Post Suite #162 Private Bag X11 HALFWAY HOUSE 1685



Tel: +27 11 468-3438/3249 Cell: 072 830-7963 Email: info@silvergenesis.com Website: www.silvergenesis.com

Scientific Research

PROFESSIONAL QUOTES

The remarkable benefit of positively charged silver ions has been conclusively demonstrated by the most rigorous scientific requirements in the world.

One of the foremost research scientists in the field has been the brilliant orthopaedic surgeon, Prof. Robert O. Becker.

"...They (electrically charged silver ions) profoundly stimulate soft-tissue healing in a way that's unlike any known natural process".

Dr. Robert O. Becker Pg 174 The Silver Wand from "The Body Electric"

"We saw positive silver's lifesaving potential most clearly in our experience with a patient named Tom in 1979. Tom had had massive doses of X rays for cancer of the larynx, and his larynx had to be removed. Because of the radiation, the surrounding tissue was helpless against infection, and the skin and muscle of his entire neck literally dissolved into a horrid wound. After one month of electrified silver treatment, the infection was gone and healing was progressing, the wound healed completely in a total of three months. One physician, who said he'd never heard of any comparable healing of such a grave wound, was moved to exclaim after seeing my slides, "I have witnessed a miracle!" Dr. Robert O. Becker Pg 174 The Silver Wand from "The Body Electric"

"We may only have scratched the surface of positive silver's medical brilliance. Already it's an amazing tool. It stimulates bone-forming cells, cures the most stubborn infections of all kinds of bacteria, and stimulates healing in skin and other soft tissues". Dr. Robert O. Becker Pg 175 The Silver Wand from "The Body Electric"

DI. RODELLO. DECKEL PY 175 THE SILVEL WAITU HOLL. THE DOUY ELECTIC

"...we studied malignant fibrosarcoma cells (cancerous fibroblasts) and found that electrically injected silver suspended their runaway mitosis.

Dr. Robert O. Becker Pg 175 The Silver Wand from "The Body Electric".

"Whatever its precise mode of action may be, the electrically generated silver ion can produce enough cells for human blastemas; it has restored my belief that full regeneration of limbs, and perhaps other body parts, can be accomplished in humans". Dr. Robert O. Becker Pg 175 The Silver Wand from "The Body Electric"

Writing about his experience with older patients, Dr. Becker wrote, "Silver did more than kill disease causing organisms. It promoted major growth of bone, and accelerated the healing of injured tissues by over 50%".

Dr. Becker discovered that the silver was promoting a new kind of cell growth, which looked like the cells of children! "These cells grew fast" he wrote "producing a diverse and surprising assortment of primitive cell forms able to multiply at a great rate, then differentiate into the specific cells of an organ or tissue that had been injured, even in patients over fifty years old."

Dr. Robert O. Becker "Treatment of Orthopaedic Infections with Electrically Generated Silver Ions". The Journal of Bone and Joint Surgery, American Volume, October, 1978. Vol. 60-A, No. 7.

In 1998, Prof. Becker received a U.S. patent (5,814,094) for the devices, materials and techniques in the regeneration of tissue using silver ions. After several hundred cases, Prof. Becker believes that the technique works in three stages.

The first stage is the chemical combination of highly active free silver ions with all bacteria or fungi present in the wound which are inactivated within 20 or 30 minutes.

The second stage occurs over the next few days. Silver acts on fibroblast cells to cause them to revert to their embryonic state, becoming stem cells. These cells are universal building blocks whose role is to reconstruct new tissue.

In the final stage, silver ions form a complex with the living cells in the wound area to produce immediately convertible stem cells.



The end result of this conversion is that the stems cells supply all the building blocks necessary to completely restore all anatomical structures. No other known treatment provides sufficient numbers of the embryonic or stem cells required for true regeneration of damaged or destroyed tissues in humans and animals. The success indicates that there is the potential not only for the healing of near surface wounds, but for regeneration repair of internal organs such as the heart, liver, brain and the spinal cord.

[Extract from Metabolic Solutions Info Report 902-584-3810]

MORE SCIENTIFIC QUOTES

Dr. Albert More scientific quotes: "YOU CAN TRACE EVERY SICKNESS, EVERY DISEASE, AND EVERY AILMENT TO A MINERAL DEFICIENCY" - Linus Pauling, Ph. D. (twice Nobel Laureate)

"...in this eye-opening research, silver is emerging as a wonder of modern medicine ...perhaps it soon will be recognized as: OUR MIGHTIEST GERM FIGHTER. For example, even the most powerful pharmaceutical antibiotics are effective against only a small number of micro-organisms, and then only until drug-resistant strains develop. Yet, research at Washington University School of Medicine...has shown that silver is bactericidal to nearly 650 different disease-causing organisms, and that silver-resistant bacteria strains do not develop." Science Digest, March 1978

"Silver is one of the most universal antibiotic substances. When administered in the colloidal form, it is for all intents and purposes non-toxic. Silver has been proven effective against hundreds of infectious conditions. It has tremendous anti-microbial power; the history of safe and successful colloidal silver use is extensive, and the number of current health professionals and individuals that successfully utilize colloidal silver to reduce the length and severity of infectious disorders is growing exponentially." Zane Baranowski, CN. Association for Advanced Colloidal Research.

The germicidal action of certain metals in the colloidal state having been demonstrated, it only remained to apply them to the human subject, and this has been done in a large number of cases with astonishingly successful results. For internal administration, either orally or hypodermically, they have the advantage of being rapidly fatal to the parasites both bacterial and otherwise without any toxic action on the host. Colloidal Silver solution is quite stable even in the presence of salts and the normal constituents of the blood. Its destructive action on toxins is very marked, so that it will protect rabbits from ten times the lethal dose of tetanic (from tetanus) or diptheric toxin." Prof. A.B. Searle in "The Use of Colloids in Health and Disease (Quoting from the British Medical Journal, May 12, 1917, pg 83.)

