

Paul B. Savage Publication List

132. Trainor, E. A.; Horton, K. E.; Savage, P. B.; Testerman, T. L.; McGee, D. J. Infect. Immun. **2011**, 79, 88-97. The role of the HefC efflux pump in Helicobacter pylori cholesterol-dependent resistance to ceragenins and bile salts.
131. Braun, N. A.; Mendez-Fernandez, Y. V.; Covarrubias, R.; Porcelli, S. A.; Savage, P. B.; Yagita, H.; Van Kaer, L.; Major, A. S. Arterialsclerosis Thrombosis Vasc. Biol. **2010**, 30, 1758-U178. Development of spontaneous anergy in invariant natural killer T cells in a mouse model of dyslipidemia.
130. Epanet, R. F.; Pollard, J. E.; Wright, J. O.; Savage, P. B.; Epanet, R. M. Antimicrob. Agents Chemother. **2010**, 54, 3708-3717. Depolarization, bacterial membrane composition and the antimicrobial action of ceragenins.
129. Smith, P. A.; Lepage, C. J.; Lukacs, M.; Martin, N.; Shufutinsky, A.; Savage, P. B.. Int. J. Mass Spectrosc. **2010**, 295, 113-118. Field-portable gas chromatography with transmission quadrupole and cylindrical ion trap mass spectrometric detection: chromatographic retention index data and ion/molecule interactions for chemical warfare agent identification.
128. Semmling, V.; Lukacs-Kornek, V.; Thaiss, C. A.; Quast, T.; Hochheiser, K.; Panzer, U.; Rossjohn, J.; Perlmutter, P.; Cao, J.; Godfrey, D. I.; Savage, P. B.; Knolle, P. A.; Kolanus, W.; Förster, I., Kurts, C. Nature Immunol. **2010**, 11, 313-U57. Alternative cross-priming through CCL17/CCR4-mediated CTL attraction towards NKT cell-licensed dendritic cells.
127. Bucki, R.; Leszczynska, K.; Byfield, F. J.; Fein, D. E.; Won, E.; Cruz, K.; Namiot, A.; Kulakowska, A.; Namiot, Z.; Savage, P. B.; Diamond, S.; Janmey, P. A. Antimicrob. Agents Chemother. **2010**, 54, 2525-2533. Combined antibacterial and anti-inflammatory activity in a cationic disubstituted dexamethasone spermine conjugate (D2S).
126. Lee, H.-H.; Meyer, E. H.; Goya, S.; Pichavant, M.; Kim, H. Y.; Umetsu, S. E.; Jones, J. C.; Savage, P. B.; Casasnovas, J. M.; Kaplan, G.; Freeman, G. J.; DeKruyff, R. H.; Umetsu, D. T. J. Immunology **2010**, 185, 522-5235. Apoptotic cells activate NKT cells through Ig-like mucin-like-1 resulting in airway hyperreactivity.

125. Lara, D.; Feng, Y.; Bader, J.; Savage, P. B.; Maldonado, R. A. *J. Parasitol.* **2010**, 96, 638-642. Anti-trypanosomatid activity of ceragenins.
124. Monine, M. I.; Posner, R. G.; Savage, P. B.; Faeder, J. R.; Hlavacek, W. S. *Biophys. J.* **2010**, 95, 48-56. Modeling multivalent ligand-receptor interactions with steric constraints on configurations of cell-surface receptor aggregates.
123. Freigang, S.; Zadorozhny, V.; McKinney, M.; Krebs, P.; Schrantz, N.; Masuda, K.; Liu, Y.; Savage, P. B.; Bendelac, A.; Cravatt, B. F.; Teyton, L. *J. Clin. Invest.* **2010**, 120, 1873-1884. Fatty acid amide hydrolyase shapes NKT cell responses by regulating the serum transport of lipid antigen.
122. Pollard, J.; Wright, J.; Feng, Y.; Geng, D.; Genberg, C.; Savage, P. B.. *Anti-Infectives in Medicinal Chemistry* **2009**, 8, 290-294. Activities of ceragenin CSA-13 against established biofilms in an in vitro model of catheter decolonization.
121. Leszczynska, K.; Namiot, A.; Fein, D. E.; Wen, Q.; Namiot, Z.; Savage, P. B.; Diamond, S.; Janmey, P. A.; Bucki, R. Bactericidal activities of the cationic steroid CSA-13 and the cathelicidin peptide LL-37 against Helicobacter pylori in simulated gastric juice. *BMC Microbiol.* **2009**, 9, 187.
120. Morshed, S. R.; Takahashi, T.; Savage, P. B.; Kambham, N.; Strober, S. *Clin. Immunol.* **2009**, 132, 321-333. b-galactosylceramide alters invariant natural killer T cell function and is effective treatment for lupus.
119. Howell, M. D.; Streib, J. E.; Kim B. E.; Lesley, L.; Dunlap, A.; Geng, D.; Savage, P. B.; Leung, D. Y. M. *J. Invest. Dermatol.* **2009**, 129, 2668-2675. Ceragenins: a new class of anti-viral compounds to treat orthopox infections.
118. Yin, N.; Long, X.; Goff, R. D.; Zhou, D.; Cantu, C.; Mattner, J.; Saint Mezard, P.; Teyton, L.; Bendelac, L.; Savage, P. B. *ACS Chem. Biol.* **2009**, 4, 191-197. Alpha anomers of iGb3 and Gb3 stimulate cytokine production by natural killer T cells. PMCID: PMC2843501
117. Kim, H. Y.; Pichavant, M.; Matangkasombut, P.; Koh, Y. I., Savage, P. B.; DeKruyff R. H.; Umetsu, D. T. *J. Immunol.* **2009**, 182, 3252-3261. The development of airway hyperreactivity in T-bet-deficient mice requires CD1d-restricted NKT cells.

