



Bibliometric Analysis **for the U.S. Environmental Protection Agency/Office of Research** **and Development's Human Health Research Program**

This is a bibliometric analysis of the papers prepared by intramural and extramural researchers of the U.S. Environmental Protection Agency (EPA) of the Human Health Research Program. For this analysis, 1,835 papers were reviewed, and they were published from 1997 to 2006. These publications were cited 22,937 times in the journals covered by Thomson's *Web of Science*¹ and Scopus². Of these 1,835 publications, 1,561 (85%) have been cited at least once in a journal.

Searches of Thomson Scientific's *Web of Science* and Scopus were conducted to obtain times cited data for the human health journal publications. The analysis was completed using Thomson's *Essential Science Indicators (ESI)* and *Journal Citation Reports (JCR)* as benchmarks. *ESI* provides access to a unique and comprehensive compilation of essential science performance statistics and science trends data derived from Thomson's databases. For influence and impact measures, *ESI* employs both total citation counts by field and cites per paper scores. The former reveals gross influence while the latter shows weighted influence, also called impact. *JCR* is a recognized authority for evaluating journals. It presents quantifiable statistical data that provide a systematic, objective way to evaluate the world's leading journals and their impact and influence in the global research community. The two key measures used in this analysis to assess the journals in which the EPA human health papers are published are the Impact Factor and Immediacy Index. The Impact Factor is a measure of the frequency with which the "average article" in a journal has been cited in a particular year. The Impact Factor helps evaluate a journal's relative importance, especially when compared to other journals in the same field. The Immediacy Index is a measure of how quickly the "average article" in a journal is cited. This index indicates how often articles published in a journal are cited within the same year and it is useful in comparing how quickly journals are cited.

The report includes a summary of the results of the analysis, an analysis of the 1,835 human health papers analyzed by *ESI* field (e.g., clinical medicine, environment/ecology, plant & animal science), an analysis of the journals in which the human health papers were published, a table of the highly cited researchers in the Human Health Research Program, and a list of the patents and patent applications resulting from the program.

¹ Thomson Scientific's *Web of Science* provides access to current and retrospective multidisciplinary information from approximately 8,830 of the most prestigious, high impact research journals in the world. *Web of Science* also provides cited reference searching.

² Scopus is a large abstract and citation database of research literature and quality Web sources designed to support the literature research process. Scopus offers access to 15,000 titles from 4,000 different publishers, more than 12,850 academic journals (including coverage of 535 Open Access journals, 750 conference proceedings, and 600 trade publications), 27 million abstracts, 245 million references, 200 million scientific Web pages, and 13 million patent records.

SUMMARY OF RESULTS

- 1. One-quarter of the human health publications are highly cited papers.** A review of the citations indicates that 462 (25%) of the human health papers qualify as highly cited when using the *ESI* criteria for the top 10% of highly cited publications. This is 2.5 times the number expected. Sixty-four (3.5%) of the human health papers qualify as highly cited when using the *ESI* criteria for the top 1%, which is 3.5 times the number expected. Six (0.33%) of these papers qualify as very highly cited when using the criteria for the top 0.1%, which is 3.3 times the number anticipated. As expected, no papers actually meet the 0.01% threshold for the most highly cited papers (the expected number for this size program is 0.18 papers in the most highly cited category).
- 2. The human health papers are more highly cited than the average paper.** Using the *ESI* average citation rates for papers published by field as the benchmark, in 16 of the 21 fields in which the EPA human health papers were published, the ratio of actual to expected cites is greater than 1, indicating that the human health papers are more highly cited than the average papers in those fields. For all 16 fields combined, the ratio of total number of cites to the total number of expected cites (22,937 to 13,742.39) is 1.67, indicating that the human health papers are more highly cited than the average paper.
- 3. More than half of the human health papers are published in high impact journals.** Nine hundred thirty-two (932) of the 1,835 papers were published in the top 10% of journals ranked by *JCR* Impact Factor, representing 51% of EPA's human health papers. This number is more than 5 times higher than expected. Nine hundred thirty-eight (938) of the 1,835 papers appear in the top 10% of journals ranked by *JCR* Immediacy Index, representing 51% of EPA's human health papers. This number is also more than 5 times higher than expected.
- 4. Fifteen of the human health papers qualify as hot papers.** Using the hot paper thresholds established by *ESI* as a benchmark, 15 hot papers, representing 0.8% of the human health papers, were identified in the analysis. Hot papers are papers that were highly cited shortly after they were published. The number of human health hot papers is 8 times higher than expected.
- 5. The authors of the human health papers cite themselves much less than the average author.** Nine hundred ninety-two (992) of the 22,937 cites are author self-cites. This 4.3% author self-citation rate is well below the accepted range of 10-30% author self-citation rate.
- 6. Eighty-one of the authors of the human health papers are included in *ISI Highly Cited.com*,** which is a database of the world's most influential researchers who have made key contributions to science and technology during the period from 1981 to 1999.

Highly Cited Human Health Publications

The 1,835 human health papers reviewed for this analysis covered 21 of the 22 *ESI* fields. The distribution of the papers among these 21 fields and the number of citations by field are presented in Table 1.

Table 1. Human Health Papers by *ESI* Fields

| No. of Citations | <i>ESI</i> Field | No. of EPA HH Papers | Average Cites/Paper |
|---------------------------|------------------------------|-----------------------------|----------------------------|
| 6,313 | Clinical Medicine | 469 | 13.46 |
| 5,809 | Pharmacology & Toxicology | 472 | 12.31 |
| 5,706 | Environment/Ecology | 424 | 13.46 |
| 1,107 | Molecular Biology & Genetics | 78 | 14.19 |
| 920 | Biology & Biochemistry | 76 | 12.10 |
| 824 | Immunology | 29 | 28.41 |
| 757 | Neuroscience & Behavior | 91 | 8.32 |
| 225 | Chemistry | 40 | 5.62 |
| 212 | Engineering | 33 | 6.42 |
| 186 | Multidisciplinary | 11 | 16.91 |
| 183 | Geosciences | 14 | 13.07 |
| 176 | Microbiology | 16 | 11.00 |
| 146 | Social Sciences, General | 38 | 3.84 |
| 134 | Agricultural Sciences | 12 | 11.17 |
| 82 | Mathematics | 6 | 13.67 |
| 62 | Plant & Animal Science | 11 | 5.64 |
| 61 | Psychiatry/Psychology | 6 | 10.17 |
| 24 | Computer Science | 4 | 6.00 |
| 7 | Economics & Business | 2 | 3.50 |
| 2 | Physics | 1 | 2.00 |
| 1 | Material Sciences | 2 | 0.50 |
| Total = 22,937 | | Total = 1,835 | 12.50 |

There are 462 (25.2% of the papers analyzed) highly cited EPA human health papers in 18 of the 21 fields—Clinical Medicine, Environment/Ecology, Pharmacology & Toxicology, Immunology, Molecular Biology & Genetics, Biology & Biochemistry, Engineering, Multidisciplinary, Geosciences, Neuroscience & Behavior, Social Sciences, General, Chemistry, Agricultural Sciences, Mathematics, Psychiatry/Psychology, Microbiology, Computer Science, and Plant & Animal Science—when using the *ESI* criteria for the **top 10% of papers**. Table 2 shows the number of EPA papers in those 18 fields that meet the **top 10% threshold in *ESI***. Sixty-four (3.5%) of the papers analyzed qualify as highly cited when using the *ESI* criteria for the **top 1% of papers**. These papers cover 10 fields—Environment/Ecology, Pharmacology & Toxicology, Clinical Medicine, Molecular Biology & Genetics, Immunology, Multidisciplinary, Agricultural Sciences, Engineering, Biology & Biochemistry, and Plant & Animal Science. Table 3 shows the 64 papers by field that meet the **top 1% threshold in *ESI***. The citations for these 64 papers are provided in Tables 4 through 13. There were 6 (0.33%) very highly cited human health paper in the fields of Environment/Ecology, Clinical Medicine, and Plant & Animal Science. These papers, which met the **top 0.1% threshold in *ESI***, are listed in Table 14. None of the human health papers actually met the **top 0.01% threshold in *ESI***, which is to be expected.

