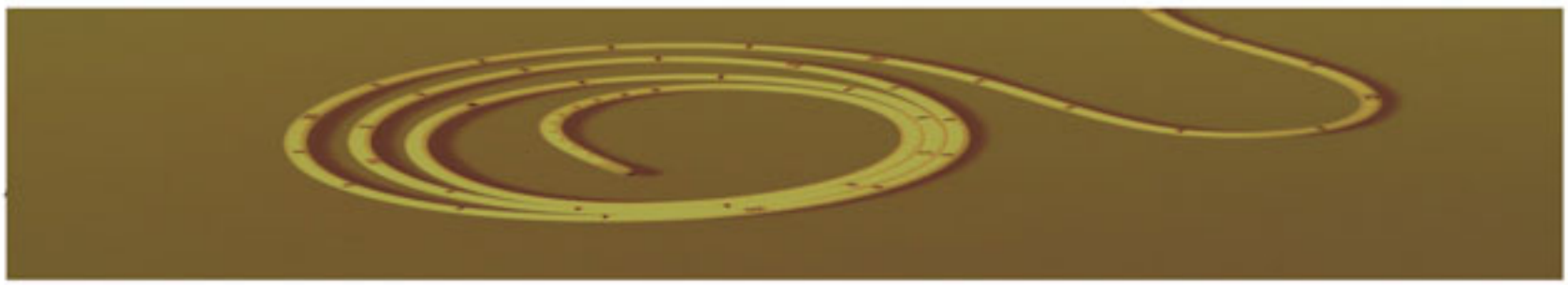
Spiegelberg:

Antimicrobial Peritoneal Catheters



Antimicrobial EVD Cateheters

Silverline Catheters are impregnated with 2% of nanoparticles of silver and an unsoluble silver salt. Silver ions are a strong antiseptic. Because of the nanometer size of the particles the specific surface is large, which results in the release of ions in antimicrobial concentration on the surface of the catheter.

The silver salt starts to release silver ions immediately when it gets in contact with body fluid. The release of silver ions from the silver salt stops after some hours. At that time the silver particles begin to release silver ions.

The combination of a fast acting substance and a slow acting substance results in an optimal short term and long term effect.

In three different shapes

Silverline Antimicrobial Ventricular Catheter 8F

Order Number	EVD 30.010.02
Material	Polyurethane
Outside Diameter	2.7 mm
Inside Diameter	1.6 mm
Length	270 mm

The catheter has numbered depth marks.

The slitted suturing wing is used for the fixation to the skin.

The Luer-Lock Connector adapts the catheter to the EVD-Kit.

The trocar is used for tunneling the catheter.

The stylet is used to introduce the catheter into the ventricle.

Silverline Antimicrobial Ventricular Catheter with Hollow Stylet 8F 'Heese'

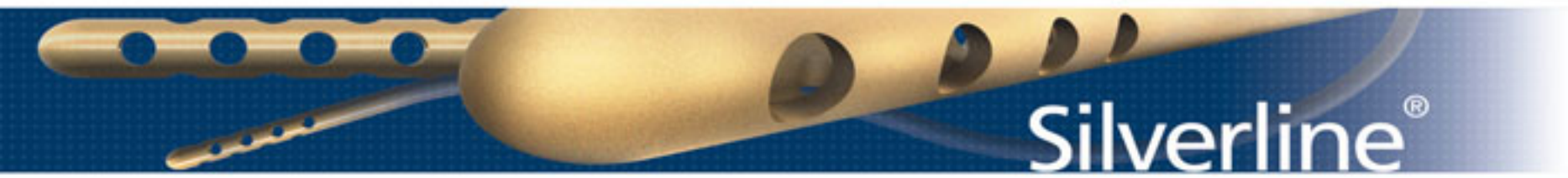
Order Number	EVD 30.012.02
Material	Polyurethane
Outside Diameter	2.7 mm
Inside Diameter	1.6 mm
Length	200 mm

CSF is released through the hollow stylet when the ventricle is punctured.

Silverline Antimicrobial Short Ventricular Catheter 8F

Order Number	EVD 30.011.02
Material	Polyurethane
Outside Diameter	2.7 mm
Inside Diameter	1.6 mm
Length	100 mm

The Luer-Lock connector for the connection with the EVD-Kit is attached to the catheter.



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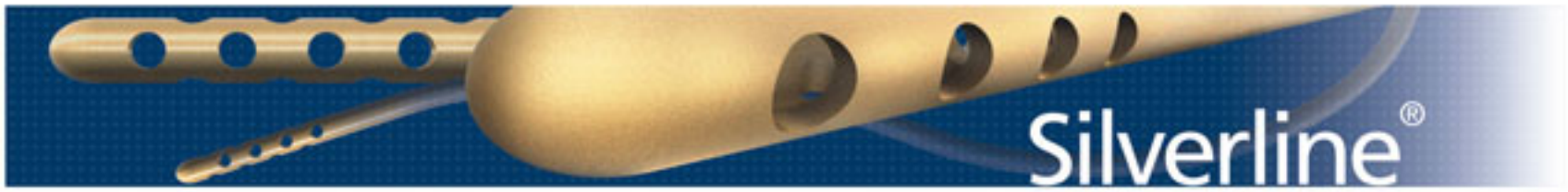


Scientific Information

Problem
Infections are a serious complication of external ventricular drainage. Even with best surgical technique and utmost aseptic handling measures infections cannot be avoided completely (1, 3, 5).

