

- Aggarwal, V., Malik, J., Prashant, A., Jaiwal, P.K. and Pundir, C.S. (2016) Amperometric Determination of Serum Total Cholesterol with Nanoparticles of Cholesterol Esterase and Cholesterol Oxidase. *Anal Biochem* 500, 6-11.
- Ahmad, S., Garg, S. K., Johri, B. N. (1992) Biotransformation of sterols: selective cleavage of the side chain. *Biotechnol Adv* 10, 1– 67.
- Ahmad, S., Goswami, P. (2014) Application of Chitosan Beads Immobilized Rhodococcus sp. NCIM 2891 Cholesterol Oxidase for Cholestenone Production. *Process Biochem* 49, 2149-2157.
- Allain, C.C., Poon, L. S., Chan, C. S. G., Richmond, W., Fu, P. C. (1974) Enzymatic determination of total serum cholesterol. *Clin Chem* 20, 470-475.
- Amundson, D.M. and Zhou, M. (1999) Fluorometric Method for the Enzymatic Determination of Cholesterol. *J Biochem Biophys Methods* 38, 43-52.
- Arima, K., Nagasawa, M., Bae, M., Tamura, G. (1969) Microbial transformation of sterols. Part 1. Decomposition of cholesterol by Microorganisms. *Agric Biol Chem* 33, 1636–1643
- Arya, S. K., Solanki, P. R., Singh, R.P., Pandey, M. K., Datta, M., Malhotra, B. D. (2006) Application of Octa-decane thiol self-assembled monolayer to cholesterol biosensor based on surface plasma resonance technique. *Talanta* 69, 918-926.
- Atrat, P. G., Wagner, B., Wagner, M., Schumann, G. Localization of the cholesterol oxidase in *Rhodococcus erythropolis* IMET 7185 studied by immune electron microscopy (1992). *J Steroid Biochem Mol Biol* 42, 193-200.
- Avnir, D., Braun, S., Lev, O., Ottolenghi, M. (1994) Enzymes and Other Proteins Entrapped in Sol-Gel Materials. *Chem Mater* 6, 1605-1614.
- Bankar, S.B., Bule, M.V., Singhal, R.S., Ananthanarayan, L. (2009) Glucose oxidase — An overview. *Biotechnol Adv* 27, 489–501.
- Bas, D., Boyaci, I. H. (2007) Modeling and optimization I: Usability of response surface methodology. *J Food Eng* 78 (3), 836-845.
- Beppu, T. (1995) Signal transduction and secondary metabolism: Prospects for controlling productivity. *Trends Biotechnol* 13, 264-269.
- Bernheimer, A. W., Linder, R. (1997) Oxidation of macrophage membrane cholesterol by intracellular Rhodococcusequi. *Veterinary Microbiology* 56, 269-276.

Besombes, J. L., Cosnier, S., Labbe, P., Reverdy, G. (1995) Improvement of the analytical characteristics of an enzyme electrode for free and total cholesterol via laponite clay additives. *Anal Chim Acta* 317, 275-280.

Betiku, E., Okunsolawo, S. S., Ajala, S. O., Odedele, O. S. (2015) Performance evaluation of artificial neural network coupled with generic algorithm and response surface methodology in modeling and optimization of biodiesel production process parameters from shea tree (*Vitellaria paradoxa*) nut butter. *Renew Energy* 76, 408-417.

Bhatia, S. (2018) Biotransformation and enzymes. *Introduction to Pharmaceutical Biotechnology*. 2, 6-13.

Bisswanger, H. (2014) Enzyme Assays. *Perspectives in Science*, 1, 41-55.

Bongiovanni, C., Ferri, T., Poscia, A., Varalli, M., Santucci, R., Desideri, A. (2001) An electrochemical multienzymatic biosensor for determination of cholesterol. *Bioelectrochemistry* 54, 17-22.

Bouchier, I.A.D. (1992) The formation of gall stones. *Keio J Med* 41, 1-5.

Bradford, M. M. (1976) A rapid and sensitive method for the quantitation of microgram quantities of protein utilizing the principle of protein-dye binding. *Anal Biochem*, 72, 248-54.

Brahim, S., Narinesingh, D., Guiseppi, E.A. (2002) Polypyrrole-hydrogel composites for the construction of clinically important biosensors. *Biosens Bioelectron* 17, 53-59.

