

Per M Roos, MD PhD

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The research concerns neurodegeneration and the contribution from neurotoxic metals to the pathogenesis of neurodegenerative disorders with a focus on amyotrophic lateral sclerosis (ALS) and multiple sclerosis (MS). By combining epidemiological research with expert knowledge in environmental medicine, analytical chemistry, biophysics, geochemistry, neurology and clinical neurophysiology we have created a new translational base for exploration of causative mechanisms in neurodegeneration.

Degrees and education

Jan 16, 1984	BA in Biochemistry. Stockholm University.
Nov 3, 1986	MD. Karolinska Institutet. Stockholm.
Nov 24, 1993	Specialist in neurology. Training at departments of Neurology at Linköping University Hospital and Academic Hospital, Uppsala.
Nov 20, 1997	Specialist in clinical neurophysiology. Training at Örebro University Hospital and Department of Clinical Neurophysiology Uppsala under the supervision of professor Erik Stalberg.
March 8, 2013	Med.Dr. Institute of Environmental Medicine (IMM), Karolinska Institutet

Positions and Employments

1976 -1980	Amanuensis department of Chemistry, Karolinska Institutet Stockholm Sweden
1980 -1988	Internship and junior doctor assignments community hospitals Stockholm Sweden
1988 -1991	Resident departments of Neurology university clinics of Linköping and Uppsala Sweden
1991 -1997	Resident departments of Clinical Neurophysiology Örebro and Uppsala Sweden
1997- 2002	Senior staff member Department of Clinical Neurophysiology Stavanger University Hospital, Stavanger Norway
2002 - 2015	Senior staff member Division of Clinical Neurophysiology, Department of Neurology, Oslo University Hospital, Oslo Norway

Present position held

Consultant Clinical Neurophysiology, St.Göran hospital Stockholm, Sweden.

Professional Memberships

1991-pres.	Member, Swedish Society for Clinical Neurophysiology
1993-pres.	Member, Swedish Neurological Society
1996-pres.	Member, Swedish Epilepsy Society
1997-pres.	Member, Norwegian Society for Clinical Neurophysiology

- 1998-pres. Member, American Acad. of Neuromuscular and Electrodiagnostic Medicine
 2006-pres. Member, Norwegian Neurological Society
 2007-pres. Member, International Society for Trace Elements in Humans - ISTERH
 2013-pres. Member, Nordic Trace Element Society
 2017-2019. Vice president International Society of Trace Element Research in Humans.

Other professional experiences and contributions

- 2005 5th International Conference on Metallothionein, Beijing, China. (**Awarded**)
 2006 28th International Congress of Clinical Neurophysiology Edinburgh, England.
 2007 International Conference on Fetal Programming and Developmental Toxicity. Faroe Islands – PPTOX
 2007 8th Conference of International Society of Trace Element Research in Humans (ISTERH)/Conference of Nordic Trace Element Society (NTES), Crete, Greece.
 2010 29th International Conference of Clinical Neurophysiology ICCN Kobe, Japan.
 2012 Nordic Congress of Clinical Neurophysiology NCCN Lund, Sweden.
 2013 Nordic Trace Element Society 2013 Loen, Norway August 25-29. **Invited speaker. Chair.**
 2013 International Society of Trace Element Research in Humans ISTERH 2013 Nov.18-22 Tokyo, Japan. **Invited speaker.**
 2014 30th International Congress of Clinical Neurophysiology ICCN, Berlin, Germany. **Poster presentation.**
 2015 International Society of Trace Element Research in Humans ISTERH 2015 Oct.18-22 Dubrovnik, Croatia. **Invited speaker. Chair.**
 2016 National Educational Conference in Clinical Neurophysiology, Jan 28-29, Linköping university hospital, Linköping, Sweden.
 2016 European congress on ALS research ENCALS, May 19-21 University of Milan, Italy. **Poster presentation.**
 2017 ISTERH/TEMA-16/NTES Conference, St.Petersburg, Russia June 26-29, 2017. **Invited speaker. Chair.**
 2018 43rd FEBS Congress, Prague, Czech Republic, July 7-12, 2018. **Invited speaker.**
 2019 International Society of Trace Element Research in Humans ISTERH 2019 Sept. 22-26, Bali, Indonesia. **Invited speaker. Organizer.**

