

## Stephan Schmitz-Esser

Associate Professor, Department of Animal Science  
Iowa State University  
3222 NSRIC, 1029 North University Boulevard, Ames, IA, 50011, USA  
Email: [sse@iastate.edu](mailto:sse@iastate.edu)  
Office phone: 515-294-2739

### Employment

Since 12-2015

#### Associate Professor

Department of Animal Science, Iowa State University, Ames, IA  
70% Research, 30% Teaching

2014 – 2015

#### Group leader

Institute for Milk Hygiene, Milk Technology and Food Science, University of Veterinary Medicine Vienna, Austria

2010 – 2014

#### Postdoctoral Associate, main focus:

Microbiome characterizations of farm animals; Ecology of food-borne pathogens: Persistence of *Listeria monocytogenes* in food production environments; host cell interaction mechanisms of *Amoebophilus asiaticus* and of *Cardinium hertigii*.  
Institute for Milk Hygiene, Milk Technology and Food Science, University of Veterinary Medicine Vienna

2004- 2010

#### Postdoctoral Associate, main focus:

Nucleotide transport proteins in intracellular bacteria, genome sequencing and analyses of *Amoebophilus asiaticus* and *Cardinium hertigii*.  
Division of Microbial Ecology, University of Vienna

### Education

2001-2004

Division of Microbial Ecology, University of Vienna (Ecology): PhD, 2004  
*Title: "Molecular interaction between a chlamydia-related endosymbiont and its Acanthamoeba host"*

1996-2001

Technische Universität München (Germany) Biology, Diploma, 2001.  
*Main subject: Microbiology*

### Awards

2014

Hygiene-Price of the Austrian Society for Hygiene, Microbiology and Preventive Medicine (ÖGHMP).

*This price is awarded yearly to one scientist in Austria for the best publication (Mueller et al., 2013 PloS One: "Tn6188 - a novel transposon in Listeria monocytogenes responsible for tolerance to benzalkonium chloride") in the fields of Environmental, Water, Hospital, Veterinary or Food Hygiene.*

### Publications in peer-reviewed journals

Total number of papers in peer-reviewed journals: 39

Total impact factor: 192.6; average impact factor per published paper: 5.5

Total number of citations: 1396, average citations per paper: 32

h-index: 14

1. Mann E, Pinior B, Wetzels SU, Metzler-Zebeli BU, Wagner M, **Schmitz-Esser S**. 2015. The metabolically active bacterial microbiome of tonsils and mandibular lymph nodes of slaughter pigs. **Front. Microbiol.** 6:1362. doi: 10.3389/fmicb.2015.01362
2. Rychli K, Grunert T, Ciolacu L, Zaiser A, Razzazi-Fazeli E, **Schmitz-Esser S**, Ehling-Schulz M, Wagner M. Exoproteome analysis reveals higher abundance of proteins linked to alkaline stress in persistent *Listeria monocytogenes* strains. 2015. **Int J Food Microbiol.** 218:17-26

