COST

Domain Committee "CMST"

COST Action CM1105

Start Date 08/05/2012

Functional metal complexes that bind to biomolecules

MONITORING PROGRESS REPORT

Reporting Period: *from 08/05/2012 to 01/06/2013*

This Report is presented to the relevant Domain Committee.
It contains three parts:

I. Management Report *prepared by the COST Office/Grant Holder*
II. Scientific Report *prepared by the Chair of the Management Committee of the Action*
III. Previous versions of the Scientific Report*; i.e., part II of past reporting periods*

The report is a "cumulative" report, i.e. it is updated annually and covers the entire period of the Action.

Confidentiality: the documents will be made available to the public via the COST Action web page except for chapter *II.D. Self evaluation*.

Based on the monitoring results, the COST Office will decide on the following year's budget allocation.

Executive summary:

Five Working Groups have been established. A Whole Action Meeting took place in September 2012 with flash presentations from all participating research groups, indicating what expertise they could offer to other groups and what they would hope that other groups could offer to them. This innovative tool was very helpful to better get to know each other and to establish new collaborations. All five WGs made excellent scientific progress with respect to the objectives mentioned in the MoU. Significant scientific results were the identification of molecular targets for organometallic compounds, new insights into the interaction of metal complexes with protein targets, the identification of platinum(II) complexes that are highly luminescent when bound to DNA (potentially useful for cellular imaging), and the re-refinement of an experimental structure of a DNA duplex containing consecutive silver(I)-mediated base pairs with QM/MM-derived constraints. One new patent on Osmium compounds with anti-cancer activity has been obtained. In general, a high level of inter-disciplinarity has been achieved during the first year of this COST Action.

I. Management Report prepared by the COST Office/Grant Holder

I.A. COST Action Fact Sheet

- **COST Action** *CM1105 - Functional metal complexes that bind to biomolecules*
- **Domain** *Chemistry and Molecular Sciences and Technologies (CMST)*

- **Action details:**

CSO Approval: *01/12/2011* **End date:** *07/05/2016*
Entry into force: *30/12/2011* **Extension:**

- **Objectives**

The aim of the Action is to develop and evaluate in a structure-targeted approach new metal-based compounds that exert their function as metallo-drugs, as research tools, or as diagnostic tools by binding to biomolecules, and to understand their modes of action.

- **Parties:**

Austria *14/12/2011*	Hungary *06/01/2012*	Romania *28/02/2012*
Croatia *09/07/2012*	Iceland *22/11/2012*	Serbia *26/12/2011*
Czech Rep. *05/01/2012*	Ireland *17/01/2012*	Slovenia *05/01/2012*
Denmark *02/03/2012*	Israel *27/12/2011*	Spain *18/01/2012*
Finland *05/03/2012*	Italy *09/01/2012*	Sweden *16/01/2012*
France *10/01/2012*	Netherlands *20/01/2012*	Switzerland *24/01/2012*
Germany *18/01/2012*	Poland *09/02/2012*	Turkey *18/05/2012*
Greece *14/02/2012*	Portugal *30/12/2011*	United Kingdom *06/12/2011*

- **Intentions to accept:** *none*

- **Other participants:**

University of Cape Town, South Africa
The University of Auckland, New Zealand
The University of Sydney, Australia
University of Western Sydney, Australia

Chair:
Prof. Jens Müller
Westfälische Wilhelms-Universität,
Institut für Anorganische und
Analytische Chemie, Corrensstr. 28/30,
48149 Münster, Germany
phone +49 251 8336006
mueller.j@uni-muenster.de

DC Rapporteur:
Prof. Jan Reedijk
Leiden Institute of Chemistry, Leiden
University, PO Box 9502, 2300 RA
Leiden, The Netherlands,
phone +31 715176596
reedijk@chem.leidenuniv.nl

Science Officer:
Dr Lucia Forzi
lucia.forzi@cost.eu

Administrative Officer:
Ms Andrea Tortajada
andrea.tortajada@cost.eu

- **Action Web site:** http://www.cm1105.eu
- **Grant Holder Representative** Prof. Jens Müller, mueller.j@uni-muenster.de

