UPDATE
National Toxicology Program

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Headquartered at the National Institute of Environmental Health Sciences HHS-NIH

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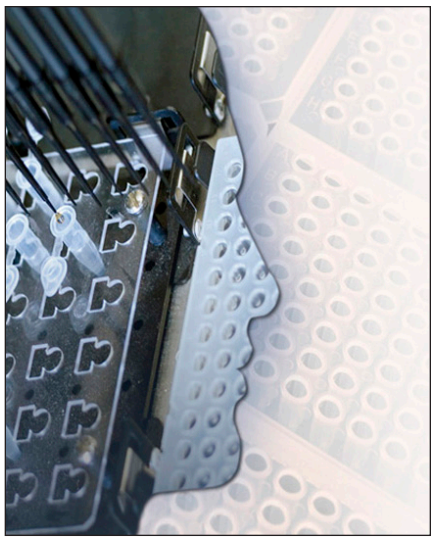
NTP Holds Meeting on High-Throughput Screening

Article by Eddy Ball, reprinted from *eFACTOR*, September 2008



The National Toxicology Program (NTP) took an important step forward in the development of a more rigorous and comprehensive high-throughput screening program for toxicology studies by hosting a Request for Information (RFI) meeting September 11-12 in Rodbell Auditorium at NIEHS.

The well-attended meeting brought together scientists from assay-development companies, government and universities to provide the NTP with information on how to identify and select critical cellular toxicity pathways to be evaluated by cell-based high-throughput screens. The NTP also solicited recommendations on particularly informative molecular targets within these pathways for both cell-based and biochemical assays.

The meeting featured 26 twenty-minute presentations on methodology, novel targets and pathway identification and was chaired by NTP Toxicologist Kristine Witt, who is involved in assay selection and study design for the NTP's High Throughput Screening (HTS) Initiative. According to event organizer Denise Lasko, more than 130 individuals registered for the meeting including presenters, NTP, NIEHS and Environmental Protection Agency (EPA) scientists, and other scientists and individuals with interests in HTS and computational toxicology.

On hand to introduce the meeting and provide clarification was Raymond Tice, Ph.D., deputy director of the NTP Interagency Center for the Evaluation of Alternative Toxicological Methods (NICEATM), acting chief of the NTP Biomolecular Screening Branch and HTS Initiative coordinator.

As Tice explained, the meeting is intended to address one of the short-term goals of the 2005 NTP Roadmap for the 21st Century to identify or develop rapid, mechanism-based predictive screening assays for use in toxicity determinations. He said that the event should also be viewed within the context of the 2007 National Academy of Sciences report *Toxicity Testing in the 21st Century: A Vision and a Strategy*.

During this same period of time, the NIEHS/NTP, EPA ToxCast Program and National Human Genome Research Institute explored ways to coordinate their work on alternative methodologies. "As a result of this publication and our own interests and efforts," Tice continued, "we put together a Memorandum of Understanding (MOU) in February 2008… on high-throughput screening toxicity pathway profiling and biological interpretation of findings."

As part of the MOU, the interagency consortium, also known as Tox21, set up four focus groups with representatives from each of the three organizations as co-chairs. The RFI meeting is intended to identify information for the first of the groups, Pathways and Assays, whose goal, Tice maintained, is "to identify key toxicity pathways and suitable assays for those pathways, including bio-transformation and evaluating assay reliability."

Over the day and a half of presentations, speakers addressed one or more of the informational needs outlined in the July 7, 2008 announcement of the meeting:

- Identification and selection of critical cellular pathways involved in toxicity and associated with disease outcome
- Assays that can be used to measure the activity of a compound on a target within a critical pathway
- Ways to select the best targets within pathways and networks
- Assays, technologies or methods for identifying compounds that are relevant only after metabolic activation
- New technologies or technologies under development that can help expand and more carefully characterize the findings from initial screens.

The next step, which Tice reminded the audience will take some time, is for the Assays and Pathways focus group to decide what test methods should be recommended to the NIH Chemical Genomics Center for further validation.