Buchland, B. C., Dunnill, P., Lilly, M. D. (1975) The enzymatic transformation of water insoluble reactants in non-aqueous solvents. Conversion of cholesterol to cholesten-4-ene-3-one by *Nocardia sp.* *Biotechnol Bioeng* 17, 815-26.

Buckland, B. C., Lilly, M. D., Dunnill, P. (1976) The kinetics of cholesterol oxidase synthesis by *Nocardia rhodochrous*. *Biotech And Bioeng* 18 (1976) 601-621.

Burkert, J.F.M., Kalil, S.J., Filho, M.F., Rodrigues, M.I. (2006) Parameters Optimization for Enzymatic Assays Using Experimental Design. *Braz J Chem Eng* 23, 163-170.

Carey, M.C. (1993) Pathogenesis of gallstones. *Am J Surg* 165, 410-419.

Cha, Y., Murray, C. J., Klinman, J. P. (1989) Hydrogen tunneling in enzyme reactions. *Science* 243, 1325-1330.

Chang, Q., Tang, H. (2014) Immobilization of Horseradish Peroxidase on NH₂-Modified Magnetic Fe₃O₄/SiO₂ Particles and Its Application in Removal of 2, 4-Dichlorophenol. *Molecules*, 19, 15768-15782.

Chang, S. C., Rawson, K., McNeil, J. C. (2002) Disposable tyrosinase-peroxidase bi-enzyme sensor for amperometric detection of phenols. *Biosens Bioelectron* 17, 1015-1023.

Chauhan, A. K., Survase, S. A. kumar, J.K., Annapure, U. S. (2009) Medium optimization by orthogonal array and response surface methodology for cholesterol oxidase production by *Streptomyces lavendulae* NCIM 2499. *J Gen Appl Microbiol* 55, 171-180.

Cho, H.J., Choi, K.P., Yamashita, M., Morikawa, H., Murooka, Y., (1995) Introduction and expression of the *Streptomyces* cholesterol oxidase gene (choA), a potent insecticidal protein against boll weevil larvae, into tobacco cells. *Appl Microbiol Biotech* 43, 133-138.

Chou, C.C., Lee, M. T., Chen, W. C. (1999) Production of cholesterol oxidase by *Rhodococcusequi* No. 23 in a jar fermenter. *Biotechnol Appl Biochem* 29 (1999) 217–221.

Chou, L. C. S., Liu, C. C. (2005) Development of a molecular imprinting thick film electrochemical sensor for cholesterol detection. *Sens Actuators B* 110, 204-208.

Corbin, D.R., Grebenok, R.J., Ohnmeiss, T.E., Greenplate, J.T., Purcell, J.P. (2001) Expression and chloroplast targeting of cholesterol oxidase in transgenic tobacco plants. *Plant Physiol* 126, 1116–1128

Corbin, D.R., Greenplate, J.T., Wong, E.Y., Purcell, J. P. (1994) Cloning of an insecticidal cholesterol oxidase gene and its expression in bacteria and in plant protoplasts. *Appl Environ Microbiol* 60, 4239–44.

Cosnier, S., Popescu, I. C. (1996) Poly (amphiphilic pyrrole)-tyrosinaseperoxidase electrode for amplified flow injection-amperometric detection of phenol. *Anal Chim Acta* 319, 145- 151.

Coulombe, R., Yue, K. Q., Ghisla, S., Vrielink, A. (2001) Oxygen access to the active site of cholesterol oxidase through a narrow channel is gated by an Arg-Glu pair. *J Biol Chem* 276, 30435–30441.

Dai, Z., Xu, X., Wu, L., Ju, H. (2005) Detection of Trace Phenol Based on Mesoporous Silica Derived Tyrosinase-Peroxidase. *Biosensor Electroanalysis* 17, 1571-1577.

Department of Health, The Health of The Nation, H M Stationery Office, London, 1992.

