



UK-Japan Partnership for Research on Endocrine Disruptors in the Aquatic Environment

Summary Report of the 12th Annual Scientific Workshop

**Matfen Hall,
Northumberland,
UK
2-4 November 2010**



Authors: T.H. Hutchinson¹ & T. Iguchi²

**¹Centre for Environment, Fisheries & Aquaculture Science, UK
&**

**²National Institute for Basic Biology, Japan
November 2010**

Table of Contents

Contents

Executive Summary	2
Introduction	4
Acknowledgements	5
Annex 1. UK-Japan Research Partnership 12 th Workshop Programme.....	6
Annex 2. Publications from UK-Japan Partnership	8

Executive Summary

1.1 Chemically-induced endocrine disruption clearly remains an internationally important issue for the risk assessment of chemicals. This is reflected in recent years in terms of advances in scientific knowledge, the recent approval of a suite of OECD test guidelines for endocrine disrupter testing and assessment, together with policy trends relevant to both national and international regulatory schemes (eg REACH, EC Plant Protection Product Directive and EC Human Medicines Directive). Since the initiative taken by the governments of Japan and the United Kingdom in 1998 to share knowledge in this important area, the UK-Japan Partnership for Research into Endocrine Disrupters in the Aquatic Environment (hereafter '*UK Japan Research Partnership*') has made an important contribution to the scientific evidence base into the exposure and effects of priority chemicals in aquatic ecosystems and has thereby provided highly valuable support for national and international policy needs.

1.2 Against this background, the UK Japan Research Partnership held its 12th annual scientific workshop at Matfen Hall, Northumberland, UK from 2-4 November 2010. This report highlights the key themes discussed at the workshop and summarizes the recommendations for future priority areas over the next five years of the Partnership. Central to these recommendations is the recognition of the value of applying the lessons learned from natural and synthetic oestrogens to emerging chemicals of growing concern for policy makers, the public and other stakeholders in both Japan and the UK.

1.3 *Core Project 1: Fate of endocrine disrupting chemicals and emerging contaminants in the environment and their remediation.* For the next 5 years, the proposed objectives of the research are to study emerging chemicals of concern (e.g. pharmaceuticals and personal care products (PPCPs)) with known or suspected endocrine disrupting properties and to address their occurrence, fate, risk assessment and control technologies (e.g. how to address the significance of combined sewer overflows).

1.4 *Core Project 2: Advancing test systems.* The on-going OECD needs underline the value of continuing to invest in the work using small fish models

(e.g. medaka and stickleback) to compare their sensitivity with respect to androgens and anti-androgens. Linked with Core Project 3, there is also a need for reporter gene assays (e.g. glucocorticoid receptor). An area of growing importance for advancing the OECD test guidelines is to invest in research using freshwater and marine invertebrate test systems for endocrine disruptors (e.g. molluscs and crustaceans). It was also recommended to evaluate critically the utility of the fish and invertebrate test systems with other classes of emerging contaminants likely to impact the reproductive endocrine systems of aquatic species (e.g. antidepressants and progestogens).

1.5 Core Project 3: Molecular and genomic approaches in fish. This is a dynamic area of work for the UK-Japan Research Partnership and is structured around four objectives: (1) Development and application of molecular tools required for Core Projects 1, 2 and 4 and provision of associated training for these methods and tools (e.g. AR reporter gene assay to link to CP2, medaka oestrogen reporter gene assays and medaka microarray to support effluent testing in CP1 and fish DNA microsatellites for use in population studies); (2) Addressing the issue of species sensitivity *in vitro* (e.g. continuation of studies on species, receptor sub-type- and ligand- specificity of fish ERs and establishment of reporter gene assay for TR, GR, AR, chemical-specific sensitivity of different receptor subtypes in model species (including the stickleback given its global geographic range); (3) addressing the issue of species sensitivity *in vivo* (e.g. comparative responsiveness of selection of fish species to oestrogens *in vivo* to support linkages with *in vitro* assessments); and (4) development of a genetic sex marker in roach for making greater use of studies undertaken to date on endocrine disruption (ED) in wild populations (e.g. from archived samples from national surveys) and application of DNA microsatellites to assess whether genetic structure/heterogeneity differs widely in populations of fish living in 'clean' versus heavily contaminated environments.

1.6 Core Project 4 – Environmental Risk Assessment & Population Impacts. There is strong support in the UK Japan Research Partnership for using risk assessment (combining exposure and hazard assessment) as the best approach for managing chemicals, utilising the knowledge gained in the other Core Projects and the OECD framework for endocrine disrupter assessment. Supporting the integration of intelligent testing strategies using a mode-of-action approach together with population-relevant endpoints is also a key priority (linking CPs 2 and 3), for both single chemicals and complex mixtures. Policy trends indicate that another area for prioritization over the next five years includes understanding exposures and impacts of endocrine disruptors and related emerging chemicals in sediments and sediment dwelling organisms (both freshwater and marine) to support national and international policy needs. One option for the future is to approach this need through selected chemical case studies which connect all four Core Projects.

1.7 It was proposed that an important conclusion of the workshop discussions was the recognition that global climate change may be a `game changer` in understanding chemical risks in aquatic ecosystems due to the evidence for significant impacts in hydrological conditions and toxic pressures on biodiversity. The UK-Japan Research Partnership is well-placed to help fill this important and large knowledge gap, thereby providing valuable support for UK and Japanese policy needs for efficiently managing chemicals risks to freshwater and marine ecosystems.

Introduction

The purpose of the UK-Japan Partnership is to build strong and productive collaborations and facilitate the exchange of information relating to research into endocrine disruption between Japan and the United Kingdom. Since 1998, co-operation has been successfully pursued through several means including:

- The free exchange of technical information;
- Where mutually beneficial, the sharing of research findings and the development of joint research projects;
- Joint symposia, workshops and academic discussions on topics of mutual interest;
- The exchange of experts, under conditions to be decided between those individuals

The research carried out by the UK-Japan partners is focussed on various aspects of ED via four core projects, ranging from assessments of the effects of treatment processes on the endocrine activity in wastewaters, quantifying the potency of the various chemicals contained in wastewater discharges, defining the mechanisms of action of the endocrine disrupting chemicals (EDCs) of concern, and ecological impacts on wildlife. A summary of the publications delivered by the UK-Japan Research Partnership is included in Annex 2 of this report.

For Core Project 1 (Fate of EDCs and Emerging Contaminants such as Pharmaceuticals and Nanoparticles in the Environment and their Remediation) the scope of work includes generating information on chemical (and particle) transport and fate in treated effluents and their receiving waters. A major aspect for this group is monitoring as well as the use, development and validation of modelling approaches. A further key activity of this group is to consider ways for remediation of the chemicals or particles of concern to reduce their environmental discharge.

For Core Project 2 (Advancing Testing Systems), work will essentially focus on research developing relevant test systems for assessing EDCs and other pollutants of concern (pharmaceuticals, nanoparticles). Japan will lead on

developing the partial life cycle test using amphibians relevant to the OECD requirements. It is proposed that work on small fish models (e.g. stickleback and medaka) will comprise part of this theme. It is also envisaged that within this core, there will be work to investigate and develop short OECD test systems using fish embryos. This core will also consider the possibility of including some invertebrate testing systems, depending on the investigators brought to this core theme.

