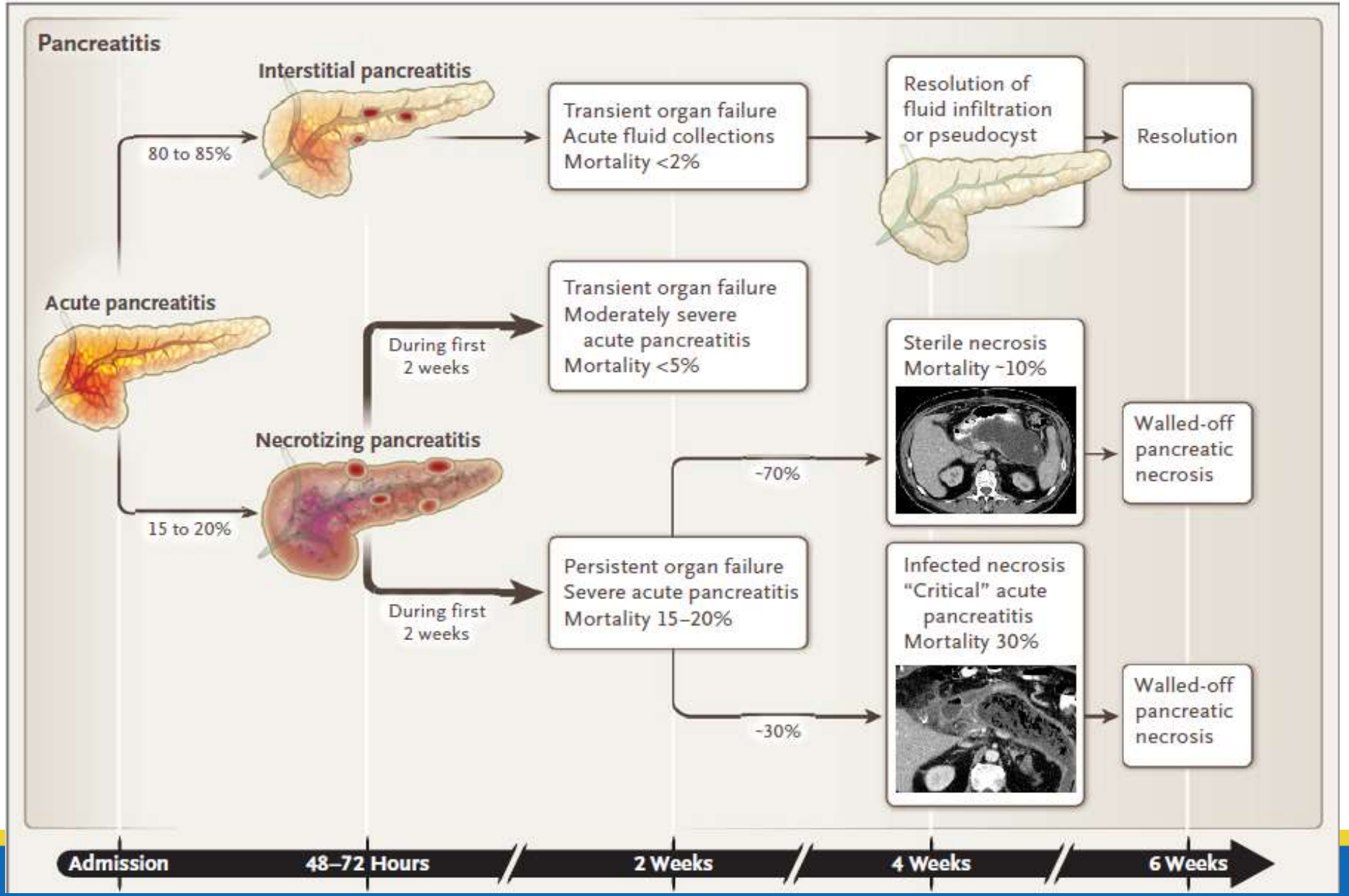
Landesklinikum Wiener Neustadt

Stellenwert der Antibiotika-Therapie bei der Akuten Pankreatitis

ISDS 2018 Malta

LÄNGLE Friedrich
Chirurgische Abteilung

Akute Pankreatitis



Krankheitsverlauf

Tabelle 2

Bedeutung der bakteriellen Infektion bei nekrotisierender Pankreatitis bezüglich klinischem Verlauf

	Sterile Nekrosen (188 Patienten)		Infizierte Nekrosen (85 Patienten)		
	Anzahl	Prozent	Anzahl	Prozent	p
Pulmonale Insuffizienz	109	58	62	73	0,021
Sepsis/SIRS	61	32	48	57	0,006
Koagulopathie	68	36	46	54	0,004
Niereninsuffizienz	40	21	18	21	1,0
Schock	43	23	25	29	0,29

Inzidenz systemischer Komplikationen der akuten Pankreatitis bei 273 Patienten mit Pankreasnekrosen.
Aus (22), mit freundlicher Erlaubnis der Autoren.

Tage nach Beginn der Symptome

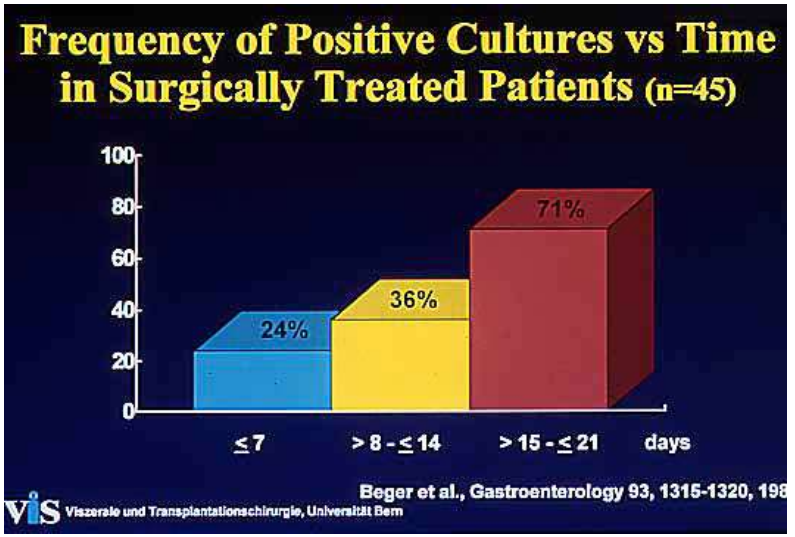
Nekrose und Infektion

< 50% Pankreasnekrose - 20% Infektions-Risiko

> 50% Pankreasnekrose - 70% Infektions-Risiko

Diagnose der Infektion:

- **Computertomographie (Luft,…)**
- **FN Biopsie der Nekrose und Kultur**
- **Serologisch (CRP, Procalcitonin,…)**



