 |
| | 12 | 1108032 |
| | 14 | 1108034 |
| | 16 | 1108001 |
| | 18 | 1108002 |
| | 20 | 1108003 |
| | 22 | 1108042 |
| 30 | 24 | 1108044 |
| | 8 | 1108004 |
| | 14 | 1108005 |
| | 16 | 1108006 |
| | 18 | 1108007 |
| | 20 | 1108008 |
| | 22 | 1108062 |
| | 24 | 1108064 |
| 40 | 6 | 1108009 |
| | 7 | 1108010 |
| | 8 | 1108011 |
| | 10 | 1108050 |
| | 12 | 1108052 |
| | 6 | 1108012 |
| 60 | 7 | 1108013 |
| | 8 | 1108014 |

Helix supported

| Usable Length (cm) | Diameter (mm) | Product Code |
|--------------------|---------------|--------------|
| 30 | 8 | 1108026 |
| 40 | 8 | 1108027 |
| 60 | 6 | 1108022 |
| | 8 | 1108023 |
| 90 | 6 | 1108024 |
| | 8 | 1108025 |

Bifurcations

| Usable Length (cm) | Diameter (mm) | Product Code |
|--------------------|---------------|--------------|
| 40 | 12 x 6 | 1108021 |
| | 14 x 7 | 1108017 |
| | 16 x 8 | 1108015 |
| | 18 x 9 | 1108016 |
| | 20 x 10 | 1108018 |
| | 22 x 11 | 1108019 |
| | 24 x 12 | 1108020 |

Axillo-Bifemoral

| Usable Length (cm) | Diameter (mm) | Product Code |
|--------------------|---------------|--------------|
| 90/60 | 8 | 1108080 |

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V02/2023