"The introduction of the metallic colloids into medicine constitutes a new departure in therapeutics, the significance of which does not appear as yet to be generally recognised" B. G. Duhamel, M.D. in "Electric Metallic Colloids and Their Therapeutical Applications," The Lancet, January 13, 1912, p. 89 – 90

"With the many research reports and personal testimonials of it being a full spectrum natural antibiotic that destroys virtually all known and developing/mutating pleomorphic pathogens, you'd think there would be a lot of excitement regarding colloidal silver, especially from within the medical community...The harsh reality regarding the FDA, AMA, Pharmaceutical, and scientific community is that there appears to be a lack of enthusiasm. Reluctance to help validate the effectiveness of colloidal silver seems all too common. Although this is changing, the reason for the possible resistance may be rooted primarily in economics. For example, colloidal silver is regarded by the FDA as a pre-1938 drug. Moreover, the FDA does not have jurisdiction regarding a pure mineral element. There has been no incentive for the aforementioned bodies to go through the expensive process of controlled studies to provide proof regarding uses and effectiveness, such as the UCLA and others have done."

"The medicine department of obstetrics and gynaecology at UCLA conducted tests in 1988 regarding the use of silver solutions as disinfectants. Anti-microbial and anti-bacterial effects were demonstrated in 10/5 concentrations per milliliter of the following:

neisseria gonorrhea, gardurella vaginalisis, streptococcus pyogenes, staphylococcus aureus, candida albicans, candida eolobata, m. furfur, salmonella typhi."

Larry C. Ford, M.D., UCLA Department of Obstetrics and Gynecology, UCLA School of Medicine, November, 1, 1988.

For a comprehensive list of documented medical journal reports on silver ion research: 1. Silver Colloid Bibliography

2. Colloidal Silver Research

2. Colloidal Silver Research



DOCUMENTED MEDICAL JOURNAL REPORTS OF SILVER COLLOID RESEARCH

The following is a list of (100+) documented Medical Journal reports of uses of silver for the treatment of various conditions, diseases and pathogens: Anthrax Bacilli [2, 3] Appendicitis (post-op) [3] Axillae and Blind Boils of the Neck [10] B. Coli [2] B. Coli Communis [7] B. Dysenteria [2] B. Pyocaneus [2] B. Tuberculosis [7] Bacillary Dysentery [4] Bladder Irritation [12] Blepharitis [13] Boils [10] Bromidrosis in Axille [12] Bromidrosis in Feet [10] Burns and Wounds of the Cornea [13] Cerebro-spinal Meningitis [3, 9] Chronic Cystitis [10] Chronic Eczema of Anterior Nares [10] Chronic Eczema of Metus of Ear [10 Colitis [4]; Cystitis [8] Dacrocystitis [13] Dermatitis suggestive of Toxaemia [4] Diarrhoea [4]; Diptheria [3] Dysentery [3,6] Ear "Affections" [5] Enlarged Prostate [12] Epiditymitis [10]; Erysipelas [3] Eustachian Tubes (potency restored) [8] Follicular Tonsilittis [10] Furunculosis [3]; Gonococcus [7] Gonorrhoea [10] Gonorrhoeal Conjunctivitis [10] Gonorrhoeal Opthalmia [13] Gonorrhoeal Prostatic Gleet [11] Haemorrhoids [12] Hypopyon Ulcer [13] Impetigo [10 Infantile Disease [16] Infected Ulcers of the Cornea [13] Inflammatory Rheumatism [3] Influenza [11] Interstitial Keratitis [13] Intestinal troubles [6] Lesion Healing [12] Leucorrhoea [8] Menier's Symptoms [8] Nasal Catarrh [5] Nasopharyngeal Catarrh (reduced) [8] Oedematous enlargement of Turbinates without True Hyperplasia [9] Offensive Discharge of Chronic Supporation in Otitis Media [10] Ophthalmology [12] Ophthalmic practices [5] Para-Typhoid [3] Paramecium [1] Perineal Eczema [12] Phlegmons [3] Phlyctenular Conjunctivitis [10] Pneumococci [2] Pruritis Ani [12] Puerperal Septicaemia [15]



Purulent Opthalmia of Infants [13] Pustular Eczema of Scalp [10] Pyorrhoea Alveolaris (Rigg's Disease) [8] Quinsies [8]; Rhinitis [9] Ringworm of the body [10] Scarlatina [3]; Sepsis [16] Septic Tonsillitis [10] Septic Ulcers of the legs [10] Septicaemia [5, 8] Shingles [8]; Soft Sores [10] Spring Catarrh [10]; Sprue [6] Staphyloclysin (inhibits) [2] Staphylococcus Pyogenea [7] Staphylococcus Pyogens Albus [2] Staphylococcus Pyogens Aureus [2] Streptococci [7] Subdues Inflammation [12] Suppurative Appendicitis (post-op) [10] Tinea Versicolor [10] Tonsillitis [8] Typhoid [3] Typhoid Bacillus [14] Ulcerative Urticaria [4] Urticaria suggestive of Toxaemia [12] Valsava's Inflammation [8] Vincent's Angina [10] Vorticella [1] Warts [12] Whooping Cough [8]

More recent articles have described silver being used to treat:

Adenovirus [5, 23] Asper Gillus Niger [18] Bacillius Typhosus [21] Bovine Rotavirus [23] Candida Albicans [18] Endamoeba Histolytica (Cysts) [24] Escherichia Coli [17, 18, 21] Legionella Pneumophilia [17] Poliovirus 1 (Sabin Strain) [23] Pseudomonas Aeruginosa [17, 18] Salmonella [22] Spore-Forming Bacteria [24] Staphylococcus Aureus [17] Streptococcus Faecalis [17] Vegetative B. Cereus Cells [24]

BIBLIOGRAPHIC FOOTNOTES

1. Bechhold, H. "Colloids in biology and medicine", translated by J.G.M. Bullow., D. Van Nostrand Company, New York, 1919, p. 367.

