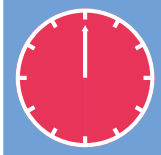
Selenium and burns

selenase®

- reduces the number of infections
- eliminates selenium deficiency

we are
research

biosyn®

Sodium selenite for burns*		
Day 1		Start of therapy preferably within 12 hours after admission to ICU
	As continuous infusion	~350–1,000 [I–II] µg Se
14 days for burns <60 % of the body surface [I]	Maintenance therapy	~350–1,000 [I–II] µg Se / day

*together with zinc and copper in the trials

I Berger MM et al. Crit Care. 2006; 10(6): R153. Reduction of nosocomial pneumonia after major burns by trace element supplementation: aggregation of two randomised trials.

II Prescribing information selenase®, biosyn Arzneimittel GmbH, as of July 2017.

Sodium selenite for burns

Sodium selenite*

- reduces the number of infections [1]
- improves wound healing [2,3]
- shortens the antibiotic treatment [1]
- shortens the ICU stay [1,4]

*together with zinc and copper in the trials

Compatibility

Yes	No
• 5 % glucose solution • Ringer solution • Carbohydrate solutions (stability 72 hours (3 days)) • Colloidal volume expander solutions (stability 72 hours (3 days)) • Electrolyte solutions with increased potassium concentration (stability 48 hours (2 days)) • Crystalloid electrolyte solutions (stability 48 hours (2 days)) • Amino acid solutions without cysteine (stability 36 hours (1.5 days)) • Fat emulsions (stability 24 hours (1 day)) • Vitamin solutions (without vitamin C) • Solutions without reducing agents	• Cytostatic agent solutions [a] • Amino acid solutions that contain cysteine [b] • Solutions that contain glutathione (GSH) [c] • Vitamin solutions that contain vitamin C [d]

[a] selenase® should generally be administered 1 hour before cytostatic agent application for timely incorporation in the endogenous protective systems.

[b, c] SH groups react with Na-selenite; Na-selenite can no longer satisfy its task as a radical scavenger.

[d] Selenium (Se^{+IV}) in sodium selenite is reduced by vitamin C to the elementary selenium (Se^{0}) and is thereby ineffective.

Robinson MF et al. N Z Med J. 1985 Aug 14; 98(784): 627-9. Effect of a megadose of ascorbic acid, a meal and orange juice on the absorption of selenium as sodium selenite.

Ip C. J Natl Cancer Inst. 1986 Jul; 77(1): 299-303. Interaction of vitamin C and selenium supplementation in the modification of mammary carcinogenesis in rats.

Sodium selenite for burns

At a glance
Sodium selenite:
• reduces the number of infections
• improves wound healing
• shortens antibiotic therapy
• shortens the ICU stay

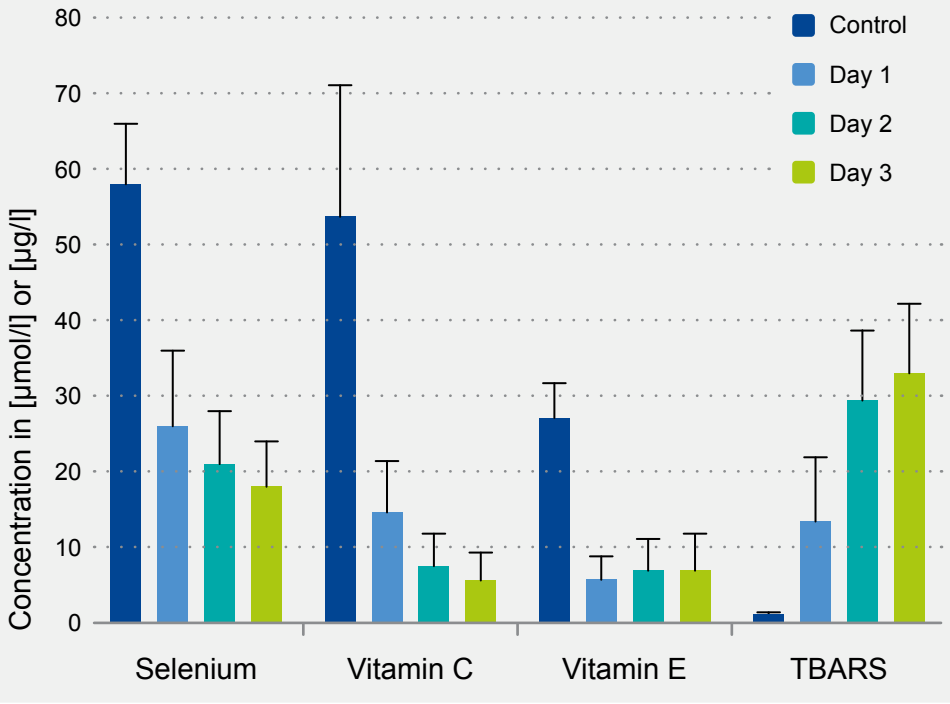
Significantly reduced selenium levels in burn victims