Table 2. Number of Highly Cited Human Health Papers by Field (top 10%)

| Citations | <i>ESI</i> Field | No. of Papers | Average Cites/Paper | % of EPA Papers in Field |
|-----------|------------------------------|---------------|---------------------|--------------------------|
| 4,049 | Clinical Medicine | 125 | 32.39 | 26.65% |
| 3,939 | Environment/Ecology | 140 | 28.14 | 33.02% |
| 3,626 | Pharmacology & Toxicology | 117 | 30.99 | 24.79% |
| 576 | Immunology | 5 | 115.20 | 17.24% |
| 575 | Molecular Biology & Genetics | 3 | 191.67 | 3.85% |
| 410 | Biology & Biochemistry | 13 | 31.54 | 17.11% |
| 182 | Engineering | 12 | 15.17 | 36.36% |
| 159 | Multidisciplinary | 5 | 31.80 | 45.45% |
| 143 | Geosciences | 5 | 28.60 | 35.71% |
| 110 | Neuroscience & Behavior | 4 | 27.50 | 4.40% |
| 108 | Social Sciences, General | 11 | 9.82 | 28.95% |
| 107 | Chemistry | 7 | 15.28 | 17.50% |
| 105 | Agricultural Sciences | 3 | 35.00 | 25.00% |
| 80 | Mathematics | 5 | 16.00 | 83.33% |
| 44 | Psychiatry/Psychology | 2 | 22.00 | 33.33% |
| 21 | Microbiology | 1 | 21.00 | 6.25% |
| 20 | Computer Science | 2 | 10.00 | 50.00% |

| Citations | ESI Field | No. of Papers | Average Cites/Paper | % of EPA Papers in Field |
|-----------------------|------------------------|--------------------|---------------------|--------------------------|
| 20 | Plant & Animal Science | 2 | 10.00 | 18.18% |
| Total = 14,274 | | Total = 462 | 30.90 | 25.18% |

Table 3. Number of Highly Cited Human Health Papers by Field (top 1%)

| Citations | ESI Field | No. of Papers | Average Cites/Paper | % of EPA Papers in Field |
|----------------------|------------------------------|-------------------|---------------------|--------------------------|
| 1,342 | Environment/Ecology | 30 | 44.73 | 7.08% |
| 1,096 | Pharmacology & Toxicology | 16 | 68.50 | 3.39% |
| 805 | Clinical Medicine | 11 | 73.18 | 2.35% |
| 473 | Molecular Biology & Genetics | 1 | 473.00 | 1.28% |
| 356 | Immunology | 1 | 356.00 | 3.45% |
| 79 | Multidisciplinary | 1 | 79.00 | 9.09% |
| 78 | Agricultural Sciences | 1 | 78.00 | 8.33% |
| 37 | Engineering | 1 | 37.00 | 3.03% |
| 19 | Biology & Biochemistry | 1 | 19.00 | 1.32% |
| 6 | Plant & Animal Science | 1 | 6.00 | 9.09% |
| Total = 4,291 | | Total = 64 | 67.05 | 3.49% |

Table 4. Highly Cited Human Health Papers in the Field of Environment/Ecology (top 1%)

| No. of Cites | First Author | Paper |
|--------------|--------------|--|
| 104 | Eskenazi B | Exposures of children to organophosphate pesticides and their potential adverse health effects. <i>Environmental Health Perspectives</i> 1999; 107(Suppl 3):409-419. |
| 100 | Landrigan PJ | Pesticides and inner-city children: exposures, risks, and prevention. <i>Environmental Health Perspectives</i> 1999;107(Suppl 3):431-437. |
| 192 | Rice D | Critical periods of vulnerability for the developing nervous system: Evidence from humans and animal models. <i>Environmental Health Perspectives</i> 2000;108(Suppl 3):511-533. |

| No. of Cites | First Author | Paper |
|--------------|---------------|--|
| 175 | Laden F | Association of fine particulate matter from different sources with daily mortality in six US cities. <i>Environmental Health Perspectives</i> 2000;108(10):941-947. |
| 54 | Lioy PJ | Characterization of the dust/smoke aerosol that settled east of the World Trade Center (WTC) in Lower Manhattan after the collapse of the WTC 11 September 2001. <i>Environmental Health Perspectives</i> 2002;110(7):703-714. |
| 68 | Schechter A | Polybrominated diphenyl ethers (PBDEs) in US mothers' milk. <i>Environmental Health Perspectives</i> 2003;111(14):1723-1729. |
| 55 | Birnbaum LS | Cancer and developmental exposure to endocrine disruptors. <i>Environmental Health Perspectives</i> 2003;111(4):389-394. |
| 53 | Perera FP | Effects of transplacental exposure to environmental pollutants on birth outcomes in a multiethnic population. <i>Environmental Health Perspectives</i> 2003;111(2):201-205. |
| 45 | Longnecker MP | Comparison of polychlorinated biphenyl levels across studies of human neurodevelopment. <i>Environmental Health Perspectives</i> 2003;111(1):65-70. |
| 38 | Curl CL | Organophosphorus pesticide exposure of urban and suburban preschool children with organic and conventional diets. <i>Environmental Health Perspectives</i> 2003;111(3):377-382. |
| 37 | Berkowitz GS | Exposure to indoor pesticides during pregnancy in a multiethnic, urban cohort. <i>Environmental Health Perspectives</i> 2003;111(1):79-84. |
| 37 | Whyatt RM | Contemporary-use pesticides in personal air samples during pregnancy and blood samples at delivery among urban minority mothers and newborns. <i>Environmental Health Perspectives</i> 2003;111(5):749-756. |
| 78 | Birnbaum LS | Brominated flame retardants: Cause for concern? <i>Environmental Health Perspectives</i> 2004;112(1):9-17. |
| 40 | Berkowitz GS | <i>In utero</i> pesticide exposure, maternal paraoxonase activity, and head circumference. <i>Environmental Health Perspectives</i> 2004;112(3):388-391. |
| 35 | Whyatt RM | Prenatal insecticide exposures and birth weight and length among an urban minority cohort. <i>Environmental Health Perspectives</i> 2004;112(10):1125-1132. |
| 32 | Eskenazi B | Association of <i>in utero</i> organophosphate pesticide exposure and fetal growth and length of gestation in an agricultural population. <i>Environmental Health Perspectives</i> 2004;112(10):1116-1124. |
| 25 | Ulrich RG | Overview of an interlaboratory collaboration on evaluating the effects of model hepatotoxicants on hepatic gene expression. <i>Environmental Health Perspectives</i> 2004;112(4):423-427. |