2. Ibid., p. 368.

3. Ibid., p. 376.

- 4. Searle, A.B. "The use of colloids in health and disease". (Quoting from the British Medical Journal, May 12, 1917)
- E.P. Dutton & Company: New York, 1919, p. 82.
- 5. Ibid., (Quoting from the British Medical Journal, Jan. 15, 1917) p. 83.
- 6. Ibid., (Quoting Sir James Cantlie in the British Medical Journal, Nov 15, 1913) p. 83.
- 7. Ibid., (Qouting Henry Crookes) p. 70.
- 8. Ibid., (Quoting J. Mark Hovell in the British Medical Journal, Dec. 15, 1917) p. 86.
- 9 Ihid (Quoting B Sevmour lones) n 86



10. Ibid., (Quoting C.E.A. MacLeod in Lancet, Feb. 3, 1912) p. 83.

11. Ibid., (Quoting J. MacMunn in the British Medical Journal, 1917, I, 685) p. 86.

12. Ibid., (Quoting Sir Malcolm Morris in the British Medical Journal, May 12, 1917) p. 85.

13. Ibid., (Quoting A. Legge Roe in the British Medical Journal, Jan 16, 1915) p. 83.

14. Ibid., (Quoting W.J. Simpson in Lancet, Dec. 12, 1914) pp. 71-72.

15. Ibid., (Quoting T.H. Anderson Wells in Lancet, Feb. 16, 1918) p. 85.

16. "Index-Catalogue of the Library of the Surgeon General's Office United States Army." United States Government Printing Office: Washington, v. IX, 1913, p. 628.

17. Moyasar, T.Y.; Landeen, L.K.; Messina, M. C.; Kutz, S.M.; and Gerba, C.P. "Disinfection of bacteria in water systems by using electrolytically generated copper, silver and reduced levels of free chlorine". Found in Canadian Journal of Microbiology. The National Research Council of Canada: Ottawa, Ont., Canada, 1919, pp. 109-116. 18. Simonetti, N.; Simonetti, G.; Bougnol, F.; and Scalzo, M. "Electrochemical Ag+ for preservative use". Article in Applied and Environmental Microbiology. American Society for Microbiology: Washington, v. 58, 12, 1992, pp. 3834-3836.

19. Slawson, R.M.; Van Dyke, M.I.; Lee, H.; and Trevors, J.T. "Germanium and silver resistance, accumulation, and toxicity in microorganisms". Article found in Plasmid. Academic Press, Inc.: San Diego, v.27, 1, 1992, 73-79. 20. Thurman, R.B. and Gerba, C.P. "The molecular mechanisms of copper and silver ion disinfection of bacteria and viruses". A paper presented in the First International Conference on Gold and Silver in Medicine. The Silver Institute: Washington, v. 18, 4,

1989, p. 295.

21. Ibid., p. 299. 22. Ibid., p. 299 23. Ibid., p. 300.

24. Ibid., p. 301. 25. Ibid., p. 302.

26. H.E.L.P. ful news, Vol. 9, No. 12., pp. 1-3[24]

HISTORY OF DOCUMENTED SCIENTIFIC RESEARCH OF SILVER IONS

Metabolic Solutions Info Report Metabolic Solutions Institute 902-584-3810

Silver Colloid Bibliography - prepared by Dr. A. Bart Flick

1. Addicks, L. et al.: Silver in Industry, Reinhold Pub. Corp., NY 401-450, 584-597 (1940). Extensive bibliography on silver for water purification.

2. Akiyama, H. and Okamoto, S.,
Prophylaxis of indwelling urethral catheter infection: clinical experience with a modified Foley catheter and drainage system,
J. Urol., 121, 40, 1979.

3. Avakyan, Z.A., Comparative toxicity of heavy metals for certain microorganisms, Microbiology, 36, 366, 1967.

4. Baenziger, N.C., Description of the structure of three silver-containing drug complexes, First International Conference on Gold and Silver in Medicine, Bethesda, MD, May 13-14, 1987.

5. Barranco, S.D. and Colmano, G., Electrical Inhibition of Staphlococcus aureus, Virginia Medical, 646, 1976.

6. Barranco, S.D., Spadaro, J.A., Berger, T.J., and Becker, R.O., In vitro effect of weak direct current on staphlococcus aureus, Clinical Orthopaedics, 100, 250, 1974.

7. Becker, R.O., Electrical treatment of osteomyelitis, Surgery of the Musculoskeletal System, Churchill Livingstone, New York, 1983, 4, 10- 197.

 Becker, R.O., The effect of electrically generated silver ions on human cells, First International Conference on Gold and Silver in Medicine, Bethesda, MD, May 13-14, 1987.



9. Becker, R.O., Effect of anodally generated silver ions on fibrosarcoma cells, Electro- and Magnetobio., 11, 57, 1992.

10. Becker, R.O. and Esper, C., Electrostimulation and undetected malignant tumors, Clin. Orthop., 161, 336, 1981.

11. Becker, R.O. and Spadaro, J.A., Treatment of Orthopedic Infections with electrically generated silver ions, J. Bone Jt. Surgery., 60-A, 871, 1978.

 Benvenisty, A.I., Tannenbaum, G., Ahlborn, T.N., Fox, C.L., Modak, S., Sampath, L., Reemtsma, K. and Nowygrod, R.,
 Control of prosthetic bacterial infections: evaluation of an easily incorporated, tightly bound, silver antibiotic PTFE graft,
 Surg. Res., 44,1, 1988.

13. Berger, T.J., Spadaro, J.A., Chapin, S.E., and Becker, R.O., Electrically generated silver ions: quantitative effects on bacterial and mammalian cells, Antimicrob. Agents Chemother., 9, 357, 1976.

14. Berger, T.J., Spadaro, J.A., Bierman, R., Chapin, S.E., and Becker, R.O., Antifungal properties of electrically generated metallic ions, Antimicrob. Agents Chemother., 10, 856, 1976.

15. Block, Seymour, Ed.: Disinfection, Sterilization and Preservation, Chapter 18; Lea & Febiger & Co., Philadelphia, 3rd Ed (1983). Extensive bibliography.

16. Bolton, L., Foleno, B., Means, B., and Petrucelli, S., Direct-current bactericidal effect on intact skin, Antimicrob. Agents Chemother., 18, 137, 1980.

17. Bolton, M., The effects of various metals on the growth of certain bacteria, Am. Phys., ?, 174, ?.

18. Bragg, P.D. and Rainnie, D.J., The effect of silver ions on the respiratory chain of Escherichia coli, Can. J. Microbiol., 20, 883, 1974.

19. Buckley, W.R.: Localized Argyria, Arch. Dermatol. 88: 531-539, 1963.

20. Bult, A., Silver sulfanilamides and related compounds for dermatological application, First International Conference on Gold and Silver in Medicine, Bethesda, MD, May 13-14, 1987.