Research

- 1977-1980 Department of Chemistry at Karolinska Institutet. Biochemical research in the area of prostaglandins and leukotrienes at the supervision of professor Bengt Samuelsson.
 2003-2013 Institute of Environmental Medicine (IMM) Karolinska Institutet, Stockholm. Dissertation 8th of March 2013. Title: Studies on metals in motor neuron disease. Thesis at KIpuplications: <http://publications.ki.se/xmlui/handle/10616/41419>
 2013 - pres. Affiliated to Karolinska Institutet, IMM, Unit of cardiovascular and nutritional epidemiology, head professor Agneta Åkesson.

Supervision

- Cosupervisor Cecilia Wallin, PhD, dissertation 2020-09-03 at Department of Biochemistry and Biophysics Stockholm University. Research subject: Biophysics Title: *Self-assembly of amyloid-β peptides in the presence of metal ions and interacting molecules*. Main supervisor prof. Astrid Gräslund.
 Cosupervisor Elina Berntsson, PhD-student, ongoing research concerning metal binding to the protein molecule amyloid beta of relevance for neurodegeneration in Alzheimers

dementia. Research at Department of Biochemistry and Biophysics Stockholm university and Tallin Technical university. Main supervisor: prof. Peep Palumaa. Student supervisor Sara Aaltonen med stud, supervisor of student thesis work entitled *Occupational metal exposure in a precision tool manufacturer with amyotrophic lateral sclerosis*. 2017. Passed.

Student supervisor Teodor Svantesson med stud, supervisor of student thesis work entitled *The Interaction between Aluminum and Amyloid- β and the Potential Role of Aluminum in Amyotrophic Lateral Sclerosis*. 2018. Passed and presented at international conference FEBS in Praha 2018 as Invited Speaker.

Funding

Funding provider	Title	TSEK
Kamprad Family Research Trust	Geochemical exposure in ALS	3,900
Strategic grant IMM	Medical consequences of climate change	300
U-C Lindqvist ALS Research Trust	Metals in motor neuron disorders	500
Magnus Bergvalls stiftelse	Metals in neurodegenerative disorders	300
Martin Rinds stiftelse	Metals in motor neuron disease	75

Scientific evaluator

Faculty opponent Gabriel Enge, PhD. Thesis title: *Looking for the Missing Link: Application of Copper Isotope Metallomics to Amyotrophic Lateral Sclerosis*. University of Wollongong Australia

Bibliometry

Number of publications: 30

Citations: 749

Average citation per item: 26

Top 5%: 3

h-index: 14

Publication list



**Karolinska
Institutet**

 **Region Stockholm**

Per Roos Publication List

Peer-reviewed papers in scientific journals

1. # Roos E, Warmlander SKTS, Meyer J, Sholts SB, Jarvet J, Graslund A, **Roos PM**. Amyotrophic Lateral Sclerosis After Exposure to Manganese from Traditional Medicine Procedures in Kenya. *BIOLOGICAL TRACE ELEMENT RESEARCH* 2020 ;

JIF(2019) 2.64

Times cited 0

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doi:10.1007/s12011-020-02501-4

2. Yuan S, **Roos PM**, Larsson SC. Interleukin-1 receptor antagonist, interleukin-2 receptor alpha subunit and amyotrophic lateral sclerosis. EUROPEAN JOURNAL OF NEUROLOGY 2020 27;10 1913-1917

JIF(2019) 4.52

Times cited 0

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doi:10.1111/ene.14338

3. Wallin C, Friedemann M, Sholts SB, Noormagi A, Svantesson T, Jarvet J, **Roos PM**, Palumaa P, Graslund A, Warmlander SKTS. Mercury and Alzheimer's Disease: Hg(II) Ions Display Specific Binding to the Amyloid-beta Peptide and Hinder Its Fibrillization. BIOMOLECULES 2020 10;1

JIF(2019) 4.08

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doi:10.3390/biom10010044

4. # Larsson SC, **Roos PM**. Serum 25-hydroxyvitamin D in amyotrophic lateral sclerosis: mendelian randomization study. Neurobiology of aging 2020 87; 140.e1-140.e3