| No. of Cites | First Author | Paper |
|--------------|--------------|---|
| 24 | Landrigan PJ | Health and environmental consequences of the World Trade Center disaster. <i>Environmental Health Perspectives</i> 2004;112(6):731-739. |
| 25 | Kunzli N | Ambient air pollution and atherosclerosis in Los Angeles. <i>Environmental Health Perspectives</i> 2005;113(2):201-206. |
| 18 | Stapleton HM | Polybrominated diphenyl ethers in house dust and clothes dryer lint. <i>Environmental Science & Technology</i> 2005;39(4):925-931. |
| 16 | Lanphear BP | Low-level environmental lead exposure and children's intellectual function: An international pooled analysis. <i>Environmental Health Perspectives</i> 2005;113(7):894-899. |
| 16 | Shafer TJ | Developmental neurotoxicity of pyrethroid insecticides: Critical review and future research needs. <i>Environmental Health Perspectives</i> 2005;113(2):123-136. |
| 16 | Yolton K | Exposure to environmental tobacco smoke and cognitive abilities among US children and adolescents. <i>Environmental Health Perspectives</i> 2005;113(1):98-103. |
| 14 | Trasande L | Public health and economic consequences of methyl mercury toxicity to the developing brain. <i>Environmental Health Perspectives</i> 2005;113(5):590-596. |
| 11 | Sapkota A | Impact of the 2002 Canadian forest fires on particulate matter air quality in Baltimore City. <i>Environmental Science & Technology</i> 2005;39(1):24-32. |
| 10 | Merchant JA | Asthma and farm exposures in a cohort of rural Iowa children. <i>Environmental Health Perspectives</i> 2005;113(3):350-356. |
| 10 | Kissel JC | Comparison of organophosphorus pesticide metabolite levels in single and multiple daily urine samples collected from preschool children in Washington State. <i>Journal of Exposure Analysis and Environmental Epidemiology</i> 2005;15(2):164-171. |
| 6 | Lu CS | Organic diets significantly lower children's dietary exposure to organophosphorus pesticides. <i>Environmental Health Perspectives</i> 2006;114(2):260-263. |
| 5 | Calderon RL | Estimates of endemic waterborne risks from community-intervention studies. <i>Journal of Water and Health</i> 2006;4(Suppl 2):89-100. |
| 3 | Selgrade MK | Induction of asthma and the environment: What we know and need to know. <i>Environmental Health Perspectives</i> 2006;114(4):615-619. |

Table 5. Highly Cited Human Health Papers in the Field of Pharmacology & Toxicology (top 1%)

| No. of Cites | First Author | Paper |
|--------------|--------------|--|
| 153 | Laws SC | Estrogenic activity of octylphenol, nonylphenol, bisphenol A and methoxychlor in rats. <i>Toxicological Sciences</i> 2000;54(1):154-167. |
| 166 | Styblo M | Comparative toxicity of trivalent and pentavalent inorganic and methylated arsenicals in rat and human cells. <i>Archives of Toxicology</i> 2000;74(6):289-299. |
| 107 | Lang T | Extensive genetic polymorphism in the human CYP2B6 gene with impact on expression and function in human liver. <i>Pharmacogenetics</i> 2001;11(5):399-415. |
| 120 | Thomas DJ | The cellular metabolism and systemic toxicity of arsenic. <i>Toxicology and Applied Pharmacology</i> 2001;176(2):127-144. |
| 143 | Mass MJ | Methylated trivalent arsenic species are genotoxic. <i>Chemical Research in Toxicology</i> 2001;14(4):355-361. |
| 169 | Kitchin KT | Recent advances in arsenic carcinogenesis: Modes of action, animal model systems, and methylated arsenic metabolites. <i>Toxicology and Applied Pharmacology</i> 2001;172(3):249-261. |
| 94 | Hughes MF | Arsenic toxicity and potential mechanisms of action. <i>Toxicology Letters</i> 2002;133(1):1-16. |
| 108 | Ding XX | Human extrahepatic cytochromes P450: Function in xenobiotic metabolism and tissue-selective chemical toxicity in the respiratory and gastrointestinal tracts. <i>Annual Review of Pharmacology and Toxicology</i> 2003;43:149-173. |
| 14 | Costa LG | Modulation of paraoxonase (PON1) activity. <i>Biochemical Pharmacology</i> 2005;69(4):541-550. |
| 3 | Barton HA | The acquisition and application of absorption, distribution, metabolism and excretion (ADME) data in agricultural chemical safety assessments. <i>Critical Reviews in Toxicology</i> 2006;36(1):9-35. |
| 4 | Furlong CE | PON1 status of farmworker mothers and children as a predictor of organophosphate sensitivity. <i>Pharmacogenetics and Genomics</i> 2006;16(3):183-190. |
| 3 | Cooper RL | A tiered approach to life stages testing for agricultural chemical safety assessment. <i>Critical Reviews in Toxicology</i> 2006;36(1):69-98. |
| 3 | Haws LC | Development of a refined database of mammalian relative potency estimates for dioxin-like compounds. <i>Toxicological Sciences</i> 2006;89(1):4-30. |
| 3 | Calafat AM | Urinary and amniotic fluid levels of phthalate monoesters in rats after the oral administration of di(2-ethylhexyl) phthalate and di-n-butyl phthalate. <i>Toxicology</i> 2006;217(1):22-30. |

| No. of Cites | First Author | Paper |
|--------------|---------------|--|
| 3 | Carmichael MG | Agricultural chemical safety assessment: a multisector approach to the modernization of human safety requirements. <i>Critical Reviews in Toxicology</i> 2006;36(1):1-7. |
| 3 | Delker D | Molecular biomarkers of oxidative stress associated with bromate carcinogenicity. <i>Toxicology</i> 2006;221(2-3):158-165. |

Table 6. Highly Cited Human Health Papers in the Field of Clinical Medicine (top 1%)

| No. of Cites | First Author | Paper |
|--------------|--------------|--|
| 144 | Pope CN | Organophosphorus pesticides: do they all have the same mechanism of toxicity? <i>Journal of Toxicology and Environmental Health-Part B-Critical Reviews</i> 1999;2(2):161-181. |
| 125 | McConnell R | Asthma in exercising children exposed to ozone: a cohort study. <i>Lancet</i> 2002;359(9304):386-391. |
| 97 | Cho HY | Role of NRF2 in protection against hyperoxic lung injury in mice. <i>American Journal of Respiratory Cell and Molecular Biology</i> 2002;26(2):175-182. |
| 205 | Canfield RL | Intellectual impairment in children with blood lead concentrations below 10 µg per deciliter. <i>New England Journal of Medicine</i> 2003;348(16):1571-1526. |
| 87 | Pope CA | Cardiovascular mortality and long-term exposure to particulate air pollution - epidemiological evidence of general pathophysiological pathways of disease. <i>Circulation</i> 2004;109(1):71-77. |
| 48 | Gauderman WJ | The effect of air pollution on lung development from 10 to 18 years of age. <i>New England Journal of Medicine</i> 2004;351(11):1057-1067. |
| 47 | Gilliland FD | Effect of glutathione-S-transferase M1 and P1 genotypes on xenobiotic enhancement of allergic responses: randomised, placebo-controlled crossover study. <i>Lancet</i> 2004;363(9403):119-125. |
| 19 | Riedl M | Biology of diesel exhaust effects on respiratory function. <i>Journal of Allergy and Clinical Immunology</i> 2005;115(2):221-228. |
| 17 | Alberg AJ | Epidemiology of lung cancer: Looking to the future. <i>Journal of Clinical Oncology</i> 2005;23(14):3175-3185. |
| 12 | Dominici F | Fine particulate air pollution and hospital admission for cardiovascular and respiratory diseases. <i>JAMA-Journal of the American Medical Association</i> 2006;295(10):1127-1134. |
| 4 | Engel SM | Xenobiotic phenols in early pregnancy amniotic fluid. <i>Reproductive Toxicology</i> 2006;21(1):110-112. |

Table 7. Highly Cited Human Health Paper in the Field of Molecular Biology & Genetics (top 1%)

| No. of Cites | First Author | Paper |
|--------------|--------------|---|
| 473 | Arbour NC | TLR4 mutations are associated with endotoxin hyporesponsiveness in humans. <i>Nature Genetics</i> 2000;25(2):187-191. |