21. Burke, J.F., and Bondoc, C.C., Combined burn therapy utilizing immediate skin allografts and 0.5% AgNO3, Arch. Surg., 97, 716, 1968.

22. Burleson, R., and Eiseman, B., Mechanisms of antibacterial effect of biologic dressings, Ann. Surg., 177, 181, 1973.

23. Burleson, R., and Eiseman, B., Effect of skin dressings and topical antibiotics on healing of partial thickness skin wounds in rats, Surg. Gynecol. Obstet., 136, 958, 1973.

24. Butts, A., The chemical properties of silver, Silver-Economics, Metallurgy, and Use, ed. Butts, A., Krieger, Huntington, NY 1975, 123.

25. Carr, H.S., Wlodkowski, T.J., Rosenkranz, H.S., Silver-sulfadiazine: in vitro antibacterial activity, Antimicrob. Agents Chemother., 4, 585, 1973.



26. Chu, C.S., McManus, A.T., Okerberg, C.V., Mason, A.D., and Pruitt, B.A., Weak direct current accelerates split-thickness graft healing on tangentially excised second-degree burns, J. Burn Care Rehab., 12, 285, 1991.

27. Chu, C.S., McManus, A.T., Mason, A.D., Okerberg, C.V. and Pruitt, B.A., Multiple graft harvestings from deep partial-thickness scald wounds healed under the influence of weak direct current, J. Trauma, 30, 1044, 1990.

28. Chu, C.C., Tsai, W.C., Yao, J.Y., and Chiu, S.S., Newly made antibacterial braided nylon sutures. 1. In vitro qualitative and in vivo preliminary biocompatibility study, J. Biomed. Mater. Res., 21, 1281, 1987

29. Cieszynski, T., Influence of negative electricity on infected callus and osteitis, Acta Morphologica Acad. Sci. Hung., 15, 309, 1967.

30. Collinge, C.A., Goll, G., Seligson, D. and Easly, K.J., Pin tract infections: silver vs. uncoated pins. Orthopedics, 17, 445, 1994.

31. Colmano, G., Medical Applications of monomolecular films of silver, gold and other metals, International Conference on Gold and Silver in Medicine, Bethesda, MD, May 13-14, 1987.

32. Colmano, G., and Barranco, S.D., Inhibition of staphlococcus aureus on a contaminated electrode in the femur of the rabbit by low electrical current and its relation to stress, Biophys. J., 15, 28a, 1975.

33. Colmano, G., and Barranco, S.D., Staphlococcus aureus inhibition by low direct current on silver electrodes in the femur of rabbits. Fifty- third Annual meeting of the Virginia Academy of Science, Harrisonburg, VA, May 6-9, 1975.

34. Colmano, G., Edwards, S.S., Lesch, T.E., and Barranco, S.D., Control of Staphlococcus aureus osteomyelitis by microampere activation of metal ions in monomolecular films on stainless steel pins, Fifty-Third Annual Meeting of the Virginia Academy of Science, Harrisonburg, VA, May 6- 9, 1978

35. Colmano, G., Edwards, S.S., and Barranco, S.D. Activation of antibacterial silver coatings on surgical implants by direct current: preliminary studies in rabbits, 41, 964, 1980.

36. Colmano, G., Edwards, S.S., Fainter, L.K. and Barranco, S. D., Electronmicrographs of silver and stainless steel surgical implants coated with silver compounds to control S. Aureus by direct current activation, Twenty-eighth Annual ORS, New Orleans, LA, January 19-21, 1982.

37. Colmano, G., Edwards, S.S. and Barranco, S.L., Effects of low direct current on monomolecular layers of metal stearates coating electrodes in bacterial cultures and surgical implants, Symposium URSI "Ondes Electro-magnetiques et Biologie", Jouy-en-Josas, Juillet, 1980, 149.

38. Colmano, G., Fainter, L.K., Edwards, S.S., and Barranco, S.D., SEM of S. aureus on current-activated surgical pins coated with silver and silver stearate monolayers, Second Annual BRAGS, Oxford, U.K., Sept. 20-22, 1982.

39. Cowlishaw, J., Spadaro, J.A., Becker, R.A., Inhibition of enzyme induction in e. coli by anadoc silver, Journal of Bioelectricity, 1, 295, 1982.

40. Crannell, M.Y., Silver in Medicine, Silver-Economics, Metallurgy and Use, ed. Butts, A., Krieger, Huntington, NY, 1975, 227.

41. Cullen, J.M. and Spadaro, J.A., Axonal regeneration in the spinal cord: a role for applied electricity, Journal of Bioelectricity, 2, 57, 1983.

42. Danscher, G., Rytter Norgaard, J.O., and Baatrup, E., Autometallography: tissue metals demonstrated by a silver enhancement kit, Histochemistry, 86, 465, 1987.



43. Deitch, E.A., Marino, A.A., Gillespie, T.E., and Albright, J.A., Silver-nylon: a new antimicrobial agent, Antimicrob. Agents Chemother., 23, 356, 1983.

44. Deitch, E . A. , Marino, A. A . , Malaleonok, V. , and Alb richt, J . A . , Silver nylon cloth: in vitro and in vivo evaluation of antimicrobial activity, J. Trauma, 27, 301, 1987.

45. Doherty, P.J. and Williams, D.F., The response of cells and cellular enzymes to silver, presented at Biointeractions '87, Cambridge, U.K., July 6-8, 1987, 38.

46. Conahue, G.F., The analytical chemistry of silver,...

47. Eichhom, G.L., Shin, Y.A., Butzow, J.J., Clark, P., and Tarien, E., Interaction of metal ions with biological systems, with special reference to silver and gold, First International Conference on Gold and Silver in Medicine, Bethesda, MD, May 13-14, 1987.

48. Ellerman-Eriksen, S., Rungby, J., and Morgensen, S.C., Autointerference in silver accumulation in macrophages without affecting phagocytic, migratory or interferonproducing capacity, Virchows Arch., B. 53, 243, 1987.

49. Ersek, R.A., and Navarro, J.A., Maximizing wound healing with silver impregnated porcine xenograft, Today's OR Nurse, 12, 4, 1990.