The UK-Japan Core Project 3 (Genomic and Molecular Approaches in Ecotoxicology) will focus on evaluating various endpoints spanning gene expression to behaviour as measures for chemical testing endpoints. Research here will include the development of molecular endpoints across both test and sentinel species. Work developing behaviour as an endpoint in fish (and possibly more widely in other animals) will be supported through the work on stickleback and zebrafish. Also included will be the reporter assay systems. Key to the work in this core is to develop a more thorough understanding of the value of the different endpoints/systems mentioned above for addressing questions of reproductive and developmental health.

Finally, Core Project 4 (Environmental Risk Assessment and Population Impacts) has been established to address the complex issue of health effects of chemicals/particles and their mixtures (including environmentally relevant discharges) on aquatic wildlife. The core will include work studying ED in wildlife populations. Understanding the possible impacts of EDCs (and other contaminants) on wild populations will require the development of associated knowledge on the basic biology of sentinel organisms. Over the next five years, consideration will be given (where possible) to chronic exposure work using emerging contaminants known or suspected to have endocrine active properties in order to strengthen the risk assessment of these chemicals.

Against this background, the UK-Japan Research Partnership met at Matfen Hall (Northumberland, UK) in November 2010 for the 12th Annual Workshop in order to provide updates in progress made over the past year within this research community and to identify priority areas for future work. It is proposed that this report summarizes the key conclusions of the workshop and further details of all the presentations are available on request.

Acknowledgements

Financial support for the UK-Japan Research Co-operation is provided by the Japanese Ministry of the Environment and the UK Department of Environment, Food and Rural Affairs. Our thanks also to all the participants of the 12th Annual Workshop at Matfen Hall for their valuable contributions to the work of the UK-Japan Research Partnership.

Annex 1. UK-Japan Research Partnership 12th Workshop Programme.

Tuesday 2 nd November	
	Arrival of delegates at Matfen Hall (car transport will be provided from Newcastle airport or train station) http://www.primahotels.co.uk/matfen/ .
19:00-21:00	Welcome reception, (Buffet & drinks) Opening address & welcome - Dr Arwyn Davies (Defra, UK) - Mr Kunihiro Yamazaki (MOE, Japan)
Wednesday 3 rd November	
	Session 1 - Introduction & Practical Arrangements
08:30– 09:15	Welcome to the Scientific Programme a) Practical arrangements & agenda (Prof Tom Hutchinson) b) Key UK-J scientific achievements & policy benefits (Prof Taisen Iguchi)
	Session 2 – Core Projects Chairs: Prof Charles Tyler (UK) & Dr Norihisa Tatarazako (Japan)
09:15-09:55	Core Project 1: Investigations into endocrine disrupters and emerging contaminants in domestic wastewaters and rivers. (Prof. Hiroaki Tanaka, Dr Mizuhiko Minamiyama & Dr Andrew Johnson)
09:55-10:35	Core Project 2: Evaluation of endocrine disrupting potency of chemicals and mode-of-action using small fish models. (Dr Masaki Nagae & Dr Ioanna Katsiadaki)
10:35-11:00	Coffee break
	Session 2 – Core Projects Chairs: Prof Yasuhiko Ohta (Japan) & Dr Christina Lye (UK)
11:00-11:40	Core Project 3: Molecular approaches to understand the differences of the sensitivity to xenoestrogens in freshwater fish and the responses to thyroid-hormones in extensive species. (Dr Shinichi Miyagawa & Dr Anke Lange)
11:40-12:20	Core Project 4: Population impacts of endocrine disrupters on aquatic wildlife, roach and leopard frog. (Prof Tohru Kobayashi and Dr Patrick Hamilton)
12:20-13:45	Buffet lunch and poster presentations
	Session 3 – Invited Presentations Chairs: Prof Alan Pickering (UK) & Prof Taisen Iguchi (Japan)
13:45-14:20	Combined effects of endocrine disrupting chemicals and global warming in aquatic environment on fish reproduction. (Prof Kiyoshi Soyano)

14:20-14:55	Applying 'systems biology' approaches for understanding the effects of EDCs and emerging contaminants in fish (Prof Charles Tyler)
14:55-15:15	MOE's Further Actions on Endocrine Disrupting Effects of Chemical Substances: EXTEND 2010 (Mr Kunihiko Yamazaki)
15:15-15:35	Coffee break
15:35-15:55	The OECD Test Guidelines Programme: An Update (Prof Peter Matthiessen, UK Co-Chair of OECD VMG-Eco)
15:55-16:30	Policy needs the essential role of scientific evidence (Dr David Williams, Defra)
16:30-as required	Informal break out discussion on key issues for each Core Project
19:30	Conference dinner
Thursday 4 th November	
	Session 4 – Key science needs and next steps for UK-J research Chairs: Prof Taisen Iguchi & Prof Tom Hutchinson
09:00-11:00	Future needs for the UK-J Core Projects and emerging policy needs in Japan and in the UK
11:00-11:20	Coffee break & group photograph
11:20-12:00	Summary of workshop highlights & closing remarks <ul style="list-style-type: none"> - Prof Tom Hutchinson (Cefas, UK) - Prof Taisen Iguchi (NIBB, Japan) - Dr Mike Roberts (Defra, UK) - Mr Kunihiko Yamazaki (MOE, Japan)
12:00	Collection of packed lunch
12:30	Depart for bus excursion to UNESCO sites at Hadrian's Wall and the historical city of Durham (details to be confirmed)
18:30	Traditional pub dinner
21:00	Transport back to Matfen Hall
Friday 5 th November	
Departure – room check out by 11:00	

Annex 2. Publications from UK-Japan Partnership

Peer-reviewed Papers & Book Chapters:

Scown, T.M., Goodhead, R.M., Johnston, B.D., Moger, J., Baalousha, M., Lead, J.R., van Aerle, R., Iguchi, T. & Tyler, C.R. (2010). Assessment of cultured fish hepatocytes for studying cellular uptake and (eco)toxicity of nanoparticles. *Environmental Chemistry* 7, 36–49. [\[Abstract\]](#)

Tyler, C.R. & Goodhead, R.M. (2010). Impact of hormone-disrupting chemicals on wildlife. In: McClean, N. (Ed.). *Silent Summer - The State of Wildlife in Britain and Ireland*. Cambridge University Press, pp. 125-140.

Van Aggelen, G., Ankley, G.T., Baldwin, W.S., Bearden, D.W., Benson, W.H., Chipman, J.K., Collette, T.W., Craft, J.A., Denslow, N.D., Embry, M.R., Falciani, F., George, S.G., Helbing, C.C., Hoekstra, P.F., Iguchi, T., Kagami, Y., Katsiadaki, I., Kille, P., Liu, L., Lord, P.G., McIntyre, T., O'Neill, A., Osachoff, H., Perkins, E.J., Santos, E.M., Skirrow, R.C., Snape, J.R., Tyler, C.R., Versteeg, D., Viant, M.R., Volz, D.C., Williams, T.D. & Yu, L. (2010). Integrating omic technologies into aquatic ecological risk assessment and environmental monitoring: Hurdles, achievements and future outlook. *Environmental Health Perspectives* 118, 1-5. [\[Abstract\]](#)

Goodhead, R.M. & Tyler, C.R. (2009). Endocrine-disrupting chemicals and their environmental impacts. In: Walker, C.H. (Ed.). *Organic Pollutants*. CRC Press, pp. 265-292.