Table 8. Highly Cited Human Health Paper in the Field of Immunology (top 1%)

| No. of Cites | First Author | Paper |
|--------------|--------------|--|
| 356 | Wills-Karp M | Immunologic basis of antigen-induced airway hyperresponsiveness. <i>Annual Review of Immunology</i> 1999;17:255-281. |

Table 9. Highly Cited Human Health Paper in the Field of Multidisciplinary (top 1%)

| No. of Cites | First Author | Paper |
|--------------|--------------|---|
| 79 | Brenner DJ | Cancer risks attributable to low doses of ionizing radiation: assessing what we really know. <i>Proceedings of the National Academy of Sciences of the United States of America</i> 2003;100(24):13761-13766. |

Table 10. Highly Cited Human Health Paper in the Field of Agricultural Sciences (top 1%)

| No. of Cites | First Author | Paper |
|--------------|--------------|---|
| 78 | Birnbaum LS | Non-carcinogenic effects of TCDD in animals. <i>Food Additives and Contaminants</i> 2000;17(4):275-288. |

Table 11. Highly Cited Human Health Paper in the Field of Engineering (top 1%)

| No. of Cites | First Author | Paper |
|--------------|--------------|---|
| 37 | Vette AF | Characterization of indoor-outdoor aerosol concentration relationships during the Fresno PM exposure studies. <i>Aerosol Science and Technology</i> 2001;34(1):118-126. |

Table 12. Highly Cited Human Health Paper in the Field of Biology & Biochemistry (top 1%)

| No. of Cites | First Author | Paper |
|--------------|--------------|--|
| 19 | Kadiiska MB | Biomarkers of oxidative stress study II. Are oxidation products of lipids, proteins, and DNA markers of CCl ₄ poisoning? <i>Free Radical Biology and Medicine</i> 2005;38(6):698-710. |

Table 13. Highly Cited Human Health Paper in the Field of Plant & Animal Science (top 1%)

| No. of Cites | First Author | Paper |
|--------------|--------------|---|
| 6 | Evenson DP | Clinical aspects of sperm DNA fragmentation detection and male infertility. <i>Theriogenology</i> 2006;65(5):979-991. |

Table 14. Very Highly Cited Human Health Papers (top 0.1%)

| ESI Field | No. of Cites | First Author | Paper |
|------------------------|--------------|--------------|--|
| Clinical Medicine | 205 | Canfield RL | Intellectual impairment in children with blood lead concentrations below 10 μ g per deciliter. <i>New England Journal of Medicine</i> 2003;348(16):1571-1526. |
| | 12 | Dominici F | Fine particulate air pollution and hospital admission for cardiovascular and respiratory diseases. <i>JAMA-Journal of the American Medical Association</i> 2006;295(10):1127-1134. |
| Environment/ Ecology | 78 | Birnbaum LS | Brominated flame retardants: Cause for concern? <i>Environmental Health Perspectives</i> 2004;112(1):9-17. |
| | 25 | Kunzli N | Ambient air pollution and atherosclerosis in Los Angeles. <i>Environmental Health Perspectives</i> 2005;113(2):201-206. |
| | 6 | Lu CS | Organic diets significantly lower children's dietary exposure to organophosphorus pesticides. <i>Environmental Health Perspectives</i> 2006;114(2):260-263. |
| Plant & Animal Science | 6 | Evenson DP | Clinical aspects of sperm DNA fragmentation detection and male infertility. <i>Theriogenology</i> 2006;65(5):979-991. |

Ratio of Actual Cites to Expected Citation Rates

The expected citation rate is the average number of cites that a paper published in the same journal in the same year and of the same document type (article, review, editorial, etc.) has received from the year of publication to the present. Using the *ESI* average citation rates for papers published by field as the benchmark, in 16 of the 21 fields in which the EPA human health papers were published, the ratio

of actual to expected cites is greater than 1, indicating that the human health papers are more highly cited than the average papers in those fields (see Table 15).

Table 15. Ratio of Actual Cites to Expected Cites for Human Health Papers by Field

| <i>ESI</i> Field | Total Cites | Expected Cite Rate | Ratio |
|------------------------------|-------------|--------------------|-------|
| Agricultural Sciences | 134 | 39.99 | 3.35 |
| Biology & Biochemistry | 920 | 823.48 | 1.12 |
| Chemistry | 225 | 282.44 | 0.80 |
| Clinical Medicine | 6,313 | 3,397.59 | 1.86 |
| Computer Science | 24 | 7.03 | 3.41 |
| Economics & Business | 7 | 5.83 | 1.20 |
| Engineering | 212 | 78.68 | 2.69 |
| Environment/Ecology | 5,706 | 2,512.79 | 2.27 |
| Geosciences | 183 | 79.25 | 2.31 |
| Immunology | 824 | 426.91 | 1.93 |
| Material Sciences | 1 | 1.60 | 0.62 |
| Mathematics | 82 | 20.62 | 3.98 |
| Microbiology | 176 | 163.88 | 1.07 |
| Molecular Biology & Genetics | 1,107 | 1,291.71 | 0.86 |
| Multidisciplinary | 186 | 42.11 | 4.42 |
| Neuroscience & Behavior | 757 | 1,010.10 | 0.75 |
| Pharmacology & Toxicology | 5,809 | 3,396.03 | 1.71 |
| Physics | 2 | 5.21 | 0.38 |
| Plant & Animal Science | 62 | 47.12 | 1.32 |
| Psychiatry/Psychology | 61 | 30.70 | 1.99 |
| Social Sciences, General | 146 | 79.32 | 1.84 |

JCR Benchmarks

Impact Factor. The *JCR* Impact Factor is a well known metric in citation analysis. It is a measure of the frequency with which the “average article” in a journal has been cited in a particular year. The Impact Factor helps evaluate a journal’s relative importance, especially when compared to others in the same field. The Impact Factor is calculated by dividing the number of citations in the current year to

articles published in the 2 previous years by the total number of articles published in the 2 previous years.

Table 16 indicates the number of human health papers published in the top 10% of journals, based on the *JCR* Impact Factor. Nine hundred thirty-two (932) of 1,835 papers were published in the top 10% of journals, representing 51% of EPA’s human health papers. This indicates that more than half of the human health papers are published in the highest quality journals as determined by the *JCR* impact factor, which is more than 5 times the expected percentage.

Table 16. Human Health Papers in Top 10% of Journals by *JCR* Impact Factor

| EPA Human Health Papers in that Journal | Journal | Impact Factor (IF) | <i>JCR</i> IF Rank |
|--|---|---------------------------|---------------------------|
| 1 | Annual Review of Immunology | 47.400 | 2 |
| 3 | New England Journal of Medicine | 44.016 | 3 |
| 3 | Science | 30.927 | 6 |
| 1 | Nature Immunology | 27.011 | 14 |
| 1 | Nature Genetics | 25.797 | 15 |
| 5 | Lancet | 23.407 | 18 |
| 7 | JAMA-Journal of the American Medical Association | 23.332 | 19 |
| 2 | Annual Review of Pharmacology and Toxicology | 19.833 | 24 |
| 1 | Journal of the National Cancer Institute | 15.171 | 41 |
| 2 | American Journal of Human Genetics | 12.649 | 63 |
| 1 | Journal of Clinical Oncology | 11.810 | 70 |
| 1 | Circulation | 11.632 | 74 |
| 1 | Progress in Lipid Research | 11.372 | 75 |
| 2 | Annual Review of Medicine | 10.383 | 86 |
| 8 | Proceedings of the National Academy of Sciences of the United States of America | 10.231 | 89 |
| 1 | Genome Research | 10.139 | 91 |
| 2 | Genome Biology | 9.712 | 106 |
| 1 | Circulation Research | 9.408 | 111 |
| 2 | British Medical Journal | 9.052 | 122 |
| 24 | American Journal of Respiratory and Critical Care Medicine | 8.689 | 126 |
| 1 | PLoS Medicine | 8.389 | 133 |