50. Ersek, R.A., and Denton, D.R., Cross-linked silver-impregnated skin for burn wound management, J. Burn Care Rehabil., 9, 476, 1988.

51. Ersek, R.A., Gadaria, U., and Denton, D.R., New natural wound dressing, Phys. Ther. Forum, 5, 1, 1986.

52. Ersek, R.A., and Denton, D.R., Silver-impregnated porcine xenograft for damaged or missing skin, Contemp. Surgery, 23, 83, 1983.

53. Ersek, R.A., and Denton, D.R., Treatment of skin graft donor sites using silver-impregnated porcine xenograft, Contemp. Orthop., 12, 27, 1986.

54. Ersek, R. A. and Denton, D. R., Silver-impregnated porcine xenografts for treatment of meshed autografts, Plast. Surg., 13, 482, 1984.

55. Ersek, R.A. and Lorio, J., The most indolent ulcers of the skin treated with porcine xenografts and silver ions, Surg. Gynecol. Obstet., 158, 431, 1984.

56. Ersek, R.A., and Denton, D.R., Rhinophyma: treatment with electrocautery and silver-impregnated porcine xenograft, Plast. Reconstr. Surg., 74, 269, 1984.

57. Ersek, R.A., and Hachen, H.J., Porcine xenografts in the treatment of pressure ulcers, Ann. Plast. Surg., 5, 464, 1980.

58. Ersek, R.A., and Denton, D.R., Nail bed avulsions treated with porcine xenografts, J. Hand Surg., 10A, 152, 1985.

59. Ersek, R.A., Denton, D.R., Surak, G.M., and Peters, C.W., Treatment of spider bites with silver-impregnated porcine xenografts, Texas Med., 81, 32, 1985.

60. Falcone, A.E., and Spadaro, J.A., Inhibitory effects of electrically activated silver material on cutaneous wound bacteria, Plast. Reconstruc. Surg., 77, 455, 1986.



61. Flick, A.B., Clinical application of electrical silver iontophoresis, First International Conference on Gold and Silver in Medicine, Bethesda, MD, May 13-14, 1987.

62. Flowers III, R.H., Schwenzer, K.J., Kopel, R.F., Fisch, M.J., Tucker, S.I., and Farr, B.M., Efficacy of an attachable subcutaneous cuff for the prevention of intravascular catheter-related infection. JAMA, 261, 878, 1989.

63. Fox, C.L., Jr.: Silver Sulfadiazine - A New Topical Therapy for Pseudomonas in Burns; Arch. Surg., 96, 184-188 (1968)

64. Fox, C.L. and Modak, S.M., Mechanism of silver sulfadiazine action on burn wound infections, Antimicrob. Agents Chemother., 5, 582, 1974.

65. Fox, C.L. and Quintiliani, R., Uses of silver sulfadiazine in burns and surgical wounds, Inf. In Surg., 13, 1982.

66. Furst, A., Schlauder, M.C.: Inactivity of Two Noble Metals as Carcinogens; Jour. Environmental Pathology and Toxicology, 1, 51-57

67. Geddes, L.A., and Baker, L.E., chlorided silver electrodes, Med. Res. Eng., Third quarter, 33, 1967.

68. Golubovich, V.N., and Rabotnova, I.L., Kinetics of growth inhibition in Candida utilis by silver ions, Microbio., 43, 948, 1974.

69. Gristina, A.G., and Costerton, J.W., Bacterial adherence to Biomaterials and tissue, J. Bone Jt. Surg., 67-A, 264, 1985.

70. Gruen, L.C., Interaction of amino acids with silver ions, Biochim. Biophys. Acta, 386, 270, 1975.

71. Haeger, K., Preoperative treatment of leg ulcers with silver spray and aluminum foil, Acta Chir. Scand., 125, 32, 1963.

72. Hall, R.E., Bender, G., and Marquis, R.E., In vitro effects of ion intensity direct current generated silver on eukaryotic cells, J. Oral Maxillofac. Surg., 46, 128, 1988.

73. Hall, R.E., Bender, G., and Marquis, R.E., Inhibitory and cidal antimicrobial actions of electrically generated silver ions, J. Oral Maxillofac. Surg., 45, 779, 1987.

74. Halsted, W.S., Ligature and suture material: the employment of fine silk in preference to catgut and the advantages of transfixion of tissues and vessels in control of hemorrhage - also an account of the introduction of gloves, gutta-percha tissue and silver foil, JAMA, LX, 1119, 1913.

75. Harker, J.M., and Hunter, D.: Occupational Argyria, Br J. Dermatol. 47: 441-455, 1935.

76. Harrison, H.N., Pharmacology of Sulfadiazine silver, Arch. Surg., 114, 281, 1979.

77. Haynes, J.L., and Schulte, T.H., Antibacterial silver surfaces and assessment of needs and opportunities for clinical devices, First International Conference on Gold and Silver in Medicine, Bethesda, MD, May 13-14, 1987.

78. Hendry, A.T., and Stewart, I.O., Silver-resistant enterobacteriaceae from hospital patients, Can. J. Microbiol., 25, 915, 1979.



79. Holder, I.A., Knoll, C.A., and Wesselman, J., Norfloxacin and silvernorfloxacin as topical antimicrobial agents: results of in vitro susceptibility testing against bacteria and Candida sp. isolated from burn patients, First International Conference on Gold and Silver in Medicine, Bethesda, MD, May 13-14, 1987.

80. Janz, G.J., and Ives, D.J.G., Silver, silver chloride electrodes, Ann. N.Y. Acad. Sci., ?, 210, ?.

81. Jono, K., Yamano, T., Fujmoto, T., and Eguchi, Y.: Bactericidal Action of Active Carbon Coated with Silver and Its Application to Water Purifiers; J. Takeda Research Lab., 33, 9-18, (1974).

82. Jones, A.M., and Bailey, J.A.: Effect of Silver from Cloud Seeding on Rabbits; Water, Air and Soil Pollution, 3/3, 353-363 (1974).