3. Metzler-Zebeli BU, **Schmitz-Esser S**, Mann E, Gröll D, Molnar T, Zebeli Q. Adaptation of the cecal bacterial microbiome of growing pigs in response to resistant starch type 4. 2015. **Appl Environ Microbiol.** 81(24):8489-99.
4. Mann E, Dzieciol M, Pinior B, Neubauer V, Metzler-Zebeli BU, Wagner M, **Schmitz-Esser S**. High diversity of viable bacteria isolated from lymph nodes of slaughter pigs and its possible impacts for food safety. 2015. **J Appl Microbiol.** 119(5):1420-1432
5. **Schmitz-Esser S**, Müller A., Wagner M. Genomes of sequence type 121 *Listeria monocytogenes* strains harbor highly conserved plasmids and prophages. 2015. **Front. Microbiol.** 28;6:380.
6. Hund A, Dzieciol M, **Schmitz-Esser S**, Wittek T. Characterization of mucosa-associated bacterial communities in abomasal ulcers by pyrosequencing. 2015 **Vet. Microbiol.** 177(1-2):132-41.
7. Metzler-Zebeli BU, Mann E, Ertl R, **Schmitz-Esser S**, Wagner M, Klein D, Ritzmann M, Zebeli Q. Dietary calcium concentration and cereals differentially affect mineral balance and tight junction proteins expression in jejunum of weaned pigs. 2015. **Br J Nutr.** 113(7):1019-31.
8. Wetzels S. U., Mann E, Metzler-Zebeli B. U., Wagner M., Klevenhusen F., Zebeli Q., **Schmitz-Esser S**. Pyrosequencing reveals shifts in the bacterial epimural community relative to dietary concentrate amount in goats. 2015. **J. Dairy Sci.** 98(8):5572-87.
9. Klein-Jöbstl D, Schornsteiner E, Mann E, Wagner M, Drillich M, **Schmitz-Esser S**. 2014. Pyrosequencing reveals diverse fecal microbiota in Simmental calves during early development. **Front. Microbiol.** 17;5:622.
10. Eichinger I., **Schmitz-Esser S**, Schmid M., Fisher C. R., Bright M. 2014. Symbiont-driven sulfur crystal formation in a thiotrophic symbiosis from deep-sea hydrocarbon seeps. **Environ. Microbiol. Rep.** 6:364-372.
11. Müller A, Rychli K, Zaiser A, Wieser C, Wagner M, **Schmitz-Esser S**. 2014. The *Listeria monocytogenes* transposon Tn6188 provides increased tolerance to various quaternary ammonium compounds and ethidium bromide. **FEMS Microbiol. Lett.** 361(2):166-73.
12. Schornsteiner E., Mann E., Bereuter O., Wagner M., **Schmitz-Esser S**. 2014. Cultivation-independent analysis of microbial communities on Austrian raw milk hard cheese rinds. **Int. J. Food Microbiol.** 180:88-97.