• **Working Groups**

WG	*Name*	*Affiliation*
WG 1: Protein targets	Barea, Elisa	Spain
	Bergamo, Alberta (WG Coordinator)	Italy
	Casini, Angela	Netherlands
	Eble, Johannes	Germany
	Gaiddon, Christian	France
	Hartinger, Christian	New Zealand
	Meggers, Eric	Germany
	Messori, Luigi	Italy
	Rigobello, Maria Pia	Italy
	Vessières-Jaouen, Anne	France
WG 2: Emerging nucleic acid targets (beyond the double helix)	Adamiak, Ryszard	Poland
	Aldrich-Wright, Janice	Australia
	Bickelhaupt, F. Matthias	Netherlands
	Bombard, Sophie	France
	Elmroth, Sofi	Sweden
	Freisinger, Eva (WG Coordinator)	Switzerland
	Hannon, Mike	United Kingdom
	Lincoln, Per	Sweden
	Müller, Jens	Germany
	Plavec, Janez	Slovenia
	Sigel, Roland	Switzerland
	Teulade-Fichou, Marie-Paule	France
	Vilar, Ramon	United Kingdom
	Rodríguez Raurell, Laura	Spain
WG 3: Metal bioconjugates for targeting and delivery	Alberto, Roger (WG Coordinator)	Switzerland
	Alessio, Enzo	Italy
	Buglyo, Peter	Hungary
	Dyson, Paul	Switzerland
	Farkas, Etelka	Hungary
	Gamez, Patrick	Spain
	Garnuszek, Piotr	Poland
	Hambley, Trevor	Australia
	Metzler-Nolte, Nils	Germany
	Mikolajczak, Renata	Poland
	Ott, Ingo	Germany
	Peacock, Anna	United Kingdom
	Rego dos Santos, Isabel	Portugal
	Ronconi, Luca	Ireland
	Rösch, Frank	Germany
	Therrien, Bruno	Switzerland

WG 4: Interactions of metallodrugs on the cellular level	Alemán, José	Spain
	Bednarski, Patrick (WG Coordinator)	Germany
	Brabec, Viktor	Czech Republic
	Gibson, Dan	Israel
	Kasparkova, Jana	Czech Republic
	Lambert, Ian	Denmark
	Marmion, Celine	Ireland
	Natile, Giovanni	Italy
	Ruiz, Jose	Spain
	Sadler, Peter	United Kingdom
	Schobert, Rainer	Germany
	Stürup, Stefan	Denmark
WG 5: Prodrugs with novel activation strategies	Berger, Walter	Austria
	Galanski, Markus	Austria
	Gasser, Gilles	Switzerland
	Gómez Quiroga, Adoración (WG Coordinator)	Spain
	Grguric-Sipka, Sanja	Serbia
	Keppler, Bernhard	Austria
	Malina, Jaroslav	Czech Republic
	Mokhir, Andriy	Germany
	Osella, Domenico	Italy
	Psomas, George	Greece
	Salassa, Luca	Spain
	Schatzschneider, Ulrich	Germany
	Turel, Iztok	Slovenia
	Weigand, Wolfgang	Germany

I.B. Management Committee member list

Name	*Country*	*E-mail*
Prof. Walter BERGER	Austria	walter.berger@meduniwien.ac.at
Prof. Bernhard KEPPLER	Austria	bernhard.keppler@univie.ac.at
Dr Srecko KIRIN	Croatia	srecko.kirin@irb.hr
Prof. Viktor BRABEC	Czech Republic	brabec@ibp.cz
Prof. Jana KASPARKOVA	Czech Republic	jana@ibp.cz
Dr Stefan STÜRUP	Denmark	sts@farma.ku.dk
Dr Ian Henry LAMBERT	Denmark	ihlambert@bio.ku.dk
Dr Satu MIKKOLA	Finland	satu.mikkola@utu.fi
Prof. Reko LEINO	Finland	reko.leino@abo.fi
Dr Anne VESSIERES-JAOUEN	France	a-vessieres@chimie-paristech.fr
Prof. Patrick BEDNARSKI	Germany	bednarsk@pharmazie.uni-greifswald.de
Prof. Nils METZLER-NOLTE	Germany	Nils.Metzler-Nolte@rub.de
Prof. Jens MÜLLER (Chair)	Germany	mueller.j@uni-muenster.de
Prof Georgios PSOMAS	Greece	gepsomas@chem.auth.gr
Dr Dionysia PAPAGIANNOPOULOU	Greece	papagd@pharm.auth.gr
Prof Etelka FARKAS	Hungary	efarkas@science.unideb.hu
Dr Peter BUGLYO	Hungary	buglyo@science.unideb.hu
Prof Sigridur SUMAN	Iceland	sgsuman@hi.is
Prof. Sean DOYLE	Ireland	sean.doyle@nuim.ie
Dr Celine J. MARMION	Ireland	cmarmion@rcsi.ie
Prof. Dan GIBSON	Israel	dang@ekmd.huji.ac.il
Prof. Giovanni NATILE	Italy	natile@farmchim.uniba.it
Prof. Enzo ALESSIO	Italy	alessi@units.it
Prof. Angela CASINI	Netherlands	a.casini@rug.nl
Prof F. Matthias BICKELHAUPT	Netherlands	f.m.bickelhaupt@vu.nl
Dr Renata MIKOLAJCZAK	Poland	r.mikolajczak@polatom.pl
Prof. Ryszard W. ADAMIAK	Poland	Ryszard.Adamiak@ibch.poznan.pl
Prof. Isabel REGO DOS SANTOS	Portugal	isantos@itn.pt
Prof Carlos ROMAO	Portugal	ccr@itqb.unl.pt
Dr Alexandrina BURLACU	Romania	sanda.burlacu@icbp.ro
Dr Roxana Mioara PITICESCU	Romania	roxana@imnr.ro
Prof. Sanja GRGURIC SIPKA	Serbia	sanjag@chem.bg.ac.rs
Prof. Janez PLAVEC	Slovenia	janez.plavec@ki.si
Prof. Iztok TUREL	Slovenia	iztok.turel@fkkt.uni-lj.si
Dr Adoracion GOMEZ QUIROGA	Spain	adoracion.gomez@uam.es
Dr Elisa BAREA MARTINEZ	Spain	ebaream@ugr.es