83. Kahn, J., Acetic acid iontophoresis for calcium deposits, Phys. Ther., 57, 658, 1977.

84. Kahn, J., Calcium iontophoresis in suspected myopathy, Phys. Ther.

85. Kirchoff, D.A.: Localized Argyria After a Surgical Endodontic Procedure, Oral Surg. 32: 613-617, 1971.

86. Kramer, S.J., Spadaro, J.A. and Webster, D.A., Antibacterial and osteoinductive properties of demineralized bone matrix treated with silver, Clin. Orthop. Rell. Res., 161, 154, 1981.

87. Kul'skii, L.A., Savluk, O.S., Moroz, O.G., and Kornievakay, L.P.: Disinfection and Conservation of Water with Silver (Russian), Aktualne Vodoprovedeniye Sanitarniy Mikrobiologii, 111 (1973).

88. Landeen, L.K., Yahya, M.T., Kutz, S.M., Gerba, C.P.: Microbiological Evaluation of Copper: Silver Disinfection Units for Use in Swimming Pools; Water Science Tech., 21, 3, 267-270 (1989).

Lee, J.V., Hibberd, M.L. and Stanley, S.C.:
 A Comparison of the Biocidal Properties of Silver Ions and Chloride Against Legionella Species;
 PHLS Centre for Applied Microbiology and Research, Porton Down, Salisbury SP4 OJG, England, DD3/2 AGREPORT (1989).

90. McHugh, G.L., Moellering, R.C., Hopkins, C.C. and Swartz, M.N., Salmonella typhimurium resistant to silver nitrate, chloramphenicol and ampicilin, Lancet, ii, 235, 1975.

91. McNamara, A. and Williams, D.F., Scanning electron microscopy of the metal-tissue interface, Biomaterials, 3, 160, 1982.

92. MacKeen, P.C., Person, S., Warner, S.C., Snipes, W., and Stevens, S.E., Silver-coated nylon fiber as an antibac-terial agent, Antimicrob. Agents Chemother., 31, 93, 1987.

93. Madden, M.R., Nolan, E., Finkelstein, J.L., Yurt, R.W., Smeland, J., Goodwin, C.W., Hefton, J., and Staiano-Coico, L., Comparison of an occlusive and semi-occlusive dressing and the effect of the wound exudate upon keratinocyte proliferation,

J. Trauma, 29, 924, 1989.

94. Mahan, J., Seligson, D., Henry, S.L., Hynes, P., and Dobbins, J., Factors in pin tract infections, Orthopedics, 14, 305, 1991.

95. Maki, D.G., Cobb, L., Garman, J.K., Shapiro, J.M., Ringer, M., and Helgerson, R.B., An attachable silver-impregnated cuff for prevention of infection with central venous catheters: a prospective randomized multicenter trial, Am. J. Med., 85, 307, 1988.



96. Marchant, R.E., Miller, K.M. and Anderson, J.M., In vivo Leukocyte interactions with Biomer, J. Biomed. Mater. Res., 18, 1169, 1984.

97. Marino, A.A., Malakonok, V., Albright, J.A., Deitch, E.A. and Specian, R.D., Electrochemical properties of silver-nylon fabrics, J. Electrochem. Soc., 132, 68, 1985.

98. Marino, A.A., Electromagnetic fields, cancer and the theory of neuroendocrine related promotion, Bioelectrochem. Bioenergetics, 29- 255, 1993.

99. Marino, A.A., Deitch, E.A., Malakanok, V., Albright, J.A., and Specian, R. D., Electrical augmentation of the antimicrobial activity of silver-nylon fabrics, J. Biol. Phys., 12, 93, 1984.

100. Marino, A.A., Malakanok, V., Deitch, E.A., and Albright, J., Electrical properties of silver-nylon, Third Annual BRAGS, San Francisco, CA, Oct. 2-5, 1983, 36.

101. Marino, A.A., Deitch, E.A. and Albright, J.A., Electric silver antisepsis, IEEE Trans. Biomed. Eng., BME-32, 336, 1985.

102. Marino, A.A., Berger, T.J., Becker, R.O. and Spadaro, J.A., The effects of selected metals on marrow cells in culture, Chem. Biol. Interactions, 9, 217, 1974.

103. Marshall, J.P., and Schneider, R.P.: Systemic Argyria Secondary to Topical Silver Nitrate, Arch. Dermatol. 113: 1077-1079, 1977.

104. Mears, D.C., Electron-probe microanalysis of tissue and cells from implant areas, J. Bone Joint Surg., 48B, 567, 1966.

105. Merril, C.R., Silver-stain detection of proteins separated by polyacrylamide gel electrophoresis, First International Conference on Gold and Silver in Medicine, Bethesda, MD, May 13-14, 1987.

106. Modak, S.M. and Fox, F.L., Binding of silver sulfadiazine to the cellular components of Pseudomonas aeruginosa, Biochem. Pharmacol., 22, 2391, 1973.

107. Modak, S.M., Sampath, L., Fox, C.L.
Combined use of silver sulfadiazine and antibiotics topically in burn wounds as a possible solution to bacterial resistance,
First International Conference on Gold and Silver in Medicine, Bethesda, MD, May 13-14, 1987.

108. Modak, S.M., Sampath, Lester and Fox, C.L.: Combined Use of Silver Sulfadiazine and Antibiotics as a Possible Solution to Bacterial Resistance in Burn Wounds; Jour. Burn Care, Vol. 9, No. 4, p. 359 (July/Aug 1988).

109. Modak, S.M. and Fox, C.L. Sulfadiazine silver-resistant Pseudomonas in burns: new topical agents, Arch. Surg., 116, 854, 1981.

110. Nordenstrom, B.E.W. Biokinetic impacts of structure and imaging of the lung: the concept of biologically closed electric circuits. AJR, 145, 1985, 447.

111. Olcott, C.T.: Experimental Argyrosis, IV, Morphological Changes in the Experimental Animal; Am. Jour. of Pathology, 24, 813, (1948).

112. Orr, M.A., Electroplating....

113. Owen, M.C.R.: A Case History of 30 Years of Use with Silver Disinfected Drinking Water; Records of EPA Public Hearing on Revised Primary Drinking Water Regulations held Jan. 28, 1986.



114. Pareilleux, A. and Sizard, N., Lethal effects of electric current on Escherichia coli. Appl. Microbiol., 19, 421, 1970.

115. Pariser, R.J., Generalized argyria: Clinopathologic Features and Histochemistry, Arch. Dermatol., 114; 373-377, 1978.