116. Bai, L.; Sagiv, Y.; Liu Y.; Freigang, S.; Yu, K. A. O.; Teyton, L.; Porcelli, S. A.; Savage, P. B.; Bendelac, A. Proc. Natl Acad. Sci. **2009**, 106, 10254-10259. Lysosomal recycling terminates CD1d-mediated presentation of short and polyunsaturated variants of the NKT cell lipid antigen aGalCer.
115. Roohi, S.; Amir, N.; Ahmed, M.; Savage, P. B.; Saluhiddin, S. M.; Jehangir, M. J. Radioanal. Nuclear Chem. **2009**, 97, 57-62. Synthesis, quality control and biological evaluation of ^{99m}Tc labeled CSA-13.
114. Farruggia, G.; Iotti, S.; Prodi, L.; Zaccheroni, N.; Montalti, M.; Savage, P. B.; Andreani, G.; Trapani, V.; Wolf, F. I. J. Fluorescence **2009**, 19, 11-19. A simple spectrofluorometric assay to measure total intracellular magnesium by a hydroxyquinoline derivative.
113. Isogai, E.; Isogai, H.; Takahashi, K.; Okumura, K.; Savage, P. B.. Oral Microbiol. Immunol. **2009**, 24, 170-172. Ceragenin CSA13 exhibits antimicrobial activity against cariogenic and periodontopathic bacteria.
112. Epand, R. M.; Epand, R. F.; Savage, P. B.. Drug News Perspect. **2008**, 21, 307-311. Ceragenins (cationic steroid compounds), a novel class of antimicrobial agents.
111. Saha, S.; Savage, P. B.; Bal M. J. Appl. Microbiol. **2008**, 105, 822-828. Enhancement of the efficacy of erythromycin in multiple antibiotic-resistant gram-negative bacterial pathogens.
110. Koh, Y. I.; Kim, H. Y.; Meyer, E. H.; Pichavant, M.; Akabri, O.; Yasumi, T.; Savage, P. B.; DeKruyff, R. H.; Umetsu, D. T. J. Immunol. **2008**, 181, 4560-4569. Activation of nonclassical CD1d restricted natural killer T cells induces airway hyperreactivity in b2-microglobulin deficient mice.
109. Lai, X.-Z.; Feng, Y.; Pollard, J.; Chin, J. N.; Rybak, M. J.; Bucki, R.; Epand, R. F.; Epand, R. M.; Savage, P. B.. Acc. Chem. Res. **2008**, 41, 1233-1240. Ceragenins: cholic acid-based mimics of antimicrobial peptides.
108. Pichavant, M.; Goya, S.; Meyer, E. H.; Johnston, R. A.; Kim, H. Y.; Matagkasombut, P.; Zhu, M.; Iwakura, Y.; Savage, P. B.; DeKruyff, R. H.; Shore, S. A.; Umetsu, D. T. J. Exp. Med. **2008**, 205, 385-393. Ozone exposure in a mouse model

induces airway hyperreactivity that requires the presence of natural killer T cells and IL-17.

107. Mattner, J.; Savage, P. B.; Leung, P.; Oertelt, S. S.; Wang, V.; Trivedi, O.; Scanlon, S. T.; Teyton, L.; Hart, J.; Ridgway, W. M.; Wicker, L. S.; Gershwin, E. M.; Bendelac, A. *Cell Host Microbe* **2008**, 3, 304-315. Liver autoimmunity triggered by microbial activation of NKT cells.
106. Matangkasombut, P.; Pichavant, M.; Yasumi, T.; Hendricks, C.; Savage, P. B.; DeKruyff, R. H.; Umetsu, D. T. *J. Allergy Clin. Immunol.* **2008**, 121, 1287-1289. Direct activation of natural killer T cells induces airway hyprractivity in nonhuman primates.
105. Fuangswasdi, S.; Kaveevivitchai, N.; Tuntulani, T.; Savage, P. B.. *J. Solution Chem.* **2008**, 37, 45-58. Complexing properties of phenolic diazacrown ethers with transition and heavy metal ions.
104. Zajonc, D.; Savage, P. B.; Bendelac, A.; Wilson, I.; Teyton, L. *J. Mol. Biol.* **2008**, 377, 1104-1116. Crystal structures of mouse CD1d-iGb3 complex and its cognate Va14 T cell receptor suggest a model for dual recognition of foreign and self glycolipids.
103. Bucki, R.; Namiot, D. B.; Namiot, Z.; Savage, P. B.; Janmey, P. A. *J. Antimicrob. Chemother.* **2008**, 62, 329-335. Salivary mucins inhibit antibacterial activity of cathelicidin-derived LL-37 peptide but not the cationic steroid CSA-13.
102. Savage, P. B.; Nielsen, J.; Lai, X.-Z.; Feng, Y.; Li, Y.; Nelson, G.; Linford, M. R.; Genberg, C. Antibacterial activities of thin films containing ceragenins. In Camesano, T.A. and Mello, C. (Eds.). *Microbial Surfaces: Structure, Interactions and Reactivity*. ACS Symposium Series 984, Washington, D.C.: American Chemical Society, **2008**, 65-78.
101. Liu, Y.; Deng, S.; Bai, L.; Freigang, S.; Mattner, J.; Teyton, L.; Bendelac, A.; Savage, P. B. *Bioorg. Med. Chem. Lett.* **2008**, 18, 3052-3055. Synthesis of diglycosylceramides and evaluation of their iNKT cell stimulatory properties. PMCID: PMC2846726
100. Chin, J. N.; Jones, R. N.; Sader, H. S.; Savage, P. B.; Rybak, M. J. *J. Antimicrob. Chemother.* **2008**, 61, 365-370. Potential synergy activity of the novel ceragenin, CSA-

13 against clinical isolates of *Pseudomonas aeruginosa*, including multi-drug resistant *P. aeruginosa*.