Kumar, V., Nakada, N., Yasojima, M., Yamashita, N., Johnson, A.C. & Tanaka, H. (2009). Rapid determination of free and conjugated estrogen in different water matrices by liquid chromatography-tandem mass spectrometry. *Chemosphere* 77, 1440-1446. [\[Abstract\]](#)

Lange, A., Paull, G.C., Coe, T.S., Katsu, Y., Urushitani, H., Iguchi, T. & Tyler, C.R. (2009). Sexual reprogramming and estrogenic sensitization in wild fish exposed to ethinylestradiol. *Environmental Science & Technology* 43, 1219-1225. [\[Abstract\]](#)

Sebire, M., Scott, A.P., Tyler, C.R., Cresswell, J., Hodgson, D.J., Morris, S., Sanders, M.B., Stebbing, P.D. & Katsiadaki, I. (2009). The organophosphorous pesticide, fenitrothion, acts as an anti-androgen and alters reproductive behavior of the male three-spined stickleback, *Gasterosteus aculeatus*. *Ecotoxicology* 18, 122-133. [\[Abstract\]](#)

Tyler, C.R., Filby, A.L., Bickley, L.K., Cumming, R.I., Gibson, R., Labadie, P., Katsu, Y., Liney, K.E., Shears, J.A., Silva-Castro, V., Urushitani, H., Lange, A.,

Winter, M.J., Iguchi, T. & Hill, E.M. (2009). Environmental health impacts of equine estrogens derived from hormone replacement therapy. *Environmental Science & Technology* 43, 3897-3904. [[Abstract](#)]

Lange, A., Katsu, Y., Ichikawa, R., Paull, G.C., Chidgey, L.L., Coe, T.S., Iguchi, T. & Tyler, C.R. (2008). Altered sexual development in roach (*Rutilus rutilus*) exposed to environmental concentrations of the pharmaceutical 17 α -ethinylestradiol and associated expression dynamics of aromatases and estrogen receptors. *Toxicological Sciences* 106, 113-123. [[Abstract](#)]

Sebire, M., Allen, Y., Bersuder, P. & Katsiadaki, I. (2008). The model anti-androgen flutamide suppresses the expression of typical male stickleback reproductive behaviour. *Aquatic Toxicology* 90, 37-47. [[Abstract](#)]

Sebire, M. & Katsiadaki, I. (2008). The reproductive behaviour of the three-spined stickleback as a novel assay for the detection of anti-androgens. *CYBIUM, International Journal of Ichthyology* 32, 59-60. [[Abstract](#)]

Iguchi, T., Katsu, Y., Urushitani, H., Lange, A. & Tyler, C.R. (2007). Developmental reproductive effects of exposure to pharmaceutical steroids in the aquatic environment: Studies on mosquitofish (*Gambusia affinis affinis*), roach (*Rutilus rutilus*) and medaka (*Oryzias latipes*). *Journal of Marine Science and Technology-Taiwan* 15 (special issue), 29-36. [[Abstract](#)]

Johnson, A., Tanaka, H., Okayasu, Y. & Suzuki, Y. (2007). Estrogen content and relative performance of Japanese and British sewage treatment plants and their potential impact on endocrine disruption. *Endocrine Disrupter News Letter* 10, 4-5.

Johnson, A., Tanaka, H., Okayasu, Y. & Suzuki, Y. (2007). Estrogen content and relative performance of Japanese and British sewage treatment plants and their potential impact on endocrine disruption. *Environmental Sciences* 14, 319-329. [[Abstract](#)]

Katsiadaki, I., Sanders, M., Sebire, M., Nagae, M., Soyano, K. & Scott, A.P. (2007). Three-spined stickleback: An emerging model in environmental endocrine disruption. *Environmental Sciences* 14, 263-283. [[Abstract](#)]

Katsu, Y., Lange, A., Urushitani, H., Ichikawa, R., Paull, G.C., Cahill, L.L., Jobling, S., Tyler, C.R. & Iguchi, T. (2007). Functional associations between two estrogen receptors, environmental estrogens, and sexual disruption in the roach (*Rutilus rutilus*). *Environmental Science & Technology* 41, 3368-3374. [[Abstract](#)]

Nagae, M., Kawasaki, F., Tanaka, Y., Ohkubo, N., Matsubara, T., Soyano, K., Hara, A., Arizono, K., Scott, A.P. & Katsiadaki, I. (2007). Detection and assessment of androgenic potency of endocrine-disrupting chemicals using

three-spined stickleback, *Gasterosteus aculeatus*. *Environmental Sciences* 14, 255-261. [[Abstract](#)]

Pickford, D.B., Larroze, S., Takase, M., Mitsui, N., Tooi, O. & Santo, N. (2007). Investigating potential for effects of environmental endocrine disruptors on wild populations of amphibians in UK and Japan: status of historical databases and review of methods. *Environmental Sciences* 14, 297-317. [[Abstract](#)]

Sebire, M., Katsiadaki, I. & Scott, A.P. (2007). Non-invasive measurement of 11-ketotestosterone, cortisol and androstenedione in male three-spined stickleback (*Gasterosteus aculeatus*). *General and Comparative Endocrinology* 152, 30-38. [[Abstract](#)]

Takase, M. & Iguchi, T. (2007). Molecular cloning of two isoforms of *Xenopus* (*Silurana*) *tropicalis* estrogen receptor mRNA and their expression during development. *Biochimica et Biophysica Acta-Gene Structure and Expression* 1769, 172-181. [[Abstract](#)]

Takase, M., Mitsui, N., Oka, T., Tooi, O., Santo, N., Pickford, D.B. & Iguchi, T. (2007). Development of biomarkers of endocrine disrupting activity in emerging amphibian model, *Silurana* (*Xenopus*) *tropicalis*. *Environmental Sciences* 14, 285-296. [[Abstract](#)]

Tyler, C.R., Filby, A.L., Iguchi, T., Kramer, V.J., Larsson, D.G.J., van Aggelen, G., van Leeuwen, K., Viant, M.R. & Tillet, D.E. (2007). Application of genomics to tiered testing. In: Ankley, G., Miracle, A., Perkins, E.J., Daston, G.P. (Eds.). *Genomics in Regulatory Ecotoxicology: Applications and Challenges*. CRC Press, Boca Raton.

Tyler, C.R., Lange, A., Paull, G.C., Katsu, Y. & Iguchi, T. (2007). The roach (*Rutilus rutilus*) as a sentinel for assessing endocrine disruption. *Environmental Sciences* 14, 235-253. [[Abstract](#)]

Urushitani, H., Katsu, Y., Kato, Y., Tooi, O., Santo, N., Kawashima, Y., Ohta, Y., Kisaka, Y., Lange, A., Tyler, C.R., Johnson, R.D. & Iguchi, T. (2007). Medaka (*Oryzias latipes*) for use in evaluating tip developmental effects of endocrine active chemicals with special reference to gonadal intersex (testis-ova). *Environmental Sciences* 14, 211-233. [[Abstract](#)]

Kawasaki, F., Katsiadaki, I., Scott, A.P., Matsubara, T., Osatomi, K., Soyano, K., Hara, A., Arizono, K. & Nagae, M. (2003). Molecular cloning of two types of spiggin cDNA in the three-spined stickleback, *Gasterosteus aculeatus*. *Fish Physiology and Biochemistry* 28, 425-425.