Es muss unterschieden werden

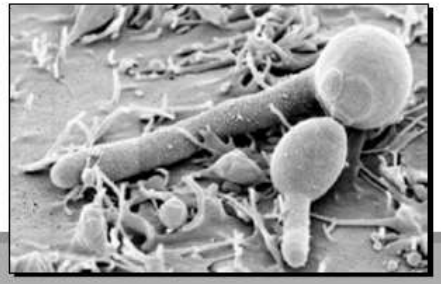
- **Prophylaktische Antibiose ohne Keimnachweis oder Infektionsnachweis in der Frühphase der AP**
- **Antibiotische Therapie bei infizierter Pankreasnekrose**
- **Antibiotische Therapie bei Cholangitis oder anderen nicht pankreatischen Infektionen**

Rationale für Antibiotikaprophylaxe

- **Verhinderung / Reduktion von Infektion in der Pankreasnekrosen (**30-40% der Patienten entwickeln eine Infektion)
- **Reduktion von extra-pankreatischen Infektionen (**Pneumonie, HWI, Katheterinfektion)
- **Reduktion von chirurgischen bzw. radiologischen Interventionen**
- **Reduktion der Mortalität**

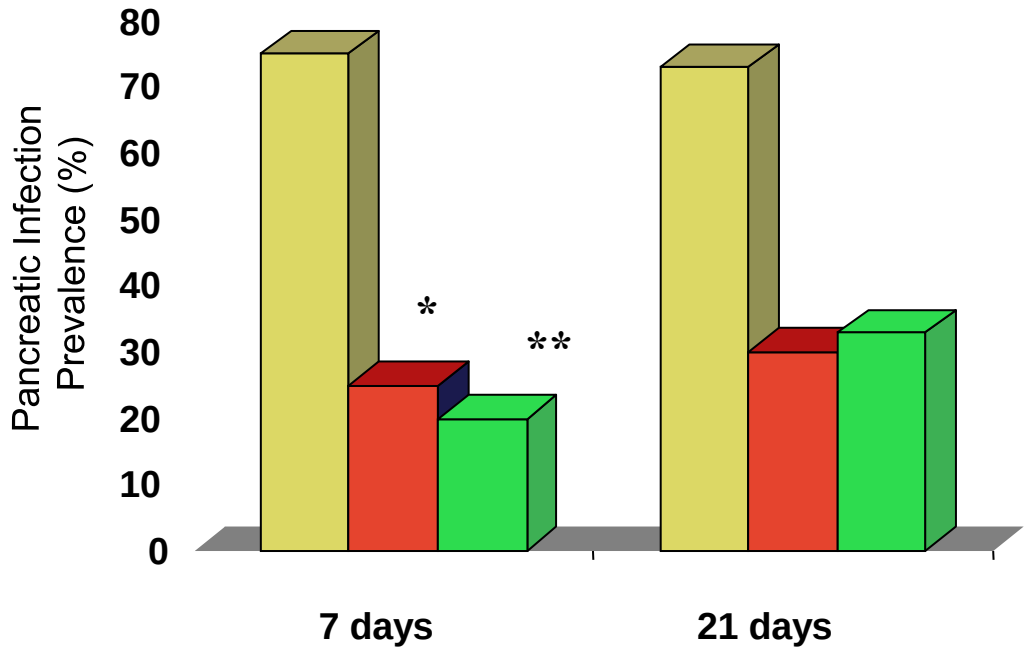
Antibiotika-Prophylaxe bei nekrotisierender Pankreatitis

- **Nekroseinfektion**: wichtigster Prognose-limitierender Faktor der schweren Pankreatitis
- Nach wie vor kontrovers, ob eine **Antibiotika-Prophylaxe**…
- …die Infektionsrate der Nekrosen senkt;
- …die Mortalität senkt;
- …zu einer Zunahme von Pilzinfektionen führt



Akute Pankreatitis-AB Prophylaxe

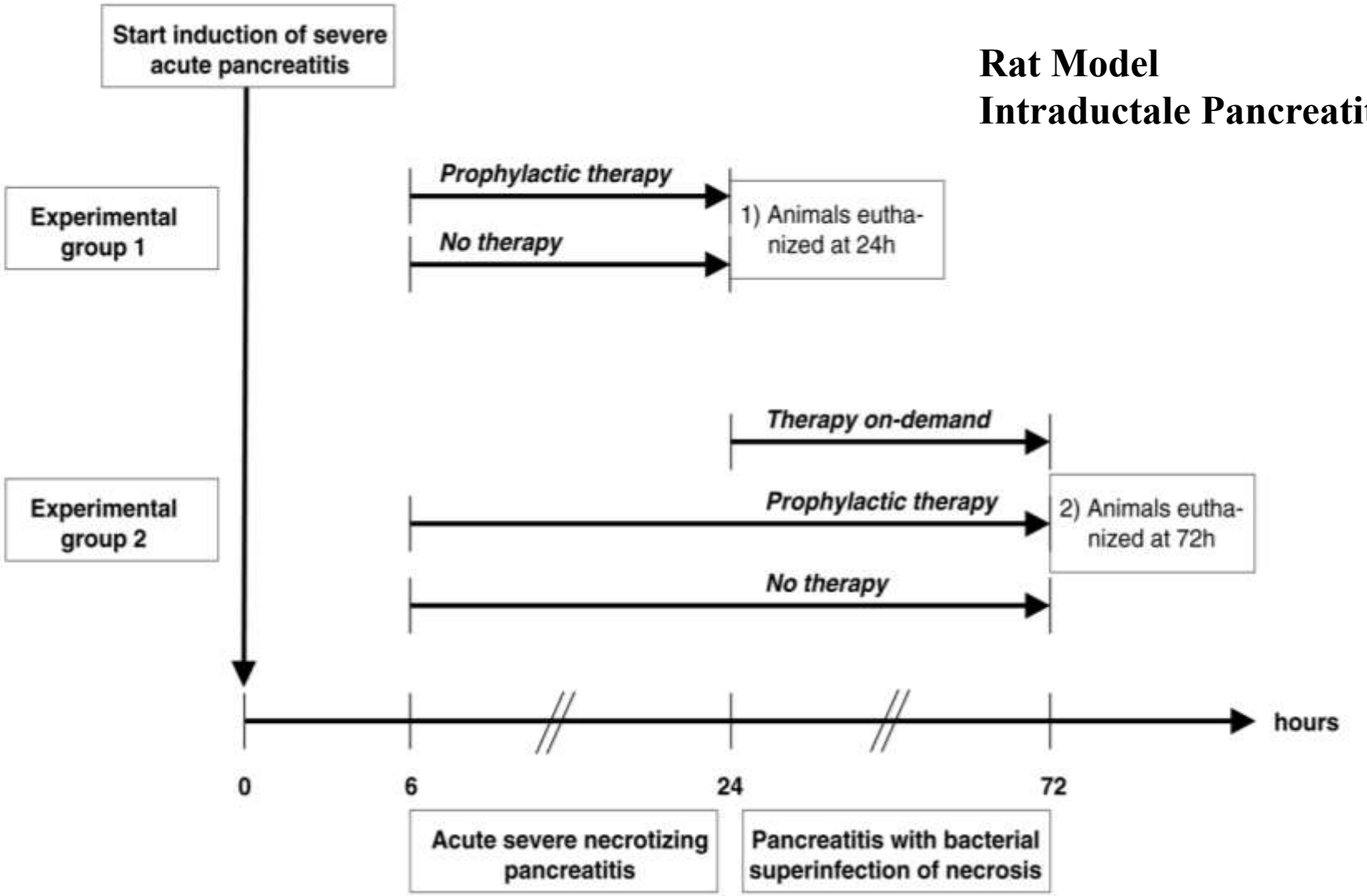
- Rat model of severe acute pancreatitis.
- Therapy with saline (n=60), imipenem (n=62), ciprofloxacin (n=60) for 7 days