13. Casey A., Fox E. M., **Schmitz-Esser S**, Coffey A., McAuliffe O., Jordan K. 2014. Transcriptome analysis of *Listeria monocytogenes* exposed to biocide stress reveals a multi-system response involving cell wall synthesis, sugar uptake, and motility. **Front. Microbiol.** 5:68.
14. Rychli K., Müller A., Zaiser A., Schoder D., Allerberger F., Wagner M., **Schmitz-Esser S**. 2014. Genome sequencing of *Listeria monocytogenes* "Quargel" listeriosis outbreak strains reveals two different strains with distinct in vitro virulence potential. **PLoS One.** 9:e89964.
15. Mann E., **Schmitz-Esser S**, Zebeli Q., Wagner M., Ritzmann M., Metzler-Zebeli B. U. 2104. Mucosa-associated bacterial microbiome of the gastrointestinal tract of weaned pigs and dynamics linked to dietary calcium-phosphorus. **PLoS One.** 9:e86950.
16. Mann E., Dzieciol M., Metzler-Zebeli B. U., Wagner M., **Schmitz-Esser S**. 2014. Microbiomes of unreactive and pathologically altered ileocecal lymph nodes of slaughter pigs. **Appl. Environ. Microbiol.** 80:193-203.
17. Metzler-Zebeli B. U., Mann E., **Schmitz-Esser S**, Wagner M., Ritzmann M., Zebeli Q. 2013. Changing dietary calcium-phosphorus level and cereal source selectively alters abundance of bacteria and metabolites in the upper gastrointestinal tracts of weaned pigs. **Appl. Environ. Microbiol.** 79:7264-7272.
18. Müller A., Rychli K., Muhterem-Uyar M., Zaiser A., Stessl B., Guinane C. M., Cotter P. D., Wagner M., **Schmitz-Esser S**. 2013. Tn6188 - a novel transposon in *Listeria monocytogenes* responsible for tolerance to benzalkonium chloride. **PLoS One.** 8:e76835.
19. Metzler-Zebeli B. U., **Schmitz-Esser S**, Klevenhusen F., Podstatzky-Lichtenstein L., Wagner M., Zebeli Q. 2013. Grain-rich diets differently alter ruminal and colonic abundance of microbial populations and lipopolysaccharide in goats. **Anaerobe.** 20:65-73.
20. Haferkamp I, Penz T, Geier M, Ast M, Mushak T, Horn M, **Schmitz-Esser S**. The endosymbiont *Amoebophilus asiaticus* encodes an S-adenosylmethionine carrier that compensates for its missing methylation cycle. 2013. **J Bacteriol.** 195(14):3183-92.
21. Penz T\*, **Schmitz-Esser S\***, Kelly S.E., Cass B.N., Müller A., Woyke T., Malfatti S.A., Hunter M.S., Horn M. 2012. Comparative genomics suggests an independent origin of cytoplasmic incompatibility in *Cardinium hertigii*. **PLoS Genet.**, 8(10):e1003012. \*contributed equally
22. Haferkamp I., **Schmitz-Esser S**. 2012. The plant mitochondrial carrier family: functional and evolutionary aspects. **Front Plant Sci.** 3:2.