In the first five days after the initial damage, extensive burns cause oxidative stress as shown by the simultaneous reduction of antioxidant vitamins and trace elements, and show a major increase of thiobarbituric acid-reactive substances (TBARS) *(Fig. 1)*.[5]

No decline of selenium values with sodium selenite therapy

The influence of selenium therapy on the selenium concentration in burn victims was examined in several studies. In every trial, with a selenium administration of 229–379 µg daily, a normalization of the selenium value could be determined, while the selenium level of the placebo group stayed in the highly deficit range *(Fig. 2)*.[2]

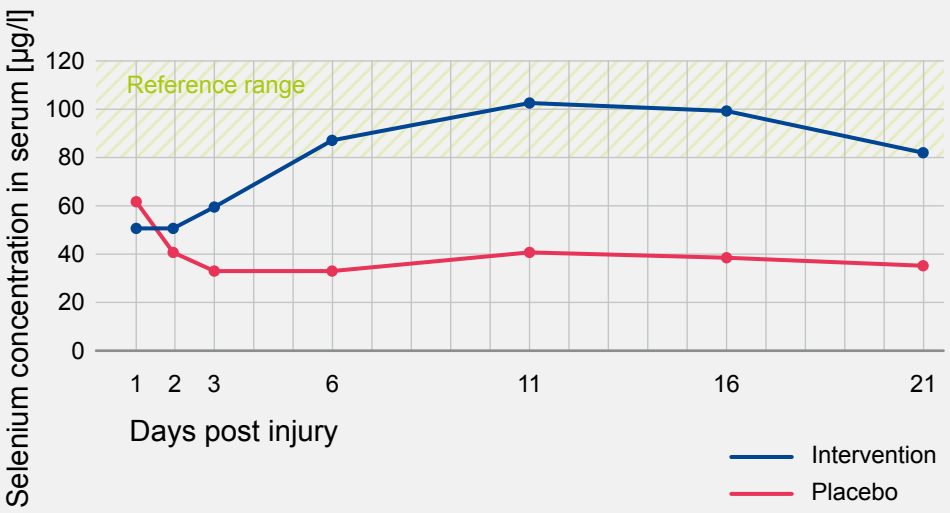
Increased oxidative stress in burn victims



Bertin-Maghit M et al. Intensive Care Med. 2000 Jun; 26(6): 800-3. Time course of oxidative stress after major burns.