- Desai, K. M., Survase, S. A., Saudagar, P. S., Lele, S. S., Singhal, R. S. (2008) Comparison of artificial neural network (ANN) and response surface methodology (RSM) in fermentation media optimization: case study of fermentative production of scleroglucan. *Biochem Eng J* 41, 266-273.
- Devlin, T. M. (1959) Enzymatic Methods in analytical chemistry. *Analytical Chemistry*, 31, 977–981.
- Doukyu, N. (2009) Characteristics and biotechnological applications of microbial cholesterol oxidases. *Appl Microbiol Biotechnol* 83, 825-837
- Doukyu, N., Aono, R. (1998) Purification of extracellular cholesterol oxidase with high activity in the presence of organic solvents from *Pseudomonas* sp. Strain ST-200. *Appl Environ Microbiol* 64, 1929–1932.
- Doukyu, N., Aono, R. (1999) Two moles of O₂ consumption and one mole of H₂O₂ formation with cholesterol peroxidation by cholesterol oxidase from *Pseudomonas* sp. ST-200. *Biochem J* 341, 621-627
- Doukyu, N., Aono, R. (2001) Cloning, sequence analysis and expression of a gene encoding an organic solvent- and detergent-tolerant cholesterol oxidase of *Burkholderiacepacia* strain ST-200. *Appl Microbiol Biotechnol* 57, 146–152.
- Doukyu, N., Hiroyasu, O. (2010) Organic solvent tolerant enzymes, *Biochemical Engineering Journal*. 4, 270-282.
- Doukyu, N., Shibata, K., Ogino, H., Sagermann, M. (2008) Purification and characterization of *Chromobacterium* sp. DS-1 cholesterol oxidase with thermal, organic solvent, and detergent tolerance. *Appl Microbiol Biotechnol* 80 59–70.
- Doukyu, N., Shibata, K., Ogino, H., Sagermann, M. (2008) Purification and characterization of *Chromobacterium* sp. DS-1 cholesterol oxidase with thermal, organic solvent, and detergent tolerance. *Appl. Microbiol. Biotechnol*, 80, 59–7.
- Dreyer, D. R., Park, S., Bielawski, W., Ruoff, R. S. (2010) The Chemistry of Graphene Oxide.
- Dutz, S., Hergt, R. (2014) The Role of Interactions in Systems of Single Domain Ferrimagnetic Iron Oxide Nanoparticles. *J Nano- and Electron Phys*, 4 (2), 02010.
- Ebrahimpour, A., Rahaman, Z. N. A., EanCh'ng, D. H., Basri, M., Salleh, A. B. (2008) A modeling study by response surface methodology and artificial neural network on culture

parameters optimization for thermostable lipase production from a newly isolated thermophilic *Geobacillus sp. strain ARM*. *BMC Biotechnol* 8, 96.

Ebrahimpour, A., Rahman, R. N. Z. R. A, Kamarudin, N. H. A, Basri, M., Salleh, A. B (2011) Lipase production and growth modeling of a novel thermophilic bacterium: *Aneurinibacillus thermoaerophilus* strain AFNA. *Electronic Journal of Biotechnology*, 14(4), 1-16.

Eisenthal, R., Bowden, C. A. (1974) The direct linear plot. A new graphical procedure for estimating enzyme kinetic parameters. *Biochem J* 139, 715-720.

Elhakeem, M. A. A., Elsayed, A. M., Alkhulaqi, T. A. (2014) Activity and stability of immobilized *Candida rugosa* lipase on chitosan coated Fe₃O₄ nanoparticles in aqueous and organic media. *J Adv Chem*, 10, 2478–2483.

El-Naggar, N.E.A., Deraz, S.F., Soliman, H.M. et al.(2017) Purification, characterization and amino acid content of cholesterol oxidase produced by *Streptomyces aegyptia* NEAE 102. *BMC Microbiol*, 17, 76 (2017).

Fazaeli, A., Golestani, A., Lakzaei, M., Rasi Varaei, S.S., Aminian, M. (2019) Expression optimization, purification, and functional characterization of cholesterol oxidase from *Chromobacterium sp. DS1*. *PLoS ONE* 14(2): e0212217.

Fitzpatrick, P. F. (2004) Carbanion versus hydride transfer mechanisms in flavoprotein-catalyzed dehydrogenations. *Bioorg Chem* 32, 125–139.

Forneris, F., Heuts, D. P. Delvecchio, M., Rovida, S., Fraaije, M. W., Mattevi, A. (2008) Structural analysis of the catalytic mechanism and stereoselectivity in *Streptomyces coelicolor* alditol oxidase. *Biochemistry* 47, 978–985.