Dr Sofi ELMROTH	Sweden	sofi.elmroth@biochemistry.lu.se
Dr Per LINCOLN	Sweden	lincoln@chalmers.se
Prof. Roland SIGEL	Switzerland	roland.sigel@aci.uzh.ch
Prof Eva FREISINGER	Switzerland	freisinger@aci.uzh.ch
Prof Mustafa Ozgur GULER	Turkey	moguler@unam.bilkent.edu.tr
Dr Turgay TEKINAY	Turkey	ttekinay@bilkent.edu.tr
Prof Michael HANNON	United Kingdom	m.j.hannon@bham.ac.uk
Prof Ramon VILAR	United Kingdom	r.vilar@imperial.ac.uk

cost

I.C. Overview activities and expenditure

2012/2013 Budget

Total Action Budget: € 156,200
Remaining Action Commitment: € 70,040 (in the following listed as "forecast")

Meetings

Meeting Type	Date	Place	Cost	Total
Workshops/ Conferences	24/06-29/06/12	Andover, NH	3,800.70	
Management Committee Meeting	16/09-18/09/12	Granada	41,955.58	
Working Group Meeting	25/02-26/02/13	Groningen	17,900.00	(forecast)
Working Group Meeting	05/03-06/03/13	Birmingham	8,950.00	(forecast)
Working Group Meeting	21/03-23/03/13	Olomouc	8,950.00	(forecast)
Working Group Meeting	07/04-10/04/13	Innsbruck	8,950.00	(forecast)
				90,506.28

STSM

Beneficiary	Date	Place	Cost	Total
Dr Daniela Donghi	07/01-26/01/13	Lund (host: S. Elmroth)	1,200.00	
Tim Richters	01/02-08/03/13	London (host: R. Vilar)	2,500.00	
M. Angeles Medrano	24/02-24/04/13	Groningen (host: A. Casini)	1,750.00	
Yunjun Shen	10/03-23/03/13	Lisbon (host: I. Santos)	1,100.00	
Sara Seren	05/04-31/05/13	Dublin (host: C. Marmion)	2,500.00	
Dr. Maria Pechlaner	10/04-30/04/13	Poznan (host: R. Adamiak)	1,200.00	
Julián Arcau Covas	14/04-28/04/13	Braunschweig (host: I. Ott)	1,100.00	

Hannah Pritchard	01/05-29/05/13	Zurich (host: R. Sigel)	2,100.00	
				13,450.00

Workshops

Title	Date		Place						Cost	Total
	From	To	From	To						
										0

General Support Grants

Beneficiary	Date								Cost	Total
										0

Schools

Title	Date	Place	Cost	Total
Solution equilibrium (speciation) studies of metal complexes	25/03-29/03/13	Debrecen	5,100.00	
Chemistry of Metals in Biological Systems	12/05-19/05/13	Louvain-la-Neuve	24,050.00	(forecast)
				29,150.00