Bibliometric Analysis of Human Health Research Program Journal Articles

| EPA Human Health Papers in that Journal | Journal | Impact Factor (IF) | JCR IF Rank |
|--|--|---------------------------|--------------------|
| 3 | Archives of Internal Medicine | 8.016 | 139 |
| 1 | Cell Death and Differentiation | 7.785 | 149 |
| 1 | Human Molecular Genetics | 7.764 | 150 |
| 3 | Drug Discovery Today | 7.755 | 151 |
| 1 | Clinical Chemistry | 7.717 | 153 |
| 33 | Journal of Allergy and Clinical Immunology | 7.667 | 155 |
| 3 | Cancer Research | 7.616 | 157 |
| 1 | Nucleic Acids Research | 7.552 | 162 |
| 1 | Brain | 7.535 | 163 |
| 3 | Journal of Neuroscience | 7.506 | 165 |
| 2 | Journal of the American Society of Nephrology | 7.240 | 176 |
| 3 | FASEB Journal | 7.064 | 181 |
| 1 | Arteriosclerosis Thrombosis and Vascular Biology | 7.053 | 182 |
| 5 | Journal of Immunology | 6.387 | 205 |
| 2 | Thorax | 6.150 | 216 |
| 3 | Bioinformatics | 6.019 | 224 |
| 9 | Pharmacogenetics | 5.882 | 229 |
| 10 | Journal of Biological Chemistry | 5.854 | 232 |
| 3 | American Journal of Clinical Nutrition | 5.853 | 233 |
| 1 | Clinical Cancer Research | 5.715 | 238 |
| 224 | Environmental Health Perspectives | 5.342 | 257 |
| 4 | Mutation Research-Reviews in Mutation Research | 5.333 | 259 |
| 2 | Endocrinology | 5.313 | 261 |
| 1 | Neuroimage | 5.288 | 267 |
| 11 | Carcinogenesis | 5.108 | 288 |
| 24 | American Journal of Epidemiology | 5.068 | 290 |
| 1 | Genetic Epidemiology | 5.064 | 291 |
| 13 | Critical Reviews in Toxicology | 5.000 | 296 |

| EPA Human Health Papers in that Journal | Journal | Impact Factor (IF) | JCR IF Rank |
|--|---|---------------------------|--------------------|
| 6 | Free Radical Biology and Medicine | 4.971 | 302 |
| 4 | Journal of Infectious Diseases | 4.953 | 306 |
| 3 | Journal of Medicinal Chemistry | 4.926 | 313 |
| 1 | Current Opinion in Neurology | 4.873 | 319 |
| 1 | Bipolar Disorders | 4.812 | 328 |
| 1 | Cancer | 4.800 | 329 |
| 1 | International Journal of Cancer | 4.700 | 338 |
| 1 | Physiological Genomics | 4.636 | 346 |
| 1 | Biostatistics | 4.529 | 361 |
| 13 | Cancer Epidemiology Biomarkers & Prevention | 4.460 | 378 |
| 1 | Human Genetics | 4.331 | 402 |
| 11 | Pediatrics | 4.272 | 420 |
| 2 | Antioxidants and Redox Signaling | 4.232 | 427 |
| 8 | Journal of Pharmacology and Experimental Therapeutics | 4.098 | 456 |
| 1 | Neurobiology of Learning and Memory | 4.091 | 458 |
| 1 | Genes Brain and Behavior | 4.091 | 458 |
| 21 | Environmental Science & Technology | 4.054 | 467 |
| 17 | Epidemiology | 4.043 | 471 |
| 7 | Drug Metabolism and Disposition | 4.015 | 481 |
| 4 | Chest | 4.008 | 482 |
| 10 | American Journal of Respiratory Cell and Molecular Biology | 3.988 | 488 |
| 1 | Obesity Research | 3.972 | 491 |
| 1 | European Journal of Neuroscience | 3.949 | 495 |
| 2 | European Respiratory Journal | 3.947 | 497 |
| 2 | American Journal of Physiology-Cell Physiology | 3.942 | 500 |
| 21 | American Journal of Physiology-Lung Cellular and Molecular Physiology | 3.939 | 502 |
| 2 | Infection and Immunity | 3.933 | 506 |

Bibliometric Analysis of Human Health Research Program Journal Articles

| EPA Human Health Papers in that Journal | Journal | Impact Factor (IF) | JCR IF Rank |
|--|---|---------------------------|--------------------|
| 2 | Journal of Lipid Research | 3.909 | 516 |
| 7 | Journal of Pediatrics | 3.837 | 541 |
| 4 | Applied and Environmental Microbiology | 3.818 | 544 |
| 1 | Journal of Computational Chemistry | 3.786 | 551 |
| 1 | Current Opinion in Drug Discovery & Development | 3.778 | 555 |
| 1 | Journal of Nutrition | 3.689 | 574 |
| 3 | Human Reproduction | 3.669 | 581 |
| 1 | Investigative Ophthalmology & Visual Science | 3.643 | 589 |
| 1 | Journal of Analytical Atomic Spectrometry | 3.640 | 591 |
| 1 | Neuropharmacology | 3.637 | 592 |
| 2 | Pharmacogenomics | 3.623 | 596 |
| 2 | Biochemical Pharmacology | 3.617 | 600 |
| 7 | Biology of Reproduction | 3.583 | 615 |
| 4 | Archives of Pediatrics & Adolescent Medicine | 3.566 | 619 |
| 4 | American Journal of Public Health | 3.566 | 619 |
| 3 | American Journal of Physiology-Heart and Circulatory Physiology | 3.560 | 623 |
| 2 | Clinical and Experimental Allergy | 3.553 | 625 |
| 1 | Glycobiology | 3.512 | 635 |
| 3 | Magnetic Resonance in Medicine | 3.508 | 638 |
| 1 | Journal of the American Geriatrics Society | 3.479 | 649 |
| 2 | Neuroscience | 3.410 | 676 |
| 14 | Mutation Research-Fundamental and Molecular Mechanisms of Mutagenesis | 3.340 | 696 |
| 20 | Chemical Research in Toxicology | 3.339 | 699 |
| 4 | Clinical Immunology | 3.217 | 733 |
| 1 | Lung Cancer | 3.172 | 753 |
| 3 | Archives of Biochemistry and Biophysics | 3.152 | 761 |
| 74 | Toxicology and Applied Pharmacology | 3.148 | 764 |

| EPA Human Health Papers in that Journal | Journal | Impact Factor (IF) | JCR IF Rank |
|--|---|---------------------------|--------------------|
| 1 | Journal of Chemical Physics | 3.138 | 766 |
| 1 | Shock | 3.122 | 769 |
| 1 | Journal of Neurology Neurosurgery and Psychiatry | 3.122 | 769 |
| 1 | Radiation Research | 3.099 | 776 |
| 1 | Journal of Chromatography A | 3.096 | 778 |
| 152 | Toxicological Sciences | 3.088 | 780 |
| 2 | American Journal of Obstetrics and Gynecology | 3.083 | 782 |
| 1 | Behavioral Neuroscience | 3.071 | 790 |
| 5 | Cancer Letters | 3.049 | 800 |
| 5 | Journal of Applied Physiology | 3.037 | 802 |
| 1 | Water Research | 3.019 | 809 |
| 1 | Journal of General Internal Medicine | 3.013 | 810 |
| 1 | Journal of Epidemiology and Community Health | 3.003 | 817 |
| 4 | Biochemical and Biophysical Research Communications | 3.000 | 819 |
| 1 | Journal of Neuroendocrinology | 2.974 | 839 |
| 1 | Pediatric Research | 2.875 | 870 |
| 1 | Cell Stress & Chaperones | 2.875 | 870 |
| Total = 932 | | | |

Immediacy Index. The *JCR Immediacy Index* is a measure of how quickly the *average article* in a journal is cited. It indicates how often articles published in a journal are cited within the year they are published. The *Immediacy Index* is calculated by dividing the number of citations to articles published in a given year by the number of articles published in that year.