Forster, J., Cassidy, J., Donoghue, O. E. (2000) Electrochemical diagnostic strip device for total cholesterol and its subfractions *Electroanalysis*. 12 (9), 716-721.

Fukuda, H., Kawakami, Y., Nakamura, S. (1973) A method to screen anticholesterol substances produced by microbes and a new cholesterol oxidase by *Streptomyces violescens*. *Chem Pharm Bull* 21, 2057–2060.

Fukuyama, M., Miyake, Y. Purification and some properties of cholesterol oxidase from *Schizopyllum commune* with covalently bound flavin. *J Biochem* 85, 1183-1193.

G.E. Turfitt, G.E. (1948) The microbiological degradation of steroids, Part IV. *Biochem J*, 42, 376-383.

Gadda, G., Wels, G., Pollegioni, L., Zucchelli, S., Ambrosius, D., Pilone, M. S., Ghisla, S. (1997) Characterization of cholesterol oxidase from *Streptomyces hygroscopicus* and *Brevibacterium sterolicum*. *Eur J Biochem* 250, 369–376.

Gadda, G., Wels, G., Pollegioni, L., Zucchelli, S., Ambrosius, D., Pilone, M. S., Ghisla, S. (1997) Characterization of cholesterol oxidase from *Streptomyces hygroscopicus* and *Brevibacterium sterolicum*. *Eur J Biochem* 250, 369–376.

Gao, W (2015). The Chemistry of Graphene Oxide. Graphene Oxide Reduction Recipes: Spectroscopy and Applications 61–95.

Geissler, J., Ghisla, S., Kroneck, P. M. (1986) Flavin-dependent alcohol oxidase from yeast. Studies on the catalytic mechanism and inactivation during turnover. *Eur J Biochem* 160, 93–100.

Ghisla, S. (1982) Dehydrogenation mechanisms in flavoprotein catalysis. In *Flavins and Flavoproteins, Proceedings of the 7th International Symposium* (Massey V & Williams CH eds), 133–142. Elsevier, North-Holland, New York.

Ghisla, S., Edmondson, D., flavin coenzymes. In *Encyclopedia of life sciences* John Wiley & Sons, Ltd: Chichester, 2000

Ghisla, S., Massey, V. (1986) New flavins for old: artificial flavins as active site probes of flavoproteins. *Biochem J*, 239, 1–12

Ghisla, S., Massey, V. (1991) L-Lactate Oxidase. In *Chemistry and Biochemistry of Flavoenzymes Vol II* (Muller Feds), 243–289. CRC Press, Boca Raton.

Ghisla, S., Massey, V., Lhoste, J. M., Mayhew, S. G (1974). Fluorescence and optical characteristics of reduced flavins and flavoproteins. *Biochemistry* 13, 589–597.

Gholivand, M.B., Khodadadian, M. (2014) Amperometric Cholesterol Biosensor Based on the Direct Electrochemistry of Cholesterol Oxidase and Catalase on a Graphene/Ionic Liquid-Modified Glassy Carbon Electrode. *Biosens Bioelectron* 53, 472–478.

Glezer, V., Lev, O. (1993) Sol-Gel Vanadium Pentoxide Glucose Biosensor. *J Am Chem Soc* 115, 2533–2534.

Grande, H. J., Visser, A. J., Wit, J. L, Mulle, F. Veeger, C. Spin label studies on the flavoproteins lipoamide dehydrogenase and D- amino acid oxidase. *Z Natur-forsch [B]* 27 (1972) 1058–1062