Publications from Core project participants:

Ghosh, G.C., Nakada, N., Yamashita, N. & Tanaka, H. (2010). Oseltamivir carboxylate, the active metabolite of oseltamivir phosphate (Tamiflu), detected in sewage discharge and river water in Japan. *Environmental Health Perspectives* 118, 103-107. [[Abstract](#)]

Halder, M., Léonard, M.A., Iguchi, T., Oris, J.T., Ryder, K., Belanger, S.E., Braunbeck, T.A., Embry, M.R., Whale, G., Norberg-King, T. & Lillicrap, A. (2010). Regulatory aspects on the use of fish embryos in environmental toxicology. *Integrated Environmental Assessment and Management* 6, 484-491. [[Abstract](#)]

Hill, E.M., Evans, K.L., Horwood, J., Rostkowski, P., Oladapo, F.O., Gibson, R., Shears, J.A. & Tyler, C.R. (2010). Profiles and some initial identifications of (anti)androgenic compounds in fish exposed to wastewater treatment works effluents. *Environmental Science & Technology* 44, 137-1143. [[Abstract](#)]

Johnston, B.D., Scown, T.M., Moger, J., Cumberland, S.A., Baalousha, M., Linge, K., van Aerle, R., Jarvis, K., Lead, J.R. & Tyler, C.R. (2010). Bioavailability of nanoscale metal oxides, TiO₂, CeO₂, and ZnO to fish. *Environmental Science & Technology* 44, 1144-1151. [[Abstract](#)]

Kato, Y., Kobayashi, K., Oda, S., Tatarazako, N., Watanabe, H. & Iguchi, T. (2010). Sequence divergence and expression of a transformer gene in the branchiopod crustacean *Daphnia magna*. *Genomics* 95, 160-165. [[Abstract](#)]

Kato, Y., Kobayashi, K., Watanabe, H. & Iguchi, T. (2010). Introduction of foreign DNA into the water flea, *Daphnia magna*, by electroporation. *Ecotoxicology* 19, 589-592. [[Abstract](#)]

Katsiadaki, I., Williams, T.D., Ball, J.S., Bean, T.P., Sanders, M.B., Wu, H., Santos, E.M., Brown, M.M., Baker, P., Ortega, F., Falciani, F., Craft, J.A., Tyler, C.R., Viant, M.R. & Chipman, J.K. (2010). Hepatic transcriptomic and metabolomic responses in the stickleback (*Gasterosteus aculeatus*) exposed to ethinyl-estradiol. *Aquatic Toxicology* 97, 174-187. [[Abstract](#)]

Katsu, Y., Taniguchi, E., Urushitani, H., Miyagawa, S., Takase, M., Kubokawa, K., Tooi, O., Oka, T., Santo, N., Myburgh, J., Matsuno, A. & Iguchi, T. (2010). Molecular cloning and characterization of ligand- and species-specificity of amphibian estrogen receptors. *General and Comparative Endocrinology* 168, 220-230. [[Abstract](#)]

Moore, B.C., Milnes, M.R., Kohno, S., Katsu, Y., Iguchi, T. & Guillette, L.J.Jr. (2010). Influences of sex, incubation temperature, and environmental quality on gonadal estrogen and androgen receptor messenger RNA expression in juvenile American alligators (*Alligator mississippiensis*). *Biology of Reproduction* 82, 194-

201. [[Abstract](#)]

Paull, G.C., Filby, A.L., Giddins, H.G., Coe, T.S., Hamilton, P.B. & Tyler, C.R. (2010). Dominance hierarchies in zebrafish (*Danio rerio*) and their relationship with reproductive success. *Zebrafish* 7, 109-117. [[Abstract](#)]

Santos, E.M., Ball, J.S., Williams, T.D., Wu, H., Ortega, F., van Aerle, R., Katsiadaki, I., Falciani, F., Viant, M.R., Chipman, J.K. & Tyler, C.R. (2010). Identifying health impacts of exposure to copper using transcriptomics and metabolomics in a fish model. *Environmental Science & Technology* 44, 820-826. [[Abstract](#)]

Bickley, L.K., Lange, A., Winter, M.J. & Tyler, C.R. (2009). Evaluation of a carp primary hepatocyte culture system for the assessment of chemicals with oestrogenic activity. *Aquatic Toxicology* 94, 195-203. [[Abstract](#)]

Björkblom, C., Högfors, E., Salste, L., Bergelin, E., Olsson, P.-E., Katsiadaki, I. & Wiklund, T. (2009). Estrogenic and androgenic effects of municipal wastewater effluent on reproductive endpoint biomarkers in three-spined stickleback (*Gasterosteus aculeatus*). *Environmental Toxicology and Chemistry* 28, 1063-1071. [[Abstract](#)]

Brown, A.R., Hosken, D.J., Balloux, F., Bickley, L.K., LePage, G., Owen, S.F., Hetheridge, M.J. & Tyler, C.R. (2009). Genetic variation, inbreeding and chemical exposure - combined effects in wildlife and critical considerations for ecotoxicology. *Philosophical Transactions of the Royal Society B* 364, 3377-3390. [[Abstract](#)]

Coe, T.S., Hamilton, P.B., Griffiths, A.M., Hodgson, D.J., Wahab, M.A. & Tyler, C.R. (2009). Genetic variation in strains of zebrafish (*Danio rerio*) and the implications for ecotoxicology studies. *Ecotoxicology* 18, 144-150. [[Abstract](#)]

Coe, T.S., Hamilton, P.B., Hodgson, D., Paull, G.C. & Tyler, C.R. (2009). Parentage outcomes in response to estrogen exposure are modified by social grouping in zebrafish. *Environmental Science & Technology* 43, 8400-8405. [[Abstract](#)]

Fujita, T., Scott, A., Katsiadaki, I., Amano, H., Hong, L., Hiramatsu, N., Todo, T. & Hara, A. (2009). Purification of multiple precursors for egg chorion proteins in Atlantic cod (*Gadus morhua*). *Zoological Science*. 26, 870-877. [[Abstract](#)]

Gaiser, B.K., Fernandes, T.F., Jepson, M., Lead, J.R., Tyler, C.R. & Stone, V. (2009). Assessing exposure, uptake and toxicity of silver and cerium dioxide nanoparticles from contaminated environments. *Environmental Health* 8 (Suppl 1), S2. [[Abstract](#)]

Grim, K.C., Wolfe, M., Braunbeck, T., Iguchi, T., Ohta, Y., Tooi, O., Touart, L., Wolf, D.C. & Tietge, J. (2009). Thyroid histopathology assessments for the amphibian metamorphosis assay to detect thyroid-active substances. *Toxicologic Pathology* 37, 415-424. [[Abstract](#)]

Hanamoto, S., Sugishita, H., Yamashita, N., Tanaka, H., Howa, I. & Konishi, C. (2009). Evaluation of dynamics of PPCPs at Yodo River system. *Environmental Engineering Research* 45, 29-37 (in Japanese). [[Abstract](#)]

Jobling, S., Burn, R.W., Thorpe, K., Williams, R. & Tyler, C. (2009). Statistical modeling suggests that antiandrogens in effluents from wastewater treatment works contribute to widespread sexual disruption in fish living in English rivers. *Environmental Health Perspectives* 117, 797-802. [[Abstract](#)]

Johnson, A.C., Acreman, M.C., Dunbar, M.J., Feist, S.W., Giacomello, A.M., Gozlan, R.E., Hinsley, S.A., Ibbotson, A.T., Jarvie, H.P., Jones, J.I., Longshaw, M., Maberly, S.C., Marsh, T.J., Neal, C., Newman, J.R., Nunn, M.A., Pickup, R.W., Reynard, N.S., Sullivan, C.A., Sumpter, J.P. & Williams, R.J. (2009). The British river of the future: How climate change and human activity might affect two contrasting river ecosystems in England. *Science of the Total Environment* 407, 4787-4798. [[Abstract](#)]