23. **Schmitz-Esser S**, T. Penz, A. Spang, M. Horn. 2011. A bacterial genome in transition - an exceptional enrichment of IS elements but lack of evidence for recent transposition in the symbiont *Amoebophilus asiaticus*. **BMC Evol. Biol.**, 11:270.
24. Toenshoff E. R., Penz T., Narzt T., Collingro A., **Schmitz-Esser S**, Pfeiffer S., Klepal W., Wagner M., Weinmaier T., Rattei T., Horn M. 2011. Bacteriocyte-associated gammaproteobacterial symbionts of the *Adelges nordmannianae/piceae* complex (Hemiptera: Adelgidae). **ISME J.** 6:384-396.
25. Knab S., Mushak T. M., **Schmitz-Esser S**, Horn M., Haferkamp I. 2011. Nucleotide parasitism by *Simkania negevensis* (Chlamydiae). **J. Bacteriol.** 193:225-235.
26. Penz T, M. Horn, **S. Schmitz-Esser**. 2010. The genome of the amoeba symbiont "*Candidatus Amoebophilus asiaticus*" encodes an afp-like prophage possibly used for protein secretion. **Virulence**, 1(6):541-5.
27. **Schmitz-Esser S**, P. Tischler, R. Arnold, J. Montanaro, M. Wagner, T. Rattei, and M. Horn. 2010. The genome of the amoeba symbiont '*Candidatus Amoebophilus asiaticus*' reveals common mechanisms for host cell interaction among amoeba-associated bacteria. **J. Bacteriol.**, 192(4):1045-57.
28. Ast M., Gruber A., **Schmitz-Esser S**, Neuhaus H. E., Kroth P. G., Horn M., Haferkamp I. 2009. Diatom plastids depend on nucleotide import from the cytosol. **Proc Natl Acad Sci USA.** 106:621-3626.
29. Rinke C., **Schmitz-Esser S**, Loy A., Horn M., Wagner M., Bright M. 2009. High genetic similarity between two geographically distinct strains of the sulfur-oxidizing symbiont '*Candidatus Thiobios zoothamnicoli*'. **FEMS Microbiol. Ecol.** 67:229-241.
30. **Schmitz-Esser S**, E.R. Toenshoff, S. Haider, E. Heinz, V.M. Hoenninger, M. Wagner, and M. Horn. 2008. Diversity of bacterial endosymbionts of environmental *Acanthamoeba* isolates. **Appl. Environ. Microbiol.**, 74:5822-5831.
31. **Schmitz-Esser S**, I. Haferkamp, S. Knab, T. Penz, M. Ast, C. Kohl, M. Wagner, and M. Horn. 2008. *Lawsonia intracellularis* encodes a functional rickettsia-like ATP/ADP translocase for host exploitation. **J. Bacteriol.**, 190:5746-52.
32. Maixner F., M. Wagner, S. Lücker, E. Pelletier, **S. Schmitz-Esser**, K. Hace, E. Spieck, R. Konrat, D. Le Paslier, and H. Daims. 2008. Environmental genomics reveals a functional chlorite dismutase in the nitrite-oxidizing bacterium '*Candidatus Nitrospira defluvii*'. **Environ. Microbiol.**, 10:3043 - 3056.
33. Haferkamp I., **S. Schmitz-Esser**, M. Wagner, N. Neigel, M. Horn, and H. E. Neuhaus. 2006. Tapping the nucleotide pool of the host: novel nucleotide carrier proteins of *Protochlamydia amoebophila*. **Mol. Microbiol.**, 60: 1534-1545.
34. Rinke C., **S. Schmitz-Esser**, K. Stoecker, A. D. Nussbaumer, D.A. Molnár, K. Vanura, M. Wagner, M. Horn, J. Ott, and M. Bright. 2006. '*Candidatus Thiobios zoothamnicoli*', an ectosymbiotic bacterium covering the giant marine ciliate *Zoothamnium niveum*. **Appl. Environ. Microbiol.**, 72: 2014-21.
35. Collingro A., S. Poppert, E. Heinz, **S. Schmitz-Esser**, A. Essig, M. Schweikert, M. Wagner, M. Horn. 2005. Recovery of an environmental chlamydia strain from activated sludge by co-cultivation with *Acanthamoeba* sp. **Microbiology**, 151: 301-309.
36. Horn M., A. Collingro, **S. Schmitz-Esser**, C. L. Beier, U. Purkhold, B. Fartmann, P. Brandt, G. J. Nyakatura, M. Droege, D. Frishman, T. Rattei, H. W. Mewes, M. Wagner. 2004. Illuminating the evolutionary history of chlamydiae. **Science**, 304:728-730.
37. Haferkamp I., **S. Schmitz-Esser**, N. Linka, C. Urbany, A. Collingro, M. Wagner, M. Horn, H. E. Neuhaus. 2004. A candidate NAD<sup>+</sup> transporter in an intracellular bacterial symbiont related to chlamydiae. **Nature**, 432: 622-625.
38. **Schmitz-Esser S**, N. Linka, A. Collingro, C. L. Beier, H. E. Neuhaus, M. Wagner, M. Horn. 2004. ATP/ADP translocases: a common feature of obligate intracellular amoebal symbionts related to chlamydiae and rickettsiae. **J. Bacteriol.**, 186:683-691.
39. Schmid M., **S. Schmitz-Esser**, M. Jetten, M. Wagner. 2001. 16S-23S rDNA intergenic spacer and 23S rDNA of anaerobic ammonium-oxidizing bacteria: implications for phylogeny and in situ detection. **Environ. Microbiol.**, 3:450-459.