Dissemination

Title	Cost	Total
Website	2,000.00	(forecast)
		2,000.00

Others

Bank charges	390.00	(forecast)
Financial & Scientific Administration and Coordination	20,300.00	
		20,690.00

Action Total : 155,796.28

II. Scientific Report

II.A. Innovative networking

Five Working Groups have been established as outlined in the MoU. A Whole Action Meeting took place in September 2012 with flash presentations from all participating research groups, indicating what expertise they could offer to other groups and what they would hope that other groups could offer to them. This innovative tool was very helpful to better get to know each other and to establish new collaborations. For the same reasons, three individual and one joint WG meeting were held in early 2013. Nine STSMs took place during the first budget year (including three STSMs between different WGs and one reciprocal STSM to New Zealand), nicely illustrating the rapidly developing numerous collaborations.

- *Innovative knowledge resulting from COST networking through the Action.*
  All five WGs made excellent scientific progress with respect to the objectives mentioned in the MoU. In particular, molecular targets for organometallic compounds were identified, such as integrins for RAPTA-T, and redox enzymes for other ruthenium-based compounds. Interaction with enzymes and proteins were explored, and redox processes emerged as fundamental in the activity of more than one metal-based compound. In addition, new insights into the biological activity and the pharmacological effects of novel metal-based compounds were obtained, such as the estrogenic/anti-estrogenic effects of ferrocifens. In parallel, new models and methods to study the biological effects of metal-based compounds were developed and set up, shown to be useful also in the identification of new molecular targets selective and specific for the neoplastic disease. Efforts in the development of methods for the administration of bioactive molecules over a long timeframe and at a controlled rate were made. These examples are excellent indicators for innovative knowledge resulting from networking between chemists and biologists.
  A range of metal complexes has been assessed as G-quadruplex DNA and RNA binders. Some of the complexes display high selectivity and affinity towards quadruplexes, are able to regulate gene expression, and show promising telomeric effects in cancer cells. Some platinum(II) complexes were found to be highly luminescent when bound to DNA, and cellular imaging has been carried out. Work on single-molecule FRET studies of G-quadruplexes has been initiated and significant progress has been made: This project evolved out of an ERC Starting Grant and is now the centre piece of a COST collaboration. A collaborative project on the stabilization of RNA 3-way junctions by a metallo-drug has been completed. The experimental structure of a DNA duplex containing metal-mediated base pairs, re-refined with QM/MM-derived constraints, has been determined. A new family of hydrazone-based nucleosides for use in metal-mediated base pairs has been devised and model complexes have been structurally characterized.
  Two porphyrin examples for photo-dynamic therapy were investigated. Terpyridine peptide dimers were designed and investigated, inspired by native transcription factors which bind selectively to target DNA only in the presence of metal ions such as copper(II). In general, the collaboration between chemists, biologists, and pharmacists was instrumental to the preparation and assessment of the properties of all newly developed potential metallo-drugs.
  Promising results have been obtained with new active metallo-drugs that target the mitochondria and cause apoptosis in cancer cells. Further progress was made in the development of photoactivatable metal complexes for use in cancer chemotherapy. New discoveries have been made in the transport of metal ion complexes into cancer cells.
  The death mechanisms and the role of biological targets such as integrines, observed in cancer cells treated with different metal complexes, have been successfully studied, demonstrating the diversity and the potential versatility metal-based compounds can offer as drugs.
- *Significant scientific breakthroughs as part of the COST Action.*
  - Identification of molecular targets for organometallic compounds (integrins for RAPTA-T, redox enzymes for RDCs (Ruthenium-Derived Compounds)).
  - Identification of anti-vascularization effects of RDCs.
  - Insights into the interaction of metal complexes with protein targets (carbonic anhydrase II, PARP, aquaporins, thioredoxin reductase, Atox1).

- Promising results with new active metallo-drugs that target the mitochondria and cause apoptosis in cancer cells.
- Platinum(II) complexes were identified that are highly luminescent when bound to DNA, potentially useful for cellular imaging.
- A collaborative project on the stabilization of RNA 3-way junctions by a metallo-drug has been completed.
- The experimental structure of a DNA duplex containing metal-mediated base pairs, re-refined with QM/MM-derived constraints, has been determined.