99. Posner, R. G.; Geng, D.; Haymore, S.; Bogert, J.; Pecht, I.; Licht, A.; Savage, P. B.. Org. Lett. **2007**, 9, 3551-3554. Trivalent antigens for degranulation of mast cells.
98. Long, X.; Deng, S.; Zang, Z.; Mattner, J.; Zhou, D.; McNary, N.; Goff, R. D.; Teyton, L.; Bendelac, A.; Savage, P. B.. Nature Chem. Biol. **2007**, 3, 559-564. Synthesis and evaluation of stimulatory properties of *Sphingomonadacea* glycolipids.
97. Epand, R. F.; Savage, P. B.; Epand, R. M. Biochim. Biophys. Acta **2007**, 1768, 2500-2509. Bacterial lipid composition and the antimicrobial efficacy of cationic steroid compounds (ceragenins).
96. Sagiv, Y.; Bai, L.; Wei, D. G.; Agami, R.; Savage, P. B.; Teyton, L.; Bendelac, A. J. Exp. Med. **2007**, 204, 921-928. A distal effect of microsomal triglyceride transfer protein deficiency on the lysosomal recycling of CD1d.
95. Michel, M.-L.; Keller, A. C.; Paget, C.; Fujio, M.; Trottein, F.; Savage, P. B.; Wong, C. H.; Schneider, E.; Dy, M.; Liete de Moraes, M. J. Exp. Med. **2007**, 204, 995-1001. Identification of a new IL-17-producing iNKT cell subset involved in airway neutrophilia.
94. Meyer, E. H.; Wurbel, M. A.; Staton, T. L.; Pichavant, M.; Savage, P. B.; Kan, M. J.; DeKruyff, R.; Butcher, E. C.; Campbell, J. J.; Umetsu, D. Immunity **2007**, 179, 4661-4671. iNKT cells require CCR4 to localize to the airways and to induce airway-hyperreactivity.
93. Chin, J. N.; Rybak, M. J.; Cheung, C. M.; Savage, P. B.. Antimicrob. Agents Chemother. **2007**, 51, 1268-1273. Antimicrobial activity of novel ceragenins against clinical isolates of resistant *Staphylococcus aureus*.
92. Bendelac, A.; Savage, P. B.; Teyton, L. Annual Rev. Immunol. **2007**, 25, 297-336. Biology of NKT cells.
91. Schrantz, N.; Sagiv, Y.; Liu, Y.; Savage, P. B.; Bendelac, Teyton, L. J. Exp. Med. **2007**, 204, 841-852. The Niemann-Pick Type C2 protein loads

isoglobotrihexosylceramide onto CD1d molecules and contributes to the thymic selection of NKT cells.

90. Bucki, R.; Sostarecz, A. G.; Byfield, F. J.; Savage, P. B.; Janmey, P. A. *J. Antimicrob. Chemother.* **2007**, 60, 535-545. Resistance of the antibacterial agent ceragenin CSA-13 to inactivation by DNA of F-actin, and its activity in cystic fibrosis sputum.
89. Savage, P. B.; Bendelac, A.; Teyton, L. *Chem. Soc. Rev.* **2006**, 35, 771-779. Glycolipids for natural killer T cells.
88. Sagiv, Y.; Hudspeth, K.; Mattner, J.; Schrantz, N.; Stern, R. K.; Zhou, D.; Savage, P. B.; Teyton, L.; Bendelac, A. *J. Immunol.* **2006**, 177, 26-30. Cutting edge: Impaired glycosphingolipids trafficking and NKT cell development in mice lacking Niemann-Pick Type C1 protein.
87. Campos-Martín, Y.; Colmenares, M.; Gozalbo-López, B.; López-Núñez, M.; Savage, P. B.; Martínez-Naves, E. *J. Immunol.* **2006**, 176, 6172-6179. Immature human dendritic cells infected with *Lieshmania infantum* are resistant to NK-mediated cytolysis but are efficiently recognized by NKT cells.
86. Wei, D. G.; Curran, S. A.; Savage, P. B.; Teyton, L.; Bendelac, A. *J. Exp. Med.* **2006**, 203, 1197-1207. Mechanisms imposing the V-beta bias of V-alpha-14 NKT cells and consequences for microbial glycolipid recognition.
85. Meyer, E. H.; Goya, S.; Akbari, O.; Berry, G. J.; Savage, P. B.; Kronenberg, M.; Nakayama, T.; DeKruyff, R. H.; Umetsu, D. T. *Proc. Natl Acad. Sci.* **2006**, 103, 2782-2787. Glycolipid mediated activation of iNKT cells is sufficient to induce airway hyperreactivity independent of conventional CD4+ T cells.
84. Liu, Y.; Goff, R. D.; Zhou, D.; Mattner, J.; Sullivan, B. A.; Khurana, A.; Cantu, C.; Altman, J. D.; Teyton, L.; Bendelac, A.; Savage, P. B.. *J. Immun. Methods* **2006**, 312, 34-39. A modified a-galactosyl ceramide for staining and stimulating natural killer T cells.
83. Farruggia, G.; Iotti, S.; Prodi, L.; Montalti, M.; Zaccheroni, N.; Savage, P. B.; Trapani, V.; Sale, P.; Wolf, F. I. *J. Am. Chem. Soc.* **2006**, 127, 344-350. 8-Hydroxyquinoline derivatives as fluorescent sensors for magnesium in living cells.

