



THE WEINBERG GROUP®

ROBERT I. ROTH, M.D., Ph.D.

Vice President and Worldwide Medical Director

P +1 415.293.1029

bob.roth@weinberggroup.com

EDUCATION

- 1986 Laboratory Medicine Residency, with Board Certification 1987, University of California, San Francisco, CA
- 1984 Anatomic Pathology Residency, with Board Certification 1987 University of California, San Francisco, CA
- 1982 M.D., University of Texas Medical Branch, Galveston, TX
- 1978 Ph.D., Biochemistry, Baylor College of Medicine, Houston, TX
- 1973 B.S., Biology, Bucknell University, Lewisburg, PA

EXPERIENCE

Dr. Robert Roth is Medical Director at The Weinberg Group Inc. He provides consultation in all phases of the research, development and marketing of FDA-regulated drugs, biologics, and medical devices. Projects have involved strategic issues, clinical evaluation, data management and analysis, development of product support documents, regulatory support, and litigation support. Examples of Dr. Roth's experience at The Weinberg Group include:

Strategic, Clinical Development, and Regulatory Support and Litigation Support: Representative Examples

- Delineation of critical scientific, regulatory and strategic issues surrounding the development of generic biological drugs.
- Critical evaluation of the clinical opportunities, technical limitations, regulatory obstacles and market potential for a novel technology in stem cell therapy.
- Clinical and regulatory risk analysis of a novel protein-based chemotherapeutic agent.
- Management of drug safety and surveillance activities for pharmaceutical clients: safety database management, expedited FDA reports of important safety information, annual and periodic safety update reports.
- Post marketing analysis of safety data and/or data to support expansion of marketing claims for drugs, medical devices, and biologics in a variety of therapeutic areas, including wound healing, orthopedic, neurological, urinary incontinence, bone graft substitutes, blood products, fibrin sealants, anti-infectives, cardiovascular products, and laxatives.

- Evaluation and strategic revision of clinical development plans for biotechnology products (biologics, medical devices, diagnostics).
- Critique of the scientific and regulatory adequacy of a critical post-marketing research protocol aimed at reversing an adverse regulatory stance.
- Evaluation of human toxicity risks due to product contamination.
- Recall evaluations.
- Contributions toward production of a variety of client submissions: NDA, IND, PMA, 510(k), clinical protocols.

Audit Support: Representative Examples

- Review and evaluate bioanalytical data in support of third-party, objective audit activities.
- Experienced with FDA-regulated clients in performing clinical and bioanalytical study audits in accordance with FDA criteria.
- Served as a Project Leader for the audit teams, ensuring that: (1) tasks were organized, communicated and controlled; (2) activities were performed in accordance with proper procedures; (3) data and other technical information were captured and interpreted correctly, and (4) reports were prepared in accordance with client expectations.

Litigation Support: Representative Examples

- For litigation involving a protein therapeutic, provided a critical review and strategic analysis of the epidemiology of a major infectious disease for use in support of expert witness testimony and litigation strategy.
- For litigation involving safety claims for a surgical device, developed scientific and medical backgrounders for counsel, provided clinical evaluations of plaintiff medical records, crafted best-case arguments for counsel, aided in expert witness identification and development for trial, and produced expert affidavits.

Prior to joining The Weinberg Group, Dr. Roth's experience included the following:

LIFE SCIENCE ECONOMICS, Director of Medical Research (1997 – 1998)

Dr. Roth was responsible for scientific, technology, and medical aspects of client projects. His expertise also was used extensively to evaluate potential clients for the Investor Attraction efforts of LifeScience Economics. Major activities included:

- Technology assessment (biotechnology, devices and diagnostics).
- Due diligence reports for investors.
- SWOT analysis of investment opportunities.
- Review of business plans for investors.
- Revision of scientific/medical market sections of client materials.
- Equity Research Reports/White Paper.
- Preparation of scientific/medical sections of private placement document.
- Medical market assessments.



- Strategic plan for a biotechnology company turnaround.
- Data analysis and clinical pipeline evaluation.
- Advisory function (Scientific Advisory Board presence).

ACADEMIC RESEARCH, TEACHING AND SERVICE WORK (1990 – 1998)

Dr. Roth held academic positions as Assistant Professor in Residence (Laboratory Medicine) and Research Associate Pathologist (Department of Pathology), University of California, San Francisco. Concomitantly, he held administrative positions at the Veterans Administration Hospital, San Francisco, CA, as Assistant Chief, Clinical Pathology Service and Acting Chief, Hematology Laboratory and Blood Bank and as Affiliate Medical Director at Irwin Memorial Blood Center, San Francisco. He established a basic research program centered on pathogenesis of sepsis and development of cell-free hemoglobin as a new blood substitute. Clinical and teaching responsibilities were in the Blood Bank and Hematology Laboratory, VA Medical Center, San Francisco. Service work focused on bone marrow, peripheral smear and cytologic fluid evaluations, analysis of abnormalities of hemostasis, and appropriate utilization of blood products. At Irwin Memorial Blood Center he participated in management meetings concerned with donation and utilization issues, pathogen testing, and review of adverse transfusion reactions.