Fig. 1

Significantly improved selenium status in the intervention group*



*Sodium selenite + zinc + copper

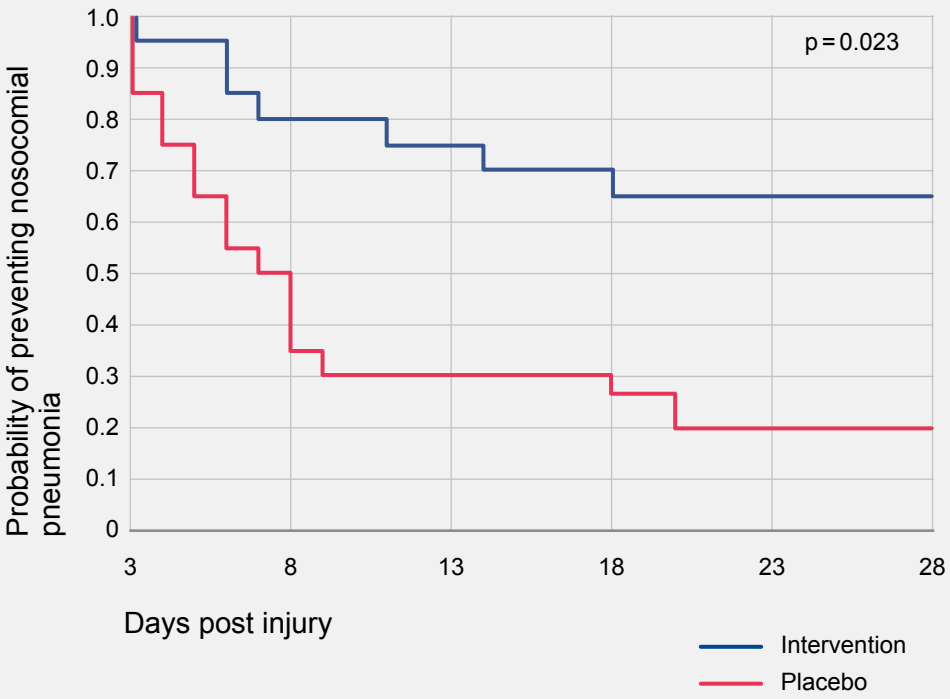
Modified according to Berger MM et al. Am J Clin Nutr. 2007 May; 85(5): 1293-300. Trace element supplementation after major burns modulates antioxidant status and clinical course by way of increased tissue trace element concentrations.

Fig. 2

Significantly fewer infections

Infections are a major problem for burn victims. Berger et al. conducted two randomized, double-blind, placebo-controlled trials to investigate the impact of a trace element supplementation (among other things, 379 µg selenium per day (sodium selenite)) on the infection rate in burn victims. [1] The infection rate was reduced from 3.5 episodes per patient in the placebo group ($n = 20$) to 2.0 episodes per patient in the intervention group ($n = 21$) ($p < 0.001$). This reduction was primarily attributed to the reduction of nosocomial pneumonias from 80 % in the placebo group to 33 % in the intervention group ($p < 0.001$), as well as to the reduction of respiratory-associated pneumonia from 13 to 6 episodes ($p = 0.023$) *(Fig. 3)*. In consequence, the number of days for which antibiotic treatment was necessary, was significantly reduced from 20 to 13 days ($p = 0.021$).