For more information regarding the RFI meeting, please visit the NTP HTS webpage at http://ntp.niehs.nih.gov/go/28213

Contact Information: Kristine Witt, NTP HTS Initiative, NIH/NIEHS, P.O. Box 12233, MD EC-32, Research Triangle Park, NC 27709; T: (919) 541-2761; FAX: (919) 316-4511; witt@niehs.nih.gov

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NTP Board of Scientific Counselors

The NTP Board of Scientific Counselors (BSC) Meeting will be held on November 20-21, 2008, at the NIEHS, 111 TW Alexander Drive, Research Triangle Park, NC. Preliminary agenda items include NTP nominations and concepts; three reports from BSC Working Groups on criteria for evaluating outcomes in NTP immunotoxicology, reproductive toxicology and developmental toxicology studies; a concept review on the production of mold materials; an update on the high throughput screening initiative and presentations on the toxicology of DNA-based therapies and NTP toxicogenomic studies.

The BSC is also tentatively scheduled to meet on February 24, 2009, at the NIEHS, 111 TW Alexander Drive, Research Triangle Park, NC. The primary agenda item will be the peer

Upcoming Events

November 20-21, 2008

NTP Board of Scientific Counselors Meeting

NIEHS, 111 TW Alexander Dr. Research Triangle Park, NC

December 9-10, 2008

NTP RoC Expert Panel Meeting on Cobalt-tungsten Carbide Powders and Hard Metals

Sheraton Chapel Hill Hotel Chapel Hill, NC

February 24, 2009

NTP Board of Scientific Counselors Meeting

NIEHS, 111 TW Alexander Dr. Research Triangle Park, NC

February 25-26, 2009

Technical Reports Review Subcommittee Meeting

NIEHS, 111 TW Alexander Dr. Research Triangle Park, NC

http://ntp.niehs.nih.gov/go/calendar

review of draft substance profiles for candidate substances under review for possible listing in the 12th Report on Carcinogens. The list of draft substance profiles will be posted on the NTP website meeting page http://ntp.niehs.nih.gov/go/165 and announced in the Federal Register prior to the meeting.

These meetings are open to the public and public comments, both written and oral, are welcome on any agenda topic. Additional details about these meetings, including preliminary agenda and roster, will be posted on the NTP website meeting page http://ntp.niehs.nih.gov/go/165 as available, announced in the Federal Register or can be obtained by contacting the executive secretary (contact information below).

NTP Board of Scientific Counselors Technical Reports Review Subcommittee

The NTP Board of Scientific Counselors Technical Reports Review Subcommittee (TRRS) is scheduled to meet on February 25-26, 2009, at the NIEHS, 111 TW Alexander Drive, Research Triangle Park, NC to peer review the findings and conclusions from 6 draft NTP Technical Reports performed in conventional rats and mice.

The draft reports tentatively scheduled for review are:

TR 557	beta-Myrcene	TR 560	Androstenedione
TR 558	3,3',4,4'-Tetrachloroazobenzene	TR 561	Tetralin
TR 559	2,3',4,4',5- Pentacchlorobiphenyl (PCB 118)	TR 562	Goldenseal root powder

Details about the TRRS meeting will be announced in the Federal Register and posted on the NTP website meeting page http://ntp.niehs.nih.gov/go/15833 or can be obtained by contacting the executive secretary (contact information below). This meeting is open to the public and public comment, both written and oral, is welcome on any report.

Contact Information: Dr. Barbara Shane, Executive Secretary, NTP Office of Liaison, Policy and Review,
NIH/NIEHS, P.O. Box 12233, MD A3-01, Research Triangle Park, NC 27709;
T: (919) 541-4253; shane@niehs.nih.gov

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NTP Testing Program

Request for Study Nominations

With a broad mandate to provide toxicological characterizations for chemicals and other substances of public health concern, the NTP accepts nominations for new toxicological studies at any time. Labor unions, academic scientists, federal and state agencies, industry, and the general public are welcome to make nominations for specific substances or for general issues related to potential human health hazards of occupational or environmental exposures. As available, a rationale for study should accompany the nomination along with background information describing sources of exposure and possible adverse health effects or concerns associated with exposure, the chemical name and the Chemical Abstract Service (CAS) registry number. Details about the nomination review and selection process are available on the NTP website (http://ntp.niehs.nih.gov, select Nominations to the Testing Program under the heading Testing Information) or by contacting the NTP Office of Nomination and Selection (contact information on next page).

Current areas of focus in the NTP's testing program include potential hazards associated with radiofrequency radiation from cellular phones, metals, nanoscale materials, perfluorinated compounds, herbal dietary supplements, photoactive chemicals, brominated flame retardants, certain complex occupational exposures, dioxin-like compounds, contaminants of finished drinking water, and endocrine-active substances.