- Halliah, G. P., Alagappan, K., Sairam, A. B. (2014) Synthesis, characterization of CH- α Fe₂O₃ nanocomposite and coating on cotton, silk for antibacterial and UV spectral studies. *Journal of Industrial Textiles* 44 (2), 275-287.
- Haykin, S. (2009) Neural Networks and Learning Machines. Pearson Education Inc, New Jersey, 1-60,122-218.
- Hotha, S., Banik, R. M. (1997) Production of alkaline protease by *Bacillus thuringiensis* H 14 in aqueous two-phase systems. *J Chem Technol Biotechnol* 69, 5-10.
- Huang, H.S., Kuan, J.C.W. and Guilbault, G.G. (1975) Fluorometric Enzymatic Determination of Total Cholesterol in Serum. *Clin Chem* 21, 1605-1608.
- Huang, J., Yang, Y., Shi, H., Song, Z., Zhao, Z., Anzai, J. I., Osa, T. Q. (2006) Multi-walled carbon nanotubes-based glucose biosensor prepared by a layer-by-layer technique. *Materials Science and Engineering C* 26, 113-117.
- Hussain, F., D.J.S. Birch, D. J. S., Pickup, J.C. (2005) Glucose sensing based on the intrinsic fluorescence of sol-gel immobilized yeast hexokinase. *Anal Biochem* 33, 137-143.
- Inouye, Y., Taguchi, K., Fuji, A., Ishimaru, K., Nakamura, S., Nomi, R. (1982). Purification and characterisation of extracellular 3 β -hydroxysteroid oxidase produced by *Streptovorticillium cholesterolicum*. *Chem Pharm Bull* 30, 951-958.
- Inouye, Y., Taguchi, K., Fujii, A., Ishimaru, K., Nakamura, S., and Nome, T. (1982) Purification and characterization of extracellular 3 β -hydroxysteroid oxidase produced by *Streptovorticillium cholesterolicum*. *Chem Pharm Bull* 30, 951-958.
- Isobe, K., Shoji, K., Nakanishi, Y., Yokoe, M., Wakao, N (2003) Purification and some properties of cholesterol oxidase stable in detergents from *gamma-proteobacterium* Y-134. *J Biosci Bioeng* 95, 257-263
- Jacob, S., Banerjee, R. (2016) Modeling and optimization of anaerobic co-digestion of potato waste and aquatic weed by response surface methodology and artificial neural network coupled genetic algorithm. *Bioresour Technol* 214, 386-395.
- Jiang, B., Yuan, Y., Zhang, X., Feng, Z., Liu, C. (2017) Separation and enrichment of Lectin from Separation and Enrichment of Lectin from Zihua Snap-Bean (*Phaseolus vulgaris*) Seeds by PEG600-Ammonium Sulfate Aqueous Two-Phase System. *Molecules*, 22, 1596.

Jin, W., Brennan, J. D. (2002) Properties and applications of proteins encapsulated within sol-gel derived materials. *Anal Chim Acta* 461, 1-36.

Juturu, V., Wu, J. C. (2014) Microbial cellulases: Engineering, production and applications. *Renew Sustain Energy Rev*, 33, 188–203.

K. Watanabe, K., Aihara, H., Nakagawa, Y., Nakamura, R., Sasaki, T. (1989) Properties of the purified extracellular cholesterol oxidase from *Rhodococcusequi* No. 23, *Agric Food Chem* 37, 1178-1182.

Kampen, W. Nutritional Requirements in Fermentation Processes, Fermentation and Biochemical Engineering Handbook.

Kass, I. J., Sampson, N. S. (1995) The isomerization catalyzed by *Brevibacterium sterolicum* cholesterol oxidase proceeds stereospecifically with one base. *Biochem Biophys Res Commun* 206, 688–693.

Kass, I. J., Sampson, N. S. (1998) Evaluation of the role of His447 in the reaction catalyzed by cholesterol oxidase. *Biochemistry* 37, 17990–18000.

Kass, I. J., Sampson, N.S. (1998) The importance of Glu361 position in the reaction catalyzed by cholesterol oxidase. *Bioorg Med Chem Lett*, 8, 2663–2668.

Kazandjian, R. Z., Durdich, J.S., Kilbanov, A. M. (1986) Enzymatic analysis in organic solvents. *Biotech Bioeng* 28, 417-421.

Khan, M. I., Mohammad, A., Patil, G., Naqvi, S. A. H., Chauhan, L. K. S., Ahmad, I. (2012) Induction of ROS, mitochondrial damage and autophagy in lung epithelial cancer cells by iron oxide nanoparticles. *Biomaterials*, 33, 1477-1488.

Khmelnitsky, Y. L., Hilhorst, R., Veeger, C. Detergent less microemulsions as media for enzymatic reactions: cholesterol oxidation catalyzed by cholesterol oxidase. *Euro J Biochem* 176, 265-271.

Kreit, J., Germain, P., Lefebvre, G. (1992) Extracellular cholesterol oxidase from *Rhodococcus* sp. cells. *J Biotech* 24, 177-188.