116. Parker, W.A.: Argyria and Cyanotic Heart Disease, Am. J. Hosp. Pharm. 34: 287-789, 1977.

117. Pharmacology and Therapeutics; Pergamon Press, Series A, Vol. 1. 127-130 (1976).

118. Pifer, J.W., Fridlander, B.R., Kintz, R.T., and Stockdale, D.K., Absence of toxic effects in silver reclamation workers, Scand. J. Work Environ. Health, 15, 210, 1989.

119. Polachek, A.A., Cope, C.B., Willard, B.S., and Enns, T.: Metabolism of Radioactive Silver in a patient with Carcinoid; Jour. Lab. and Clinical Medicine, 56, 1976-1979 (1949).

120. Rich, L.L., Epinette, W.W., and Wasser, W.K.: Argyria Presenting as Cyanotic Heart Disease, Am J. Cardiol. 30: 290, 1972.

121. Rode, H. de Wet, P.M. and Cywes, S., Germicidal efficacy of silver sulfadiazine in burn wounds. First International Conference on Gold and Silver in Medicine, Bethesda, MD, May 13-14, 1987.

122. Ronchese, F.: Argyrosis and Cyanosis – Melanosis and Cyanosis, Arch. Dermatol. 80: 277-282, 1959.

123. Rosenberg, B., Van Camp, L., and Krigas, T., Inhibition of cell division in Escherrichia coli by electrolysis products from a platinum electrode, Nature, 205, 1965.

124. Rosenkranz, H.S. and Carr, H.S., Silver sulfadiazine: effect on the growth and metabolism of bacteria, Antimicrob. Agents Chemother., 2, 948-951, 1972.

125. Rosenkranz, H. S., Coward, J.E., Wlodkowski, T.J. and Carr, H. S. Properties of silver sulfadiazine-resistant enterobacter cloacae. Antimicrob. Agents Chemother., 5, 199, 1974.

126. Rosenkranz, H.S. and Rosenkranz, S., Silver sulfadiazine: interaction with isolated deoxyribonucleic acid, Antimicrob. Agents. Chemother., 2, 373, 1972.

127. Rosenman, K.D., Moss, A., Kon, S. Argyria: Clinical Implications of Exposure to Silver Nitrate and Silver Oxide; Jour. Occupational Med. 21, 430-435 (1979)

128. Ross, E.M.: Argyria Caused by Chewing of Photographic Film, N Engl. J. Med. 299: 798, 1963.

129. Rowley, B.A., and McKenna, J.M. Electrical current effects on E. coli growth rates (36269), P.S.E.B.M., 139, 929, 1972.

130. Rungby, J., Experimental argyosis: ultrastructural localization of silver in rat eye, Exp. Mol. Pathol., 45, 22, 1986.

131. Rungby, J., Exogenous silver in dorsal root ganglia, peripheral nerve, enteric ganglia and adrenal medulla, Acta Neuropathol. (Berlin), 69, 46, 1986.



132. Rungby, J., Ellerman-Eriksen, S. and Danscher, G., Effects of selenium on toxicity and ultrastructural localization of silver in cultured macrophages, Arch. Toxicol., 61, 40, 1987.

133. Rungby, J., Huffman, P., and Ellermann-Eriksen, S., Silver affects viability and structure of cultured mouse peritoneal macrophages and peroxidative capacity of whole mouse liver, Arch. Toxicol., 59, 408, 1987.

134. Savluk, O.S.: Influence of Anodically Dissolved Silver on the Reticuloendothelial System in Test Animals (Russian); Vodopodgotovka I Ochistka Promyshlennyh Stokov, 10, 72-77 (1973).

135. Schaefer, A.J., K.O. and Johnson, S.M., Effect of silver oxide/trichloroisocyanuric acid antimicrobial urinary drainage system on catheter associated bacteriuria, J. Urol., 139, 69, 1988.

136. Shafik, A., The electrified drain. A new device for sterilizing the field of drainage, Int. Surg., 78, 357, 1993.

137. Sobotka, H., Monomolecular laters,....

138. Spadaro, J.A., Silver anode inhibition of bacteria, First International Conference on Gold and Silver in Medicine, Bethesda, MD, May 13-14, 1987.

139. Spadaro, J.A., Antibacterial effects of silver electrodes, Third Ann. Conf. Eng. Med. Biol. Soc. of IEEE, 1981, 215.

140. Spadaro, J.A., Bioelectric stimulation of bone formation: methods, models and mechanisms, J. Bioelect., 1, 99, 1982.

141. Spadaro, J.A., Electrically stimulated bone growth in animals and man. Clin. Orthop. Rel. Res., 122, 325, 1977.

142. Spadaro, J.A., Bone formation arterial inhibition with silver and other electrodes, Reconstr. Surg. Traumat. 19, 40, 1985.

143. Spadaro, J.A., Electrical osteogenesis - role of the electrode material, Elect. Prop. Bone Cartillage, 189, 1979.

144. Spadaro, J.A., Electrically enhanced osteogenesis at various metal cathodes, J. Biomed. Mat. Res., 16, 861, 1982.

145. Spadaro, J.A. and Becker, R.O., Function of implanted cathodes in electrode-induced bone growth, Med. Biol. Eng. Compuit., 17, 769, 1979.

146. Spadaro, J.A. and Becker, R.O. Some specific cellular effects of electrically injected silver and gold ions, Bioelectrochem. Bioenergetics, 3, 49, 1976.

147. Spadaro, J.A. and Becker, R.O., Size-specific metal complexing sites in native collagen, Nature, 225, 1134, 1970.

148. Spadaro, J.A., Berger, T.J., Barranco, S.D., Chapin, S.E., and Becker, R.O., Antibacterial effects of silver electrodes with weak direct current, Microb. Agents. Chemother., 6, 637, 1974.

149. Spadaro, J.A., Chase, S.E., and Webster, D.A., Bacterial inhibition by electrical activation of percutaneous silver implants, J. Biomed. Mater. Res., 20, 565, 1986.



150. Spadaro, J.A., Kramer, S.J., and Webster, D.A., Antibacterial demineralized bone matrix using silver, 28th Annual ORS, New Orleans, LA, Jan. 19-21, 1982.