All nominations undergo several levels of review before being selected by the NTP for study. These steps of review help to ensure that the NTP's testing program addresses toxicological concerns pertinent to all areas of public

health and helps maintain balance among the types of substances and issues evaluated. Studies are initiated on selected nominations as time and resources permit.

Study Nominations Currently in Review

The six new study nominations briefly described below will be reviewed by the NTP Board of Scientific Counselors (BSC) at a public meeting on November 20-21, 2008 (see NTP Board of Scientific Counselors in this issue). Supporting documents and any public comments received for these nominations are available on the NTP website at http://ntp.niehs.nih.gov/go/nom; select Current under Nominations Review.

Questions or comments on any of the new study nominations should be directed to Dr. Scott Masten (contact information below).

- **Bisphenol AF:** a moderate production monomer used for making industrial plastics and resins; recommended for comprehensive toxicological characterization.
- **Dimethylamine borane:** an industrial reducing agent recommended for dermal absorption, toxicity and sensitization studies.
- **Ethylene glycol 2-ethylhexyl ether:** a high production industrial solvent recommended for reproductive and developmental toxicity studies.
- **Hydroxyurea:** a drug used for treating sickle cell anemia and certain cancers; no experimental animal toxicity studies are recommended at this time.
- **L-β-Methylaminoalanine:** an excitatory amino acid naturally produced by cyanobacteria (blue-green algae); recommended for absorption, distribution, metabolism, and elimination studies, neurotoxicity studies, and biomolecular screening studies.
- **Triclosan:** a bacteriostatic agent widely used in consumer products; recommended for carcinogenicity studies via dermal administration, phototoxicity studies, and reproductive toxicity studies.

Contact Information: Dr. Scott A. Masten, Director, NTP Office of Nomination and Selection, NIH/NIEHS, P.O. Box 12233, MD EC-31, 79 T.W. Alexander Dr., Research Triangle Park, North Carolina 27709; T: (919) 541-5710; FAX: (919) 541-3647; email; masten@niehs.nih.gov

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Report on Carcinogens (RoC)

Recommendations on Listing Status of Styrene

The expert panel meeting for the scientific review of styrene took place on July 21-22, 2008, at the Radisson Hotel, Research Triangle Park, NC. At this public meeting, the expert panel peer reviewed the draft background document for styrene and made a recommendation regarding its listing status in the RoC. The expert panel recommended that styrene be listed in the 12th RoC as reasonably anticipated to be a human carcinogen. The Styrene Expert Panel Report, Part B, which contains the recommendation and its scientific justification, is posted on the RoC website http://ntp.niehs.nih.gov/go/29682 and the NTP is now soliciting public comment (see September 28, 2008 Federal Register notice). Written comments should be submitted to the RoC Office (contact information on the next page) by October 23, 2008. The NTP considered the expert panel's peer review comments (Styrene Expert Panel Report, Part A) and public comments and has finalized the background document on styrene, which is also posted on the RoC website.

Final Background Documents on Riddelliine and Aristolochic Acids Available

The public expert panel meeting for the scientific review of aristolochic acid related exposures and riddelliine took place on January 24-25, 2008, at the Sheraton Hotel, Chapel Hill, NC. At this meeting, the expert panel

reviewed the draft background documents for these two candidate substances and made recommendations regarding their listing status in the 12th RoC. The final background documents, peer review comments on these documents, and the panel's listing recommendations and scientific justifications are posted on the RoC website http://ntp.niehs.nih.gov/go/29682 and are also available in hardcopy or on CD from the RoC Office (contact information below).

Scientific Review of Cobalt-Tungsten Carbide Powders and Hard Metals December 9-10, 2008

The expert panel meeting for the scientific review of cobalt-tungsten carbide powders and hard metals is scheduled for December 9-10, 2008, at the Sheraton Chapel Hill Hotel in Chapel Hill, NC. At this public meeting, the cobalt-tungsten expert panel will (1) peer review the draft background document and (2) provide a recommendation and scientific justification for its listing status in the 12th RoC. Meeting information and the draft background document will be available on the RoC meeting page at http://ntp.niehs.nih.gov/go/29679 in early October 2008.