PROFESSIONAL AFFILIATIONS

American Association of Blood Banks, 1992 – present
International Endotoxin Society, 1995 – present
Regulatory Affairs Professionals Society, 1998 – present

PROFESSIONAL ACTIVITIES

Editorial contributions, Regulatory Affairs Journal
Lecturer, University of California Santa Cruz Extension, Course: Regulation of Drugs, Biologics, Devices and Diagnostics
Lecturer, Northern California Pharmaceutical Discussion Group
Reviewer, Journal of Endotoxin Research; Transfusion; Biochemistry; Thrombosis Research; Infection and Immunity; Journal of Laboratory and Clinical Medicine
Editorial contributions, Bay Area Biosciences FDA Update

BOARD AFFILIATIONS

Cell Path, Scientific Advisory Board, 1997 – 2001



PRESENTATIONS

Roth RI, Flesicher NM. 2011. Important Lessons in Developing Biosimilars. A Webinar presented by The Weinberg Group Inc.; 28 Sep; Washington, DC.

Roth RI, Adams DG, Dennis A. 2010. Navigating the New Law on Licensing Biosimilars. A Webinar presented by Venable LLP and The Weinberg Group Inc.; 12 May; Washington, DC.

Roth RI. 2009. Understanding What FDA is Looking for in Post Market Safety Assessments: Going Beyond AERS. A Webinar presented by The Weinberg Group Inc.; 16 Dec; Washington, DC.

Roth RI. 2009. Global Lessons in Developing Biosimilars. A Webinar presented by The Weinberg Group Inc.; 27 May; Washington, DC.

Roth RI, Dunkelberger HE. 2009. Medical Monitoring: Igniting Future Litigation and Strategies for Defense. A Webinar presented by The Weinberg Group Inc.; 19 Feb; Washington, DC.

PUBLICATIONS

Roth RI. 2009. Human Clinical Safety Assessment Procedures, Comprehensive Toxicology 2nd Edition (in press).

Roth RI, Fleischer NM. 2009. A Follow-on Biological Drug is not a Biogenic: Lessons from Omnitrope and Valtropin. *J. Generic Med.* 6:237-245.

Roth RI. 2008. Preparing the Common Technical Document for registration of pharmaceuticals for human use (CTD) – insights and recommendations. *Drug Info. J.* 42:149-159.

Roth RI, Dunkelberger HE. 2008. Medical Monitoring Litigation: Influence of Evolving Diagnostic Technologies. *For The Defense*, pp. 14-17.

Roth RI. 2006. Phase IV commitments: What works and what does not. *Food and Drug Law, Regulation, and Education UPDATE Issue 5, Sept/Oct*: 19-23.

Roth RI, Fleischer NM. 2005. Scientific issues for biogenics/biosimilars. *Journal of Generic Medicines.* 2(2):125-132.

diZerega GS, Roth RI, Johns DB. 2003. Quantitation of peritoneal adhesions and correlation with clinical outcomes. In: *Infertility and Reproductive Medicine Clinics of North America.* Diamond MP, DeCherney AH (eds.). Philadelphia: W.B. Saunders Company.

Roth RI. 2003. Street Talk: A winning combination. *Red Herring Feb*: 122:53.



Robert I. Roth, M.D., Ph.D.

Page 5

Roth RI, Falk JI. 2003. Accomplishing long term follow up (LTFU) of gene therapy patients. *Regul Aff J.* 14(2):99-100.

Ripa S, Bruno N, Reder RF, Cassillis R, Roth RI. 2002. Clinical applications of povidone-iodine as a topical antimicrobial. In: Paulson, D.S. (ed). *Handbook of Topical Antimicrobials and Their Applications.* New York: Marcel Dekker.

Roth RI, Fleischer NM. 2002. Gene therapy: Applications to pharmacy practice. *J Am Pharm Assoc.* 42(5):692-698.

Roth RI. 2001. Magic bullets finally find the mark. *J Am Pharm Assoc.* 41:383-391.

Roth RI. 2001. Emerging biomedical technologies stretch the regulatory framework. *Regulatory Affairs Focus.* Jun: 44.

Roth RI. 2001. Whither the EU-USE mutual recognition agreement (MRA). *Regul Aff J.* 12:90-91.