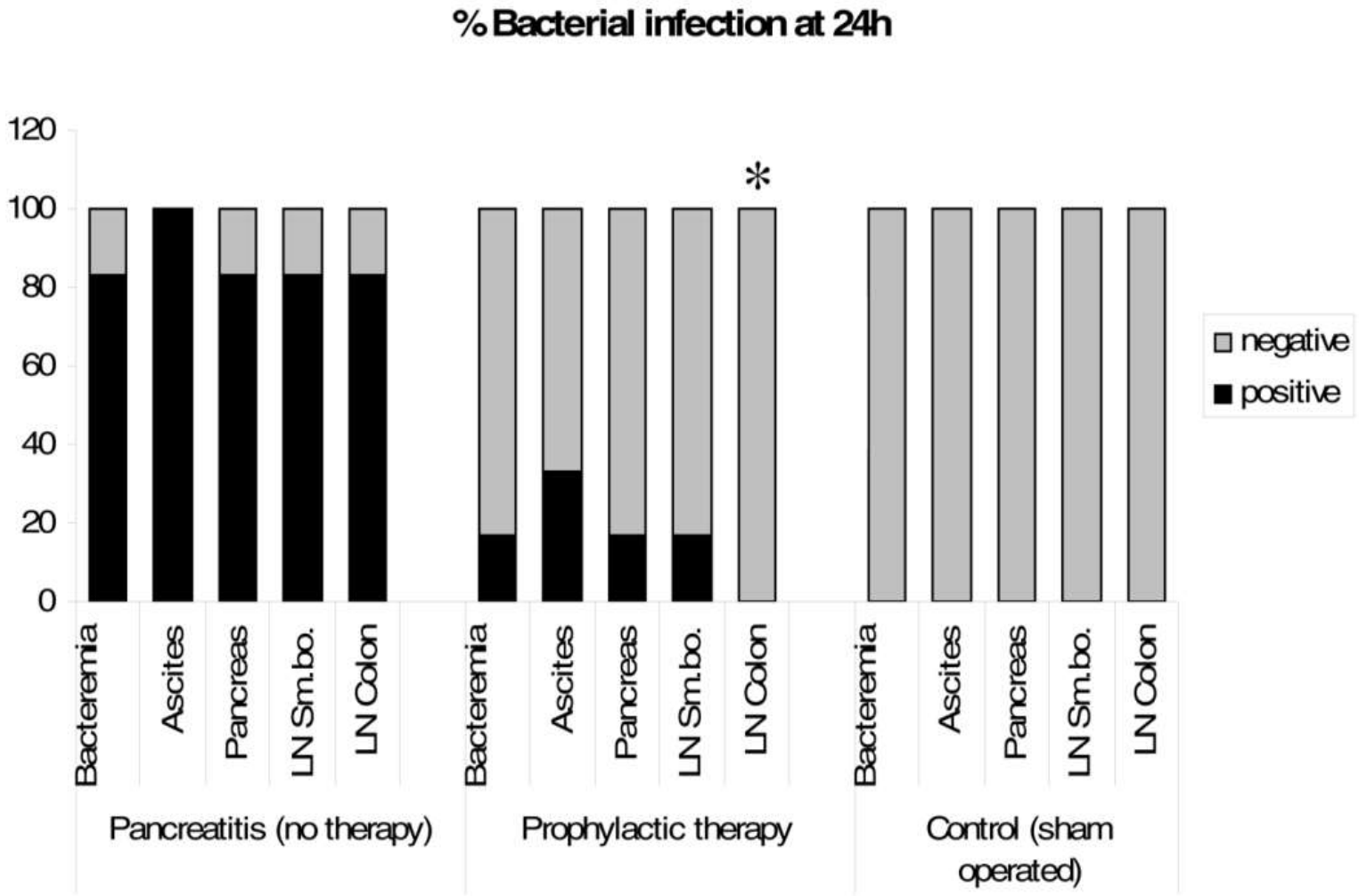
Prevalence of infection in pancreatic tissue specimens from animals treated with saline, imipenem or ciprofloxacin 7 and 21 days after induction of ANP.

Mithöfer K et al. Antibiotic treatment improves survival in experimental acute necrotizing pancreatitis. Gastroenterology 1996;110:232-240