Contact Information: Dr. Ruth M. Lunn, Report on Carcinogens Office,
NIH/NIEHS, P.O. Box 12233, MD EC-14, 79 T.W. Alexander Dr., Research Triangle Park, NC 27709;
T: (919)-316-4637; FAX: (919)-541-0144; lunn@niehs.nih.gov

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NTP Center for the Evaluation of Risks to Human Reproduction (CERHR)

NTP-CERHR Review of Bisphenol A Completed

In December 2005, the CERHR announced its intention to conduct an evaluation of the potential for bisphenol A to cause adverse effects on reproduction and development in humans. The final results of this evaluation are now available in the NTP-CERHR Monograph on Bisphenol A that includes (1) the NTP Brief on Bisphenol A and (2) the CERHR Expert Panel Report on the Reproductive and Developmental Toxicity of Bisphenol A. The NTP Brief provides the public, as well as government health, regulatory, and research agencies, with the NTP's conclusions regarding the potential for bisphenol A to adversely affect human reproductive health or children's development. It is based on information about bisphenol A provided in the expert panel report, public comments, comments from peer reviewers of the draft NTP Brief and additional scientific information available since the expert panel meeting. This monograph is now available on the CERHR website: http://cerhr.niehs.nih.gov (select CERHR Reports and Monographs) and in hardcopy or on CD from CERHR (contact information below).

Hydroxyurea Monograph

The draft NTP Brief on Hydroxyurea was released for public comment on March 17, 2008, followed by peer review by four scientific experts. The NTP carefully considered the public comments and the peer review comments and has now finalized the NTP Brief on Hydroxyurea. It will be included in the NTP-CERHR Monograph on the Potential Human Reproductive and Developmental Effects of Hydroxyurea, which will be available this fall.

Contact Information: Dr. Michael D. Shelby, Director CERHR, NIH/NIEHS,
NIH/NIEHS, P.O. Box 12233, MD EC-14, 79 T.W. Alexander Dr., Research Triangle Park, NC 27709;
T: (919) 541-3455; FAX: (919) 316-4511; shelby@niehs.nih.gov

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NTP Interagency Center for the Evaluation of Alternative Toxicological Methods NICEATM)

Test Method Recommendations for Alternative, Non-Animal Ocular Toxicity Test Methods Accepted by Agencies

On June 23, 2008, the National Institute of Environmental Health Sciences (NIEHS) announced that Federal regulatory agencies had accepted recommendations of the Interagency Coordinating Committee on the Validation of Alternative Methods (ICCVAM) for two toxicological test methods that can reduce live animal use for ocular safety testing. Acceptance of these recommendations is featured in the Forum section of the September 2008 issue of Environmental Health Perspectives (EHP, available at http://www.ehponline.org/docs/2008/116-9/forum.html#ocul), the NIEHS journal.

ICCVAM recommended the two alternative test methods, the bovine corneal opacity and permeability (BCOP) assay and the isolated chicken eye (ICE) assay, following an extensive evaluation of their scientific validity. NICEATM provided scientific support for the evaluation, which included independent scientific peer review by an international expert panel and consideration of public comments.

The BCOP and ICE do not involve the use of live animals, and the tissues used are obtained from animals intended for food consumption. If a positive response is obtained using either of the two new approved alternative methods, the product can be labeled as causing irreversible or severe eye damage without animal testing. These are the first scientifically valid *in vitro* alternative methods to gain regulatory acceptance for ocular safety testing.

Information about the NICEATM-ICCVAM evaluation of the ocular safety test methods, including the Test Method Evaluation Report, the ICCVAM recommendations, and the agency responses, can be found at: http://iccvam.niehs.nih.gov/methods/ocutox/ivocutox.htm

Test Guidelines for Alternative, Non-Animal Ocular Toxicity Forwarded to OECD

In a related activity, NICEATM, on behalf of ICCVAM, forwarded draft test guidelines for the BCOP and ICE test methods to the Organisation of Economic Co-operation and Development (OECD), via the U.S. National Coordinator on August 20, 2008. The test guidelines were developed by NICEATM and the ICCVAM Ocular Toxicity Working Group in collaboration with the European Centre for the Validation of Alternative Methods (ECVAM), the Japanese Center for the Validation of Alternative Methods (JaCVAM), and the developers of the BCOP and ICE. The draft test guidelines are based on the ICCVAM recommended test method protocols that were developed following a comprehensive review of the validation status of both methods and included independent scientific peer review by an international expert panel and consideration of public comments. The approval of these test methods by the OECD will allow use of the test methods in the other 29 OECD member countries including Japan, Canada, and most countries in the European Union, and will broaden the impact on reducing animal use.