82. Kichler, A.; Leborgne, C.; Savage, P. B.; Danos, O. J. Controlled Release **2005**, 107, 174-182. Cationic steroid antibiotics demonstrate DNA delivery properties.
81. Zajonc, D. M.; Cantu, C. III; Mattner, J.; Zhou, D.; Savage, P. B.; Bendelac, A.; Wilson, I. A.; Teyton, L. Nature Immunol. **2005**, 6, 810-818. Structure and function of a potent a-galactosylceramide agonist for the semi-invariant NKT cell receptor.
80. Mattner, J.; DeBord, K. L.; Goff, R. D.; Cantu, C.; Zhou, D.; Saint-Mezard, P.; Wang, V.; Gao, Y.; Yin, N.; Hoebe, K.; Schneewind, O.; Ismail, N.; Walker, D.; Buetler, B.; Teyton, L.; Savage, P. B.; Bendelac, A. Nature **2005**, 434, 525-528. Both exogenous and endogenous glycolipid antigens activate NKT cells during microbial infections.
79. Bronson, R. T.; Michaelis, D. J.; Lamb, R. D.; Husseini, G. A.; Farnsworth, P. B.; Linford, M. A.; Izatt, R. M; Bradshaw, J. S.; Savage, P. B. Org. Lett. **2005**, 7, 1105-1108. Efficient immobilization of a cadmium chemosensor in a thin film: generation of a cadmium sensor prototype.
78. Lua, Y. Y.; Fillmore, W. J. J.; Yang, L.; Lee, M. V.; Savage, P. B.; Asplund, M. C.; Linford, M. R. Langmuir **2005**, 21, 2093-2097. First reaction of a bare silicon surface with acid chlorides and a one-step preparation of a acid chloride terminated monolayers on scribed silicon.
77. Lua, Y. Y.; Yang, L.; Pew, C. A.; Zhang, F.; Fillmore, W. J. J.; Bronson, R. T.; Sathyapalan, A.; Savage, P. B.; Whittaker, J. D.; Davis, R. C.; Linford, M. R. J. Am. Soc. Mass Spec. **2005**, 16, 1575-1582. Polyelectrolytes as new matrices for secondary ion mass spectrometry.
76. Zhou, D.; Mattner, J.; Cantu, C.; Schrantz, N.; Yin, N.; Gao, Y.; Sagiv, Y.; Hudspeth, K.; Wu, Y.; Yamashita, T.; Teneberg, S.; Wang, D.; Proia, R.; Levery, S. B.; Savage, P. B.; Teyton, L.; Bendelac, A. Science **2004**, 306, 1786-1789. Lysosomal glycosphingolipid recognition by NKT cells.
75. Ding, B.; Taotafa, U.; Orsak, T.; Chadwell, M.; Savage, P. B. Org. Lett. **2004**, 6, 3433-3436. Synthesis and characterization of peptide-cationic steroid antibiotic conjugates.

74. Ding, B.; Yin, N.; Liu, Y.; Cardenas-Garcia, J.; Evanson, R.; Orsak, R.; Fan, M.; Turin, G.; Savage, P. B. *J. Am. Chem. Soc.* **2004**, 126, 13642-13648. Origins of cell selectivity of cationic steroid antibiotics.
73. Goff, R. D.; Gao, Y.; Mattner, J.; Zhou, D.; Yin, N.; Cantu, C. III; Teyton, L.; Bendelac, A.; Savage, P. B. *J. Am. Chem. Soc.* **2004**, 126, 13602-13603. Effects of lipid chain lengths in a-galactosylceramides on cytokine release by natural killer T cells.
72. Bronson, R. T.; Montalti, M.; Prodi, L.; Zaccheroni, N.; Lamb, R. D.; Dalley, N. K.; Izatt, R. M.; Bradshaw, J. S.; Savage, P. B. *Tetrahedron* **2004**, 60, 11139-11144. Origins of "on-off" fluorescent behavior of 8-hydroxyquinoline-containing chemosensors.
71. Zhou, D.; Cantu, C. C.; Sagiv, Y.; Kulkarni, A. B.; Qi, X.; Morales, C.; Grabowski, G. A.; Benlagha, K.; Savage, P. B.; Bendelac, A. Teyton, L. *Science* **2004**, 303, 523-527. Editing of Cd1-bound lipid antigens by endosomal lipid transfer proteins.
70. Xue, G.; Bradshaw, J. S.; Dalley, N. K.; Savage, P. B.; Izatt, R. M. *J. Heterocyclic Chem.* **2003**, 40, 383-388. Synthesis of trans-disubstituted cyclam ligands appended with two 6-hydroxymethylpyridin-2-ylmethyl sidearms: crystal structures of the 1,8-dimethyl-4,11-di(6-hydroxymethylpyridin-2-ylmethyl)cyclam ligand and its Co(II) and Ni(II) complexes.
69. Hook, G. L.; Kimm, G.; Betsinger, G.; Savage, P. B.; Swift, A.; Logan, T.; Smith, P. A. *J. Sep. Sci.* **2003**, 26, 1091-1096. Solid phase microextraction sampling and gas chromatography/mass spectrometry for field detection of the chemical warfare agent O-ethyl-S-(s-diisopropylaminoethyl)methylphosphonothiolate (VX).
68. Song, H.-C.; Chen, Y.W.; Yao, J.-H.; Bradshaw, J. S.; Savage, P. B.; Izatt, R. M. *J. Heterocyclic Chem.* **2003**, 40, 475-479. Synthesis of diazadithiacrown ethers containing appended coumarin or 1-aminonaphthalene sidearms.
67. Hook, G. L.; Kimm, G.; Koch, D.; Savage, P. B.; Ding, B.; Smith, P. A. *J. Chrom. A* **2003**, 992, 1-9. Detection of VX contamination in soil through solid-phase microextraction sampling and gas chromatography-mass spectrometry of the VX degradation product bis(diisopropylaminoethyl)disulfide.