- *Tangible medium term socio-economic impacts achieved or expected.*
  - new patent on Osmium compounds with anti-cancer activity (FR 12 51292)
  - patent for a novel *in vitro* model of colorectal cancer metastases (expected)
  - *in vivo* testing of anticancer complexes currently being performed, probably leading to the development of new and improved anticancer drugs and other metal-based drugs
- *Spin off of new EC RTD Framework Programme proposals/projects.*
  - P. J. Sadler, ERC Advanced Investigator Grant, BIOINCMED: Bioinorganic Chemistry for the design of new medicines
  - P. J. Sadler, ERC Proof-of-Concept Award, Organomet - Novel organometallic anticancer compounds, Jan 2013-Dec 2013
  - J. Ruiz, Marie Curie COFUND (FP7/2007-2013) under UMU Incoming Mobility Programme ACTion (U-IMPACT) Grant Agreement 267143
  - A . Gómez Quiroga and I. Santos, joined grant in the Spanish Portuguese program "Acciones Integradas" titled "Target-specific and Heterobimetallic Platinum Complexes. Synthesis, Characterization and Mechanistic Studies", PRI-AIBPT-2011-0980.
- *Spin off of new National Programme proposals/projects.*
  - R. Schobert, DFG Scho 402/8-3, "Metallkomplexe antitumoraler Organoliganden – Synergismen der Wechselwirkung mit DNA und Proteinen"
  - R. Schobert, DFG Scho 402/9-2, "Synthesen und Struktur-Wirkungsbeziehungen makrocyclischer 3-Acyltetram- und tetronsäuren und ihrer Chelatkomplexe"
  - R. Schobert, DFG SFB 840/A6, "Synthese poröser Hybridmaterialien durch Pillaring"
  - P. J. Sadler, EPSRC Impact Acceleration Account (IAA) Proof of Concept Fund, "Metabolic stability assessment of anticancer complexes"
  - R. K. O. Sigel, Swiss State Secretariat for Education, Research, and Innovation, "RNA quadruplex folding and stabilisation by metal ion complexes on the single molecule level"
  - P. Lincoln, Swedish Research Council, "Studies on the selectivity in intermolecular interactions of ruthenium complexes"
  - A. F. A. Peacock, raised £29,000 to support research under the COST CM1105 remit.

II.B. Inter-disciplinary networking

- *Additional knowledge obtained from working with other disciplines within the COST framework.*
  Via the collaboration of researchers from the fields of chemistry, biochemistry, biophysics, pharmacology, and medicine, new insights in one of these fields are disseminated much faster into the other fields. Specific examples include new investigational models for drug screening, new technologies to assess the metabolites of metal-based compounds, and new activation strategies of metal-based drugs in biological systems, to name just a few.
  A joint Summer School of COST Actions CM1105 and CM1003 on the topic of "Chemistry of Metals in Biological Systems" is held in Louvain-la-Neuve in May 2013. This interdisciplinary measure will be used to teach the results of the latest cutting-edge research to PhD students and postdocs, contributing significantly to capacity building in Europe.
- *Evaluation of whether the level of inter-disciplinarity is sufficient to potentially provide scientific impacts.*
  A high level of inter-disciplinarity is certainly achieved in this COST Action, as can be seen for example from the highly successful Whole Action Meeting and the joint meeting by WGs 1 and 5. This Action provides a unique environment for chemists, biologists, and pharmacologists to work in collaboration towards the discovery of novel metal-based anticancer drugs.
- *Evaluation of whether the level of inter-disciplinarity is sufficient to potentially provide socio-economic impacts.*

It is probably too early to consider the socio-economic impact of a COST Action running in its first year, but the fact that new patents have already been obtained / submitted (*vide supra*) is highly promising.

II.C. New networking

- *Additional new members joining the Action during its life.*
  21 new members have been admitted to the Action since the 1st MC Meeting.
- *Total number of individual participants involved in the Action work.*
  231 individuals have participated in the events organized by the Action (e.g. WHAM, MC Meeting, WG Meetings, STSMs, Training Schools). 44% of them are female, 44% are ESRs.
- *Involvement of Early Stage Researchers in the Action, in particular with respect to STSMs, networking activities, and Training Schools.*
  A particular focus of this Action is given to ESRs. Accordingly, all STSMs were performed by ESRs. Moreover, all trainee positions at the Training Schools were given to ESRs. Finally, the Whole Action Meeting and the WG Meetings comprised particular sessions devoted to presentations by ESRs.
- *Involvement of researchers from outside of COST Countries.*
  5 research groups from 4 institutions from non-COST Countries are participating in this Action. All groups come from countries with reciprocal agreements. Despite the great distance to these countries, the participants contribute significantly to the Action (as can be seen e.g. from the list of joint publications, two of which are with partners from non-COST Countries).
- *Advancement and promotion of scientific knowledge through publications and other outreach activities.*
  Since the start of the Action, 35 publications have been published acknowledging COST Action CM1105, including 20 joint publications (see annex). In addition, work of this COST network has been presented at many national and international meetings (see annex), including the Gordon Research Conference “Metals in Medicine”, where Action participants will act as Chair and Vice-Chair of this conference in 2014.
- *Activities and projects with COST network colleagues*
  More than 50 scientific projects have been established amongst the COST network colleagues, many of them between different WGs, including a collaboration with COST Action CM0902 (“Molecular machineries for ion translocation across biomembranes”). The highly successful implementation of Training Schools in the first budget year has spurred interest in organising joint Training Schools in the future. Accordingly, both Training Schools scheduled for the second budget years will rely on teachers from different research groups.