Fewer nosocomial pneumonias in the intervention group*



*Sodium selenite + zinc + copper

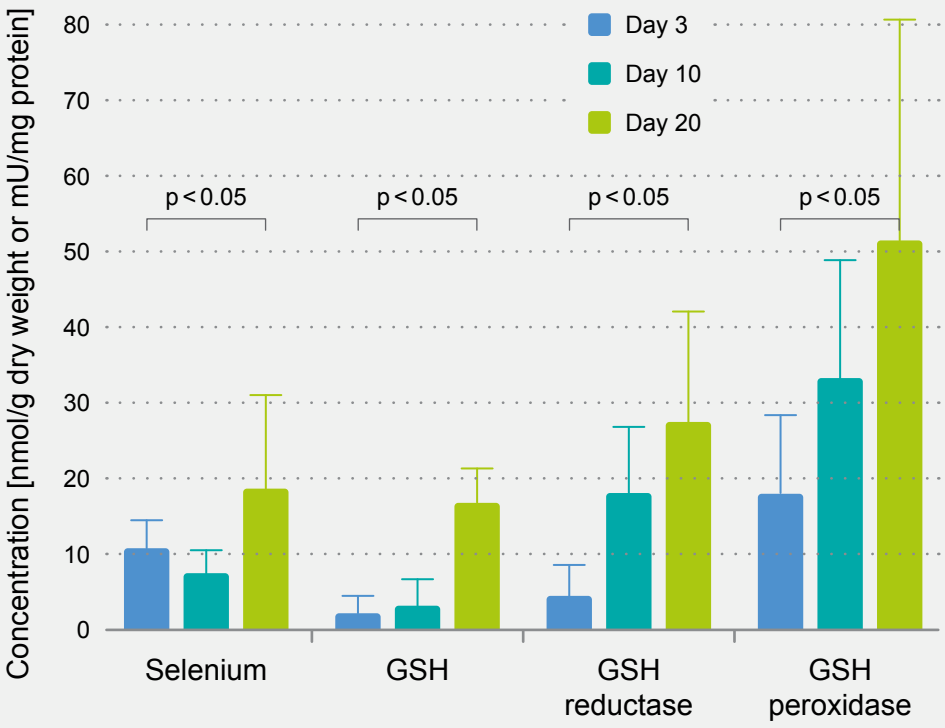
Berger MM et al. Crit Care. 2006; 10(6): R153. Reduction of nosocomial pneumonia after major burns by trace element supplementation: aggregation of two randomised trials.

Fig. 3

Improved wound healing

Berger et al. conducted a trial that investigated the impact of trace element supplementation (among other things, 379 µg selenium per day (sodium selenite)) on wound healing.[2,3] Eleven patients were assigned to the intervention group and ten patients to the placebo group for this randomized double-blind placebo-controlled trial. An examination of the burnt tissue after 3, 10 and 20 days revealed that the selenium concentration in burnt tissue of the trace element supplemented group was significantly increased. Simultaneously the concentration of glutathione, glutathione reductase and glutathione peroxidase was significantly increased in the burnt tissue of the intervention group *(Fig. 4)*.

Improved selenium status in the intervention group*



* Sodium selenite + zinc + copper

Modified according to:

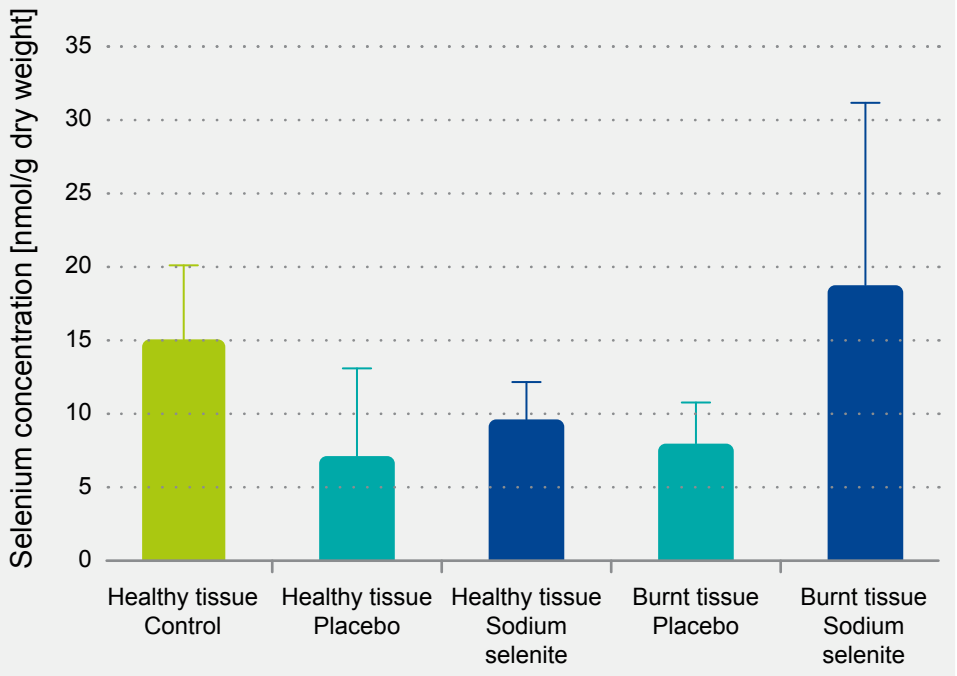
Berger MM et al. Am J Clin Nutr. 2007 May; 85(5): 1293-300. Trace element supplementation after major burns modulates antioxidant status and clinical course by way of increased tissue trace element concentrations.