Roth RI, Levin J. 2000. Transfusion of soluble hemoglobin. *N Engl J Med.* 343:1273.

Roth RI, Panter SS, Zegna AI, Levin J. 2000. Bacterial endotoxin (lipopolysaccharide) stimulates the rate of iron oxidation. *J Endotoxin Res.* 6:313-319.

Roth RI. 2000. Periodic safety update reports. *Regul Aff J.* 11:890-891.

Roth RI. 2000. New approach to cellular and tissue-based products. *Regul Aff J.* 11(3):162-163.

Roth RI, Levin, J. 1999. Effects of human hemoglobin on bacterial endotoxin in vitro and in vivo. In: *Endotoxin in Health and Disease.* Brade H, Opal SM, Vogel SN, Morrison DC (eds.). New York: Marcel Dekker.

Su D, Roth RI, Levin J. 1999. Hemoglobin infusion augments the tumor necrosis factor response to bacterial endotoxin (lipopolysaccharide) in mice. *Crit Care Med.* 27:771-778.

Roth RI, Su D, Child AH, Wainwright NR, Levin J. 1998. Limulus anti-lipopolysaccharide factor (LALF) prevents mortality late in the course of endotoxemia. *J Infect Dis.* 177:388-94.

Roth RI, Panter SS, Zegna AI, Arellano FA, Levin J. 1997. Effects of iron on bacterial endotoxin. *J Endotoxin Res.* 4:273-278.

Yoshida M, Roth RI, Grunfeld C, Feingold KR, Levin J. 1997. Pharmacokinetics, biological effects and distribution of (1 \rightarrow 3) β -D-glucan in blood and organs of rabbits. *Mediators Inflamm.* 6:279-283.



Levin J, Roth RI. 1998. Interactions between hemoglobin and bacterial endotoxin in vitro and in vivo. In: Fundamental Principles and Clinical Applications of Blood Substitutes. Rudolph AS, Feuerstein G, Rabinovici R (eds.). New York: Marcel Dekker.

Su D, Roth RI, Yoshida M, Levin J. 1997. Hemoglobin increases mortality from bacterial endotoxin. *Infect Immun.* 65(4):1258-1266.

Roth RI, Wong JS, Hamilton RL. 1996. Ultrastructural changes in bacterial lipopolysaccharide induced by human hemoglobin. *J Endotoxin Res.* 3:361-366.

Roth RI. 1996. Hemoglobin enhances the binding of bacterial endotoxin to human endothelial cells. *Thromb Haemost.* 76:258-262.

Levin J, Roth RI, Kaca W, Yoshida M, Su D. 1996. Hemoglobin-endotoxin interactions. In: Blood Substitutes: New Challenges. Winslow RM, Vandegriff KD, Intaglietta M (eds.). Cambridge, MA: Birkhäuser Boston.

Yoshida M, Roth RI, Grunfeld C, Feingold KR, Levin J. 1996. Soluble (1 \rightarrow 3) β -D-glucan purified from *Candida albicans*: pharmacokinetics, biological effects, and distribution in blood and organs of rabbits. *J Lab Clin Med.* 128:103-114.

Gelb AB, Roth RI, Levin J, London MJ, Noall RA, Hauck WW, Cloutier M, Verrier E, Mangano DT. 1996. Changes in blood coagulation during and following cardiopulmonary bypass: lack of correlation with clinical bleeding. *Am J Clin Pathol.* 106:87-99.

Kaca W, Roth RI, Vandegriff KD, Chen GC, Kuypers FA, Winslow RM, Levin J. 1995. Effects of bacterial endotoxin on human crosslinked and native hemoglobins. *Biochemistry.* 34:11176-11185.

Kaca W, Roth RI. 1995. Activation of complement by human hemoglobin and by mixtures of hemoglobin and bacterial endotoxin. *Biochim Biophys Acta.* 1245:49-56.

Yoshida M, Roth RI, Levin J. 1995. The effect of cell-free hemoglobin on intravascular clearance and cellular, plasma, and organ distribution of bacterial endotoxin in rabbits. *J Lab Clin Med.* 126:151-160.

Roth RI, Powanda MC. 1994. Blood substitutes and related products: Advances in development, trial design, and clinical application. *BioVenture View.* Nov:14-17.

Kaca W, Roth RI, Ziolkowski A, Levin J. 1994. Human hemoglobin increases the biological activity of bacterial lipopolysaccharides in activation of *Limulus* amoebocyte lysate and stimulation of tissue factor production by endothelial cells in vitro. *J Endotoxin Research.* 1:243-252.

Kaca W, Roth RI, Levin J. 1994. Hemoglobin, a newly recognized lipopolysaccharide (LPS)-binding protein that enhances LPS biological activity. *J Biol Chem.* 269:25078-25084.