Jolly, C., Katsiadaki, I., Morris, S., Le Belle, N., Dufour, S., Mayer, I., Pottinger, T.G. & Scott, A.P. (2009). Detection of the anti-androgenic effect of endocrine disrupting environmental contaminants using *in vivo* and *in vitro* assays in the three-spined stickleback. *Aquatic Toxicology* 92, 228-239. [[Abstract](#)]

Jürgens, M.D., Johnson, A.C., Pottinger, T.G. & Sumpter, J.P. (2009). Do suspended sediments modulate the effects of octylphenol on rainbow trout? *Water Research* 43, 1381-1391. [[Abstract](#)]

Kim, H., Hayashi, S., Chambon, P., Watanabe, H., Iguchi, T. & Sato, T. (2009). Effects of diethylstilbestrol on ovarian follicle development in neonatal mice. *Reproductive Toxicology* 27, 55-62. [[Abstract](#)]

Kim, H., Nakajima, T., Hayashi, S., Chambon, P., Watanabe, H., Iguchi, T. & Sato, T. (2009). Effects of diethylstilbestrol on programmed oocyte death and induction of polyovular follicles in neonatal mouse ovaries. *Biology of Reproduction* 81, 1002-1009. [[Abstract](#)]

Kim, I. & Tanaka, H. (2009). Photodegradation characteristics of PPCPs in water with UV treatment. *Environment International* 35, 793-802. [[Abstract](#)]

Kim, I., Yamashita, N. & Tanaka, H. (2009). Performance of UV and UV/H₂O₂ processes for the removal of pharmaceuticals detected in secondary effluent of a

sewage treatment plant in Japan. *Journal of Hazardous Materials* 166, 1134-1140. [[Abstract](#)]

Kim, I., Yamashita, N. & Tanaka, H. (2009). Photodegradation of pharmaceuticals and personal care products during UV and UV/H₂O₂ treatments. *Chemosphere* 77, 518-525. [[Abstract](#)]

Kim, I.H., Yamashita, N., Kato, Y. & Tanaka, H. (2009). Discussion on the application of UV/H₂O₂, O₃ and O₃/UV processes as technologies for sewage reuse considering the removal of pharmaceuticals and personal care products. *Water Science and Technology* 59, 945-955. [[Abstract](#)]

Kirigaya, A., Kim, H., Hayashi, S., Chambon, P., Watanabe, H., Iguchi, T. & Sato, T. (2009). Involvement of estrogen receptor β in the induction of polyovular follicles in mouse ovaries exposed neonatally to diethylstilbestrol. *Zoological Science* 26, 704-712. [[Abstract](#)]

Macnab, V., Katsiadaki, I. & Barber, I. (2009). Reproductive potential of *Schistocephalus solidus*-infected male three-spined stickleback (*Gasterosteus aculeatus*) from two UK populations. *Journal of Fish Biology* 75, 2095-2107. [[Abstract](#)]

Miyagawa, S., Katsu, Y., Ohta, Y., Sudo, T., Lubahn, D.B. & Iguchi, T. (2009). Estrogen receptor ESR1 is indispensable for the induction of persistent vaginal change by neonatal 5 α -dihydrotestosterone exposure. *Biology of Reproduction* 82, 497-503. [[Abstract](#)]

Miyagawa, S., Moon, A., Haraguchi, R., Inoue, C., Harada, M., Nakahara, C., Suzuki, K., Matsumaru, D., Kaneko, T., Matsuo, I., Yang, L., Taketo, M.M., Iguchi, T., Evans, S.M. & Yamada, G. (2009). Dosage-dependent hedgehog signals integrated with Wnt/b-catenin signaling regulate embryonic external genitalia formation as an appendicular program. *Development* 136, 3969-3978. [[Abstract](#)]

Miyagawa, S., Satoh, Y., Haraguchi, R., Suzuki, K., Iguchi, T., Taketo, M.M., Nakagata, N., Matsumoto, T., Takeyama, K., Kato, S. & Yamada, G. (2009). Genetic interactions of the androgen and Wnt/b-catenin pathways for the masculinization of external genitalia. *Molecular Endocrinology* 23, 871-880. [[Abstract](#)]

Myers, J.P., vom Saal, F.S., Akingbemi, B.T., Arizono, K., Belcher, S., Colborn, T., Chahoud, I., Crain, D.A., Farabolini, F., Guillette, L.J., Hassold, T., Ho, S.M., Hunt, P.A., Iguchi, T., Jobling, S., Kanno, J., Laufer, H., Marcus, M., McLachlan, J.A., Nadal, A., Oehlmann, J., Olea, N., Palanza, P., Parmigiani, S., Rubin, B.S., Schoenfelder, G., Sonnenschein, C., Soto, A.M., Taisness, C.E., Taylor, J.A., Vandenberg, L.N., Vandenberg, J.G., Vogel, S., Watson, C.S., Welshons, W.V.

& Zoeller, R.T. (2009). Why public health agencies cannot depend on good laboratory practices as a criterion for selecting data: The case of bisphenol A. *Environmental Health Perspectives* 117, 309-315. [[Abstract](#)]

Oehlmann, J., Schulte-Oehlmann, U., Kloas, W., Jagnytsch, O., Lutz, I., Kusk, K.O., Wollenberger, L., Santos, E.M., Paull, G.C., Van Look, K.J.W. & Tyler, C.R. (2009). A critical analysis of the biological impacts of plasticizers on wildlife. *Philosophical Transactions of the Royal Society B-Biological Sciences* 364, 2047-2062. [[Abstract](#)]

Oka, T., Miyahara, M., Yamamoto, J., Mitsui, N., Fujii, T., Tooi, O., Kashiwagi, K., Takase, M., Kashiwagi, A. & Iguchi, T. (2009). Application of metamorphosis assay to a native Japanese amphibian species, *Rana rugosa*, for assessing effects of thyroid system affecting chemicals. *Ecotoxicology and Environmental Safety* 72, 1400-1405. [[Abstract](#)]

Paull, G.C., Filby, A.L. & Tyler, C.R. (2009). Growth rate during early life affects sexual differentiation in roach (*Rutilus rutilus*). *Environmental Biology of Fishes* 85, 277-284. [[Abstract](#)]

Scown, T.M., van Aerle, R., Johnston, B.D., Cumberland, S., Lead, J.R., Owen, R. & Tyler, C.R. (2009). High doses of intravenously administered titanium dioxide nanoparticles accumulate in the kidneys of rainbow trout but with no observable impairment of renal function. *Toxicological Sciences* 109, 372-380. [[Abstract](#)]

Sebire, M., Katsiadaki, I. & Scott, A.P. (2009). Further refinement of the non-invasive procedure for measuring steroid production in the male stickleback, *Gasterosteus aculeatus* L. *Journal of Fish Biology* 75, 2082-2094. [[Abstract](#)]

Thorpe, K.L., Maack, G., Benstead, R. & Tyler, C.R. (2009). Estrogenic wastewater treatment works effluents reduce egg production in fish. *Environmental Science & Technology* 43, 2976-2982. [[Abstract](#)]

Williams, R.J., Keller, V.D.J., Johnson, A.C., Young, A.R., Holmes, M.G.R., Wells, C., Gross-Sorokin, M. & Benstead, R. (2009). A national risk assessment for intersex in fish arising from steroid estrogens. *Environmental Toxicology and Chemistry* 28, 220-230. [[Abstract](#)]

Williams, T.D., Wu, H.F., Santos, E.M., Ball, J., Katsiadaki, I., Brown, M.M., Baker, P., Ortega, F., Falciani, F., Craft, J.A., Tyler, C.R., Chipman, J.K. & Viant, M.R. (2009). Hepatic transcriptomic and metabolomic responses in the stickleback (*Gasterosteus aculeatus*) exposed to environmentally relevant concentrations of dibenzanthracene. *Environmental Science & Technology* 43, 6341-6348. [[Abstract](#)]

Allen, Y.T., Katsiadaki, I., Pottinger, T.G., Jolly, C., Matthiessen, P., Mayer, I., Smith, A., Scott, A.P., Eccles, P., Sanders, M.B., Pulman, K.G.T. & Feist, S. (2008). Intercalibration exercise using a stickleback endocrine disrupter screening assay. *Environmental Toxicology and Chemistry* 27, 404-412.