Berger MM et al. Am J Clin Nutr. 2007 May; 85(5): 1301-6. Trace element supplementation after major burns increases burned skin trace element concentrations and modulates local protein metabolism but not whole-body substrate metabolism.

Fig. 4

The comparison of healthy and of burnt tissue in the burn victims versus healthy controls' tissue revealed a significant reduction of selenium status in healthy as well as in burnt tissue. After 20 days, within the intervention group, the selenium level significantly increased in the burnt tissue *(Fig. 5)*.

Improved selenium status in burnt tissue in the intervention group*



* Sodium selenite + zinc + copper

Modified according to:

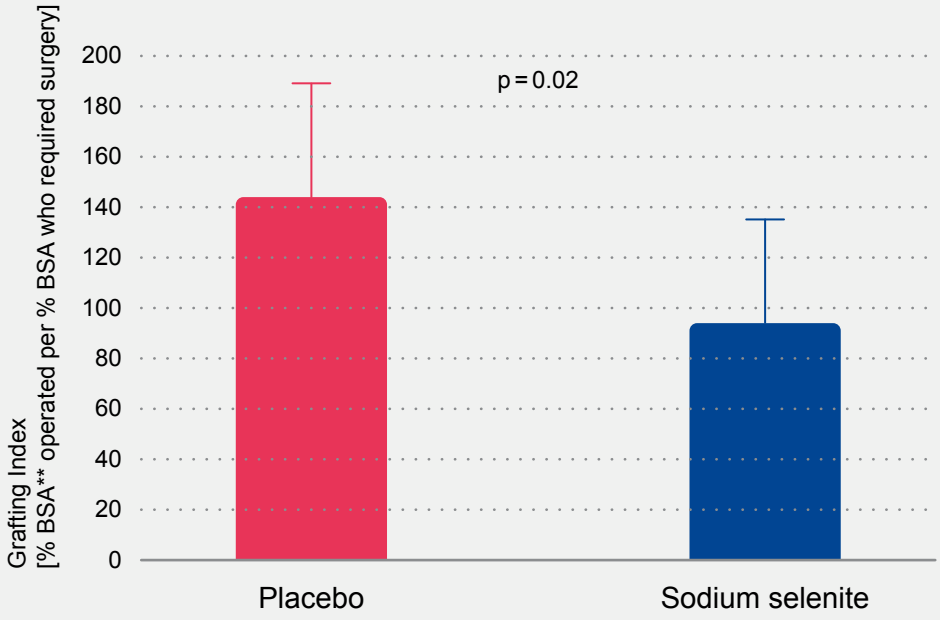
Berger MM et al. Am J Clin Nutr. 2007 May; 85(5): 1293-300. Trace element supplementation after major burns modulates antioxidant status and clinical course by way of increased tissue trace element concentrations.

Berger MM et al. Am J Clin Nutr. 2007 May; 85(5): 1301-6. Trace element supplementation after major burns increases burned skin trace element concentrations and modulates local protein metabolism but not whole-body substrate metabolism.

