Barbara Mounho-Zamora, Ph.D.,
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senior consultant

Contact Information

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Professional Profile

Dr. Barbara Mounho-Zamora is a Senior Consultant with ToxStrategies, Inc., and is based in Bend, Oregon. She is a board-certified toxicologist with more than 17 years of experience in the biopharmaceutical and pharmaceutical industry.

Dr. Mounho-Zamora has extensive experience developing and overseeing comprehensive toxicology programs to support the development and, ultimately, approval of drug candidates in various therapeutic areas, including oncology and inflammation (autoimmune indications). As a toxicologist in the pharmaceutical and biopharmaceutical industry, she has been responsible for designing, monitoring, and interpreting toxicology studies to support the development of biopharmaceutical (biotechnology-derived) therapeutics (e.g., vaccines, monoclonal antibodies, antibody-drug conjugates, bispecific antibodies, fusion proteins), including screening and mechanism-of-action studies; repeat-dose, bridging, and chronic studies; embryo/fetal development; reproductive toxicity; and carcinogenicity assessment studies.

Dr. Mounho-Zamora specializes in addressing the scientific challenges related to the development of biological products (novel and biosimilars), such as selection of relevant animal species, immunogenicity (anti-drug antibodies), alternative models for safety assessment (e.g., homologous proteins), immune-mediated toxicity, and embryo/fetal development, reproductive toxicity, and carcinogenicity assessment of these molecules. In addition, she has been responsible for developing the nonclinical comparability studies to support manufacturing process changes (e.g., host cell line, manufacturing facilities, excipients/formulation) that occur during the life cycle of a biopharmaceutical (pre-market and post-market). Dr. Mounho-Zamora has also served as the toxicology representative for due diligence meetings for in- and out-licensing biopharmaceutical/pharmaceutical products in various therapeutic areas (e.g., oncology, inflammation, cardiovascular indications), as well as company acquisitions and partnerships.

Dr. Mounho-Zamora has been involved in developing various biosimilar products in different therapeutic areas (e.g., inflammatory disease; oncology) and has experience in addressing the scientific, regulatory, and business-related challenges associated with the global development of biosimilars. She has expertise in addressing the nonclinical *in vitro* and *in vivo* studies (e.g., pharmacology, PK, toxicology) necessary to support global applications for different biosimilar products, including biosimilars of recombinant proteins and monoclonal antibodies. She has also participated in the development of industry and trade-association comments in response to concept papers and draft guidance for biosimilar products issued by global authorities worldwide. She has written the pharmacology/toxicology sections for numerous regulatory documents, including pre- Introduction of a New Drug (IND) packages, INDs/ Clinical Trial Authorisations (CTA)s, Biologic License Applications (BLAs)/New Drug Applications (NDAs), investigator brochures, and annual reports, as well as the safety information on product labels and package inserts.

Dr. Mounho-Zamora has extensive experience meeting with regulatory authorities in different regions (e.g., US, Europe, Canada) representing the nonclinical safety assessment package in support of the global development of drug candidates and biosimilar products (e.g., pre-IND meetings, clinical hold issues, pre-BLA, label negotiations). She also supports clients in addressing programs that have been placed on Full Clinical Hold by the FDA, and in developing the scientific and regulatory strategy to meet the Agency’s concerns and remove the Full Clinical Hold. Dr. Mounho-Zamora has experience in developing risk assessment/ toxicology monographs that can be used to evaluate the safety implications for an active pharmaceutical ingredient (API), including formulation excipients, product- and process-related impurities, or raw materials for both small-molecule and biological products. In generating toxicology monographs, she has experience in the determination of risk-based limits (e.g., occupational exposure limits [OELs] and/or permissible daily exposure [PDE]), depending on the intended use of the monograph (workplace risk assessment or risk to human health/patients in the context of how the product is used).

Prior to joining ToxStrategies, Dr. Mounho-Zamora was at Amgen, Inc. (Director, Regulatory Affairs Biosimilars Policy and Strategy; Scientific Director, Toxicology Department), and Genentech, Inc. (Scientist, Toxicology Department). She is a Fellow of the Academy of Toxicological Sciences (2013), a Diplomate of the American Board of Toxicology, and a member of the American College of Toxicology (Council member, 2005–2008; Continuing Education Committee, 2003-2005) and the Society of Toxicology (Continuing Education Committee, 2006–2009; President of the Biotechnology Specialty Section, 2010–2011). Dr. Mounho-Zamora is recognized in the biopharmaceutical industry for her strong working knowledge of biological/biosimilar products, and is the author of numerous journal articles and book chapters on the challenges associated with these products.