Annex: Dissemination

Reviews acknowledging COST Action CM1105:

1. A. Quiroga, “Understanding trans platinum complexes as potential antitumor drugs beyond targeting DNA”, *J. Inorg. Biochem.* **2012**, *114*, 106-112.
2. R. K. O. Sigel, M. Skilandat, A. Sigel, B. P. Operschall, H. Sigel, "Complex Formation of Cadmium with Sugar Residues, Nucleobases, Phosphates, Nucleotides, and Nucleic Acids", *Met. Ions Life Sci.* **2013**, *11*, 191-274.
3. H. Sigel, R. K. O. Sigel, "Metal Ion Interactions with Nucleic Acids and Their Constituents", Chapter 3.17 in *Comprehensive Inorganic Chemistry*, 2nd Edition, Jan Reedijk, Kenneth Poeppelmeier (Editors), Elsevier Ltd., Oxford, UK, **2013**, in press.
4. A. de Almeida, B. Oliveira, J. G. Correia, G. Soveral, A. Casini, “Emerging protein targets for metallodrugs: new insights”, *Coord. Chem. Rev*. **2013**, in press (10.1016/j.ccr.2013.01.031).

Original joint publications acknowledging COST Action CM1105:

1. I. Buss, G. Kalayda, A. Lindauer, M. Reithofer, M. Galanski, B. Keppler, U. Jähde, “Effect of reactivity on cellular accumulation and cytotoxicity of oxaliplatin analogues”, *J. Biol. Inorg. Chem.* **2012**, *17*, 699-708.
2. D. Donghi, S. Johannsen, R. K. O. Sigel, E. Freisinger, “NMR Spectroscopy in Bioinorganic Chemistry”, *CHIMIA* **2012**, *66*, 791-797.
3. W. Ginzinger, A. Egger, G. Mühlgassner, V. B. Arion, M. A. Jakupec, M. Galanski, W. Berger, B. K. Keppler, “Water-Soluble Cationic Derivatives of Indirubin, the Active Anticancer Component from *Indigo naturalis*”, *Chem. Biodiv.* **2012**, *9*, 2175-2185.
4. W. Ginzinger, G. Mühlgassner, V. B. Arion, M. A. Jakupec, A. Roller, M. Galanski, M. Reithofer, W. Berger, B. K. Keppler, “A SAR Study of Novel Antiproliferative Ruthenium and Osmium Complexes with Quinoxalinone Ligands in Human Cancer Cell Lines”, *J. Med. Chem.* **2012**, *55*, 3398-3413.
5. R. Hudej, J. Kljun, W. Kandioller, U. Repnik, B. Turk, C. Hartinger, B. K. Keppler, D. Miklavcic, I. Turel, “Synthesis and Biological Evaluation of the Thionated Antibacterial Agent Nalidixic Acid and Its Organoruthenium(II) Complex”, *Organometallics* **2012**, *31*, 5867-5874.
6. N. Margiotta, C. Marzano, V. Gandin, D. Osella, M. Ravera, E. Gabano, J. Platts, E. Petruzzella, J. Hoeschele, G. Natile, “Revisiting [$PtCl_2$(*cis*-1,4-DACH)]: An Underestimated Antitumor Drug with Potential Application to the Treatment of Oxaliplatin-Refractory Colorectal Cancer”, *J. Med. Chem.* **2012**, *55*, 7182-7192.
7. S. Gama, F. Mendes, T. Esteves, F. Marques, A. Matos, J. Rino, J. Coimbra, M. Ravera, E. Gabano, I. Santos, A. Paulo, “Synthesis and Biological Studies of Pyrazolyl-Diamine Pt^{II} Complexes Containing Polyaromatic DNA-Binding Groups”, *ChemBioChem* **2012**, *13*, 2352-2362.
8. A. Rilak, I. Bratsos, E. Zangrando, J. Kljun, I. Turel, Z. Bugarcic, E. Alessio, “Factors that influence the antiproliferative activity of half sandwich Ru^{II}-[9]aneS3 coordination compounds: activation kinetics and interaction with guanine derivatives”, *Dalton Trans.* **2012**, *41*, 11608-11618.
9. F. Guidi, A. Modesti, I. Landini, S. Nobili, E. Mini, L. Bini, M. Puglia, A. Casini, P. Dyson, C. Gabbiani, L. Messori, “The molecular mechanisms of antimetastatic ruthenium compounds explored through DIGE proteomics”, *J. Inorg. Biochem.* **2013**, *118*, 94-99.
10. A. Tarushi, J. Kljun, I. Turel, A. Pantazaki, G. Psomas, D. Kessissoglou, “Zinc(II) complexes with the quinolone antibacterial drug flumequine: structure, DNA- and albumin-binding”, *New J. Chem.* **2013**, *37*, 342-355.
11. A. Meyer, A. Gutiérrez, I. Ott, L. Rodríguez, "Phosphine-bridged Dinuclear Gold(I) Alkynyl Complexes: Thioredoxin Reductase Inhibition and Cytotoxicity", *Inorg. Chim. Acta* **2013**, *398*, 72-76.
12. K. de Oliveira Navakoski, V. Andermark, S. von Grafenstein, L. Onambele, G. Dahl, R. Rubbiani, G. Wolber, C. Gabbiani, L. Messori, A. Prokop, I. Ott, “Butyltin(IV) Benzoates: Inhibition of Thioredoxin Reductase, Tumor Cell Growth Inhibition, and Interactions with Proteins”, *ChemMedChem* **2013**, *8*, 256-264.