Fig. 5

This result is mirrored in the required skin grafts, which were significantly less in the intervention group (p = 0.02) *(Fig. 6)*.

Fewer required skin grafts in the intervention group*



* Sodium selenite + zinc + copper
** BSA = Body Surface Area

Modified according to Berger MM et al. Am J Clin Nutr. 2007 May; 85(5): 1293-300. Trace element supplementation after major burns modulates antioxidant status and clinical course by way of increased tissue trace element concentrations.

Fig. 6

Shorter ICU stay

Supplementation of trace elements (among other things, 379 µg selenium per day (sodium selenite)) significantly reduced the ICU stay after normalization for the extent of the burn *(Table 1)*.[1,4] At a burnt body surface of 40 % the average duration of ICU stay decreased from 40 to 25 days.

Successful intervention* shortens the ICU stay

	Intervention*	Placebo	p value
Berger et al. (1998) N = 20			
ICU stay (days)	30 (14 – 46)	39 (18 – 58)	n.s.
ICU stay dependent on the burnt body surface (days / %)	0.6 ± 0.2	0.9 ± 0.3	0.034
Berger et al. (2006) N = 41			
ICU stay (days)	28 (9 – 151)	39 (16 – 145)	0.18
ICU stay dependent on the burnt body surface (days / %)	0.63 (0.23 – 1.64)	0.99 (0.43 – 2.48)	0.002
Selenoprotein P [µg/l]	54.5 ± 8.69	63.0 ± 9.18	0.006

* Sodium selenite + zinc + copper

Modified according to:

Berger MM et al. Crit Care. 2006; 10(6): R153. Reduction of nosocomial pneumonia after major burns by trace element supplementation: aggregation of two randomised trials.

Berger MM et al. Am J Clin Nutr. 1998 Aug; 68(2): 365-71. Trace element supplementation modulates pulmonary infection rates after major burns: A double-blind, placebo-controlled trial.

Table 1

Bibliography

1. Berger MM et al. 2006; 10(6): R153. Reduction of nosocomial pneumonia after major burns by trace element supplementation: aggregation of two randomised trials.
2. Berger MM et al. Am J Clin Nutr. 2007 May; 85(5): 1293-300. Trace element supplementation after major burns modulates antioxidant status and clinical course by way of increased tissue trace element concentrations.
3. Berger MM et al. Am J Clin Nutr. 2007 May; 85(5): 1301-6. Trace element supplementation after major burns increases burned skin trace element concentrations and modulates local protein metabolism but not whole-body substrate metabolism.
4. Berger MM et al. Am J Clin Nutr. 1998 Aug; 68(2): 365-71. Trace element supplementation modulates pulmonary infection rates after major burns: a double-blind, placebo-controlled trial.
5. Bertin-Maghit M et al. Intensive Care Med. 2000 Jun; 26(6): 800-3. Time course of oxidative stress after major burns.

biosyn Arzneimittel GmbH

World market leader for high-dose selenium injections

biosyn Arzneimittel GmbH is a pharmaceutical and biotech company based in Fellbach, Germany. It specializes in trace elements, is a world market leader for high-dose selenium injections, developer and operator of two unique GMP manufacturing operations for producing active ingredients, and in the biotech sector, is actively involved in the production of glycoprotein isolated from the Megathura crenulata, a sea snail found in California. 70 percent of our sales turnover is realized outside of Germany – in 26 countries all around the world.

With products geared to the areas of intensive care, oncology and endocrinology, biosyn is a partner to hospitals and physicians in private practice, as well as to naturopathic physicians and holistic health practitioners. We pursue research and development and evaluate the current medical-scientific literature as well as engage in modern online marketing. Our mid-sized family enterprise places great value on an open, engaged and customer-oriented corporate culture.