EDUCATION AND DEGREES EARNED

1997 Ph.D., Pharmacology/Toxicology (focus in immunotoxicology), College of Pharmacy and Toxicology, University of New Mexico

1991 B.S., Biology and Psychology (double major)*,* University of New Mexico

Professional experience

ToxStrategies, Inc. Biopharmaceutical Practice Leader (2012 to Present)

Amgen, Inc. Director, Regulatory Affairs Biosimilars Policy and Strategy
(2010–2012), Thousand Oaks, CA

Amgen, Inc. Scientific Director, Comparative Biology and Safety Sciences (Toxicology) (2008–2010)
Principal Scientist (2004–2008)
Research Scientist III (2002–2004)

Genentech, Inc. Scientist, Toxicology Department (1999–2002), South San Francisco, CA

CERTIFICATIONS

2013 Fellow, Academy of Toxicological Sciences

2001–present Diplomate, American Board of Toxicology

PROFESSIONAL HONORS/AWARDS

2001 Society of Toxicology—Board of Publications Award for the Best Paper in *Toxicology and Applied Pharmacology*

1996 1st place — Mountain West Society of Toxicology Student Award

1993–1996 University of New Mexico Graduate Studies Fellowship

1996 University of New Mexico Graduate Research, Project and Travel Grant

1993–1994 UNM College of Pharmacy Stipend Award

1994 Rho Chi Honor Society (1994)

1990–1991 Blue Key Honor Society

1990–1991 Mortar Board Honor Society

1989–1991 Golden Key Honor Society

PROFESSIONAL ASSOCIATIONS

Society of Toxicology

* SOT Pacific Northwest Association of Toxicologists, Councilor, 2015–present
* SOT Biotechnology Specialty Section, President (and co-founder), 2010–2011
* SOT Continuing Education Committee Member, 2006–2009
* SOT Continuing Education Committee Student Liaison, 2007–2008
* SOT Specialty Section for Immunotoxicology, 2002–present

American College of Toxicology (ACT), 2000–present

* ACT Council Member, 2006–2008
* ACT Continuing Education Committee, 2003–2005
* ACT Program Committee, 2007

BioSafe General Membership, 2004–present

* Member/author of Chronic Toxicity Testing, Immunogenicity White, and Tissue-Cross Reactivity Paper working groups

Immunotoxicology Technical Committee member (ILSI/HESI), 2003–2007

Pacific Northwest Chapter of SOT, 1997–1999

Safety Pharmacology Society, 2000–2005

Society of Toxicologic Pathologists, 2000–2009

SCIENTIFIC ADVISORY PANELS, COMMITTEES, & WORKGROUPS

2002–present Member of the Scientific Advisory Board for The AEHS Foundation Annual International Conference on Contaminated Soils, Sediments and Water, University of Massachusetts, Amherst, MA

2002–present Member of AEHS Foundation

selected areas of expertise

Biosimilar Regulatory Policy

Nonclinical (pharmacology, PK, toxicology) scientific expert for the development of biosimilar products. Experience in addressing the scientific, regulatory, and business challenges for the global development of biosimilar products. Wrote articles and gave oral presentations on global regulatory standards for biosimilar products (see publications and oral presentations below). Participated in internal and external (e.g., trade associations, including PhRMA and BIO) teams submitting comments on regulatory biosimilar guidance and concept papers issued by regulatory authorities around the world (US, EU, India, Brazil, and others).

Toxicology

Responsible for nonclinical toxicology program for biopharmaceuticals to support development program, ranging from first-in-human studies to registration to post-market. Expertise in designing, implementing/monitoring, and data interpretation for toxicology studies (general to specific) in small and large animal models. Experience in standardizing terminology and endpoints ranging from study protocols to study reports; member of internal team (in collaboration with CROs) responsible for ensuring standardization in study data (such as clinical pathology, anatomical and microscopic pathology) to facilitate data analysis and interpretation. Author of toxicology/pharmacology sections for regulatory documents including pre-IND, IND, investigator brochures, annual reports, marketing applications (BLA), and product labels. Expertise in addressing challenges associated with nonclinical safety evaluation of biologics, including species selection, chronic toxicity assessment, and immunogenicity. Met with regulatory authorities (FDA, EMA, Health Canada, etc.) on product-specific and public policy issues. Expertise in nonclinical comparability studies to support manufacturing process changes. Author of scientific, peer-reviewed articles/book chapters and has given oral presentations on topics in toxicology and protein therapeutics (see publications and oral presentations below). Actively involved in toxicology field, including Society of Toxicology (e.g., President of Biotechnology Specialty Section, 2010), American College of Toxicology (e.g., chair for the Study Director Training Course for 7 years), and BioSafe (see professional affiliations).

manuscripts

Ramani T, Auletta CS, Weinstock D, **Mounho-Zamora B**, Ryan PC, Salcedo TW, Bannish G. 2015. Cytokines: The good, the bad, and the deadly. Int J Toxicol 34(4):355–365, DOI 10.1177/1091581815584918.