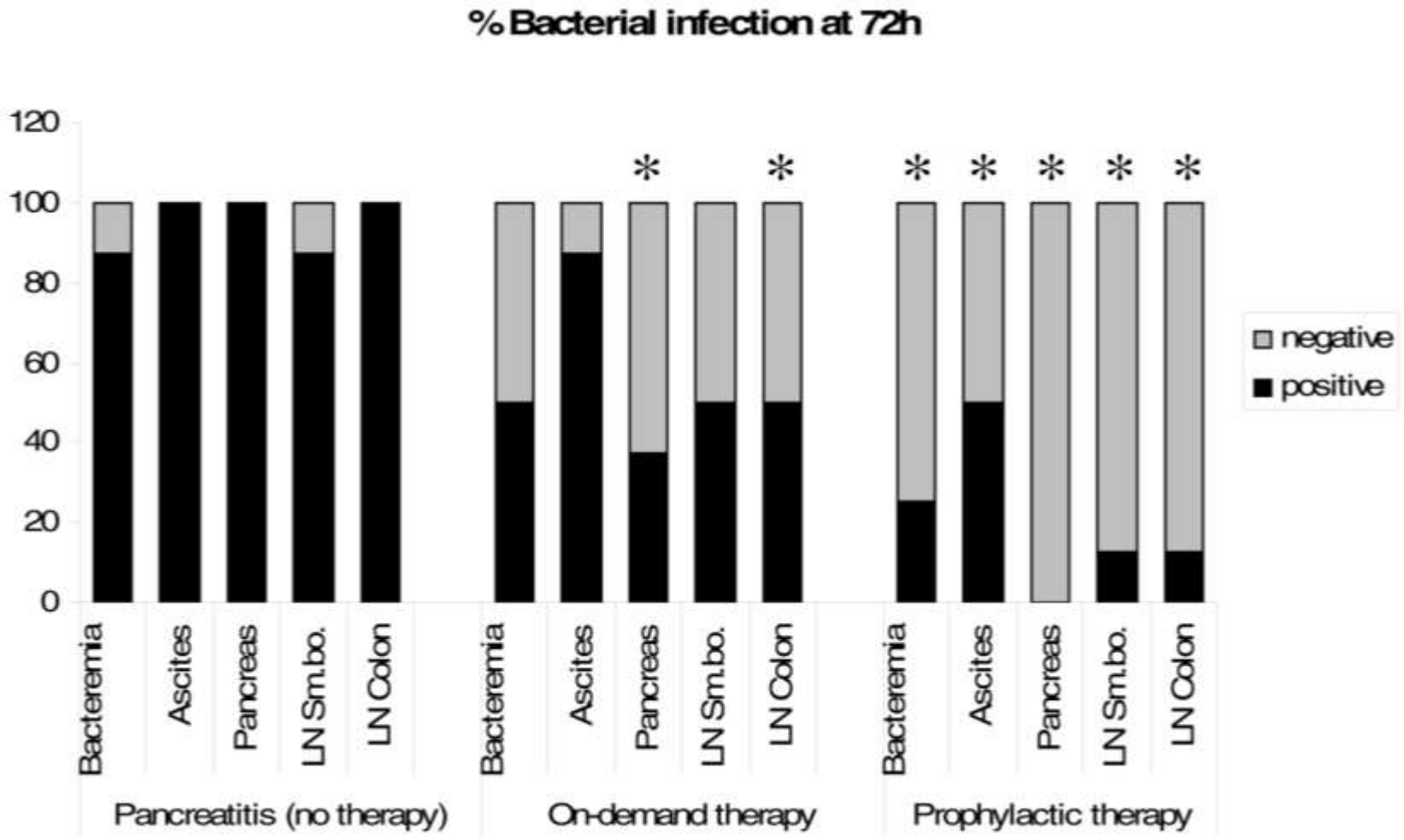
Rat Model
Intraductale Pancreatitis



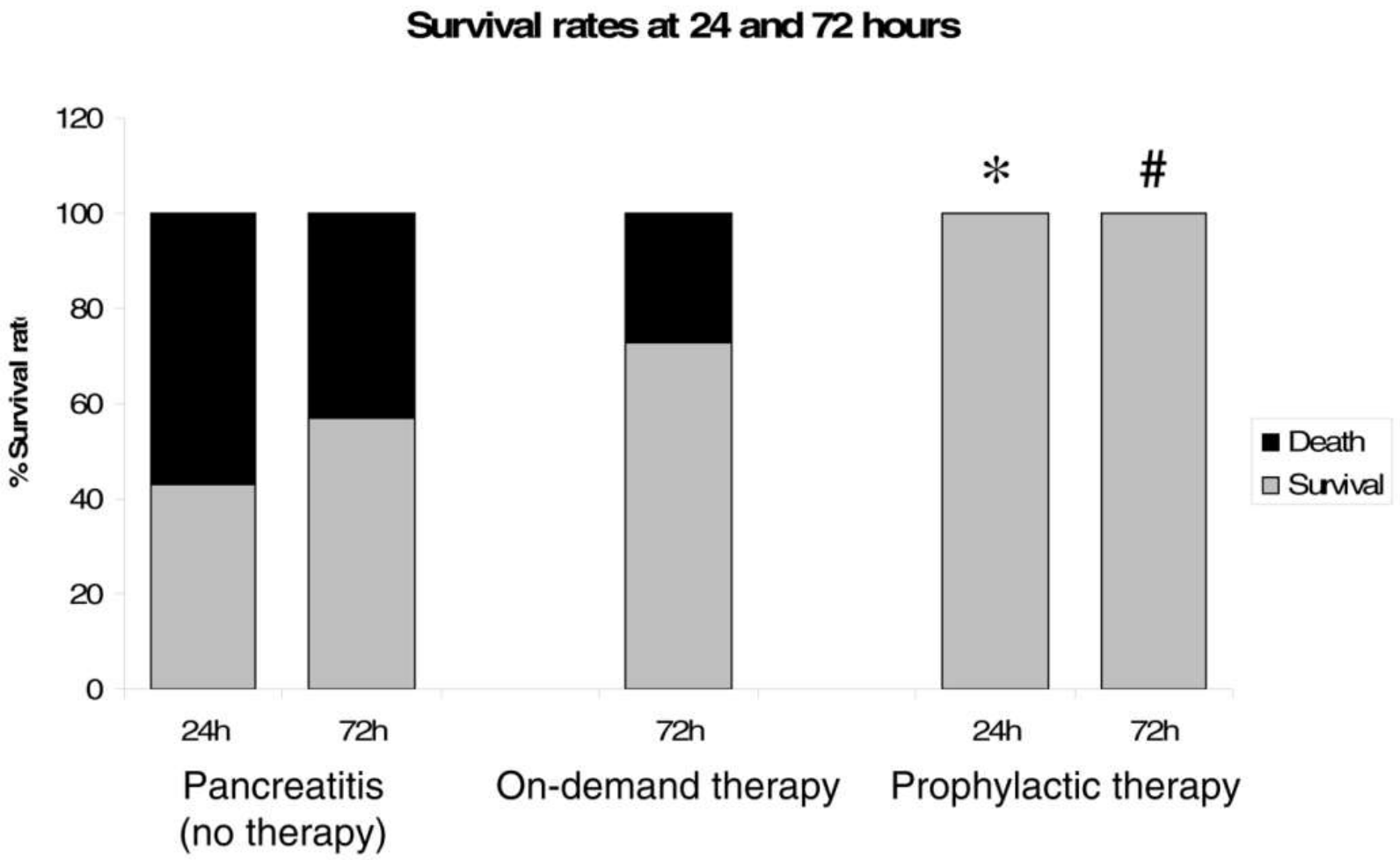
Fritz Stefan, Critical Care 2008



Fritz Stefan, Critical Care 2008



Fritz Stefan, Critical Care 2008



Fritz Stefan, Critical Care 2008

Tab. 7.3 Kontrollierte Studien zur Antibiotikaprophylaxe bei schwerer akuter oder nekrotisierender Pankreatitis

Autor u. Jahr	Untersuchte Antibiotika	Doppelblind	Patienten	Effekt infizierte Nekrosen	Effekt Mortalität
Pederzoli et al. 1993	Imipenem vs. keines	Nein	41/33	Ja, Reduktion in Antibiotikagruppe	Nein
Sainio et al. 1995	Cefuroxim vs. keines	Nein	30/30	Nein	Ja, Reduktion in Antibiotikagruppe
Delcenserie et al. 1996	Ceftazidime + Amikacin + Metronidazol vs. keines	Nein	11/12	Ja, Reduktion in Antibiotikagruppe	Nein
Schwarz et al. 1997	Ofloxacin + Metronidazol vs. keines	Nein	13/13	Nein	Nein
Bassi et al. 1998	Pefloxacin vs. Imipenem	Nein	30/30	Ja, Reduktion in Imipenemgruppe	Nein
Nordback et al. 2001	Imipenem früh vs. Imipenem spät	Nein	25/33	Ja, Reduktion in der frühen Therapiegruppe	Nein
Spicak et al. 2002	Ciprofloxacin + Metronidazol sofort vs. Ciprofloxacin + Metronidazol bei Bedarf	Nein	33/30	Nein	Nein
Spicak et al. 2003	Meropenem sofort vs. Meropenem bei Bedarf	Nein	20/21	Nein	Nein
Isenmann et al. 2004	Ciprofloxacin + Metronidazol vs. Placebo	Ja	58/56	Nein	Nein
Røkke et al. 2007	Imipenem vs. keines	Nein	36/37	Nein	Nein
Dellinger et al. 2007	Meropenem vs. Placebo	Ja	50/50	Nein	Nein
Barreda et al. 2009	Imipenem vs. keines	Nein	24/34	Nein	Nein
García-Barrasa et al. 2009	Ciprofloxacin vs. Placebo	Ja	22/19	Nein	Nein
Xue et al. 2009	Imipenem vs. keines	Nein	29/27	Nein	Nein
Yang et al. 2009	Imipenem vs. keines	Nein	28/26	Nein	Nein