13. C. Spagnul, R. Alberto, G. Gasser, S. Ferrari, V. Pierroz, A. Bergamo, T. Gianferrara, E. Alessio, “Novel water-soluble ^{99m}Tc(I)/Re(I)-porphyrin conjugates as potential multimodal agents for molecular imaging”, *J. Inorg. Biochem.* **2013**, *122*, 57-65.
14. I. Romero-Canelón, L. Salassa, P. J. Sadler, “The Contrasting Activity of Iodido versus Chlorido Ruthenium and Osmium Arene Azo- and Imino-pyridine Anticancer Complexes: Control of Cell Selectivity, Cross-Resistance, p53 Dependence, and Apoptosis Pathway”, *J. Med. Chem.* **2013**, *56*,1291-300.
15. A. Tarushi, K. Lafazanis, J. Kljun, I. Turel, A. A. Pantazaki, G. Psomas, D. P. Kessissoglou, “First- and second-generation quinolone antibacterial drugs interacting with zinc(II): Structure and biological perspectives”, *J. Inorg. Biochem.* **2013**, *121*, 53-65.
16. P. Tsiliki, F. Perdih, I. Turel, G. Psomas, “Structure, DNA- and albumin-binding of the manganese(II) complex with the non-steroidal antiinflammatory drug niflumic acid”, *Polyhedron* **2013**, *53*, 215-222.
17. C. Tolia, A.N. Papadopoulos, C.P. Raptopoulou, V. Psycharis, C. Garino, L. Salassa, G. Psomas, “Copper(II) interacting with the non-steroidal antiinflammatory drug flufenamic acid: Structure, antioxidant activity and binding to DNA and albumins”, *J. Inorg. Biochem.* **2013**, *123*, 53-65.
18. W. Kandioller, E. Balsano, S. M. Meier, U. Jungwirth, S. Göschl, A. Roller, M. A. Jakupec, W. Berger, B. K. Keppler, C. G. Hartinger, "Organometallic anticancer complexes of lapachol: metal centre-dependent formation of reactive oxygen species and correlation with cytotoxicity", *Chem. Commun.* **2013**, *49*, 3348-3350.
19. S. Kumbhar, S. Johannsen, R. K. O. Sigel, M. P. Waller, J. Müller, "A QM/MM Refinement of an Experimental DNA Structure with Metal-Mediated Base Pairs", *J. Inorg. Biochem.* **2013**, in press (10.1016/j.jinorgbio.2013.03.009).
20. C. Radunsky, D. A. Megger, A. Hepp, J. Kösters, E. Freisinger, J. Müller, "A Family of Hydrazone-Based Nucleosides for Use in Metal-Mediated Base Pairs", *Z. Anorg. Allg. Chem.* **2013**, in press (10.1002/zaac.201300061).