Lansita JA, Burke JM, Apgar JF, **Mounho-Zamora B**. 2015. An introduction to the regulatory and nonclinical aspects of the nonclinical development of antibody drug conjugates. Pharm Res. DOI 10.1007/s11095-015-1742-y.

Lansita JA, **Mounho-Zamora B**. 2015. The development of therapeutic monoclonal antibodies: Overview of the nonclinical safety assessment. Curr Pain Headache Rep 19(3):472.

Miletich J, Eich G, Grampp G, **Mounho B**. 2011. Guiding principles for a global “patients first” standard. mAbs, 3(3):318–325.

Bussiere J, Leach M, Price K, **Mounho B**, Lightfoot-Dunn R. 2011. Survey results on the use of the tissue cross-reactivity immunohistochemistry assay. Reg Toxicol Pharm 59(3):493–505.

**Mounho B**, Phillips A, Holcombe K, Grampp G, Lubiniecki T, Mollup I, Jones C. 2010. Global regulatory standards for the approval of biosimilars. FDLI 65(4):819–837.

Ponce R, Abad L, Lakshmi A, Gelzleichter T, Gore E, Green J, Gupta S, Herzyk D, Hurst C, Iven I, Kawabata T, **Mounho B**, Rup B, Shankar G, Smith H, Thomas P, Wierda D. 2009. Immunogenicity of biologically-derived therapeutics: Assessment and interpretation of non-clinical safety studies. Reg Toxicol Pharm 54(2):164–182.

Clarke J, Hurst C, Martin P, Vahle J, Ponce R, **Mounho B**, Heidel S, Andrews L, Reynolds T, Cavagnaro J. 2007. Duration of chronic toxicity studies for biotechnology-derived pharmaceuticals: Is six months still appropriate? Reg Toxicol Pharm 50:2–22.

Kakkar T, Ma M, Zhuang Y, Patton A, Hu Z, **Mounho B.** 2007. Pharmacokinetics and safety of a fully human hepatocyte growth factor antibody, AMG 102, in cynomolgus monkeys. Pharm Res 24(10):1910–1918.

Gaudreaulat J, Shiu V, Bricarello A, Christian BJ, Zuch CL, **Mounho B.** 2005. Concomitant administration of bevacizumab, irinotecan, 5-fluorouracil, and leucovorin: Nonclinical safety and pharmacokinetics. Int J Toxicol 24:357–363.

Lawrence D, Shahrokh Z, Marsters S, Achilles K, Shih D, **Mounho B**, Hillan K, Totpal K, DeForge L, Schow P, Hooley J, Sherwood S, Brush J, Goddard A, Pai R, Leung S, Khan L, Gliniak, B, Bussiere J, Smith C, Kelley S, Fox J, Thomas D, Ashkenazi A. 2001. In Vitro hepatocyte toxicity of Apo2L/TRAIL is associated with aberrant biochemical properties of nonoptimized recombinant ligand preparations. Nature Med 7:383–385.

**Mounho B,** Thrall BD. 1999. The extracellular signal-regulated kinase pathway contributes to mitogenic and antiapoptotic effects of peroxisome proliferators in vitro. Toxicol Appl Pharmacol 159:125–133.

Burchiel SW, Lauer FT, Gurule D, **Mounho B**, Salas VM. 1999. Uses and future applications of flow cytometry in immunotoxicity testing. Methods 19:28–35.

**Mounho B**, Burchiel SW. 1998. Alterations in human B cell calcium homeostasis by polycyclic aromatic hydrocarbons: Possible associations with cytochrome P450 metabolism and increased protein tyrosine phosphorylation. Toxicol Appl Pharmacol 149:80–89.

Burchiel SW, **Mounho B**, Lauer FT, Seamer L, Davila DR. 1997. Analysis of human peripheral blood lymphocyte activation and apoptosis by flow cytometry. In: Burchiel SW, Kerkvliet NL, Gerberick GF, Lawrence DL, Ladics GS. Workshop overview: Assessment of immunotoxicity by multiparameter flow cytometry. Fund Appl Toxicol 38:38–54.

Romero DL, **Mounho B**, Born JL, Burchiel SW. 1997. Depletion of glutathione by benzo(a)pyrene metabolites, ionomycin, thapsigargin, and phorbol esters in human peripheral blood mononuclear cells. Toxicol Appl Pharmacol 144:62–69.