Roth RI. 1994. Hemoglobin enhances the production of tissue factor by endothelial cells in response to bacterial endotoxin. *Blood.* 83:2860-2865.



Roth RI, Levin J. 1994. Measurement of endotoxin levels in hemoglobin preparations. *Meth Enz Hemoglobins, Part B* 231:75-91.

Roth RI, Kaca W, Levin J. 1994. Hemoglobin: a newly recognized binding protein for bacterial endotoxins (LPS). In: *Bacterial Endotoxins: Basic Science to Anti-Sepsis Strategies*. Levin J, van Deventer SJH, van der Poll T, Sturk A (eds.). New York: Wiley-Liss.

Roth RI, Kaca W. 1994. Toxicity of hemoglobin solutions: hemoglobin is a lipopolysaccharide (LPS) binding protein which enhances LPS biological activity. *Artif Cells Blood Substit Immobil Biotechnol.* 22:387-398.

Halvorsen L, Roth RI, Gunther RA, Firoozmand E, Buoncristiani AM, Kramer GC. 1993. Liver hemodynamics during portal endotoxemia in swine. *Circ Shock.* 41:166-175.

Roth RI, Levin J, Chapman KW, Schmeizl M, Rickles FR. 1993. Production of modified crosslinked cell-free hemoglobin for human use: the role of quantitative determination of endotoxin contamination. *Transfusion.* 33:919-924.

Roth RI, Levin FC, Levin J. 1993. Distribution of bacterial endotoxin in human and rabbit blood and effects of stroma-free hemoglobin. *Infect Immun.* 61:3209-3215.

Roth RI, Tobias PS. 1993. Lipopolysaccharide-binding proteins of *Limulus* amoebocyte lysate. *Infect Immun.* 61:1033-1039.

Roth RI, Levin J. 1992. Purification of *Limulus polyphemus* proclotting enzyme. *J Biol Chem.* 267:24097-24102.

Roth RI, Yamasaki R., Mandrell RE, Griffiss J.McL. 1992. Ability of gonococcal and meningococcal lipooligosaccharides to clot *Limulus* amoebocyte lysate. *Infect Immun.* 60:762-767.

Obuch ML, Baker G, Roth RI, Yen TSB, Levin J, Berger TG. 1992. Selective cutaneous hyperpigmentation in mice following Zidovudine administration. *Arch Derm.* 64:437-439.

Roth RI, Baker G, Levin J. 1991. An animal model for the study of AZT-induced hyperpigmentation. *Lab Invest.* 63:437-439.

Roth RI, Levin FC, Levin J. 1990. Optimization of detection of bacterial endotoxin in plasma with the *Limulus* amoebocyte lysate test. *J Lab Clin Med.* 116:153-161.

Roth RI, Levin J, Behr S. 1989. A modified *Limulus* amoebocyte lysate test with increased sensitivity for detection of bacterial endotoxin. *J Lab Clin Med.* 114:306-311.

Roth RI, Chen J.C-R., Levin, J. 1989. Stability of gels formed following coagulation of *Limulus* amoebocyte lysate: lack of covalent crosslinking of coagulin. *Thromb Res.* 55:25-36.



Roth RI, Levin J. 1989. Amplification of chromogenic staining of proteases within electrophoretic gels. *J Biochem Biophys Methods*. 19:129-142.

Roth RI, Owen RL, Keren DF, Volberding PA. 1985. Intestinal infection with *Mycobacterium avium* in Acquired Immune Deficiency Syndrome (AIDS): histological and clinical comparisons with Whipple's Disease. *Dig Dis Sci*. 30:497-504.

Roth RI, Owen RL, Keren DF. 1983. AIDS with *Mycobacterium avium*-intracellular lesions resembling those of Whipple's Disease. *N Eng J Med*. 309:1324-1325.

Roth RI, Gaubatz JW, Gotto AM, Patsch JR. 1983. Effect of cholesterol feeding on the distribution of plasma lipoproteins and on the metabolism of apolipoprotein E in the rabbit. *J Lipid Res*. 24:1-11.

Pownall HJ, Jackson RL, Roth RI, Gotto AM, Patsch JR. 1980. Influence of an atherogenic diet on the structure of swine low density lipoproteins. *J Lipid Res*. 21:1108-1115.

Roth RI, Jackson RL, Pownall HJ, Gotto AM. 1977. Interaction of plasma "Arginine-rich" apolipoprotein with dimyristoyl-phosphatidylcholine. *Biochem*. 16:5030-5036.

Nazar BL, Harclerode J, Roth RI, Butler RC. 1974. Acquisition of tolerance to delta-9-THC as measured by the response of a cellular function. *Life Sci*. 14:2315-2520.