#### Book chapters

1. Schmitz-Esser S, Wagner M. Genome sequencing of *Listeria monocytogenes*. 2014. Methods Mol Biol. 1157:223-32. (Jordan K, Fox EM, Wagner M, ed.) Springer, New York.
2. Horn, M., A. Collingro, S. Schmitz-Esser, and M. Wagner. 2006. Environmental Chlamydia Genomics. In: Chlamydia: genomics and pathogenesis, pp. 25-44. (Bavoil PM, Wyrick PB, ed.). Horizon Scientific Press, Norfolk.
3. Schmid MC, Schmitz-Esser S, Jetten M, Wagner M. 2001. The rDNA operon of anaerobic ammonium oxidizing bacteria: Implications for phylogeny and in situ detection In: Der Stickstoff im Wasser/Abwasser, pp. 7-19. (Metzger J W, ed.). Oldenbourg Industrieverlag GmbH, München.

### **Other publications (non refereed)**

1. Schmitz-Esser S, Gram L, Wagner M. Complete genome sequence of the persistent *Listeria monocytogenes* strain R479a. 2015. *Genome Announc.* 2015 Mar 19;3(2).
2. Schmitz-Esser S. Book Review: „Cheese and Microbes by Catherine W. Donnelly“ *The Quarterly Review of Biology*, Vol. 90, No. 3 (September 2015), p. 346.

### **Synergistic and Interdisciplinary Activities and Training**

- Task leader COST Action FA1202 “A European Network for Mitigating Bacterial Colonisation and Persistence on Foods and Food Processing Environments”
- Co-organizer, Joint Conference PROMISE and BacFood Net: Persistent lifestyles of food-borne pathogens and its consequence. Austrian Agency for Health and Food Safety, Vienna, Austria, November 2014 (Attendance approximately 120)
- Co-organizer, International Workshop on New Techniques in Microbial Ecology (INTIME-7), Lackenhof, Austria, August 2009 (Attendance approximately 80).

### **Membership in professional societies**

- American Society for Microbiology (ASM)
- International Society for Microbial Ecology (ISME)

### **Invited reviewer for the following scientific journals**

- Environmental Microbiology, FEMS Microbiology Ecology, PloS Genetics, PloS One, Genome Biology and Evolution, Applied Microbiology and Biotechnology, BMC Microbiology, BMC Genomics, Journal of Clinical Microbiology, Molecular Microbiology, International Journal of Food Microbiology, Food Microbiology

### **Funded projects prior to appointment at Iowa State University**

- Austrian Science Fund FWF, NSF: since 08/2013 Joint International project: “Genetic and cytogenetic bases of *Cardinium*-caused cytoplasmic incompatibility” (174,000 €)  
Role: co-PI
- Austrian Science Fund FWF 2010 – 2013:  
“*Amoebophilus asiaticus* mechanisms for host cell interaction” (302,000 €)  
Role: PI
- Austrian Science Fund FWF 2006 – 2008:  
“The evolution of symbiosis in the Bacteroidetes” (136,000 €)  
Role: PI

### **Oral presentations**

1. Schmitz-Esser, S; Müller, A; Pricope, L; Zaiser, A; Rychli, K; Wagner, M: Comparative genome analyses of persistent *Listeria monocytogenes* strains. ISOPOL XVIII - International Symposium on Problems of Listeriosis; Sept 19-22, 2013; Goa, India. 2103.
2. Schmitz-Esser, S; Müller, A; Muhterem-Uyar, M; Zaiser, A; Steßl, B; Rychli, K; Wagner, M (2013): Tn6188 - a novel transposon in *Listeria monocytogenes* conferring tolerance to benzalkonium chloride. 54-55.-Joint annual meeting of the Association for General and Applied Microbiology (VAAM) and the Royal Dutch Society of Microbiology (KNVM) 2013; Mar 10-13, 2013; Bremen, Germany.
3. Schmitz-Esser, S; Müller, A; Pricope, L; Zaiser, A; Rychli, K; Wagner, M: Comparative genome analyses of persistent *Listeria monocytogenes* strains. Foodmicro 2012; Sep 3-7, 2012; Istanbul, Turkey. 2012.
4. Schmitz-Esser, S; Müller, A; Allerberger, F; Wagner, M: Comparative genome analyses of *Listeria monocytogenes* outbreak strains. 33rd Annual Meeting of the Austrian Society of Hygiene, Microbiology and Preventive Medicine (ÖGHMP); May 22-24, 2012; Salzburg, Austria. 2012.
5. Schmitz-Esser S., T. Penz, A. Spang, M. Wagner, M. Horn. Identification and characterization of IS elements in the genome of the obligate intracellular amoeba symbiont ‘*Candidatus Amoebophilus asiaticus*’ 13th International Symposium on Microbial Ecology ISME13, Seattle, WA, USA, Aug 2010.
6. Schmitz-Esser S., M. Walcher, A. Horn, M. Horn, M. Wagner, M. Wagner. 2010. Interaction of *Listeria monocytogenes* with free-living amoebae. 32nd Annual Meeting of the Austrian Society of Hygiene, Microbiology and Preventive Medicine (ÖGHMP), Vienna, Austria, May 2010.
7. Schmitz-Esser S., P. Tischler, R. Arnold, J. Montanaro, M. Wagner, T. Rattei, and M. Horn. 2009. The genome of the amoeba symbiont ‘*Candidatus Amoebophilus asiaticus*’ reveals common mechanisms for