**Mounho B**, Davila DR, Burchiel SW. 1997. Characterization of intracellular calcium responses produced by polycyclic aromatic hydrocarbons in surface marker-defined human peripheral blood mononuclear cells. Toxicol Appl Pharmacol 145:323–330.

Davila DR, **Mounho B**, Burchiel SW. 1996. How toxic are polycyclic aromatic hydrocarbons to the human immune system? The need for appropriate modeling. Toxicol Ecotoxicol News 4:5–9.

Clarke J, Beyer J, Ortega S, Wu B, Hoberman W, Brechbill A, **Mounho B.** 2003. Fertility and general reproduction toxicity study of a surrogate murine anti-CD11a antibody in mice. Toxicologist 72:361.

**Mounho B**, Beyer J, Ortega S, Wu B, Hoberman W, Brechbill A, Clarke J. 2003. Four-week toxicity study of a surrogate murine anti-CD11a antibody in mice. Toxicologist 72:1880.

**Mounho B**, Bussiere J, Ortega S, Kapeghian J. 2002. A model of cisplatin-induced renal impairment in the cynomolgus monkey. Toxicologist 66:1283.

Lawrence D, Shahrokh Z, Marsters S, Achilles K, Shih D, **Mounho B**, Hillan K, Totpal K, DeForge L, Schow P, Hooley J, Sherwood S, Pai R, Leung S, Khan L, Gliniak B, Bussiere J, Smith C, Strom S, Kelley S, Fox J, Thomas D, Ashkenazi A. 2001. Apo2L/TRAIL hepatocyte toxicity is associated with aberrant biochemical and structural properties of non-optimized recombinant ligand preparations. AACR Abstracts.

Ortega S, **Mounho B**, Kelley S, Harris L, Shahrokh Z, Khan L, Torres E, Gillett N, Dybdal N. 2001. L-tartaric acid-induced nephrotoxicity. Toxicologist 60:1539.

Thrall B, **Mounho B**, Bull R, Lingohr M. 2000. Evidence for divergent signaling pathways in regulation of receptor mediated effects of peroxisome proliferators. Toxicologist 54(1):1512.

**Mounho B**, Thrall B. 1999. Hepatocyte plasma membrane ATP-dependent transport protein expression following induction of hepatocellular proliferation in vivo. Toxicologist 48:645.

**Mounho B**, Thrall B. 1998. Tumor promotion by peroxisome proliferators may involve the activation of mitogen activated protein kinases (ERK1/ERK2). Toxicologist 42:51.

Burchiel S, **Mounho B**, Davila D, Salas V. 1997. Analysis of human peripheral blood lymphocytes activation and apoptosis by flow cytometry. Fund Appl Tox 36: 552.

**Mounho B**, Burchiel S. 1998. The role of cytochrome P450 metabolism in polycyclic aromatic hydrocarbons (PAH)-induced alterations in intracellular calcium mobilization in human B cells. Fund Appl Tox 1002:552.

Salas V, **Mounho B**, Lauer F, Burchiel S. 1998. The role of benzo(a)pyrene (BaP) metabolites in apoptotic death in the Daudi Human B cell line. Fund Appl Tox 1476:552.

Book chapters

**Mounho-Zamora B.** 2013. Regulatory standards for the approval of biosimilar products: A global review. In: Nonclinical development of novel biologics, biosimilars, vaccines, and specialty biologics. Plitnick L, Herzyk D (eds). Academic Press, San Diego, CA.

**Mounho-Zamora, B.** 2013. Regulatory standards for the approval of biosimilar products. In: Challenges in nonhuman primate research in the 21st century. Weinbauer G, Friedhelm V (eds). Waxmann, New York.

**Mounho B.** 2008. Anti-drug antibody responses in nonclinical studies and their implications. In: Immunotoxicology strategies for pharmaceutical safety assessment. Herzyk DJ. Bussiere JL (eds). John Wiley and Sons Inc, New Jersey.

Bussiere J, **Mounho B.** 2008. Differentiating between desired immunomodulation and potential immunotoxicity. In: Immunotoxicology Strategies for Pharmaceutical Safety Assessment. Herzyk DJ, Bussiere JL (eds). John Wiley and Sons Inc. New Jersey.

**Mounho B**, Bussiere JL, Weir AB. 2008. Safety assessment of biotechnology-derived therapeutic drugs. In: Food safety of proteins in agricultural biotechnology. Hammond BG (ed). Taylor and Francis Group. Florida.