66. Cantu, C.; Benlagha, K.; Savage, P. B.; Bendelac, A.; Teyton, L. J. Immunol. 2003, 170, 4673-4682. The paradox of immune molecular recognition of a-galactosylceramide: low affinity, low specificity for CD1d, high affinity for ab T cell receptors.

65. Yin, N.; Marshall, R. L.; Matheson, S.; Savage, P. B. J. Am. Chem. Soc. **2003**, 126, 2426-2435. Synthesis of lipid A derivatives and their interactions with polymyxin B and polymyxin B nonapeptide.

64. Kawakami, J.; Bronson, R. T.; Xue, G.; Bradshaw, J. S.; Izatt, R. M.; Savage, P. B. Supramol. Chem. **2003**, 1, 221-227. Characterization of bis-8-hydroxyquinoline-armed diazatrithia-16-crown-5 and diazadibenzo-18-crown-6 ligands as fluorescent chemosensor for zinc.

63. Savage, P. B.; Li, C.; Taotafa, U.; Ding, B.; Guan, Q. FEMS Lett. **2002**, 217, 1-7. Antibacterial properties of cationic steroid antibiotics.

62. Zhou, X. T.; Forestier, C.; Goff, R. D.; Li, C.; Teyton, L.; Bendelac, A.; Savage, P. B. Org. Lett. **2002**, 4, 1267-1270. Synthesis and NKT cell stimulating properties of fluorophore and biotin appended 6"-amino-6"-deoxy-galactosylceramides.

61. Posner, R. G.; Savage, P. B.; Peters, A. S.; Macias, A.; DelGado, J.; Schwarz, G.; Sklar, L. A.; Hlavacek, W.; Goldstein, B. Molecular Immunol. **2002**, 38, 1221-1228. A quantitative approach for studying IgE-Fc ϵ RI aggregation.

60. Chiu, Y.-H.; Park, S.-H.; Benlagha, K.; Forestier, C.; Jayawardena-Wolf, J.; Savage, P. B.; Teyton, L.; Bendelac, A. Nature Immunol. **2002**, 3, 55-60. Multiple defects of antigen presentation and T cell development in mice expressing tail-truncated CD1d.

59. Kluchinsky, T. A. Jr.; Savage, P. B.; Fitz, R.; Smith, P. A. AIHA Journal **2002**, 63, 493-496. Liberation of hydrogen cyanide and hydrogen chloride during high temperature dispersion of CS riot control agent.

58. Ding, B.; Guan, Q.; Walsh, J. P.; Boswell, J. S.; Winter, T. W.; Winter, E. S.; Boyd,

S. S.; Li, C.; Savage, P. B. J. Med. Chem. **2002**, 45, 663-669. Correlation of the antibacterial activities of cationic peptide antibiotics and cationic steroid antibiotics.

57. Savage, P. B. Curr. Med. Chem. Anti-Infective Agents **2002**, 3, 293-304. Cationic steroid antibiotics.

56. Savage, P. B. European J. Org. Chem. **2002**, 759-768. Design, synthesis and characterization of cationic peptide and steroid antibiotics.

55. Xue, G.-P.; Bradshaw, J. S.; Dalley, N. K.; Savage, P. B.; Izatt, R. M.; Prodi, L.; Montalti, M.; Zaccheroni, N. Tetrahedron **2002**, 58, 4809-4815. Synthesis of azacrown ethers with quinoline-based sidearms as potential zinc(II) fluorophores.

54. Song, H.-C.; Bradshaw, J. S.; Y.-W. Chen, Xue, G.-P.; Li, W.-M.; Krakowiak, K. E.; Savage, P. B.; Xu, Z.-L.; Izatt, R. M. Supramolecular Chem. **2002**, 14, 263-269. Synthesis of new crown ethers containing appended pyridine, 10-hydroxybenzoquinoline, 8-hydroxyquinoline and 2-amino-1-hydroxybiphenyl sidearms.

53. Kluchinsky, T. A.; Sheely, M. V.; Savage, P. B.; Smith, P. A. J. Chromatography A **2002**, 952, 205-213. Formation of 2-chlorobenzylidenemalononitrile (CS riot control agent) thermal degradation products at elevated temperatures.

52. Smith, P. A.; Kluchinsky, T. A.; Savage, P. B.; Erickson, R. P.; Lee, A. P.; Williams, K.; Stevens, M.; Thomas, R. J. AIHA J. **2002**, 63, 284-292. Traditional sampling with laboratory analysis and solid phase microextraction sampling with field gas chromatography/mass spectrometry by military industrial hygienists.

51. Song, H. C.; Chen, Y.-W.; Song, J.-C.; Savage, P. B.; Xue, G.-P.; Chiara, J. A.; Krakowiak, K. E.; Izatt, R. M.; Bradshaw, J. S. J. Heterocyclic Chem. **2001**, 38, 1369-1376. New diazadi(and tri)thia-21-crown-7 ethers containing 8-hydroxyquinoline side arms.