Prophylactic antibiotics in acute pancreatitis: endless debate

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Table 1 Meta-analyses showing benefits of antibiotic treatment in acute pancreatitis

Study	Year	Study type	Studies (*n*)	Patients		Pancreatitis[a]	Significant reduction with antibiotics	
				Total(*n*)	Controls(*n*)		All-cause mortality	Infection/pancreatic necrosis
Ukai et al[20]	2015	RCT	6	397	195	NP	Yes	Yes
Lim et al[21]	2015	RCT (9) Cohort (2)	11	864	413	NP	All studies: Yes RCT alone: No Cohort alone: Yes	No
Jiang et al[31]	2012	RCT	11[b]	183 (< 2000) 439 (> 2000)	95 219	SAP	Yes < 2000 No > 2000	–
Wittau et al[32]	2011	RCT	14	841	421	SAP	No	No
Bai et al[33]	2010	RCT	9	519	256	NP	No	No
Yao et al[25]	2010	RCT	9	564	277	NP	No	Yes
Villatoro et al[27]	2010	RCT	7	404	201	NP	No	No
Jafri et al[30]	2009	RCT	8	502	249	SAP	No	No
Hart et al[34]	2008	RCT	7	429		NP	No	No
Bai et al[38]	2008	RCT	7	467	231	NP	No	No
Xu et al[26]	2008	RCT	8	540	270	NP	No	Yes
Dambrauskas et al[18]	2007	RCT	10	1,279	638	NP	Yes	Yes
De Vries et al[35]	2007	RCT	6	397	194	SAP	No	No
Mazaki et al[36]	2006	RCT	6	329	162	NP	No	No
Xiong et al[37]	2006	RCT	6	338	165	SAP	No	No
Villatoro et al[22]	2006	RCT	5	294		NP	Yes	No
Sharma et al[23]	2001	RCT	3	160	76	NP	Yes	No
Golub et al[24]	1998	RCT	8	514	255	SAP	Yes	–

NP, necrotising pancreatitis; RCT, randomised controlled trial; SAP, severe acute pancreatitis
[a] All patients with SAP/NP alone.
[b] 4 up to year 2000, 7 after 2000 (no studies in year 2000 itself)

Villatoro E, Cochrane Review 2010

- Seven randomised controlled trials, 404 pts
- SAP with proven pancreatic necrosis
- Prophylactic antibiotics vs placebo therapy / best supportive care
- Antibacterial therapy administered within 7 days of onset of the attack.

- Studies: Pederzoli 1993, Sainio 1995, Nordback 2001, Schwarz 1997, Isenmann 2004, Rokke 2007, Dellinger 2007.

Analysis 1.1. Comparison 1 Antibiotics versus control, Outcome 1 Mortality.

Review: Antibiotic therapy for prophylaxis against infection of pancreatic necrosis in acute pancreatitis

Comparison: 1 Antibiotics versus control

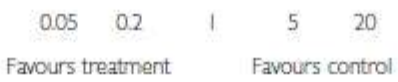
Outcome: 1 Mortality

Study or subgroup	Antibiotics n/N	Control n/N	Risk Ratio M-H,Fixed,95% CI	Weight	Risk Ratio M-H,Fixed,95% CI
Pederzoli 1993	3/41	4/33		15.1 %	0.60 [0.15, 2.51]
Sainio 1995	1/30	7/30		23.9 %	0.14 [0.02, 1.09]
Schwarz 1997	0/13	2/13		8.5 %	0.20 [0.01, 3.80]
Nordback 2001	2/25	5/33		14.7 %	0.53 [0.11, 2.50]
Isenmann 2004	3/41	4/35		14.7 %	0.64 [0.15, 2.67]
Dellinger 2007	6/41	5/41		17.1 %	1.20 [0.40, 3.62]
Rkke 2007	2/12	2/16		5.9 %	1.33 [0.22, 8.16]
Total (95% CI)	**203**	**201**		**100.0 %**	**0.60 [0.34, 1.05]**

Total events: 17 (Antibiotics), 29 (Control)

Heterogeneity: Chi² = 4.75, df = 6 (P = 0.58); I² =0.0%

Test for overall effect: Z = 1.80 (P = 0.072)



Villatoro E, Cochrane Review 2010

Analysis 1.2. Comparison 1 Antibiotics versus control, Outcome 2 Infected Pancreatic Necrosis.

Review: Antibiotic therapy for prophylaxis against infection of pancreatic necrosis in acute pancreatitis

Comparison: 1 Antibiotics versus control

Outcome: 2 Infected Pancreatic Necrosis

Study or subgroup	Antibiotics n/N	Control n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
Pederzoli 1993	5/41	10/33		14.2 %	0.40 [0.15, 1.06]
Sainio 1995	9/30	12/30		24.3 %	0.75 [0.37, 1.51]
Schwarz 1997	8/13	7/13		26.5 %	1.14 [0.59, 2.22]
Nordback 2001	1/25	6/33		3.6 %	0.22 [0.03, 1.71]
Isenmann 2004	7/41	5/35		12.3 %	1.20 [0.42, 3.43]
Dellinger 2007	8/41	5/41		12.8 %	1.60 [0.57, 4.48]
Rkke 2007	2/12	4/16		6.3 %	0.67 [0.15, 3.06]
Total (95% CI)	**203**	**201**		**100.0 %**	**0.85 [0.57, 1.26]**

Total events: 40 (Antibiotics), 49 (Control)

Heterogeneity: $Tau^2 = 0.04$; $Chi^2 = 6.94$, df = 6 (P = 0.33); $I^2 = 13\%$

Test for overall effect: Z = 0.80 (P = 0.42)

Villatoro E, Cochrane Review 2010

Analysis 1.3. Comparison 1 Antibiotics versus control, Outcome 3 Non-Pancreatic Infections.

