表１　ヒトの核内受容体に対するマウス、ラット、カエルの類似性

（DNA 結合領域）

Receptor	mouse	rat	frog
ERα	100%	100%	98%
ERβ	100%	100%	98%
AR	100%	100%	100%
GR	100%	100%	100%
MR	100%	100%	98%
PR	100%	100%	96%
RARα	100%	100%	100%
RARβ	100%	100%	N.D.
RARγ	100%	100%	96%
TRα	100%	100%	93%
TRβ	96%	96%	100%
VDR	100%	100%	95%

Receptor	mouse	rat	frog
RXRα	100%	100%	96%
RXRβ	100%	100%	95%
RXRγ	100%	100%	96%
PPARα	100%	98%	90%
PPARγ	100%	100%	96%
PPARδ	96%	95%	N.D.
LXRα	96%	98%	N.D.
LXRβ	92%	93%	85%
FXR	100%	98%	N.D.
CAR	90%	90%	N.D.
SXR	95%	95%	74% (α)
			74% (β)

表２　ヒトの核内受容体に対するマウス、ラット、カエルの類似性

（リガンド結合領域）

Receptor	mouse	rat	frog
ERα	91%	91%	75%
ERβ	89%	90%	75%
AR	98%	98%	85%
GR	94%	95%	73%
MR	93%	93%	81%
PR	94%	94%	77%
RARα	99%	98%	92%
RARβ	98%	98%	N.D.
RARγ	99%	98%	89%
TRα	98%	98%	88%
TRβ	99%	99%	93%
VDR	91%	92%	81%

Receptor	mouse	rat	frog
RXRα	99%	99%	95%
RXRβ	99%	99%	94%
RXRγ	99%	98%	91%
PPARα	91%	92%	89%
PPARγ	99%	99%	84%
PPARδ	94%	92%	N.D.
LXRα	98%	98%	N.D.
LXRβ	99%	99%	88%
FXR	94%	93%	N.D.
CAR	79%	73%	N.D.
SXR	77%	76%	43% (α)
			44% (β)

Xenopus as model animal for endocrine disrupter research

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Key Word: endocrine disrupter, nuclear receptor family, retinoids, amphibians, xenopus

Abstract:

Xenopus serves as an excellent model for the effects of endocrine disrupters on development and physiology because they afford an ideal combination of embryological and biochemical approaches to study the developmental biology. *Xenopus laevis* has led the way in identifying the mechanisms of early fate decisions, patterning of the basic vertebrate body plan, and early organogenesis. In addition, it has been reported that amphibian populations have declined significantly around the world in recent years. Therefore, the research on amphibians is necessary to elucidate the relationship between industrial chemicals and abnormalities observed in wild life. In this research project, we have developed *in vitro* detection method for potential endocrine disrupting chemicals and conducted comprehensive screening of suspected endocrine disrupters on many nuclear receptors. As a result, we found that several compounds possess agonistic activities for multiple nuclear receptors simultaneously. In particular, alkylphenols (e.g., nonylphenol and octylphenol) showed agonistic activity on retinoic acid receptor as well as estrogen receptor. Further, some organotin compounds (e.g., TBT and TPT) showed strong effects on retinoid X receptor or peroxisome proliferator-activated receptor γ. These results suggest that the toxicity of some endocrine disrupters came from their simultaneous effects on multiple nuclear receptors. To confirm our *in vitro* data in biological relevance, we have to carry out animal expeiments, and chose *Xenopus* as a model animal for future study.