50. Xue, G.-P.; Bradshaw, J. S.; Dalley, N. K.; Savage, P. B.; Krakowiak, K. E.; Izatt, R. M.; Prodi, L.; Montalti, M.; Zaccheroni, N. Tetrahedron **2001**, 57, 7623-7628. Convenient synthesis and preliminary photophysical properties of novel 8-aminoquinoline appended diaza-18-crown-6 ligands.

49. Xue, G.-P.; Savage, P. B.; Krakowiak, K. E.; Izatt, R. M.; Bradshaw, J. S. J. Heterocyclic Chem. **2001**, 38, 1453-1457. Synthesis of diazadibenzo-18-crown-6 ligands with appended chromophoric and fluorophoric groups as potential metal ion chemosensors.
48. Song, H. C.; Bradshaw, J. S.; Chen, Y.-W.; Xue, G.-P.; Chiara, J. A.; Krakowiak, K. E.; Savage, P. B.; Xue, Z.-L.; Izatt, R. M. ARKIVOK **2001**, 2, ms#116. Syntheses of diazadithiacrown ethers containing two 8-hydroxyquinoline side arms.
47. Kluchinsky, T. A., Jr.; Savage, P. B.; Sheely, M. V.; Thomas R. J.; Smith, P. A. Microcolumn Sep. **2001**, 13, 186-190. Identification of CS-derived compounds formed during heat-dispersion of CS riot control agent.
46. Bradshaw, J. S.: Song, H.-C.; Xue, G.-P.; Bronson, R. T.; Chiara, J. A.; Krakowiak, K. E.; Savage, P. B.; Izatt, R. M. Supramol. Chem. **2001**, 13, 499-505. Synthesis of diazadi(and tri)thiacrown ethers containing two 5-substituent(or 2-methyl)-8-hydroxyquinoline side arms.
45. Savage, P. B.. Annals of Med. **2001**, 33, 167-171. Multidrug resistant bacteria: overcoming antibiotic permeability barriers of gram-negative bacteria.
44. Lee, S. C.; Izatt, R. M.; Zhang, X. X.; Nelsen, E. G.; Lamb, J. D.; Savage, P. B.; Bradshaw, J. S. Inorg. Chim. Acta **2001**, 317, 174-180. Highly selective copper(II) ion receptors: tetraazacrown ethers bearing two 8-hydroxyquinoline side arms.
43. Bronson, R. T.; Bradshaw, J. S.; Savage, P. B.; Fuangwasdi, S.; Lee, S. C.; Krakowiak, K. E.; Izatt, R. M. J. Org. Chem. **2001**, 66, 4752-4758. Bis-8-hydroxyquinoline-armed diazatrithia-15-crown-5 and diazathithia-16-crown-5 ligands: possible fluorophoric metal ion sensors.
42. Prodi, L.; Montalti, M.; Zaccheroni, N.; Bradshaw, J. S.; Izatt, R. M.; Savage, P. B.. J. Incl. Phenom. **2001**, 41, 123-127. pH dependence of the luminescent properties of metal ion complexes of 5-chloro-8-hydroxyquinoline appended diaza-18-crown-6.
41. Schmidt, E. J.; Boswell, S. R.; Walsh, J. P.; Schellenberg, M. M.; Winter, T. W.; Li,

C.; Allman, G. W.; Savage, P. B. J. Antimicrob. Chemother. **2001**, 47, 671-674.
Activities of cholic acid-derived antimicrobial agents against multidrug-resistant bacteria.

40. Prodi, L.; Montalti, M; Zaccheroni, N; Bradshaw, J. S.; Izatt, R. M.; Savage, P. B. Tetrahedron Lett. **2001**, 42, 2941-2944. Characterization of 5-methoxyquinoline appended diaza-18-crown-6 as a chemosensor for cadmium.
39. Dalley, N. K.; Xue, G.-P.; Bradshaw, J. S.; Zhang, X. X.; Harrison, R. G.; Savage, P. B.; Krakowiak, K. E.; Izatt, R. M. J. Heterocyclic Chem. **2001**, 38, 1-9. A new diaza-18-crown-6 ligand containing two quinolin-8-ylmethyl side arms: crystal structures and characterization of the ligand, the protonated ligand and its mononuclear barium (II) and dinuclear copper (II) complexes.
38. Xue, G.-P.; Bradshaw, J. S.; Song, H.-C.; Bronson, R. T.; Savage, P. B.; Krakowiak, K. E.; Izatt, R. M.; Prodi, L.; Montalti, M.; Zaccheroni, N. Tetrahedron **2001**, 57, 87-91. A convenient synthesis and preliminary photophysical study of novel fluoroionophores: macrocyclic polyamines containing two dansylamidoethyl side arms.
37. Zhou, X.-T.; Rehman, A.; Li, C.; Savage, P. B. Org. Lett. **2000**, 2, 3015-3018. Preparation of a protected triamino-analogue of cholic acid and sequential incorporation of amino acids in solution and on a solid support.
36. Taotafa, U.; McMullin, D. M.; Lee, S. C.; Savage, P. B. Org. Lett. **2000**, 2, 4117-4120. Anionic facial amphiphiles from cholic acid.
35. Guan, Q.; Schmidt, E. J.; Boswell, S. R.; Li, C.; Allman, G. W.; Savage, P. B. Org. Lett. **2000**, 2, 2837-2840. Preparation and characterization of cholic acid-derived antimicrobial agents with controlled stabilities.
34. Prodi, L.; Bargossi, C.; Montalti, M.; Zaccheroni, N.; Su, N.; Bradshaw, J. S.; Izatt, R. M.; Savage, P. B. J. Am. Chem. Soc. **2000**, 122, 6769-6770. An effective fluorescent chemosensor for mercury ions.
33. Savage, P. B.; Li, C. Exp. Op. Invest. Drugs **2000**, 9, 263-269. Cholic acid derivatives: novel antimicrobials.