Materials related to the NICEATM-ICCVAM review of these test methods are available on the NICEATM-ICCVAM website http://iccvam.niehs.nih.gov/methods/ocutox/ivocutox/ocu_recommend.htm.

Agency Responses on Alternative, Non-Animal Acute Toxicity Test Method Recommendations

NICEATM, on behalf of ICCVAM, forwarded the ICCVAM Test Method Evaluation Report: *In Vitro* Cytotoxicity Test Methods for Estimating Starting Doses for Acute Oral Systemic Toxicity Tests (NIH Publication No. 07-4519) to U.S. Federal agencies in February 2008 for regulatory consideration. ICCVAM recommended that the *in vitro* basal cytotoxicity test methods evaluated in the joint ICCVAM/ECVAM validation study (the neutral red uptake assay using rodent (mouse fibroblast [3T3]) and human (normal human epidermal keratinocyte [NHK]) cells) should be considered before using animals for acute oral toxicity testing, and that the methods should be used when determined appropriate. Data from the test methods should be used in a weight-of-evidence

approach for determining starting doses for *in vivo* studies. Using these *in vitro* methods is expected to reduce the number of animals required for each toxicity test. ICCVAM concluded that the *in vitro* test methods are not sufficiently accurate to replace animals for regulatory hazard classification purposes.

Responses to the ICCVAM recommendations were received from all Federal agencies and are posted on the NICEATM-ICCVAM website http://iccvam.niehs.nih.gov/methods/acutetox/inv_nru_announce.htm.

All Federal agencies concurred with ICCVAM's recommendation regarding the two test methods. The website has other links to documents associated with evaluation of these test methods.

Progress on Validation Studies of *In Vitro* Methods to Identify Potential Endocrine Disruptors

A NICEATM-sponsored, multi-phased, international validation study of the LUMI-CELL® test method is in progress in collaboration with ECVAM and JaCVAM. Recently, efforts have been made to optimize the test method protocol in order to demonstrate repeatability of assay results within a laboratory and their reproducibility within and across laboratories. Using an optimized protocol based on a standardization study completed by the lead laboratory Xenobiotic Detection Systems, Inc. (XDS), the three participating laboratories (XDS, Hiyoshi Corporation, and an ECVAM laboratory) have completed Phase 1 and 2A testing. Phase 2B testing was initiated recently.

More information about the LUMI-CELL validation study can be found on the NICEATM-ICCVAM website at http://iccvam.niehs.nih.gov/methods/endocrine/end_eval.htm.

Progress on the Murine Local Lymph Node Assay (LLNA)

Revised ICCVAM LLNA Performance Standards have been drafted and are being considered in conjunction with draft ECVAM LLNA Performance Standards by representatives of ICCVAM, the ICCVAM Immunotoxicity Working Group, NICEATM, ECVAM, and the ECVAM Task Force on Skin Sensitization. A meeting of representatives from these groups will be convened at ECVAM on September 23-24, 2008, with the goal of reaching agreement on a consensus document that will have international applicability and that can be included in a revised OECD Test Guideline for the LLNA.

NICEATM and ICCVAM are also finalizing the background review document and test method evaluation report (TMER) for the reduced Local Lymph Node Assay (rLLNA), a method identical to the traditional LLNA except that the rLLNA uses only a single test substance dose. The dose is the maximum soluble concentration that is not systemically toxic or excessively irritating. The TMER will present ICCVAM recommendations on the usefulness and limitations of the rLLNA, a standardized protocol, performance standards, and any future studies to further characterize the usefulness and limitations of the rLLNA.

NICEATM received additional data and information for the non-radioactive versions of the LLNA, which will be used to update a review of their validation status as replacements for the traditional (radioactive) LLNA. NICEATM has also received from chemical companies and trade organizations data from over 70 traditional LLNA studies on mixtures. These data will also be used in an updated evaluation of the usefulness and limitations of the LLNA for testing mixtures. Once these evaluations are completed, the international independent peer review panel will be reconvened via teleconference to consider the updated information and any revisions to the draft ICCVAM test method recommendations. ●

Contact Information: Dr. William S. Stokes, Director, NICEATM, NIH/NIEHS,
NIH/NIEHS, P.O. Box 12233, MD EC-14, 79 T.W. Alexander Dr., Research Triangle Park, NC 27709;
T: 919-541-2384; FAX 919-541-0947; niceatm@niehs.nih.gov