For ventricular catheters impregnated with antibiotics a reduction of the rate of infection was described (7). In the product used for that study a combination of two antibiotics is used (Rifampicin and Minocyclin). Also a product is on the market that uses a combination of Rifampicin and Clindamycin. However, antibiotics can generate resistancies when used prophylactiely. Also an increasing proportion of device-related infections are being caused by Candida (9).

Method
Silverline Catheters are impregnated with 2% of nanoparticles of silver and an unsoluble silver salt. Silver ions are a strong antiseptic with a broad spectrum (4, 6). Should a resistancy to silver develop under the influence of the the silver ions, the antibiotic therapy will still be possible.

The nanometer-size particles have a large specific surface resulting in the release of silver ions in antiseptic concentration on the surface of the catheter.

The silver salt starts to release silver ions in antiseptic concentration immediately after placement of the catheter. The release of silver ions from the silver particles starts several hours later, when the ion release from the silver salt slows down. The release of silver ions from the silver particles then continues over a long interval.

Silver inactivates the enzyme systems with SH-groups of the cell wall that are active in the transmembraneous energy metabolism. Silver ions block the breathing chain of the bacteria (6).

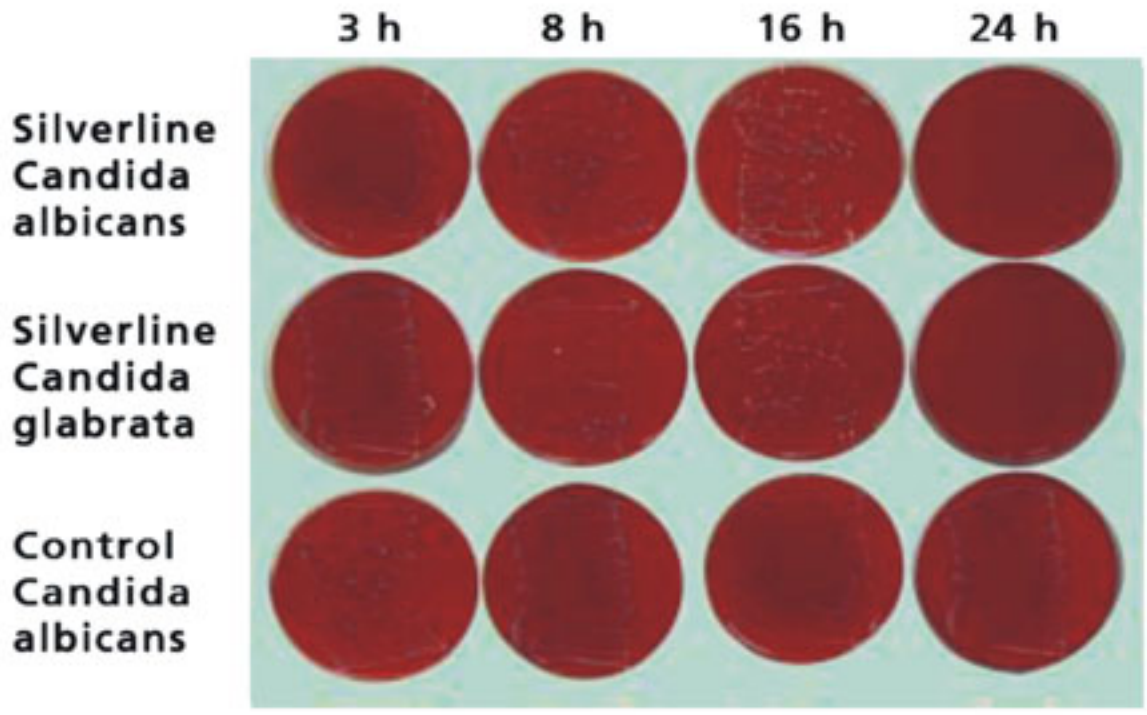
Results
Silverline Ventricular Catheters were tested with the roll-culture method (2). Catheters were subjected to different bacteria suspensions. After that, roll-cultures were done in fixed time intervals. For control purposes non-antimicrobial catheters were subjected to the the same test.

Silverline Catheters could demonstrate their effect in a spectacular manner:

- Staph. aureus,
- Staph. epidermidis,
- Methicillin resistant Staphylococcus,
- E. coli,
- Pseudomonas aeruginosa,
- Candida albicans, and
- Candida glabrata

were eradicated (8).

The picture shows cultures of the Silverline Catheter and of a non-antimicrobial control made of the same material after subjecting them to a suspension of Candida albicans and Candida glabrata. The top rows are cultures of the Silverline Catheters after certain time intervals. The lower row is the control.



Discussion
The antimicrobial effect of Silverline Catheters could be shown in the in-vitro trial in a spectacular manner. The broad spectrum of efficacy against all hospital bacteria gives the product a very good effect.

Silver as an antimicrobial substance has been used in central venous catheters for some time (Erlangen Silver Catheter). A commercially available product that uses the same combination of antiseptic substances which is used in the Silverline Catheters, showed a significant reduction in the infection rate in controlled studies (2).

Because of its broad band effect with no danger of resistancies the Silverline Catheters are a new element for fighting infection of ventricular catheters.

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