JIF(2019) 4.35

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doi:10.1016/j.neurobiolaging.2019.10.024

5. # **Roos PM**. Ultraclean paired sampling for metal analysis in neurodegenerative disorders. Journal of trace elements in medicine and biology : organ of the Society for Minerals and Trace Elements (GMS) 2019 52; 48-52

JIF(2019) 3.25

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doi:10.1016/j.jtemb.2018.11.007

6. Warmlander S, Wallin C, Sholts S, **Roos P**, Jarvet J, Graslund A. Mercury and Alzheimers Disease: HG(II) Ions Display Specific Binding to the Amyloid-Beta Peptide and Modulate its Aggregation. BIOPHYSICAL JOURNAL 2018 114;3 219A-219A

JIF(2019) 3.85

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7. # Aaseth J, Dusek P, **Roos PM**. Prevention of progression in Parkinson's disease. Biometals : an international journal on the role of metal ions in biology, biochemistry, and medicine 2018 31;5 737-747

JIF(2019) 2.48

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doi:10.1007/s10534-018-0131-5

8. Wallin C, Sholts SB, Österlund N, Luo J, Jarvet J, **Roos PM**, Ilag L, Gräslund A, Wärmländer SKTS. Alzheimer's disease and cigarette smoke components: effects of nicotine, PAHs, and Cd(II), Cr(III), Pb(II), Pb(IV) ions on amyloid- β peptide aggregation. *Scientific reports* 2017 7;1 14423-

JIF(2019) 4

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doi:10.1038/s41598-017-13759-5

9. Wallin C, Kulkarni YS, Abelein A, Jarvet J, Liao Q, Strodel B, Olsson L, Luo J, Abrahams JP, Sholts SB, **Roos PM**, Kamerlin SC, Gräslund A, Wärmländer SK. Characterization of Mn(II) ion binding to the amyloid- β peptide in Alzheimer's disease. *Journal of trace elements in medicine and biology : organ of the Society for Minerals and Trace Elements (GMS)* 2016 38; 183-193

JIF(2019) 3.25

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doi:10.1016/j.jtemb.2016.03.009

10. Roos E, Mariosa D, Ingre C, Lundholm C, Wirdefeldt K, **Roos PM**, Fang F. Depression in amyotrophic lateral sclerosis. *Neurology* 2016 86;24 2271-7

JIF(2019) 8.77

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doi:10.1212/WNL.0000000000002671

11. Tiiman A, Luo J, Wallin C, Olsson L, Lindgren J, Jarvet J, **Roos P**, Sholts SB, Rahimipour S, Abrahams JP, Karlström AE, Gräslund A, Wärmländer SK. Specific Binding of Cu(II) Ions to Amyloid-Beta Peptides Bound to Aggregation-Inhibiting Molecules or SDS Micelles Creates Complexes that Generate Radical Oxygen Species. *Journal of Alzheimer's disease : JAD* 2016 54;3 971-982

JIF(2019) 3.91

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doi:10.3233/JAD-160427

12. Aaseth J, Alexander J, Bjørklund G, Hestad K, Dusek P, **Roos PM**, Alehagen U. Treatment strategies in Alzheimer's disease: a review with focus on selenium supplementation. *Biometals : an international journal on the role of metal ions in biology, biochemistry, and medicine* 2016 29;5 827-39

JIF(2019) 2.48

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doi:10.1007/s10534-016-9959-8

13. Aspli KT, Flaten TP, **Roos PM**, Holmøy T, Skogholt JH, Aaseth J. Iron and copper in progressive demyelination--New lessons from Skogholt's disease. *Journal of trace elements in medicine and biology : organ of the Society for Minerals and Trace Elements (GMS)* 2015 31; 183-7

JIF(2019) 3.25

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doi:10.1016/j.jtemb.2014.12.002

14. Ingre C, **Roos PM**, Piehl F, Kamel F, Fang F. Risk factors for amyotrophic lateral sclerosis. *Clinical epidemiology* 2015 7; 181-93