ABSTRACTS AND PRESENTATIONS

**Mounho-Zamora B**, Weissman I, Volkmer J, Willingham S, Prohaska S, Howard M, Jie L, Majeti R. Nonclinical safety assessment of a monoclonal antibody against CD47. Presented at the Society of Toxicology’s 54th Annual Meeting. San Diego, CA. March 22-26, 2015.

**Mounho-Zamora B**. Regulatory standards for the approval of biosimilar products: A global review. Presented at the Society of Toxicology’s 52nd Annual Meeting Continuing Education Class on Biosimilar Monoclonal Antibodies. San Antonio, TX. March 2013.

Finch G, **Mounho B.** Development of biosimilar products: Overview of standards and regulations. Presented at the Society of Toxicology’s 51st Annual Meeting. San Francisco, CA. March 11-15, 2012.

**Mounho B.** Overview of the history and development of regional guidelines for the approval of biosimilar products. Presented at the Society of Toxicology’s 51st Annual Meeting. San Francisco, CA. March 11-15, 2012.

**Mounho B.** Regulatory standards for the approval of biosimilar products: A global review. Presented in Münster, Germany. May 23, 2012.

**Mounho B.** History and review of regulatory pathways for the approval of biosimilar products. Presented at Applied Pharmaceutical Toxicology Annual Meeting. Baltimore, MD. May 17, 2012.

**Mounho B.** Definitions and standards for the approval of biosimilar products. Presented at American College of Toxicology Annual Meeting. Phoenix, AZ. November 2011.

**Mounho B.** Study director training course. Course Chair and Topic Presenter. American College of Toxicology Annual Meeting. 2004-2011.

**Mounho B.** Safety evaluation of biotechnology derived products. Presented at Toxicology for Industrial and Regulatory Scientists, Sponsored by American College of Toxicology. Falls Church, VA. April 2010.

**Mounho B.** General review of the types of anti-drug antibody-mediated responses that can occur in toxicology studies. Presented at the 49th Annual Meeting of Society of Toxicology. Salt Lake City, Utah. March 7–11, 2010.

**Mounho B**. Small molecule and biological therapeutics: History and inherent differences. Presented at Cambridge Healthtech Institute’s PEGS Summit. Boston, MA. April 6-10, 2009.

**Mounho B.** Preclinical toxicology studies to support the development of monoclonal abs: Scientific issues and challenges. Presented at Cambridge Healthtech Institute’s PEGS Summit. Boston, MA. April 6-10, 2009.

**Mounho B.** Scientific challenges in preclinical studies to support the clinical development of biologics. Presented at Cambridge Healthtech Institute’s Molecular Medicine Tri-Conference. San Francisco, CA. February 25-27, 2009.

**Mounho B.** Preclinical development of biologics. Presented at Cambridge Healthtech Institute’s Molecular Medicine Tri-Conference. San Francisco, CA. February 25-27, 2009.

**Mounho B.** Comparability challenges: Regulatory and scientific issues in the assessment of biopharmaceuticals. Presented at Drug Information Association Meeting. 2009.

**Mounho B.** Nonclinical safety assessment studies to support manufacturing process changes for Vectibix®. Presented at Drug Information Association Meeting. 2009.

**Mounho B.** Comparison of nonclinical toxicology programs for epidermal growth factor antagonists for cancer therapy: Monoclonal antibodies Vectibix® and Erbitux® vs. small molecules Iressa® and Tarceva®. Presented at BioSafe General Membership Annual Meeting. 2007.

**Mounho B.** Therapeutic biologics. Presenter and course director: Biologics drug development: An integrated overview of manufacturing, nonclinical, clinical, and regulatory requirements, PERI Course. Bethesda, MD. 2007.

**Mounho B.** Nonclinical safety assessment of therapeutic biologics. Presenter and course director: Biologics drug development: An integrated overview of manufacturing, nonclinical, clinical, and regulatory requirements, PERI Course. Bethesda, MD. 2007.

**Mounho B.** Chronic toxicity studies for monoclonal antibodies: Avastin® and Erbitux®. Presented at BioSafe/FDA meeting. 2006.

**Mounho B.** The use of toxicokinetics and toxicodynamics in the safety assessment and development of small and large molecule therapeutic products. Presenter and Symposium Chair: American College of Toxicology Annual Meeting. 2006.

**Mounho, B.** Immunomodulation in nonhuman primates. Presented at Pharmaceutical Education Associates Immunotoxicology IV Meeting. 2006.

**Mounho B.** Immunotoxicology. Channel Islands College - Toxicology Course. 2006.

**Mounho B.** Differences between small molecules and biological therapeutic drug products. Society of Toxicology. New Orleans, LA. March 6-10, 2005.