32. Xue, G.-P.; Bradshaw, J. S.; Su, N.; Krakowiak, K. E.; Savage, P. B.; Izatt, R. M. J. Heterocyclic Chem. **2000**, 37, 1-9. Syntheses of two 1,3-2,4-calix[4]bis-crown ethers containing two 1,2-phenylene and one pyridine or anisole units in each crown ether moiety.
31. Su, N.; Bradshaw, J. S.; Xue, G.; Dalley, N. K.; Zhang, X. X.; Savage, P. B.; Krakowiak, K. E.; Izatt, R. M. J. Heterocyclic Chem. **2000**, 37, 711-720. Synthesis, crystal structures, and metal ion complexation studies of novel diaza-18-crown-6 ligands containing aromatic thiol-derived side arms.
30. Fleming, S. A.; Hart, G. R.; Savage, P. B. J. Chem. Ed. **2000**, 77, 790-794. Molecular orbital animations for organic chemistry.
29. Xue, G.-P.; Bradshaw, J. S.; Chiara, J. A.; Savage, P. B.; Krakowiak, K. E.; Izatt, R. M. Syn. Lett. **2000**, 1181-1183. "A convenient synthesis of novel fluorophores: macrocyclic polyamines containing two dansylamidoethyl side arms.
28. Xue, G.-P.; Savage, P. B.; Bradshaw, J. S.; Zhang, X. X.; Izatt, R. M. in Advances in Supramolecular Chemistry, Vol. 7; JAI Press, **2000**, pp. 99-137. Functionalized macrocyclic ligands as sensory molecules for metal ions.
27. Bradshaw, J. S.; Izatt, R. M.; Savage, P. B.; Bruening, R. L.; Krakowiak, K. E. Supramolecular Chem. **2000**, 12, 23-38. The design of ion selective macrocycles and the solid-phase extraction of ions using molecular recognition technology: A synopsis.
26. Li, C.; Lewis, M. R.; Gilbert, A. B.; Noel, M. D.; Scoville, D. H.; Allman, G. W.; Savage, P. B. Antimicrob. Agents. Chemother. **1999**, 43, 1347-1351. Antimicrobial activities of amine- and guanidine-functionalized cholic acid derivatives.
25. Li, C.; Budge, L. P.; Driscoll, C. D.; Willardson, B. M.; Allman, G. W.; Savage, P. B. J. Am. Chem. Soc. **1999**, 121, 931-940. Incremental conversion of outer-membrane permeabilizers into potent antibiotics for Gram-negative bacteria.
24. Rehman, A.; Li, C.; Budge, L. P.; Street, S. E.; Savage, P. B. Tetrahedron Lett. **1999**, 40, 1865-1868. Preparation of amino acid-appended cholic acid derivatives as sensitizers of Gram-negative bacteria.

23. Li, C.; Rehman, A.; Dalley, N. K.; Savage, P. B. Tetrahedron Lett. **1999**, 40, 1861-1864. Short syntheses of triamine-derivatives of cholic acid.
22. Su, N.; Bradshaw, J. S.; Zhang, X. X.; Song, H.-C.; Savage, P. B.; Xue, G.-P.; Krakowiak, K. E.; Izatt, R. M. J. Org. Chem. **1999**, 64, 8855-8865. Syntheses and metal ion complexation of novel 8-hydroxyquinoline-containing diaza-18-crown-6 ligands and analogs.
21. Su, N.; Bradshaw, J. S.; Savage, P. B.; Krakowiak, K. E.; Izatt, R. M.; DeWall, S. L.; Gokel G. W. Tetrahedron **1999**, 55, 9737-9746. Syntheses and aggregate study of bisphenol-containing diaza-18-crown-6 ligands.
20. Su, N.; Bradshaw, J. S.; Savage, P. B.; Krakowiak, K. E.; Izatt, R. M. J. Org. Chem. **1999**, 64, 3825-3836. Diaza-18-crown-6 ligands containing two aminophenol sidearms: new heterobinuclear metal ion receptors.
19. Yang, Z.; Bradshaw, J. S.; Zhang, X. X.; Savage, P. B.; Krakowiak, K. E.; Dalley, N. K.; Su, N.; Bronson, T.; Izatt, R. M. J. Org. Chem. **1999**, 64, 3162-3172. New tetraazacrown ethers containing two pyridine, quinoline, 8-hydroxyquinoline or 8-aminoquinoline sidearms.
18. Su, N.; Bradshaw, J. S.; Savage, P. B.; Krakowiak, K. E.; Izatt, R. M. J. Heterocyclic Chem. **1999**, 36, 771-780. Syntheses of diaza-18-crown-6 ligands containing two 4-hydroxyzobenzene, two benzimidazole, two uracil, two anthraquinone, or two ferrocene units.
17. Fleming S. A.; Hart, G. R.; Savage, P. B. Organic Reaction Animations v1.5; W. W. Norton: New York, **1999**. (Fleming S. A.; Hart, G. R.; Savage, P. B. Organic Reaction Animations v1.0; W. W. Norton: New York, **1998**.)
16. Li, C.; Peters, A. S.; Meredith, E. L.; Allman, G. H.; Savage, P. B. J. Am. Chem. Soc. **1998**, 120, 2961-2962. Design and synthesis of potent sensitizers of Gram-negative bacteria based on a cholic acid scaffolding.
15. Prodi, L.; Bolletta, F.; Montalti, M.; Zaccheroni, N.; Savage, P. B.; Bradshaw, J. S.;

Izatt, R. M. Tetrahedron Lett. **1998**, 39, 5451-5454. A fluorescent sensor for magnesium ions.