Review: Antibiotic therapy for prophylaxis against infection of pancreatic necrosis in acute pancreatitis

Comparison: 1 Antibiotics versus control

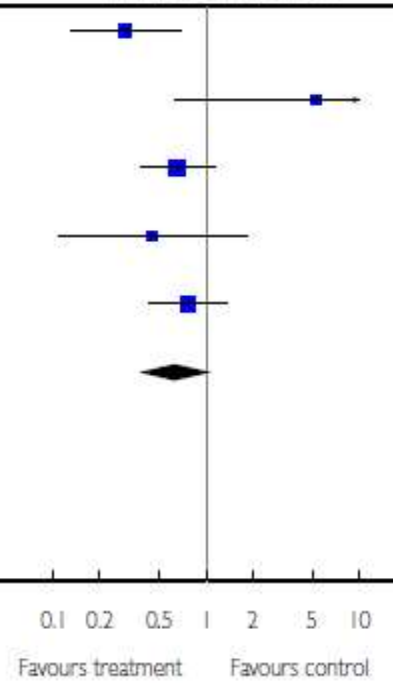
Outcome: 3 Non-Pancreatic Infections

Study or subgroup	Antibiotics n/N	Control n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
Pederzoli 1993	6/41	16/33		22.4 %	0.30 [0.13, 0.68]
Nordback 2001	4/25	1/33		5.6 %	5.28 [0.63, 44.38]
Isenmann 2004	13/41	17/35		30.7 %	0.65 [0.37, 1.15]
Rkke 2007	2/12	6/16		11.0 %	0.44 [0.11, 1.83]
Dellinger 2007	13/41	17/41		30.2 %	0.76 [0.43, 1.36]
Total (95% CI)	**160**	**158**		**100.0 %**	**0.62 [0.36, 1.06]**

Total events: 38 (Antibiotics), 57 (Control)

Heterogeneity: $Tau^2 = 0.16$; $Chi^2 = 7.61$, df = 4 (P = 0.11); $I^2 = 47\%$

Test for overall effect: Z = 1.73 (P = 0.083)



Villatoro E, Cochrane Review 2010

Analysis 4.2. Comparison 4 Imipenem versus control, Outcome 2 Infected Pancreatic Necrosis (imipenem).

Review: Antibiotic therapy for prophylaxis against infection of pancreatic necrosis in acute pancreatitis

Comparison: 4 Imipenem versus control

Outcome: 2 Infected Pancreatic Necrosis (imipenem)

Study or subgroup	Treatment n/N	Control n/N	Odds Ratio M-H,Random,95% CI	Weight	Odds Ratio M-H,Random,95% CI
Pederzoli 1993	5/41	10/33		59.0 %	0.32 [0.10, 1.05]
Nordback 2001	1/25	6/33		17.6 %	0.19 [0.02, 1.67]
Rkke 2007	2/12	4/16		23.5 %	0.60 [0.09, 3.99]
Total (95% CI)	**78**	**82**		**100.0 %**	**0.34 [0.13, 0.84]**

Total events: 8 (Treatment), 20 (Control)

Heterogeneity: $Tau^2 = 0.0$; $Chi^2 = 0.64$, df = 2 (P = 0.72); $I^2 = 0.0\%$

Test for overall effect: Z = 2.32 (P = 0.020)

Villatoro E, Cochrane Review 2010

Analysis 4.4. Comparison 4 Imipenem versus control, Outcome 4 All sites infections (imipenem).

Review: Antibiotic therapy for prophylaxis against infection of pancreatic necrosis in acute pancreatitis

Comparison: 4 Imipenem versus control

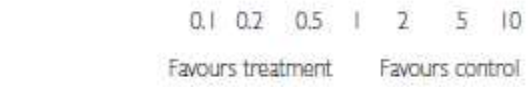
Outcome: 4 All sites infections (imipenem)

Study or subgroup	Treatment n/N	Control n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
Pederzoli 1993	11/41	26/33		48.9 %	0.34 [0.20, 0.58]
Nordback 2001	5/25	7/33		23.0 %	0.94 [0.34, 2.62]
Rkke 2007	4/12	10/16		28.1 %	0.53 [0.22, 1.29]
Total (95% CI)	**78**	**82**		**100.0 %**	**0.49 [0.28, 0.87]**

Total events: 20 (Treatment), 43 (Control)

Heterogeneity: $Tau^2 = 0.10$; $Chi^2 = 3.22$, df = 2 (P = 0.20); $I^2 = 38\%$

Test for overall effect: Z = 2.45 (P = 0.014)



Villatoro E, Cochrane Review 2010

Comparison 1. Antibiotics versus control

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Mortality	7	404	Risk Ratio (M-H, Fixed, 95% CI)	0.60 [0.34, 1.05]
2 Infected Pancreatic Necrosis	7	404	Risk Ratio (M-H, Random, 95% CI)	0.85 [0.57, 1.26]
3 Non-Pancreatic Infections	5	318	Risk Ratio (M-H, Random, 95% CI)	0.62 [0.36, 1.06]
4 All sites infections	5	318	Risk Ratio (M-H, Random, 95% CI)	0.69 [0.44, 1.09]
5 Fungal Infection	7	404	Risk Ratio (M-H, Random, 95% CI)	1.06 [0.41, 2.70]
6 Operative Treatment	6	378	Risk Ratio (M-H, Random, 95% CI)	0.90 [0.62, 1.31]

Villatoro E, Cochrane Review 2010

Comparison 2. Beta-lactam versus control

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Mortality (beta-lactam)	5	302	Risk Ratio (M-H, Random, 95% CI)	0.72 [0.37, 1.40]
2 Infected Pancreatic Necrosis (beta-lactam)	5	302	Risk Ratio (M-H, Random, 95% CI)	0.69 [0.40, 1.19]
3 Non-Pancreatic Infections (beta-lactam)	4	242	Risk Ratio (M-H, Random, 95% CI)	0.64 [0.28, 1.47]
4 All sites infections (beta-lactam)	4	242	Risk Ratio (M-H, Random, 95% CI)	0.63 [0.35, 1.13]
5 Fungal Infection (beta-lactam)	5	302	Risk Ratio (M-H, Random, 95% CI)	0.88 [0.21, 3.76]
6 Operative Treatment (beta-lactam)	5	302	Risk Ratio (M-H, Random, 95% CI)	0.82 [0.54, 1.23]

Villatoro E, Cochrane Review 2010

Comparison 4. Imipenem versus control

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Mortality (imipenem)	3	160	Risk Ratio (M-H, Random, 95% CI)	0.70 [0.28, 1.75]
2 Infected Pancreatic Necrosis (imipenem)	3	160	Odds Ratio (M-H, Random, 95% CI)	0.34 [0.13, 0.84]
3 Non-pancreatic infections (imipenem)	3	160	Risk Ratio (M-H, Random, 95% CI)	0.67 [0.16, 2.77]
4 All sites infections (imipenem)	3	160	Risk Ratio (M-H, Random, 95% CI)	0.49 [0.28, 0.87]
5 Fungal Infection (imipenem)	3	160	Risk Ratio (M-H, Random, 95% CI)	0.42 [0.05, 3.64]
6 Operative Treatment (imipenem)	3	160	Risk Ratio (M-H, Random, 95% CI)	0.85 [0.47, 1.54]