Table 17 indicates the number of human health papers published in the top 10% of journals, based on the *JCR Immediacy Index*. Nine hundred thirty-eight (938) of the 1,835 papers appear in the top 10% of journals, representing 51% of the human health papers. This indicates that more than half of the human health papers are published in the highest quality journals as determined by the *JCR immediacy index*, which is more than 5 times higher than the expected percentage.

Table 17. Human Health Papers in Top 10% of Journals by JCR Immediacy Index

| EPA Human Health Papers in that Journal | Journal | Immediacy Index (II) | JCR II Rank |
|--|---|-----------------------------|--------------------|
| 3 | New England Journal of Medicine | 13.422 | 3 |
| 1 | Annual Review of Immunology | 10.828 | 4 |
| 3 | Science | 6.398 | 6 |
| 5 | Lancet | 6.253 | 7 |
| 1 | Nature Genetics | 5.921 | 10 |
| 2 | Annual Review of Pharmacology and Toxicology | 5.793 | 12 |
| 1 | Nature Immunology | 5.362 | 15 |
| 7 | JAMA-Journal of the American Medical Association | 5.082 | 17 |
| 2 | British Medical Journal | 4.248 | 26 |
| 1 | Journal of the National Cancer Institute | 4.063 | 27 |
| 2 | Annual Review of Medicine | 4.033 | 28 |
| 1 | PLoS Medicine | 4.033 | 28 |
| 1 | BMC Genetics | 3.717 | 35 |
| 2 | American Journal of Human Genetics | 2.959 | 49 |
| 1 | Journal of Clinical Oncology | 2.831 | 55 |
| 33 | Journal of Allergy and Clinical Immunology | 2.402 | 64 |
| 1 | Genome Research | 2.000 | 92 |
| 24 | American Journal of Respiratory and Critical Care Medicine | 1.883 | 104 |
| 3 | Archives of Internal Medicine | 1.782 | 113 |
| 8 | Proceedings of the National Academy of Sciences of the United States of America | 1.746 | 121 |
| 1 | Circulation Research | 1.702 | 126 |
| 1 | Circulation | 1.641 | 134 |
| 1 | Human Molecular Genetics | 1.621 | 135 |
| 1 | Cell Death and Differentiation | 1.602 | 136 |
| 2 | Antioxidants and Redox Signaling | 1.583 | 139 |
| 4 | Journal of Infectious Diseases | 1.547 | 145 |
| 1 | Arteriosclerosis Thrombosis and Vascular Biology | 1.452 | 157 |

Bibliometric Analysis of Human Health Research Program Journal Articles

| EPA Human Health Papers in that Journal | Journal | Immediacy Index (II) | JCR II Rank |
|--|--|-----------------------------|--------------------|
| 1 | Nucleic Acids Research | 1.391 | 173 |
| 1 | International Journal of Toxicology | 1.309 | 193 |
| 17 | Epidemiology | 1.298 | 198 |
| 1 | Brain | 1.266 | 207 |
| 10 | Journal of Biological Chemistry | 1.265 | 208 |
| 2 | Endocrinology | 1.260 | 210 |
| 3 | Journal of Neuroscience | 1.254 | 212 |
| 2 | Genome Biology | 1.230 | 221 |
| 3 | American Journal of Clinical Nutrition | 1.200 | 227 |
| 1 | Journal of Community Psychology | 1.200 | 227 |
| 3 | FASEB Journal | 1.181 | 239 |
| 4 | Mutation Research-Reviews in Mutation Research | 1.143 | 252 |
| 2 | Journal of the American Society of Nephrology | 1.129 | 257 |
| 3 | Drug Discovery Today | 1.125 | 258 |
| 24 | American Journal of Epidemiology | 1.099 | 271 |
| 2 | Thorax | 1.097 | 273 |
| 1 | Physiological Genomics | 1.058 | 287 |
| 1 | International Journal of Cancer | 1.016 | 306 |
| 11 | Pediatrics | 1.005 | 309 |
| 3 | Cancer Research | 1.001 | 310 |
| 224 | Environmental Health Perspectives | 0.955 | 346 |
| 23 | Inhalation Toxicology | 0.947 | 352 |
| 1 | Genetic Epidemiology | 0.945 | 353 |
| 3 | Bioinformatics | 0.944 | 354 |
| 2 | Mechanisms of Ageing and Development | 0.942 | 356 |
| 3 | Journal of Medicinal Chemistry | 0.937 | 360 |
| 11 | Carcinogenesis | 0.935 | 362 |
| 1 | Biostatistics | 0.933 | 363 |
| 1 | Progress in Lipid Research | 0.929 | 366 |

Bibliometric Analysis of Human Health Research Program Journal Articles

| EPA Human Health Papers in that Journal | Journal | Immediacy Index (II) | JCR II Rank |
|--|---|-----------------------------|--------------------|
| 2 | European Respiratory Journal | 0.916 | 372 |
| 5 | Journal of Immunology | 0.906 | 381 |
| 8 | Journal of Pharmacology and Experimental Therapeutics | 0.891 | 397 |
| 4 | Archives of Pediatrics & Adolescent Medicine | 0.875 | 411 |
| 2 | Infection Control and Hospital Epidemiology | 0.868 | 416 |
| 2 | Journal of Lipid Research | 0.855 | 426 |
| 1 | Clinical Cancer Research | 0.846 | 434 |
| 1 | Clinical Chemistry | 0.839 | 441 |
| 21 | American Journal of Physiology-Lung Cellular and Molecular Physiology | 0.816 | 464 |
| 1 | Neuropeptides | 0.812 | 467 |
| 2 | American Journal of Physiology-Cell Physiology | 0.808 | 473 |
| 4 | American Journal of Public Health | 0.805 | 475 |
| 3 | Archives of Biochemistry and Biophysics | 0.774 | 495 |
| 3 | American Journal of Physiology-Heart and Circulatory Physiology | 0.757 | 505 |
| 7 | Biology of Reproduction | 0.755 | 507 |
| 10 | American Journal of Respiratory Cell and Molecular Biology | 0.745 | 517 |
| 1 | Glycobiology | 0.736 | 530 |
| 1 | Lung Cancer | 0.735 | 532 |
| 7 | Drug Metabolism and Disposition | 0.733 | 534 |
| 5 | Journal of Applied Physiology | 0.732 | 537 |
| 1 | Journal of Computational Chemistry | 0.731 | 538 |
| 10 | Science of the Total Environment | 0.731 | 538 |
| 20 | Chemical Research in Toxicology | 0.729 | 542 |
| 1 | Shock | 0.718 | 559 |
| 1 | Journal of Chemical Physics | 0.710 | 572 |
| 1 | Journal of Inorganic Biochemistry | 0.696 | 585 |
| 6 | Free Radical Biology and Medicine | 0.696 | 585 |