JIF(2019) 2.94

Times cited 172

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doi:10.2147/CLEP.S37505

15. Dusek P, **Roos PM**, Litwin T, Schneider SA, Flaten TP, Aaseth J. The neurotoxicity of iron, copper and manganese in Parkinson's and Wilson's diseases. *Journal of trace elements in medicine and biology : organ of the Society for Minerals and Trace Elements (GMS)* 2015 31; 193-203

JIF(2019) 3.25

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doi:10.1016/j.jtemb.2014.05.007

16. # **Roos PM**. Osteoporosis in neurodegeneration. *Journal of trace elements in medicine and biology : organ of the Society for Minerals and Trace Elements (GMS)* 2014 28;4 418-21

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doi:10.1016/j.jtemb.2014.08.010

17. **Roos PM**, Vesterberg O, Syversen T, Flaten TP, Nordberg M. Metal concentrations in cerebrospinal fluid and blood plasma from patients with amyotrophic lateral sclerosis. *Biological trace element research* 2013 151;2 159-70

JIF(2019) 2.64

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doi:10.1007/s12011-012-9547-x

18. **Roos PM**, Lierhagen S, Flaten TP, Syversen T, Vesterberg O, Nordberg M. Manganese in cerebrospinal fluid and blood plasma of patients with amyotrophic lateral sclerosis. EXPERIMENTAL BIOLOGY AND MEDICINE 2012 237;7 803-10

JIF(2019) 3.14

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doi:10.1258/ebm.2012.011396

19. **Roos PM**, Dencker L. Mercury in the Spinal Cord After Inhalation of Mercury. BASIC & CLINICAL PHARMACOLOGY & TOXICOLOGY 2012 111;2 126-32

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doi:10.1111/j.1742-7843.2012.00872.x

20. **Roos PM**, Vesterberg O, Nordberg M. Inclusion body myositis in Alzheimer's disease. ACTA NEUROLOGICA SCANDINAVICA 2011 124;3 215-7

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doi:10.1111/j.1600-0404.2010.01461.x

21. Gellein K, **Roos PM**, Evje L, Vesterberge O, Flaten TP, Nordberg M, Syversen T. Separation of proteins including metallothionein in cerebrospinal fluid by size exclusion HPLC and determination of trace elements by HR-ICP-MS. BRAIN RESEARCH 2007 1174; 136-42

JIF(2019) 2.73

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doi:10.1016/j.brainres.2007.08.004

22. Holmoy T, Bjorgo K, **Roos PM**. Slowly progressing amyotrophic lateral sclerosis caused by H46R SOD1 mutation. EUROPEAN NEUROLOGY 2007 58;1 57-8

JIF(2019) 1.18

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doi:10.1159/000102170

23. Holmoy T, **Roos PM**, Kvale EO. ALS: Cytokine profile in cerebrospinal fluid T-cell clones. AMYOTROPHIC LATERAL SCLEROSIS 2006 7;3 183-6

JIF(2012) 2.37

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doi:10.1080/17482960600664730

24. **Roos PM**, Vesterberg O, Nordberg M. Metals in motor neuron diseases. EXPERIMENTAL BIOLOGY AND MEDICINE 2006 231;9 1481-7

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doi:10.1177/153537020623100906

25. **Roos PM**. Inclusion body myositis in dementia of Alzheimer type. EUROPEAN JOURNAL OF NEUROLOGY 2004 11; 190-190

JIF(2019) 4.52

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26. **Roos PM**. Mitochondrial changes in scollotic Parkinson's disease. EUROPEAN JOURNAL OF NEUROLOGY 2004 11; 259-259

JIF(2019) 4.52

Times cited 0

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27. Omdal R, **Roos P**, Wildhagen K, Gunnarsson R. Respiratory arrest in systemic lupus erythematosus due to phrenic nerve neuropathy. LUPUS 2004 13;10 817-9

JIF(2019) 2.25

Times cited 5

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28. **Roos PM**. Inclusion body myositis and Alzheimer. JOURNAL OF THE NEUROLOGICAL SCIENCES 2002 199; S50-S51

JIF(2019) 3.12

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Indicators summary for verified articles and reviews

P	22	Number of verified publications
Sum JIF	75.31	Sum of Latest Known Journal Impact Factor
C	636	Total number of Citations
Avg C top5	84.4	Average number of citations for the 5 highest cited publications
Avg JIF top5	5.1	Average Journal Impact Factor for the 5 publications with highest JIF