14. Marshall, R. L.; Dalley, N. K.; Savage, P. B. Tetrahedron Lett. **1998**, 39, 3923-3926. Synthesis of novel 3',6'-dideoxy-3',6'-epithio and 2',6'-dideoxy-2',6'-epithio nucleosides.

13. Smith, P. A.; Bowerbank, C. R.; Savage, P. B.; Drown, D. B.; Lee, M. L.; Alexander, W.; Jederberg, W. W.; Still, K. Appl. Occ. Env. Hygiene **1998**, 14, 171-179. Conjugation of 7-oxodehydroabietic acid to lysine, a haptenation mechanism for an oxidized resin acid with dermal sensitizing properties.

12. Bordunov, A. V.; Bradshaw, J. S.; Bastushok, V. N.; Zhang, X. X.; Kou, X.; Dalley, N. K.; Yang, Z.; Savage, P. B.; Izatt, R. M. Tetrahedron **1997**, 53, 17595-17603. Azacrown ethers containing oximic and Schiff base sidearms-potential heteronuclear metal ion receptors.

11. Savage, P. B.; Thomas, W. D.; Dalley, N. K. J. Incl. Phenom. **1997**, 29, 335-339. Synthesis of two new glycophanes comprised of thioglucose molecules linked by hydrocarbons.

10. Homlgren, S. K.; Savage, P. B.; Desper, J. M.; Schladetzky, K. D.; Powell, D. R.; Gellman, S. H. Tetrahedron, **1997**, 53, 12249-12257. Steric control of oxidation selectivity in macrocyclic phosphine oxide-dithioethers.

9. Paquette, L. A.; Sun, L.-Q.; Friedrich, D.; Savage, P. B. J. Am. Chem. Soc. **1997**, 119, 8438-8439. Total synthesis of (+)-epoxydictymene. Application of alkoxy-directed cyclization to diterpenoid construction.

8. Paquette, L. A.; Sun, L.-Q.; Friedrich, D.; Savage, P. B. Tetrahedron Lett. **1997**, 38, 195-199. Highly enantioselective total synthesis of natural epoxydictymene. An alkoxy-directed cyclization route to highly strained trans-oxabicyclo[3.3.0]octanes.

7. Savage, P. B.; Holmgren, S. K.; Gellman, S. H. J. Am. Chem. Soc. **1994**, 116, 4069-4070. Anion and ion pair complexation by a macrocyclic phosphine oxide disulfoxide.

6. Savage, P. B.; Gellman, S. H. J. Am. Chem. Soc. **1993**, 115, 10448-10449.

Complexation of ammonium hexoses: evidence for contributions from OH-OH hydrogen bonds in a hydroxylic medium.

5. Savage, P. B.; Holmgren, S. K.; Gellman, S. H. J. Am. Chem Soc. **1993**, 115, 7900-7901. Optimization of a phosphine oxide-disulfoxide array for multipoint hydrogen bonding to ammonium ions.

4. Savage, P. B.; Holmgren, S. K.; Desper, J. M.; Gellman, S. H. Pure Appl. Chem. **1993**, 65, 461-468. Macrocycles containing sulfur and phosphorus: structure and complexation properties.

3. Savage, P. B.; Desper, J. M.; Gellman, S. H. Tetrahedron Lett. **1992**, 33, 2107-2110. Stereoselective oxidation of an eleven-membered heterocycle.

2. McDaniel, C. W.; Bradshaw, J. S.; Krakowiak, K. E.; Izatt, R. M.; Savage, P. B.; Tarbet, B. J.; Bruening, R. L. J. Heterocyclic Chem. **1989**, 26, 413-419. Preparation of crown compounds containing allyloxymethyl or butenyl groups for attachment to silica gel or containing long chain lipophilic groups for use in liquid membrane systems.

1. Bradshaw, J. S.; Krakowiak, K. E.; Bruening, R. L.; Tarbet, B. J.; Savage, P. B.; Izatt, R. M. J. Org. Chem. **1988**, 53, 3190-3197. Synthesis of (allyloxy)methyl-substituted diaza-18-crown-6 compounds for attachment to silica gel.

Issued U.S. Patents

7. Teyton, L.; Bendelac, A.; Savage, P. B. "Adjuvants and Methods of Use," US Patent # 7,794,722, Sept. 14, **2010**.

6. Savage, P. B.; Leung, D. L. "Cationic Steroid Antimicrobial Compositions and Methods of Use," US Patent # 7,754,705, July 13, **2010**.

5. Savage, P. B.; Bendelac, A.; Teyton, L. "6"-Amino-6"-Deoxygalactosylceramides," US Patent # 7,645,873, January 12, **2010**.

4. Savage, P. B.; Li, C. "Steroid Derived Antibiotics," US patent # 7,598,234, October 6, **2009**.

3. Savage, P. B.; Li, C. "Steroid Derived Antibiotics," US patent # 6,767,904, July 27, **2004**.

2. Savage, P. B.; Li, C. "Steroid Derived Antibiotics," US patent # 6,486,148, November 26, **2002**.

1. Savage, P. B.; Li, C. "Steroid Derived Antibiotics," US patent # 6,350,738, February 26, **2002**.