Additional publications acknowledging COST Action CM1105:

1. L. Bíró, D. Hüse, A. Bényei, P. Buglyó, “Interaction of [Ru(η^6-*p*-cym)(H_2O)$_3$]$^{2+}$ with citrate and tricarballate ions in aqueous solution; X-ray crystal structure of novel half-sandwich Ru(II)-citrato complexes, *J. Inorg. Biochem.* **2012**, *116*, 116-125.
2. M. Groessl, C. Hartinger, “Anticancer metallodrug research analytically painting the "omics" picture-current developments and future trends”, *Anal. Bioanal. Chem.* **2013**, *405*, 1791-1808.
3. S. Garcia, C. Cusco, R. Brissos, E. Torrents, A. Caubet, P. Gamez, “Dual role of Cu^{2+} ions on the aggregation and degradation of soluble Aβ oligomers and protofibrils investigated by fluorescence spectroscopy and AFM”, *J. Inorg. Biochem.* **2012**, *116*, 26-36.
4. G. Morais, A. Paulo, I. Santos, “Organometallic Complexes for SPECT Imaging and/or Radionuclide Therapy”, *Organometallics* **2012**, *31*, 5693-5714.
5. T. Nguyen, F. Arnesano, S. Scintilla, G. Rossetti, E. Ippoliti, P. Carloni, G. Natile, “Structural Determinants of Cisplatin and Transplatin Binding to the Met-Rich Motif of Ctr1: A Computational Spectroscopy Approach”, *J. Chem. Theor. Comput.* **2012**, *8*, 2912-2920.
6. J. Platts, M. Ravera, E. Gabano, M. Sardi, S. Bianco, D. Osella, “Solvolysis of a Series of Cisplatin-Like Complexes - Comparison between DNA-Biosensor and Conductivity Data”, *Eur. J. Inorg. Chem.* **2012**, *34*, 5625-5631.
7. I. Romero-Canelón, A. Pizarro, A. Habtemariam, P. Sadler, “Contrasting cellular uptake pathways for chlorido and iodido iminopyridine ruthenium arene anticancer complexes”, Metallomics **2012**, *4*, 1271-1279.
8. M. Sinisi, F. Intini, G. Natile, “Dependence of the Reduction Products of Platinum(IV) Prodrugs upon the Configuration of the Substrate, Bulk of the Carrier Ligands, and Nature of the Reducing Agent”, *Inorg. Chem.* **2012**, *51*, 9694-9704.
9. I. Zanellato, I. Bonarrigo, E. Gabano, M. Ravera, N. Margiotta, P. Betta, D. Osella, “Metallo-drugs in the treatment of malignant pleural mesothelioma”, *Inorg. Chim. Acta* **2012**, *393*, 64-74.
10. M. Zampakou, M. Akrivou, E. G. Andreadou, C. P. Raptapoulou, V. Psycharis, A. A. Pantazaki, G. Psomas, *J. Inorg. Biochem.* **2013**, *121*, 88-99.
11. P. K. Choudhary, S. Gallo, R. K.O. Sigel, "Monitoring Global Structural Changes and Specific Metal Binding Sites in RNA by In-Line Probing and Tb(III) Cleavage", *Methods Mol. Biol.* **2013**,

in press.

Conferences and Workshops

Work of this COST network has been presented at many meetings, including the following ones.

- XX International Roundtable on Nucleosides, Nucleotides and Nucleic Acids (XX IRT), Montreal, Quebec, Canada, August 2012. (multiple presentations)
- 40th International Conference on Coordination Chemistry (ICCC-40), Valencia, Spain, September 2012. (multiple presentations)
- 11th European Biological Inorganic Chemistry Conference (EUROBIC-11), Granada, Spain, September 2012. (multiple presentations)
- Fall Meeting of the Swiss Chemical Society, ETH Zürich, Switzerland, September 2012. (multiple presentations)
- EMBO meeting on Telomeres and the DNA damage response, L'Isle-sur-la Sorge, France, October 2012.
- 12th Workshop on PharmacoBioMetallics (BIOMET12), Padova, Italy, October 2012.
- 39. International Symposium on Nucleic Acid Chemistry, Nagoya, Japan, November 2012.
- SupraChem 2013, Münster, Germany, February 2013.