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Published before 1995

29. Hammarstrom S, Lindgren. J.A., **Roos P**, *Biosynthesis of prostaglandins and thromboxanes*. Chemistry, Biochemistry and Pharmacological Activity of Prostanoids 1979: p. 221-232. Number of citations: 0

30. **Roos P.**, J.A. Lindgren, and S. Hammarstrom, *On the mechanism of elevated prostaglandin E2 production in 3T3 fibroblasts transformed by polyoma virus*. Eur J Biochem, 1980. **108**(1): p. 279-83. Number of citations: 13. [PMID: 6250831](#)
-

Referee evaluated abstracts

Roos, P.M., *A case of Lambert-Eaton Myasthenic Syndrome?* 10th European Congress of Clinical Neurophysiology August 26-30 2000 Lyon France. **Abstract poster presentation.**

Roos, *Inclusion body myositis and Alzheimer*, Journal of the Neurological Sciences 199 (2002) P256. **Abstract poster presentation.**

Omdal R, **Roos P**, Wildhagen K, Gunnarsson R., *Respiratory arrest in SLE caused by phrenic nerve paralysis*. Annals of the rheumatic diseases. July 2003, 62 (Suppl 1) 444-444. **Published abstract.**

Roos, P.M., *Mitochondrial alterations in scoliotic Parkinson disease*. The 12th European Congress of Clinical Neurophysiology (ECCN) May 8-12 2005 Stockholm Sweden, 2005. **Abstract poster presentation.**

Roos, P.M., *Inclusion body myositis in dementia of Alzheimer type*. The 12th European Congress of Clinical Neurophysiology (ECCN) May 8-12 2005 Stockholm Sweden. **Abstract poster presentation.**

Lars G Evje, **P.M. Roos**, Tore Syversen, *The importance of matrix match in trace element analysis*. The fifth international conference on metallothionein, Metals and metallothionein in Biology and Medicine, Beijing, China, October 8-12, 2005. **Abstract poster presentation.**

Per M Roos, Monica Nordberg, Olof Vesterberg, *Metals in motor neuron disorders*. The fifth international conference on metallothionein, Metals and metallothionein in Biology and Medicine, Beijing, China, October 8-12, 2005. **Abstract poster presentation** (awarded).

Roos Per M, Nordberg Monica, Vesterberg Olof, *Metals in cerebrospinal fluid a diagnostic tool*, International Conference on Fetal Programming and Developmental Toxicity – PPTOX, Torshavn Faroe Islands, May 20-24, 2007. **Abstract poster presentation.**

Roos Per M, Nordberg Monica, *Metal exposure in neurodegenerative disorders* VIIIth ISTERH Conference, Crete, Greece, Oct. 21-26, 2007. **Oral presentation.** Cell Biology and Toxicology, vol 24, June 2008.

Roos P.M, Vesterberg O, Nordberg M. *Concentrations of manganese in cerebrospinal fluid and blood plasma from patients with amyotrophic lateral sclerosis*

Clinical Neurophysiology 01/2010; 121. DOI:10.1016/S1388-2457(10)60593-7.
Published abstract.

Roos PM., *Concentrations of manganese in cerebrospinal fluid and blood plasma from patients with amyotrophic lateral sclerosis.* 29th ICCN 2010, Kobe, Japan.
Abstract poster presentation.

Roos PM, Lierhagen S, Flaten TP, Syversen T, Bergström J, Vesterberg O and Nordberg M., *Manganese in CSF and blood plasma from ALS patients.* IXth ISTERH Conference, Belek, Turkey, Oct. 16-21, 2011. **Oral presentation.**

Roos P, Lierhagen S., Flaten TP, Syversen T., Bergström J., Vesterberg O., Nordberg M. *Manganese in CSF and blood plasma from ALS patients.* ISTERH 2011, Belek Turkey. Journal of Trace Elements in Medicine and Biology, 26S1, 31. **Published abstract.**

Roos PM., *Metal measurements in cerebrospinal fluid.* 26th Nordic Congress of Clinical Neurophysiology, May 10-12, 2012 Lund, Sweden. **Abstract poster presentation.**