Villatoro E, Cochrane Review 2010

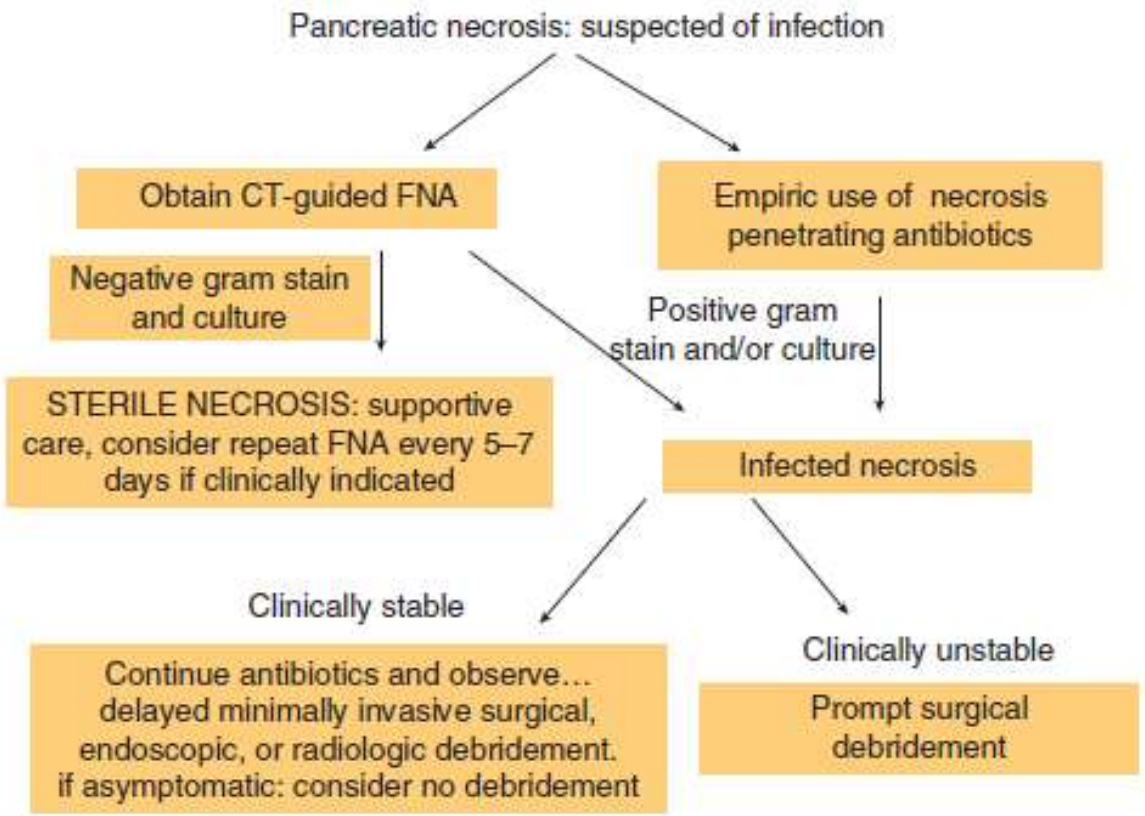
Recommendations

- **Imaging** — **iv Kontrast CT 2-3 Tage nach Aufnahme im Krankenhaus**
- **Antibiotics** — **AB Prophylaxe wird nicht empfohlen**
- **Nutrition** — **Enterale vor Parenterale Ernährung**

Bakns PA, Practice Parameters Committee of the American College of Gastroenterology – Am J Gastroenterol 2006, 101:2379-2400

American College of Gastroenterology Guideline: Management of Acute Pancreatitis

Scott Tenner, MD, MPH, FACG[1], John Baillie, MB, ChB, FRCP, FACG[2], John DeWitt, MD, FACG[3] and Santhi Swaroop Vege, MD, FACG[4]



Am J Gastroenterol 2013; 108:1400–1415; doi:10.1038/ajg.2013.218; published online 30 July 2013

American College of Gastroenterology Guideline: Management of Acute Pancreatitis

Scott Tenner, MD, MPH, FACG[1], John Baillie, MB, ChB, FRCP, FACG[2], John DeWitt, MD, FACG[3] and Santhi Swaroop Vege, MD, FACG[4]

20.	Antibiotics should be given for an extrapancreatic infection, such as cholangitis, catheter-acquired infections, bacteremia, urinary tract infections, pneumonia (strong recommendation, high quality of evidence).
21.	Routine use of prophylactic antibiotics in patients with severe acute pancreatitis is not recommended (strong recommendation, moderate quality of evidence).
22.	The use of antibiotics in patients with sterile necrosis to prevent the development of infected necrosis is not recommended (strong recommendation, moderate quality of evidence).
23.	Infected necrosis should be considered in patients with pancreatic or extrapancreatic necrosis who deteriorate or fail to improve after 7–10 days of hospitalization. In these patients, either (i) initial CT-guided fine needle aspiration (FNA) for Gram stain and culture to guide use of appropriate antibiotics or (ii) empiric use of antibiotics without CT FNA should be given (strong recommendation, low quality of evidence).
24.	In patients with infected necrosis, antibiotics known to penetrate pancreatic necrosis, such as carbapenems, quinolones, and metronidazole, may be useful in delaying or sometimes totally avoiding intervention, thus decreasing morbidity and mortality (conditional recommendation, low quality of evidence).
25.	Routine administration of antifungal agents along with prophylactic or therapeutic antibiotics is not recommended (conditional recommendation, low quality of evidence).

Am J Gastroenterol 2013; 108:1400–1415; doi:10.1038/ajg.2013.218;

Failure to follow evidence-based best practice guidelines in the treatment of severe acute pancreatitis

Adrian C. Vlada*, Bradley Schmit*, Andrew Perry, Jose G. Trevino, Kevin E. Behrns & Steven J. Hughes

Modality of initial imaging, *n* (%)	
CT with i.v. contrast	43 (72%)
CT without i.v. contrast	11 (18%)
Abdominal ultrasound	5 (8%)
No abdominal radiological imaging	1 (1.5%)

Timing of CT imaging, *n* (%)	
At time of admissiona	40 (66%)
After admission	15 (25%)
Time from admission, days, mean (range)	3.1 (1–7)
CT with i.v. contrast at 48–72 h, *n* (%)	15 (31%)

HPB 2013, 15, 822–827

Failure to follow evidence-based best practice guidelines in the treatment of severe acute pancreatitis

Adrian C. Vlada*, Bradley Schmit*, Andrew Perry, Jose G. Trevino, Kevin E. Behrns & Steven J. Hughes

Antibiotic use, *n* (%)	51 (79%)
Prophylactic use	26 (53%)
Carbapenem antibiotics	11 (42%)
Non-carbapenem antibiotics	15 (58%)
Nutrition	
Time without nutritionc, days, mean (range)	2.6 (0–7)
Enteral feeding, *n* (%)	10 (17%)
TPN administration, *n* (%)	38 (60%)
Enteral or oral feeding used or considered first, *n* (%)	7 (23%)

HPB 2013, 15, 822–827

Original article

Antibiotic use in acute pancreatitis: An audit of current practice in a tertiary centre

Minas Baltatzis [a], J.M. Mason [b], Vishnu Chandrabalan [a], Panagiotis Stathakis [a], Ben McIntyre [c], Santhalingam Jegatheeswaran [a], Saurabh Jamdar [a], Derek A. O'Reilly [a, d], Ajith K. Siriwardena [a, d, *]

Table 3
Antibiotic use and outcome in mild, moderate and severe acute pancreatitis.