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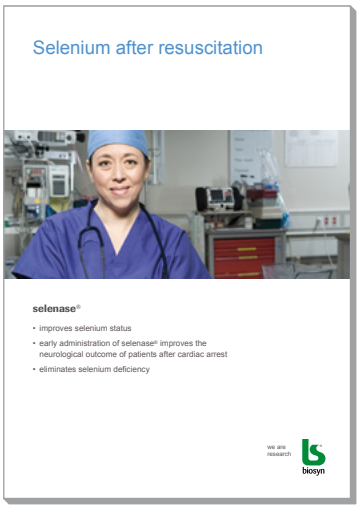
Overview of intensive care trials
Folder for medical experts
Size: A4, 20 pages



Selenium after resuscitation
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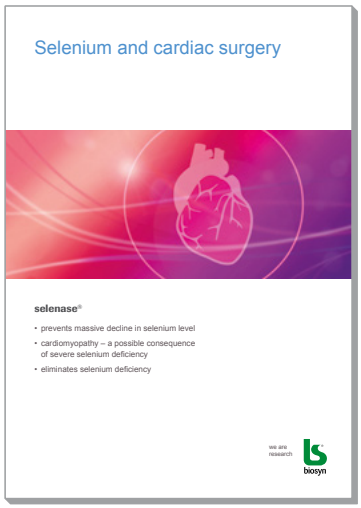

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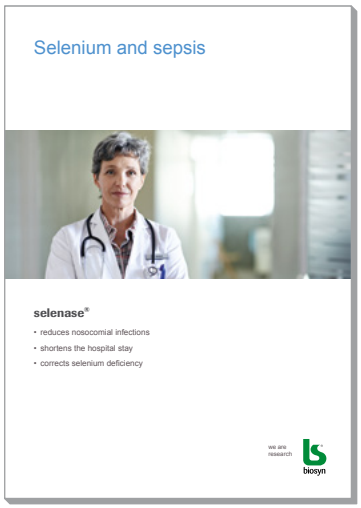

Selenium and sepsis
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Products for injection therapy

Prescription only

selenase® 100 µg pro injectione	selenase® T pro injectione	selenase® T pro injectione
100 µg selenium / injection ampoule	500 µg selenium / injection vials	1,000 µg selenium / injection vials
		
10 and 50 ampoules with 2 ml solution for injection	2, 10, 30 (3 × 10) and 50 (5 × 10) glass vials with 10 ml solution for injection	2, 10, 30 (3 × 10) and 50 (5 × 10) glass vials with 20 ml solution for injection

Subject to sale in pharmacies

selenase® 50 Mikrogramm Injektionslösung (selenase® 50 microgram injection solution)

50 µg selenium / injection ampoule

New

10 (N2) and 50 ampoules with 1 ml solution for injection

Picture credits
Cover (2 ×), page 6: © TommL / iStockphoto

Selenium in guidelines

	Premature babies	Infants with low birth weight	Critically ill: Children and adolescents	Critically ill: Adults	Sepsis patients	Burn patients
Parenteral Nutrition in Paediatrics S3-Guideline of the DGEM [1]	×		×			
ESPEN/ESPGHAN Guidelines on paediatric parenteral nutrition [2]		×				
ESPEN Guidelines on Parenteral Nutrition: Intensive Care [3]				×	×	
ESPEN endorsed recommendations: Nutritional therapy in major burns [4]						×
The Canadian Critical Care Nutrition Guidelines in 2013 [5]				×	×	

1. Jochum F et al. Aktuelle Ernährungsmedizin 2014; 39; e99-e147.
2. Koletzko B et al. J Pediatr Gastroenterol Nutr. 2005 Nov; 41 Suppl 2: S1-87.
3. Singer P et al. Clin Nutr. 2009 Aug; 28(4): 387-400.
4. Rousseau AF et al. Clin Nutr. 2013 Aug; 32(4): 497-502.
5. Dhaliwal R et al. Nutr Clin Pract. 2014 Feb; 29(1): 29-43.

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