[[Abstract](#)]

Aniagu, S.O., Williams, T.D., Allen, Y., Katsiadaki, I. & Chipman, J.K. (2008). Global genomic methylation levels in the liver and gonads of the three-spine stickleback (*Gasterosteus aculeatus*) after exposure to hexabromocyclododecane and 17 β -oestradiol. *Environment International* 34, 310-317. [[Abstract](#)]

Björkblom, C., Salste, L., Katsiadaki, I., Wiklund, T. & Kronberg, L. (2008). Detection of estrogenic activity in municipal wastewater effluent using primary cell cultures from three-spined stickleback and chemical analysis. *Chemosphere* 73, 1064-1070. [[Abstract](#)]

Brown, M.M., Williams, T.D., Chipman, J.K., Katsiadaki, I., Sanders, M. & Craft, J.A. (2008). Construction of subtracted EST and normalised cDNA libraries from liver of chemical-exposed three-spined stickleback (*Gasterosteus aculeatus*) containing pollutant-responsive genes as a resource for transcriptome analysis. *Marine Environmental Research* 66, 127-130. [[Abstract](#)]

Coe, T.S., Hamilton, P.B., Hodgson, D., Paull, G.C., Stevens, J.R., Sumner, K. & Tyler, C.R. (2008). An environmental estrogen alters reproductive hierarchies, disrupting sexual selection in group-spawning fish. *Environmental Science & Technology* 42, 5020-5025. [[Abstract](#)]

Crain, D.A., Janssen, S.J., Edwards, T.M., Heindel, J., Ho, S.M., Hunt, P., Iguchi, T., Juul, A., McLachlan, J.A., Schwartz, J., Skakkebaek, N., Soto, A.M., Swan, S., Walker, C., Woodruff, T.K., Woodruff, T.J., Giudice, L.C. & Guillette, L.J. (2008). Female reproductive disorders: the roles of endocrine-disrupting compounds and developmental timing. *Fertility and Sterility* 90, 911-940. [[Abstract](#)]

Filby, A.L., van Aerle, R., Duitman, J. & Tyler, C.R. (2008). The kisspeptin/gonadotropin-releasing hormone pathway and molecular signaling of puberty in fish. *Biology of Reproduction* 78, 278-289. [[Abstract](#)]

Geoghegan, F., Katsiadaki, I., Williams, T.D. & Chipman, J.K. (2008). A cDNA microarray for the three-spined stickleback, *Gasterosteus aculeatus* L., and analysis of the interactive effects of oestradiol and dibenzanthracene exposures. *Journal of Fish Biology* 72, 2133-2153. [[Abstract](#)]

Hamilton, P.B. & Tyler, C.R. (2008). Identification of microsatellite loci for

parentage analysis in roach *Rutilus rutilus* and eight other cyprinid fish by cross-species amplification, and a novel test for detecting hybrids between roach and other cyprinids. *Molecular Ecology Resources* 8, 462-465. [Abstract]

Handy, R.D., Henry, T.B., Scown, T.M., Johnston, B.D. & Tyler, C.R. (2008). Manufactured nanoparticles: their uptake and effects on fish—a mechanistic analysis. *Ecotoxicology* 17, 396-409. [Abstract]

Iguchi, T. & Katsu, Y. (2008). Commonality in signaling of endocrine disruption from snail to human. *Bioscience* 58, 1061-1067. [Abstract]

Iguchi, T., Watanabe, H. & Katsu, Y. (2008). Toxicogenomics and ecotoxicogenomics: Studying chemical effects and basic biology in vertebrates and invertebrates. In: Sahu, S. (Ed.). *Toxicogenomics: A Powerful Tool for Toxicology Assessment*. John Wiley & Sons, pp. 143-158.

Iguchi, T., Watanabe, H., Ohta, Y. & Blumberg, B. (2008). Developmental effects: oestrogen-induced vaginal changes and organotin-induced adipogenesis. *International Journal of Andrology* 31, 263-268. [Abstract]

Johnson, A.C., Ternes, T., Williams, R.J. & Sumpter, J.P. (2008). Assessing the concentrations of polar organic microcontaminants from point sources in the aquatic environment: Measure or model? *Environmental Science & Technology* 42, 5390-5399. [Abstract]

Katsu, Y., Ichikawa, R., Ikeuchi, T., Kohno, S., Guillette, L.J. & Iguchi, T. (2008). Molecular cloning and characterization of estrogen, androgen, and progesterone nuclear receptors from a freshwater turtle (*Pseudemys nelsoni*). *Endocrinology* 149, 161-173. [Abstract]

Katsu, Y., Kohno, S., Hyodo, S., Ijiri, S., Adachi, S., Hara, A., Guillette, L.J. & Iguchi, T. (2008). Molecular cloning, characterization, and evolutionary analysis of estrogen receptors from phylogenetically ancient fish. *Endocrinology* 149, 6300-6310. [Abstract]

Kohno, S., Katsu, Y., Iguchi, T. & Guillette, L.J. (2008). Novel approaches for the study of vertebrate steroid hormone receptors. *Integrative and Comparative Biology* 48, 527-534. [Abstract]

Moger, J., Johnston, B.D. & Tyler, C.R. (2008). Imaging metal oxide nanoparticles in biological structures with CARS microscopy. *Optics Express* 16, 3408-3419. [Abstract]

Naidoo, V., Katsu, Y. & Iguchi, T. (2008). The influence of non-toxic concentrations of DDT and DDE on the old world vulture estrogen receptor alpha. *General and Comparative Endocrinology* 159, 188-195. [Abstract]

Nakamura, T., Katsu, Y., Watanabe, H. & Iguchi, T. (2008). Estrogen receptor subtypes selectively mediate female mouse reproductive abnormalities induced by neonatal exposure to estrogenic chemicals. *Toxicology* 253, 117-124.

[[Abstract](#)]

Oka, T., Tooi, O., Mitsui, N., Miyahara, M., Ohnishi, Y., Takase, M., Kashiwagi, A., Shinkai, T., Santo, N. & Iguchi, T. (2008). Effect of atrazine on metamorphosis and sexual differentiation in *Xenopus laevis*. *Aquatic Toxicology* 87, 215-226. [[Abstract](#)]

Paull, G.C., Lange, A., Henshaw, A.C. & Tyler, C.R. (2008). Ontogeny of sexual development in the roach (*Rutilus rutilus*) and its interrelationships with growth and age. *Journal of Morphology* 269, 884-895. [[Abstract](#)]

Paull, G.C., Van Look, K.J.W., Santos, E.M., Filby, A.L., Gray, D.M., Nash, J.P. & Tyler, C.R. (2008). Variability in measures of reproductive success in laboratory-kept colonies of zebrafish and implications for studies addressing population-level effects of environmental chemicals. *Aquatic Toxicology* 87, 115-126.