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NTP Staff Publications April - June 2008

Alper S, Laws, R, Lackford, B, Boyd, WA, Dunlap, P, Freedman, JH and Schwartz, DA (2008). "Identification of innate immunity genes and pathways using a comparative genomics approach." Proceedings of the National Academy of Sciences of the United States of America 105(19): 7016-7021.
PubMed: http://www.ncbi.nlm.nih.gov/pubmed/18463287
DOI: http://dx.doi.org/10.1073/pnas.0802405105

Boyd WA, McBride, SJ and Freedman, JH (2008). "Effects of genetic mutations and chemical exposures on Caenorhabditis elegans feeding: Evaluation of a novel, high-throughput screening assay." PLoS ONE 2(12): e1259
PubMed: http://www.ncbi.nlm.nih.gov/pubmed/18060055

Chan PC, Sills, RC, Kissling, GE, Nyska, A and Richter, W (2008). "Induction of thyroid and liver tumors by chronic exposure to 2-methylimidazole in F344/N rats and B6C3F1 mice." Arch Toxicol 82(6): 399-412.
PubMed: http://www.ncbi.nlm.nih.gov/pubmed/17924096
DOI: http://dx.doi.org/10.1007/s00204-007-0249-7

Di X, Yu, L, Moore, AB, Castro, L, Zheng, X, Hermon, T and Dixon, D (2008). "A low concentration of genistein induces estrogen receptor-alpha and insulin-like growth factor-I receptor interactions and proliferation in uterine leiomyoma cells." Hum Reprod 23(8): 1873-83.
PubMed: http://www.ncbi.nlm.nih.gov/pubmed/18492705
DOI: http://humrep.oxfordjournals.org/cgi/content/abstract/23/8/1873

Dixon D, Herbert, RA, Kissling, GE, Brix, AE, Miller, RA and Maronpot, RR (2008). "Summary of chemically induced pulmonary lesions in the National Toxicology Program (NTP) toxicology and carcinogenesis studies." Toxicol Pathol 36(3): 428-39.
PubMed: http://www.ncbi.nlm.nih.gov/pubmed/18441259
DOI: http://tpx.sagepub.com/cgi/content/abstract/36/3/428

Gao X, Hu, X, Qian, L, Yang, S, Zhang, W, Zhang, D, Wu, X, Fraser, A, Wilson, B, Flood, PM, Block, M and Hong, JS (2008). "Formyl-methionyl-leucyl-phenylalanine-induced dopaminergic neurotoxicity via microglial activation: a mediator between peripheral infection and neurodegeneration?" Environ Health Perspect 116(5): 593-8.
PubMed: http://www.ncbi.nlm.nih.gov/pubmed/18470306
DOI: http://www.ehponline.org/docs/2008/11031/abstract.html

Hotchkiss CE, Weis, C, Blaydes, B, Newbold, R and Delclos, KB (2008). Multigenerational exposure to ethinyl estradiol affects bone geometry, but not bone mineral density in rats." Bone 2008 Jul;43(1): 110-8.
PubMed: http://www.ncbi.nlm.nih.gov/pubmed/18467201
DOI: http://linkinghub.elsevier.com/retrieve/pii/S8756328208001725

Kang-Sickel JCC, Fox, DD, Nam, TG, Jayaraj, K, Ball, LM, French, JE, Klapper, DG, Gold, A and Nylander-French, LA (2008). "S-arylcysteine-keratin adducts as biomarkers of human dermal exposure to aromatic hydrocarbons." Chemical Research in Toxicology 21(4): 852-858.
PubMed: http://www.ncbi.nlm.nih.gov/pubmed/18361511

Kim YS, Kang, HS, Herbert, R, Beak, JY, Collins, JB, Grissom, SF and Jetten, AM (2008). "Kruppel-like zinc finger protein Glis2 is essential for the maintenance of normal renal functions." Mol Cell Biol 28(7): 2358-67.
PubMed: http://www.ncbi.nlm.nih.gov/pubmed/18227149
DOI: http://dx.doi.org/10.1128/MCB.01722-07

Lobenhofer EK, Auman, JT, Blackshear, PE, Boorman, GA, Bushel, PR, Cunningham, ML, Fostel, JM, Gerrish, K, Heinloth, AN, Irwin, RD, Malarkey, DE, Merrick, BA, Sieber, SO, Tucker, CJ, Ward, SM, Wilson, RE, Hurban, P, Tennant, RW and Paules, RS (2008). "Gene expression response in target organ and whole blood varies as a function of target organ injury phenotype." Genome Biology 9(6): R100.
PubMed: http://www.ncbi.nlm.nih.gov/pubmed/18570634
DOI: http://genomebiology.com/2008/9/6/R100