151. Spadaro, J.A., Mino, D.E. and Chase, S.E., Bone formation without current: The effect of electrode motion, 30th Annual ORS, Atlanta, GA, Feb. 7-9, 1984, 69.

152. Spadaro, J.A., Mino, D.E., Chase, S.E., Werner, F.W. and Murray, D.G., Mechanical factors in electrode-induced osteogenesis, J. Orthop. Res., 4, 37, 1986.

153. Spadaro, J.A., Webster, D.A., Chapin, S.E., Yuan, H.A., Murray, D.G. and Becker, R.O. Silver-PMMA antibacterial bone cement, 24th Annual ORS, Dallas, TX, Feb. 21-23, 1978, 173.

154. Spadaro, J.A., Webster, D.A. and Chase, S.E., Direct current activation of bacteriostatic silver electrodes, Third Annual BRAGS, San Francisco, CA, Oct. 2-5, 1983.

155. Spadaro, J.A., Webster, D.A., and Becker, R.O., Silver polymethyl methacrylate antibacterial bone cement, Clin. Orthop. 143, 266, 1979.

156. Spadaro, J.A., Webster, D.A., Kovach, J. and Chase, S.E. Antibacterial fixation pins with silver: animal models, 30th Annual ORS, Atlanta, GA, Feb. 7-9, 1984, 335.

157. Tarr, R., Luck, J.V., Snyder, S. and Mills, B., Laboratory experiences with silver electrode bone stimulation, 29th Annual ORS, Anaheim, CA, March 8-10, 1983, 253.

158. Taubes, G., An electrifying possibility, Discover, 7, 23, 1986.

159. Thibodeau, E.A., Handelman, S.L. and Marquis, R.E., Inhibition and killing of oral bacteria by silver ions generated with low intensity direct current, J. Dent. Res., 57, 922, 1978.

160. Thurman, R.B., and Gerba, C.P.: The Molecular Mechanisms of Copper and Silver Ion Disinfection of Bacteria and Viruses; CRC Critical Reviews in Environmental Control, Vol. 18, Issue 4 (1989). Extensive bibliography.

161. Tsai, W.C., Chu, C.C., Chin, S.S. and Yao, J.Y., In vitro quantitative study of newly made antibacterial braided nylon sutures, Surg. Gynecol. Obstet., 165, 207, 1987.

162. Vince, D.G. and Williams, D.F., Determination of silver in blood and urine by graphite furnace atomic absorption spectrometry, Analyst, 112, 1627.

163. Vince, D.G. and Williams, D.F., Systemic distribution of metals following implantation, presented at Biointeractions '87, Cambridge, U.K., July 6-8, 1987, 40.

164. Wataha, J.C., Hanks, C.T. and Craig, R.G., The effect of cell monolayer density on the cytotoxicity of metal ions released from dental alloys, Dent. Mater., 9, 172, 1993.

165. Watts, S.H., The silver bolt as a means of fixing ununited fractures of certain long bones. Johns Hopkins Hospital Bulletin, April 1904, 135.

166. Webster, D.A., Spadaro, J.A., Kramer, S., and Becker, R.O., Silver anode treatment of chronic osteomyelitis, Clin. Orthop., 1961, 105, 1981.

167. West, H.D., Johnson, A.P., and Johnson, C.W.: The Use of Radioactive Silver for the Detection of Abscesses and Tumors; Jour. Lab. and Clinical Medicine, 34, 1976-1979 (1949).



168. Whalberg, Vivian: The Crede Prophylaxis; Acta Paediatrica Scandinavica, Supplement 295, Stockholm 1982.

169. Williams, D.F. The biocompatibility of silver, First International Conference on Gold and Silver in Medicine, Bethesa, MD, May 13-14, 1987.

170. Williams, D.F., Definitions in Biomaterials, Essevier, Amsterdam, 1987.

171. Williams, D.F., and Doherty, P.J. and Oliver, C., The analysis of inflammatory exudates in the assessment of biocompatibility, presented at Biointeractions '87, Cambridge, U.K., July 6-7, 1987, 22.

172. Williams, R.L., Doherty, P.J., Vince, D.G., Grashoff, G.J. and Williams, D.F., The biocompatibility of silver, Critical Reviews in Biocompatibility, 5, 221, 1989.

173. Williams, R.L. and Williams, D.F., Albumin absorption on metal surfaces, Biomaterials, 1988.

174. Williams, R.L. and Williams, D.F., The spatial resolution of protein absorption on ogeneous metallic biomaterials, J. Biomed. Mater. Res., 23, 339, 1989.

175. Williams, R.L. and Williams, D.F., The effect of albumin on the wettability of pure metal and metal oxide surfaces, J. Colloid Interface Sci., 126, 596, 1988.

176. Wlodkowski, T.J. and Rosenkranz, H.S., Antifungal activity of silver sulphadiazine, Lancet, 1972, 739.

177. Wysor, M.S. and Zollinhofer, R.E., On the mode of action of silver sulfadiazine, Pathol. Microbiol., 38, 296, 1972.

178. Wysor, M.S. and Zollinhofer, R.E., Silver phosphanilamidopyrimidine, Chemother. 18, 342, 1973.

179. Wysor, M.S. and Zollinhofer, R.E., Reactivity of silver sulfadiazine and the silver uracils with the glucose oxidase of Aspergillus niger, Enzyme, 14, 185, 1972-73.

180. Wysor, M.S. and Zollinhofer, R.E., Deoxyribonucleic acid repair replication in Pseudomonas aeroginosa after sublethal doses of silver sulfadiazine, Path. Microbiol. 39, 434, 1973.

181. Wolcott, L.E., Wheeler, P.C., Hardwicke, H.M. and Rowley, B.A., Accelerated healing of skin ulcers by electrotherapy: preliminary clinical results, Southern Med. J., 62, 795, 1969.

182. Zimmerman, R.L.,Piezoelectricity and biological materials,J. Bioelectricity, 1, 265, 1982.

183. Zmener, O. and Dominguez, F., Silver accumulations in periapical granulomas: report of five cases using the scanning electron microscope, the electron microprobe and other complementary methods. Oral Surg. Oral Med. Oral Pathol., 65, 94, 1988.