[[Abstract](#)]

Sanchez, W., Katsiadaki, I., Piccini, B., Ditché, J.M. & Porcher, J.M. (2008). Biomarker responses in wild three-spined stickleback (*Gasterosteus aculeatus* L.) as a useful tool for freshwater biomonitoring: A multiparametric approach. *Environment International* 34, 490-498. [[Abstract](#)]

Sanders, M.B., Sebire, M., Sturve, J., Christian, P., Katsiadaki, I., Lyons, B.P., Sheahan, D., Weeks, J.M. & Feist, S.W. (2008). Exposure of sticklebacks (*Gasterosteus aculeatus*) to cadmium sulfide nanoparticles: Biological effects and the importance of experimental design. *Marine Environmental Research* 66, 161-163. [[Abstract](#)]

Santos, E.M., Kille, P., Workman, V.L., Paull, G.C. & Tyler, C.R. (2008). Sexually dimorphic gene expression in the brains of mature zebrafish. *Comparative Biochemistry and Physiology A* 149, 314-324. [[Abstract](#)]

Sumpter, J.P. & Johnson, A.C. (2008). 10th Anniversary Perspective: Reflections on endocrine disruption in the aquatic environment: from known knowns to unknown unknowns (and many things in between). *Journal of Environmental Monitoring* 10, 1476-1485. [[Abstract](#)]

Takao, Y., Oishi, M., Nagae, M., Kohra, S. & Arizono, K. (2008). Bisphenol A incorporated into eggs from parent fish persists for several days. *Journal of Health Science* 54, 235-239. [[Abstract](#)]

Takao, Y., Shimazu, M., Fukuda, M., Ishibashi, H., Nagae, M., Kohra, S., Tabira,

- Y., Ishibashi, Y. & Arizono, K. (2008). Seasonal and diurnal fluctuations in the concentrations of pharmaceuticals and personal care products (PPCPs) in residential sewage water. *Journal of Health Science* 54, 240-243. [Abstract]
- Thorpe, K.L., Benstead, R., Eccles, P., Maack, G., Williams, T. & Tyler, C.R. (2008). A practicable laboratory flow-through exposure system for assessing the health effects of effluents in fish. *Aquatic Toxicology* 88, 164-172. [Abstract]
- Tyler, C.R., Filby, A.L., van Aerle, R., Lange, A., Ball, S. & Santos, E.M. (2008). Fish toxicogenomics. In: Hogstrand, C., Kille, P. (Eds.). *Comparative Toxicogenomics*. Elsevier, Amsterdam, The Netherlands, pp. 75-132, 324-325. [Abstract]
- Tyler, C.R. & Jobling, S. (2008). Roach, sex, and gender-bending chemicals: The feminization of wild fish in English rivers. *Bioscience* 58, 1051-1059. [Abstract]
- van Aerle, R., Kille, P., Lange, A. & Tyler, C.R. (2008). Evidence for the existence of a functional Kiss1/Kiss1 receptor pathway in fish. *Peptides* 29, 57-64. [Abstract]
- Watanabe, H., Kobayashi, K., Kato, Y., Oda, S., Abe, R., Tatarazako, N. & Iguchi, T. (2008). Genomic response in *Daphnia* to chemical pollutants. In: Murakami, Y., Nakayama, K., Kitamura, S.-I., Iwata, H., Tanabe, S. (Eds.). *Interdisciplinary Studies on Environmental Chemistry – Biological Responses to Chemical Pollutants*. TERRAPUB, pp. 133-142.
- Watanabe, H., Kobayashi, K., Kato, Y., Oda, S., Abe, R., Tatarazako, N. & Iguchi, T. (2008). Transcriptome profiling in crustaceans as a tool for ecotoxicogenomics. *Cell Biology and Toxicology* 24, 641-647. [Abstract]
- Amano, H., Fujita, T., Hiramatsu, N., Shimizu, M., Sawaguch, S., Iatsubara, T., Kagawa, H., Nagae, M., Sullivan, C.V. & Hara, A. (2007). Egg yolk proteins in gray mullet (*Mugil cephalus*): Purification and classification of multiple lipovitellins and other vitellogenin-derived yolk proteins and molecular cloning of the parent vitellogenin genes. *Journal of Experimental Zoology Part A-Ecological Genetics and Physiology* 307A, 324-341. [Abstract]
- Andersson, C., Katsiadaki, I., Lundstedt-Enkel, K. & Orberg, J. (2007). Effects of 17 α -ethynylestradiol on EROD activity, spiggin and vitellogenin in three-spined stickleback (*Gasterosteus aculeatus*). *Aquatic Toxicology* 83, 33-42. [Abstract]
- Björkblom, C., Olsson, P.-E., Katsiadaki, I. & Wiklund, T. (2007). Estrogen- and androgen-sensitive bioassays based on primary cell and tissue slice cultures from three-spined stickleback (*Gasterosteus aculeatus*). *Comparative Biochemistry and Physiology C* 146, 431-442. . [Abstract]

Filby, A.L., Neuparth, T., Thorpe, K.L., Owen, R., Galloway, T.S. & Tyler, C.R. (2007). Health impacts of estrogens in the environment, considering complex mixture effects. *Environmental Health Perspectives* 115, 1704-1710. [[Abstract](#)]

Filby, A.L., Santos, E.M., Thorpe, K.L., Maack, G. & Tyler, C.R. (2007). Gene expression profiling for understanding chemical causation of biological effects for complex mixtures: A case study on estrogens. *Environmental Science & Technology* 41, 8187-8194. [[Abstract](#)]

Filby, A.L., Thorpe, K.L., Maack, G. & Tyler, C.R. (2007). Gene expression profiles revealing the mechanisms of anti-androgen- and estrogen-induced feminization in fish. *Aquatic Toxicology* 81, 219-231. [[Abstract](#)]

Filby, A.L. & Tyler, C.R. (2007). Appropriate 'housekeeping' genes for use in expression profiling the effects of environmental estrogens in fish. *BMC Molecular Biology* 8. [[Abstract](#)]

Guillette, L.J., Jr., Edwards, T.M. & Moore, B.C. (2007). Alligators, contaminants and steroid hormones. *Environmental Sciences* 14, 331-347. [[Abstract](#)]

Iguchi, T., Watanabe, H. & Katsu, Y. (2007). Toxicogenomics and ecotoxicogenomics for studying endocrine disruption and basic biology. *General and Comparative Endocrinology* 153, 25-29. [[Abstract](#)]

Johnson, A.C., Williams, R.J., Simpson, P. & Kanda, R. (2007). What difference might sewage treatment performance make to endocrine disruption in rivers? *Environmental Pollution* 147, 194-202. [[Abstract](#)]

Katsu, Y., Hinago, M., Sone, K., Urushitani, H., Guillette, L.J. & Iguchi, T. (2007). *In vitro* assessment of transcriptional activation of the estrogen and androgen receptors of mosquitofish, *Gambusia affinis affinis*. *Molecular and Cellular Endocrinology* 276, 10-17. [[Abstract](#)]

Pettersson, M., Hahlbeck, E., Katsiadaki, L., Asplund, L. & Bengtsson, B.E. (2007). Survey of estrogenic and androgenic disruption in Swedish coastal waters by the analysis of bile fluid from perch and biomarkers in the three-spined stickleback. *Marine Pollution Bulletin* 54, 1868-1880. [[Abstract](#)]