Bibliometric Analysis of Human Health Research Program Journal Articles

| EPA Human Health Papers in that Journal | Journal | Immediacy Index (II) | JCR II Rank |
|--|---|-----------------------------|--------------------|
| 3 | Human Reproduction | 0.693 | 596 |
| 1 | Genes Brain and Behavior | 0.690 | 598 |
| 14 | Mutation Research-Fundamental and Molecular Mechanisms of Mutagenesis | 0.682 | 604 |
| 1 | ATLA-Alternatives to Laboratory Animals | 0.676 | 615 |
| 1 | Neuroimage | 0.668 | 627 |
| 2 | Mental Retardation and Developmental Disabilities Research Reviews | 0.667 | 628 |
| 1 | Current Opinion in Drug Discovery & Development | 0.662 | 642 |
| 7 | Journal of Pediatrics | 0.660 | 645 |
| 2 | Infection and Immunity | 0.648 | 664 |
| 1 | Cancer | 0.641 | 677 |
| 1 | Human Genetics | 0.639 | 679 |
| 2 | Journal of Geophysical Research-Atmospheres | 0.630 | 696 |
| 11 | Human and Ecological Risk Assessment | 0.628 | 699 |
| 2 | American Journal of Managed Care | 0.624 | 705 |
| 152 | Toxicological Sciences | 0.617 | 716 |
| 1 | Journal of Nutrition | 0.598 | 742 |
| 1 | Neurobiology of Learning and Memory | 0.593 | 754 |
| 1 | Journal of Neurology Neurosurgery and Psychiatry | 0.593 | 754 |
| 1 | Medical Decision Making | 0.585 | 768 |
| 1 | Journal of Epidemiology and Community Health | 0.580 | 783 |
| 13 | Cancer Epidemiology Biomarkers & Prevention | 0.579 | 785 |
| 73 | Journal of Exposure Analysis and Environmental Epidemiology | 0.571 | 801 |
| 2 | Archives of Disease in Childhood | 0.569 | 810 |
| 1 | Journal of the American Dietetic Association | 0.559 | 830 |
| 2 | Neuroscience | 0.555 | 842 |
| 1 | Neuropharmacology | 0.552 | 843 |
| 25 | Environmental Research | 0.551 | 848 |

| EPA Human Health Papers in that Journal | Journal | Immediacy Index (II) | JCR II Rank |
|---|---|----------------------|-------------|
| 7 | American Journal of Industrial Medicine | 0.549 | 858 |
| 1 | Analyst | 0.546 | 862 |
| Total = 938 | | | |

Hot Papers

ESI establishes citation thresholds for hot papers, which are selected from the highly cited papers in different fields, but the time frame for citing and cited papers is much shorter—papers must be cited within 2 years of publication and the citations must occur in a 2-month time period. Papers are assigned to 2-month periods and thresholds are set for each period and field to select 0.1% of papers. There were no hot papers identified for the current 2-month period (i.e., July-August 2006), but there were a number of hot papers identified from previous periods.

Using the hot paper thresholds established by *ESI* as a benchmark, 15 hot papers, representing 0.8% of the human health papers, were identified in three fields—Clinical Medicine, Environment/Ecology, and Pharmacology & Toxicology. The hot papers are listed in Table 18.

Table 18. Hot Papers Identified Using *ESI* Thresholds

| Field | <i>ESI</i> Hot Papers Threshold | No. of Cites in 2-Month Period | Paper |
|-------------------------|---------------------------------|---------------------------------------|--|
| Clinical Medicine | 4 | 5 cites in June-July 2005 | Alberg AJ, et al. Epidemiology of lung cancer: looking to the future. <i>Journal of Clinical Oncology</i> 2005;23(14):3175-3185. |
| Environment/ Ecology | 7 | 7 cites in May-June 2004 | Perera FP, et al. Effects of transplacental exposure to environmental pollutants on birth outcomes in a multiethnic population. <i>Environmental Health Perspectives</i> 2003;111(2):201-205. |
| | 5 | 6 cites in December 2005-January 2006 | Kunzli N, et al. Ambient air pollution and atherosclerosis in Los Angeles. <i>Environmental Health Perspectives</i> 2005;113(2):201-206. |
| | 5 | 5 cites in April-May 2006 | Lanphear BP, et al. Low-level environmental lead exposure and children's intellectual function: An international pooled analysis. <i>Environmental Health Perspectives</i> 2005;113(7):894-899. |
| | 3 | 3 cites in April-May 2004 | Sexton K, et al. Comparison of personal, indoor, and outdoor exposures to hazardous air pollutants in three urban communities. <i>Environmental Science & Technology</i> 2004;38(2):423-430. |

| Field | ESI Hot Papers Threshold | No. of Cites in 2-Month Period | Paper |
|------------------------------|--------------------------|------------------------------------|---|
| Environment/ Ecology | 3 | 3 cites in March-April 2001 | Garman RH, et al. Methods to identify and characterize developmental neurotoxicity for human health risk assessment. II: Neuropathology. <i>Environmental Health Perspectives</i> 2001;109(Suppl 1):93-100. |
| | 3 | 3 cites in November-December 2003 | Schreinemachers DM. Birth malformations and other adverse perinatal outcomes in four US wheat-producing states. <i>Environmental Health Perspectives</i> 2003;111(9):1259-1264. |
| | 3 | 3 cites in August-September 2005 | Neednam LL, et al. Exposure assessment in the National Children's Study: Introduction. <i>Environmental Health Perspectives</i> 2005;113(8):1076-1082. |
| | 3 | 3 cites in May-June 2005 | Yolton K, et al. Exposure to environmental tobacco smoke and cognitive abilities among US children and adolescents. <i>Environmental Health Perspectives</i> 2005;113(1):98-103. |
| Pharmacology & Toxicology | 8 | 11 cites in August-September 2004 | Nesnow S, et al. DNA damage induced by methylated trivalent arsenicals is mediated by reactive oxygen species. <i>Chemical Research in Toxicology</i> 2002;15(12):1627-1634. |
| | 8 | 10 cites in November-December 2002 | Kitchin KT. Recent advances in arsenic carcinogenesis: Modes of action, animal model systems, and methylated arsenic metabolites. <i>Toxicology and Applied Pharmacology</i> 2001;172(3):249-261. |
| | 2 | 3 cites in January-February 2006 | Carmichael NG, et al. Agricultural chemical safety assessment: A multisector approach to the modernization of human safety requirements. <i>Critical Reviews in Toxicology</i> 2006;36(1):1-7. |
| | 2 | 3 cites in January-February 2006 | Cooper RL, et al. A tiered approach to life stages testing for agricultural chemical safety assessment. <i>Critical Reviews in Toxicology</i> 2006;36(1):69-98. |
| | 2 | 2 cites in September-October 2006 | Anand SS, et al. Characterization of deltamethrin metabolism by rat plasma and liver microsomes. <i>Toxicology and Applied Pharmacology</i> 2006;212(2):156-166. |
| | 2 | 2 cites in June-July 1999 | Faustman EM, et al. Biologically based dose-response models for developmental toxicants: lessons from methylmercury. <i>Inhalation Toxicology</i> 1999;11(6-7):559-572. |

Author Self-Citation

Self-citations are journal article references to articles from that same author (i.e., the first author). Because higher author self-citation rates can inflate the number of citations, the author self-citation rate was calculated for the human health papers. Of the 22,937 total cites, 992 are author self-cites—a 4.3% author self-citation rate. Garfield and Sher³ found that authors working in research-based disciplines tend to cite themselves on the average of 20% of the time. MacRoberts and MacRoberts⁴ claim that approximately 10% to 30% of all the citations listed fall into the category of author self-citation. Kovacic and Misak⁵ recently reported a 20% author self-citation rate for medical literature. Therefore, the 4.3% self-cite rate for the human health papers is well below the range for author self-citation.