	Pancreatitis clinical severity			Total
	Mild	Moderate	Severe	
Number of Patients (n)	78 (70%)	16 (14%)	17 (15%)	111
Antibiotic use	34 (44%)	13 (81%)	17 (100%)	64 (57.6%)
Indication not related to pancreatitis:	10 (13%)	2 (15%)	3 (18%)	15 (14%)
Cholecystitis	1	0	0	1
Cholangitis	1	0	0	1
Chest infection	0	1	1	2
Urinary tract infection	3	0	0	3
MRSA/VRE/CPE[a]	2	0	2	4
Clostridium difficile infection	1	1	0	2
Post-ERCP prophylaxis	2	0	0	2
Hospital stay (days - median/range)				
Total	9 (1–52)	23 (2–133)	31 (8–89)	11 (1–133)
High dependency/Intensive care unit	0 (0–6)	0 (0–24)	14 (0–46)	0 (0–46)
Mortality	0	0	4 (23.5%)	4 (3.6%)

[a] MRSA: Methicillin Resistant Staphylococcus Aureus, VRE: Vancomycin Resistant Enterococci, CPE: Carbapenemase-producing Enterobacteriaceae.

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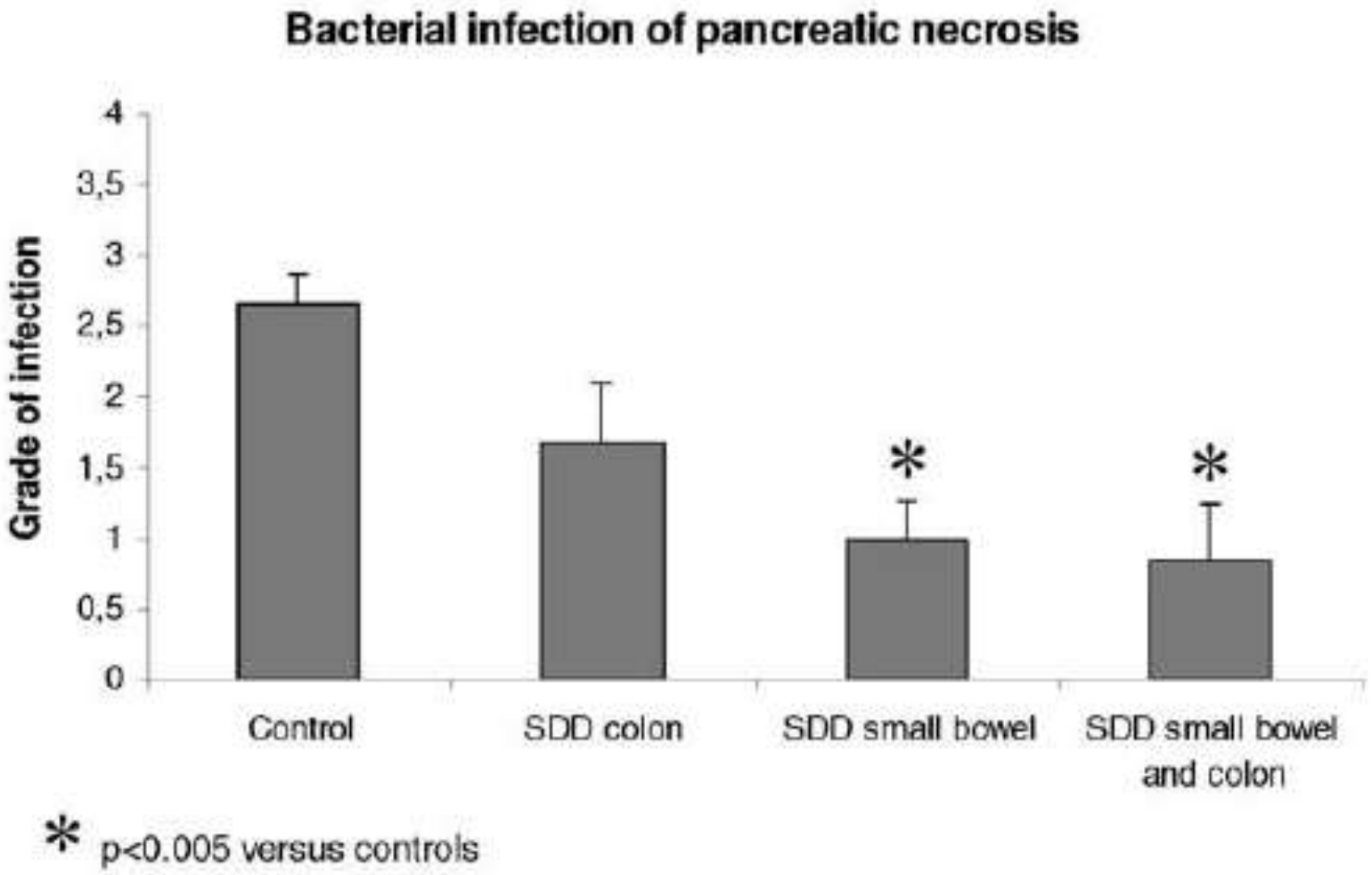
Therapiestrategien

- Volumen- und Elektrolytsubstitution
- Nahrungskarenz oder Ernährung (enteral vor parenteral)
- Analgetikatherapie
- AB - Prophylaxe / AB - Behandlung
- SOD / SDD
- Endoskopische / interventionelle / operative Verfahren



Stefan Fritz, The Am J Surg 2010, 200:111-117

- n=102 in 16 Spitälern
- EInschlußkriterien: Imriescore>3 und/oder Balthazar
- Mortalität SDD: OR 0,3 p=0,048

	Gram neg. Pankreasinf.	Gram neg. Sepsis	Laparotomie/Patient	Mortalität
SDD	4 (8%)	3	0,9	11 (22%)
Kontrolle	17 (33%)	10	3,1	18 (35%)
p-Wert	0,003	0,07	p<0,05	0,048

Luiten et al. Ann of Surg 1995

S2 Leitlinie der Deutschen Sepsis Gesellschaft und der DIVI 2010

Prävention, Diagnose, Therapie und Nachsorge der Sepsis

131 Empfehlungen

positiver Empfehlungsgrad A; Evidenzgrad Ia:

- Hygienische Händedesinfektion vor und nach Patientenkontakt
- **SDD oder SOD** bei Patienten mit vorrausichtlich längerer Beatmungsdauer (> 48 Stunden)

Rainer Isenmann, H.G. Beger, 2013

Klinische Praxis: Antibiotikatherapie on demand

- Im Verlauf neu aufgetretene Sepsis
- Neu aufgetretenes Mehrorganversagen
- Unklarer Anstieg CRP und V.a. extrapankreatische Infektion
- CT nachgewiesene subtotale / totale Nekrose

Antibiotika-Prophylaxe - Zusammenfassung

1. **Experimentelle Studien** **Ja**
2. **Klinische Studien** **Nein**
3. **Keine Zunahme von Pilzinfektionen**

Realität: „Antibiotika-Prophylaxe on demand“

(Carbapeneme, Chinolone, Breitspektrumcephalosperine, Breitspektrumpenicilline, Metronidazol)