Rushbrook, B.J., Katsiadaki, I. & Barber, I. (2007). Spiggin levels are reduced in male sticklebacks infected with *Schistocephalus solidus*. *Journal of Fish Biology* 71, 298-303. [[Abstract](#)]

Santos, E.M., Paull, G.C., Van Look, K.J.W., Workman, V.L., Holt, W.V., van Aerle, R., Kille, P. & Tyler, C.R. (2007). Gonadal transcriptome responses and physiological consequences of exposure to oestrogen in breeding zebrafish

(*Danio rerio*). *Aquatic Toxicology* 83, 134-142. [[Abstract](#)]

Santos, E.M., Workman, V.L., Paull, G.C., Filby, A.L., Van Look, K.J.W., Kille, P. & Tyler, C.R. (2007). Molecular basis of sex and reproductive status in breeding zebrafish. *Physiological Genomics* 30, 111-122. [[Abstract](#)]

Schulz, R.W., Bogerd, J., Male, R., Ball, J., Fenske, M., Olsen, L.C. & Tyler, C.R. (2007). Estrogen-induced alterations in amh and dmrt1 expression signal for disruption in male sexual development in the zebrafish. *Environmental Science & Technology* 41, 6305-6310. [[Abstract](#)]

Thorpe, K.L., Benstead, R., Hutchinson, T.H. & Tyler, C.R. (2007). Associations between altered vitellogenin concentrations and adverse health effects in fathead minnow (*Pimephales promelas*). *Aquatic Toxicology* 85, 176-183. [[Abstract](#)]

Hirobe, M., Goda, Y., Okayasu, Y., Tomita, J., Takigami, H., Ike, M. & Tanaka, H. (2006). The use of enzyme-linked immunosorbent assays (ELISA) for the determination of pollutants in environmental and industrial wastes. *Water Science and Technology* 54, 1-9. [[Abstract](#)]

Iguchi, T., Irie, F., Urushitani, H., Tooi, O., Kawashima, Y., Roberts, M., Norrgren, L. & Hutchinson, T.H. (2006). Availability of in vitro vitellogenin assay for screening of estrogenic and anti-estrogenic activities of environmental chemicals. *Environmental Sciences* 13, 161-183. [[Abstract](#)]

Iguchi, T., Watanabe, H. & Katsu, Y. (2006). Application of ecotoxicogenomics for studying endocrine disruption in vertebrates and invertebrates. *Environmental Health Perspectives* 114, 101-105. [[Abstract](#)]

Jolly, C., Katsiadaki, I., Le Belle, N., Mayer, I. & Dufour, S. (2006). Development of a stickleback kidney cell culture assay for the screening of androgenic and anti-androgenic endocrine disrupters. *Aquatic Toxicology* 79, 158-166. [[Abstract](#)]

Katsiadaki, I., Morris, S., Squires, C., Hurst, M.R., James, J.D. & Scott, A.P. (2006). Use of the three-spined stickleback (*Gasterosteus aculeatus*) as a sensitive *in vivo* test for detection of environmental antiandrogens. *Environmental Health Perspectives* 114, 115-121. [[Abstract](#)]

Katsiadaki, I. & Scott, A.P. (2006). The stickleback model in endocrine disruption research: An essential tool in the laboratory and the field. *Marine Environmental Research* 62, S228-S229. [[Abstract](#)]

Katsu, Y., Kohno, S., Oka, T., Mitsui, N., Tooi, O., Santo, N., Urushitani, H., Fukumoto, Y., Kuwabara, K., Ashikaga, K., Minami, S., Kato, S., Ohta, Y., Guillette, L.J. & Iguchi, T. (2006). Molecular cloning of estrogen receptor alpha

(ER α ; ESR1) of the Japanese giant salamander, *Andrias japonicus*. *Molecular and Cellular Endocrinology* 257-258, 84-94. [[Abstract](#)]

Komori, K., Okayasu, Y., Yasojima, M., Suzuki, Y. & Tanaka, H. (2006). Occurrence of nonylphenol, nonylphenol ethoxylate surfactants and nonylphenol carboxylic acids in wastewater in Japan. *Water Science and Technology* 53, 27-33. [[Abstract](#)]

Mitsui, N., Fujii, T., Miyahara, M., Oka, T., Kashiwagi, A., Kashiwagi, K., Hanada, H., Urushitani, H., Santo, N., Tooi, O. & Iguchi, T. (2006). Development of metamorphosis assay using *Silurana tropicalis* for the detection of thyroid system-disrupting chemicals. *Ecotoxicology and Environmental Safety* 64, 281-287. [[Abstract](#)]

Nakada, N., Yasojima, M., Okayasu, Y., Komori, K., Tanaka, H. & Suzuki, Y. (2006). Fate of oestrogenic compounds and identification of oestrogenicity in a wastewater treatment process. *Water Science and Technology* 53, 51-63. [[Abstract](#)]

Oka, T., Mitsui, N., Hinago, M., Miyahara, M., Fujii, T., Tooi, O., Santo, N., Urushitani, H., Iguchi, T., Hanaoka, Y. & Mikami, H. (2006). All ZZ male *Xenopus laevis* provides a clear sex-reversal test for feminizing endocrine disruptors. *Ecotoxicology and Environmental Safety* 63, 236-243. [[Abstract](#)]

Yamashita, N., Tanaka, H., Miyajima, K., Tamamoto, H., Miyamoto, N., Yasojima, M., Komori, K. & Suzuki, Y. (2006). Fate estimation of estrogenic substances in an urban river by flux calculation. *Water Environment Research* 78, 2330-2334. [[Abstract](#)]

Higashitani, T., Miyajima, K., Nakada, N., Yasojima, M., Tanaka, H. & Suzuki, Y. (2005). Development of on-site fish exposure system placed in water quality monitoring stations along a river. *Water Science and Technology* 52, 275-282. [[Abstract](#)]

Nagae, M., Shiroyama, K., Inoue, M., Hara, A., Takao, Y., Kohra, S., Ishibashi, Y., Tominaga, N., Yoshihara, S. & Arizono, K. (2005). Estrogenic potency of a bisphenol A metabolite on vitellogenin synthesis in medaka, *Oryzias latipes*. *Journal of Health Science* 51, 93-95. [[Abstract](#)]

Komori, K., Tanaka, H., Okayasu, Y., Yasojima, M. & Sato, C. (2004). Analysis and occurrence of estrogen in wastewater in Japan. *Water Science and Technology* 50, 93-100. [[Abstract](#)]

Mibu, K., Wada, J., Okayasu, Y., Tsumori, J., Komori, K., Tanaka, H., Li, J.H.,

Sasaki, M. & Sato, C. (2004). Distribution of estrogen, nonylphenol and its derivatives in the sediments of a shallow lake. *Water Science and Technology* 50, 173-179. [[Abstract](#)]

Higashitani, T., Tamamoto, H., Takahashi, A. & Tanaka, H. (2003). Study of estrogenic effects on carp (*Cyprinus carpio*) exposed to sewage treatment plant effluents. *Water Science and Technology* 47, 93-100. [[Abstract](#)]

Takahashi, A., Higashitani, T., Yakou, Y., Saitou, M., Tamamoto, H. & Tanaka, H. (2003). Evaluating bioaccumulation of suspected endocrine disruptors into periphytons and benthos in the Tama River. *Water Science and Technology* 47, 71-76. [[Abstract](#)]