Lodge JW, Fletcher, BL, Brown, SS, Parham, AJ, Fernando, RA and Collins, BJ (2008). "Determination of lovastatin hydroxy acid in female B6C3F(1) mouse serum." Journal of Analytical Toxicology 32(3): 248-252.
PubMed: http://www.ncbi.nlm.nih.gov/pubmed/18397577

Longnecker MP, Smith, CS, Kissling, GE, Hoppin, JA, Butenhoff, JL, Decker, E, Ehresman, DJ, Ellefson, ME, Flaherty, J, Gardner, MS, Langlois, E, LeBlanc, A, Lindstrom, AB, Reagen, WK, Strynar, MJ and Studabaker, WB (2008). "An interlaboratory study of perfluorinated alkyl compound levels in human plasma." Environmental Research 107(2): 152-159.
PubMed: http://www.ncbi.nlm.nih.gov/pubmed/18295197

Morgan DL, Flake, GP, Kirby, PJ and Palmer, SM (2008).
"Respiratory toxicity of diacetyl in C57BL/6 mice." Toxicol Sci 103(1): 169-80.
PubMed: http://www.ncbi.nlm.nih.gov/pubmed/18227102
DOI: http://toxsci.oxfordjournals.org/cgi/content/abstract/103/1/169

Newbold RR, Padilla-Banks, E, Jefferson, WN and Heindel, JJ (2008).
"Effects of endocrine disruptors on obesity." Int J Androl 31(2): 201-8.
PubMed: http://www.ncbi.nlm.nih.gov/pubmed/18315718
DOI: http://dx.doi.org/10.1111/j.1365-2605.2007.00858.x

Stout MD, Bodes, E, Schoonhoven, R, Upton, PB, Travlos, GS and Swenberg, JA (2008). "Toxicity, DNA binding, and cell proliferation in male F344 rats following short-term gavage exposures to trans-2-hexenal." Toxicologic Pathology 36(2): 232-246.
PubMed: http://www.ncbi.nlm.nih.gov/pubmed/18362197
DOI: http://tpx.sagepub.com/cgi/content/abstract/36/2/232

Wakamatsu N, Collins, JB, Parker, JS, Tessema, M, Clayton, NP, Ton, TVT, Hong, HHL, Belinsky, S, Devereux, TR, Sills, RC and Lahousse, SA (2008). "Gene expression studies demonstrate that the K-ras/Erk MAP kinase signal transduction pathway and other novel pathways contribute to the pathogenesis of cumene-induced lung tumors." Toxicologic Pathology 36(5): 743-752.
PubMed: http://www.ncbi.nlm.nih.gov/pubmed/18648096
DOI: http://tpx.sagepub.com/cgi/content/abstract/36/5/743

Yu L, Saile, K, Swartz, CD, He, H, Zheng, X, Kissling, GE, Di, X, Lucas, S, Robboy, SJ and Dixon, D (2008). "Differential expression of receptor tyrosine kinases (RTKs) and IGF-I pathway activation in human uterine leiomyomas." Mol Med 14(5-6): 264-75.
PubMed: http://www.ncbi.nlm.nih.gov/pubmed/18231572
DOI: http://www.molmed.org/

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The NTP website offers electronic files of the Report on Carcinogens and the library of NTP Technical Reports and NTP Toxicity Reports. The PDF files of these reports are available free-of-charge through the NTP website at http://ntp.niehs.nih.gov (see Resources).

Contact Information: NTP Office of Liaison, Policy and Review, NIEHS, P.O. Box 12233, MD EC-01, Research Triangle Park, NC 27709; T: (919) 541-0530; FAX: (919) 541-0295; CDM@niehs.nih.gov

Recent NTP Publications

NTP Technical Reports:

TR 541: Toxicology and Carcinogenesis Studies of Formamide

TR 546: Toxicology and Carcinogenesis Studies of Sodium Dichromate Dihydrate

TR 550: Toxicology and Carcinogenesis Studies of Cresols

TR 552: Toxicology and Carcinogenesis Studies of Propargyl Alcohol

Available at: http://ntp.niehs.nih.gov/go/reports