Highly Cited Researchers

A search of Thomson's *ISI Highly Cited.com* revealed that 81 (3.3%) of the 2,432 authors of the human health papers are highly cited researchers. *ISI Highly Cited.com* is a database of the world's most influential researchers who have made key contributions to science and technology during the period from 1981 to 1999. The highly cited researchers identified during this analysis of the human health publications are presented in Table 19.

Table 19. Highly Cited Researchers Authoring Human Health Publications

| Highly Cited Researcher | Affiliation | ESI Field |
|--------------------------------|--|--|
| Amaral, David G. | University of California–Davis | Neuroscience |
| Ames, Bruce N. | Children's Hospital Oakland Research Institute | Biology & Biochemistry Molecular Biology & Genetics |
| Andersen, Melvin E. | CIIT Centers for Health Research | Pharmacology |
| Ankley, Gerald T | U.S. EPA | Environment/Ecology |
| Arey Janet | Air Pollution Research Center | Environment/Ecology |
| Atkinson, Roger | Air Pollution Research Center | Environment/Ecology |
| Benowitz, Neil L. | University of California–San Francisco | Pharmacology |
| Birnbaum, Linda S. | U.S. EPA | Pharmacology |
| Bishop, John Michael | University of California–San Francisco | Molecular Biology & Genetics |

³ Garfield E, Sher IH. New factors in the evaluation of scientific literature through citation indexing. *American Documentation* 1963;18(July):195-210.

⁴ MacRoberts MH, MacRoberts BR. Problems of citation analysis: a critical review. *Journal of the American Society of Information Science* 1989;40(5):342-349.

⁵ Kavaci N, Misak A. Author self-citation in medical literature. *Canadian Medical Association Journal* 2004;170(13):1929-1930.

| Highly Cited Researcher | Affiliation | ESI Field |
|--------------------------------|---|------------------------------|
| Boobis, Alan R. | Imperial College London | Pharmacology |
| Breslau, Naomi | Michigan State University | Psychology/Psychiatry |
| Chapman, Martin D. | INDOOR Biotechnologies, Inc. | Immunology |
| Clegg, William | University of Newcastle upon Tyne | Chemistry |
| Eisenreich, Steven J. | Rutgers, The State University of New Jersey | Environment/Ecology |
| Elliott, Lloyd F. | Oregon State University | Environment/Ecology |
| Evans, David A. | Harvard University | Chemistry |
| Fischer, Jean | Chemistry | Chemistry |
| Fornace Jr., Albert J | Harvard School of Public Health | Molecular Biology & Genetics |
| Garcia, Rolando R. | National Center for Atmospheric Research | Geosciences |
| German, J. Bruce | University of California–Davis | Agricultural Sciences |
| Goldman, John M. | Imperial College School of Medicine | Clinical Medicine |
| Goldman, Lee | University of California–San Francisco | Clinical Medicine |
| Gray Jr., Leon Earl | U.S. EPA | Pharmacology |
| Greenberg, Everett P. | University of Iowa | Microbiology |
| Guillette, Louis J. | University of Florida | Environment/Ecology |
| Harris, Curtis C. | National Cancer Institute | Clinical Medicine |
| Jones, Russell L. | University of California–Berkeley | Plant & Animal Science |
| Kadlubar, Fred F. | U.S. Food and Drug Administration | Pharmacology |
| Kimber, Ian | Syngenta Central Toxicology Laboratory | Pharmacology |
| Koutrakis, Petros | Harvard School of Public Health | Environment/Ecology |
| Lee, Kuo-Hsiung | University of North Carolina | Agricultural Sciences |
| Levin, Simon A. | Princeton University | Environment/Ecology |
| Levine, Michael | University of California–Berkeley | Molecular Biology & Genetics |
| Lewis, Jack | University of Cambridge | Chemistry |
| Liang, Kung Yee | Johns Hopkins University | Mathematics |
| Lindberg, Steven E. | Oak Ridge National Laboratory | Environment/Ecology |
| Lioy, Paul J. | University of Medicine & Dentistry of | Environment/Ecology |

| Highly Cited Researcher | Affiliation | ESI Field |
|--------------------------------|---|-------------------------------------|
| | New Jersey | |
| Lippmann, Morton | New York University School of Medicine | Environment/Ecology |
| Liu, Jie | National Cancer Institute | Pharmacology |
| Liu, Yong-Jun | DNAX Research Institute of Molecular and Cellular Biology | Immunology |
| Mazurek, Monica A. | Rutgers, The State University of New Jersey | Environment/Ecology |
| Morris, Peter John | Royal College of Surgeons | Clinical Medicine |
| Murphy, Dennis L. | National Institute of Mental Health | Psychology/Psychiatry |
| Murphy, Patricia A. | Iowa State University | Agricultural Sciences |
| Murray, David M. | University of Memphis | Social Sciences, General |
| Needham, Larry L. | National Center for Environmental Health | Environment/Ecology |
| Olmstead, Marilyn M. | University of California–Davis | Chemistry |
| Parker, John C. | Oak Ridge National Laboratory | Environment/Ecology |
| Peterson, Richard E. | University of Wisconsin–Madison | Pharmacology |
| Plattsmills, Thomas A.E. | University of Virginia Health System | Immunology |
| Rasmussen, Steven A. | Brown University | Psychology/Psychiatry |
| Richards, James H. | University of California–Davis | Environment/Ecology |
| Roberts, Robert | Baylor College of Medicine | Clinical Medicine |
| Ross, Judith | Thomas Jefferson University | Clinical Medicine |
| Roy, Alec | New Jersey Healthcare System | Psychology/Psychiatry |
| Safe, Stephen H. | Texas A&M University | Pharmacology Environment/Ecology |
| Schroeder, Julian I. | University of California–San Diego | Plant & Animal Science |
| Schwartz, Joel D. | Harvard School of Public Health | Pharmacology Environment/Ecology |
| Sharp, Frank R. | University of Cincinnati | Neuroscience |
| Shaw, George M. | University of Alabama at Birmingham School of Medicine | Microbiology |
| Speizer, Frank E. | Harvard Medical School | Clinical Medicine |
| Spengler, John D. | Harvard University | Environment/Ecology |

| Highly Cited Researcher | Affiliation | ESI Field |
|--------------------------------|--|--|
| Stamler, Jeremiah | Northwestern University | Clinical Medicine |
| Stewart, Patricia | National Cancer Institute | Clinical Medicine |
| Thompson, Craig B. | University of Pennsylvania Cancer Center | Molecular Biology & Genetics Immunology |
| Turco, Richard P. | University of California–Los Angeles | Geosciences |
| Van Thiel, David H. | Loyola University Medical Center | Clinical Medicine |
| Walker, Nigel | National Institute of Environmental Health Sciences | Chemistry |
| Wallace, Robert B. | University of Iowa | Social Sciences, General |
| Walter, Peter | University of California–San Francisco | Molecular Biology & Genetics |
| Wand, Matthew P. | University of South Wales | Mathematics |
| Wang, Xiadong | University of Texas Southwest Medical Center at Dallas | Molecular Biology & Genetics |
| Watson, John G. | Desert Research Institute | Environment/Ecology |
| Willett, Walter C. | Harvard School of Public Health | Clinical Medicine |
| Williams, Roger S. | Royal Free and University College Medical School | Clinical Medicine |
| John T. Wilson | U.S. EPA | Environment/Ecology |
| Winer, Arthur M. | University of California–Los Angeles | Environment/Ecology |
| Yang, Chung S. | Rutgers, The State University of New Jersey | Pharmacology |
| Yang, Wei T. | Duke University | Physics |
| Zeger, Scott L. | Johns Hopkins University | Mathematics |
| Zhang, Jinghui | National Cancer Institute | Biology & Biochemistry |
| Total = 81 | | |

Patents

There were no patents or patent applications associated with this research program.