- host cell interaction among amoeba-associated bacteria. 6th congress of the International Symbiosis Society (ISS), Madison, WI, USA, Aug 2009
8. Schmitz-Esser S., P. Tischler, J. Montanaro, M. Wagner, T. Rattei, M. Horn. 2008. Whole genome analysis of the symbiont 'Candidatus Amoebophilus asiaticus' reveals a unique adaptation to eukaryotic host cells. 12th International Symposium on Microbial Ecology ISME12, Cairns, Australia, Aug 2008.
  9. Schmitz-Esser S., P. Tischler, J. Montanaro, M. Wagner, T. Rattei, M. Horn. 2008. Whole genome analysis of the symbiont 'Candidatus Amoebophilus asiaticus' reveals a unique adaptation to eukaryotic host cells. 5th International Wolbachia Conference, Kolymbari, Greece, Jun 2008.
  10. Schmitz-Esser S., I. Haferkamp, M. Wagner, N. Neigel, M. Horn, H. E. Neuhaus. Tapping the nucleotide pool of the host: novel nucleotide carrier proteins of Protochlamydia amoebophila UWE25. 2006. 4<sup>th</sup> German Chlamydia Workshop, Düsseldorf, Germany, Mar 2006.
  11. Schmitz-Esser S., I. Haferkamp, N. Linka, A. Collingro, C. Urbany, M. Wagner, H. E. Neuhaus, M. Horn. Characterization of nucleotide transport proteins of the environmental chlamydia UWE25. 5th Meeting of the European society for chlamydia research (ESCR), Budapest, Hungary, Sep 2004.
  12. Schmitz-Esser S., D. Heuer, A. Collingro, A.J. Szczepek, M. Wagner, M. Horn. Molecular mechanisms of interaction between chlamydia-related symbionts and their amoebal hosts. 2<sup>nd</sup> German Chlamydia Workshop, Berlin, Germany, Mar 2004.
  13. Schmitz-Esser S., D. Heuer, A. Collingro, A.J. Szczepek, T.F. Meyer, M. Wagner, M. Horn. Characterization of an ATP/ADP translocase and a chlamydial virulence factor in the environmental chlamydia isolate UWE25. 1<sup>st</sup> German Chlamydia Workshop, Berlin, Germany, Mar 2003.

**Graduate students advised or co-advised (University of Veterinary Medicine Vienna)**

<b>Student</b>	<b>Degree/Date</b>	<b>Major</b>	<b>Role</b>
Ertl, Daniel	MS, 2015	Biomedicine and Biotechnology	Co-supervisor
Müller, Anneliese	PhD, 2015	Life Sciences	Co-supervisor
Schornsteiner, Elisa	Dr. med. vet, 2014	Veterinary Medicine	Co-supervisor
Mann, Evelyne	PhD, 2014	Veterinary Medicine	Co-supervisor
Vizvari, Fruzsina	Diploma, 2013	Veterinary Medicine	Co-supervisor
Wetzels, Stefanie	Diploma, 2012	Veterinary Medicine	Co-supervisor