Roos PM., *Metal concentrations in cerebrospinal fluid and blood plasma from patients with neurodegenerative disorders.* NTES Conference. 10th Nordic Symposium on Trace and Mineral Elements in Health and Disease Loen, Norway Aug 25-29, 2013. **Invited speaker. Chair.**

Roos PM. *Manganese concentrations in cerebrospinal fluid and blood plasma from patients with neurodegenerative disorders.* Xth ISTERH Conference, Tokyo, Japan Nov 18-22, 2013. **Invited speaker.**

Roos PM. *Metal concentrations in cerebrospinal fluid and blood plasma from patients with neurodegenerative disorders.* International Congress of Clinical Neurophysiology (ICCN) Berlin, Germany March 19-23, 2014. **Abstract poster presentation.**

Roos PM. *Osteoporosis in neurodegeneration.* XIth ISTERH Conference, Dubrovnik, Croatia Oct 18-22, 2015. **Invited speaker. Chair.**

Roos PM. *Metal concentrations in cerebrospinal fluid and blood plasma from patients with ALS.* European congress on ALS ENCALS, May 19-21, 2016. University of Milan, Italy. **Poster presentation.**

Roos E, Mariosa D, Ingre C, Lundholm C, Wirdefeldt K, **Roos PM**, Fang F. *Depression in amyotrophic lateral sclerosis.* European congress on ALS ENCALS, May 19-21, 2016. University of Milan, Italy. **Poster presentation.**

Roos PM. *Ultraclean paired sampling for metal analysis in neurodegenerative disorders.* ISTERH/TEMA-16/NTES Conference, St.Petersburg, Russia June 26-29, 2017. **Invited speaker. Chair.**

Roos PM. *Metal chemistry in neurodegenerative disorders*. 43rd FEBS Congress, Prague, Czech Republic, July 7-12, 2018. **Invited speaker.**

Roos PM. *Neurotoxic metals in neurodegenerative diseases*. International Society of Trace Element Research in Humans ISTERH, Bali, Indonesia. Sept. 22-26, 2019. **Invited speaker. Organizer.**

Xiaolin Dong, Cecilia Wallin, Teodor Svantesson, Jonathan Pansieri, Igor A. Iashchishyn, Elina Berntsson, Lucija Ostojic, Belinda Trachsel, Jüri Jarvet, **Per M. Roos**, Astrid Gräslund, Ludmilla Morozova-Roche, Sebastian K.T.S. Wärmländer. P-54. *Characterization of Ni(II) ion binding to the amyloid-beta (1-40) peptide: Residue-specific interactions retard A β aggregation*. The Swedish meeting for Alzheimer research. Center for Alzheimer Research at Karolinska Institutet. Karolinska Institutet, Nov 20, 2019. **Poster presentation.**

Wang L, Paul S, Berntsson E, **Roos P**, Barth A, Gräslund A, Wärmländer S. P-27. *The drug Edaravone induces rapid aggregation of amyloid-beta peptides*. The Swedish meeting for Alzheimer research. Center for Alzheimer Research at Karolinska Institutet. Karolinska Institutet, Nov 20, 2019. **Poster presentation.**

Teodor Svantesson, **Per Roos**, Astrid Gräslund, Sebastian Wärmländer. P-49. *Aluminium and Alzheimer's disease: Al (III) ions do not bind specifically to the amyloid- β (A β) peptide*. The Swedish meeting for Alzheimer research. Center for Alzheimer Research at Karolinska Institutet. Karolinska Institutet, Nov 20, 2019. **Poster presentation.**

Books and reports

Book

Roos PM. *Studies on metals in motor neuron disease*. **Doctoral thesis**. March 8, 2013. Institute of Environmental Medicine, Karolinska Institutet, Stockholm, Sweden. <http://publications.ki.se/xmlui/handle/10616/41419>

Book chapter

Roos PM. *Metals and motor neuron disease*. In: *Biometals in Neurodegenerative Diseases: Mechanisms and Therapeutics*. Editors White A, Aschner M, Bush I and Costa L. Academic Press 2017.

Report

Roos PM. *Metaller vid motorneuronsjukdom*. Summary of Thesis in Swedish language. Neurologi i Sverige.