Kreit, J., Lefebvre, G., Germain, P. (1994) Membrane bound cholesterol oxidase from *Rhodococcus* sp. Cells. Production and extraction. *J Biotechnol* 33, 271–282.

- Kreit, J., Sampson, N. S. (2009) Cholesterol oxidase: physiological functions. *FEBS Journal* 276, 6844-6856.
- Kuboi, R., Umakoshi, H., Komasa, I. (1995) Extractive cultivation of *Escherichia coli* using two phase aqueous polymer systems to produce intracellular β -galactosidase. *Biotechnol Prog* 11, 202-207.
- Kuswandi, B., Andres, R., Narayanaswamy, R. (2001) An investigation into the use of electrochromic polymers in optical fibre gas. *Sensors Analyst.* 126, 1469-1491.
- Laemmli, U.K. (1970) Cleavage of structural proteins during the assembly of the head of bacteriophage T4. *Nature*, 227:680-5.
- Lario, P. I., Sampson, N., Vrielink, A. (2003) Sub-atomic resolution crystal structure of cholesterol oxidase: What atomic resolution crystallography reveals about enzyme mechanism and the role of the FAD cofactor in redox activity. *J Mol Biol* 326, 1635-1650.
- Lartillot, S., Kedziora, P. (1990) Production, purification and some properties of cholesterol oxidase from a *Streptomyces sp.* *Prep Biochem* 20, 51- 62.
- Lau, S. C., Lim, H. N., Basri, M., Masoumi, H. R. F., Tajudin, A. A., Hua, N. M., Pandikumar, A., Chia, C. H., Andou, Y. (2014) Enhanced Biocatalytic Esterification with Lipase-Immobilized Chitosan/Graphene Oxide Beads. *PLOS ONE*, 9(8), e104695
- Lee, Y. H., Chang, H. N. (1990) Production of alkaline protease by *Bacillus licheniformis* in an aqueous two-phase system. *J Ferment Bioeng* 2, 89-92.
- Lev, O., Glezer, V., Sampath, S., Pankratov, I. (1995) Organically modified sol-gel sensors. *J Gun Anal Chem* 67, 22A-30A
- Li, J., Peng, T., Peng, Y. (2003) A Cholesterol Biosensor Based on Entrapment of Cholesterol Oxidase in a Silicic Sol-Gel Matrix at a Prussian Blue Modified Electrode. *Electroanalysis* 15, 1031-1037.
- Li, J., Vrielink, A., Brick, P., Blow, D. M. (1993) Crystal structure of cholesterol oxidase complexed with a steroid substrate: implications for flavin adenine dinucleotide dependent alcohol oxidases. *Biochemistry* 32, 11507-11515.
- Liang, Y., Feng, Z., Yesuf, J. and Blackburn, J.W. (2010) Optimization of Growth Medium and Enzyme Assay Conditions for Crude Cellulases Produced by a Novel

Thermophilic and Cellulolytic Bacterium, *Anoxybacillus* sp. 527. *Appl Biochem Biotechnol* 160, 1841-1852.

Liang, Z. X., Klinman, J. P. (2004) Structural bases of hydrogen tunneling in enzymes: progress and puzzles. *Curr Opin Struct Biol* 14, 648–655.

Lim L, Molla G, Guinn N, Ghisla S, Pollegioni L & Vrielink A (2006) Structural and kinetic analyses of the H121A mutant of cholesterol oxidase. *Biochem J* 400, 13–22.

Lin, Y., Fu, J., Song, X. (2010) Purification and characterization of an extracellular cholesterol oxidase from a *Bordetella* species. *Process Biochem* 45, 1563-1569.

Lin, Y., Fu, J., Song, X. (2010). Purification and characterization of an extracellular cholesterol oxidase from a *Bordetella* sp. *Proc Biochem* 45, 1563-1569.

Liu, L., Sun, J., Zhang, D., Du, G., Chen, J., Xu, W. (2009) Culture conditions optimization of hyaluronic acid production by *Streptococcus zooepidemicus* based on radial basis function neural network and quantum-behaved particle swarm optimization algorithm. *Enzyme Microb Technol* 44, 24-32.

Liu, W.H., Meng, M.H., Chen, K.S. (1988) Purification and some properties of cholesterol oxidase produced by an inducible and a constitutive constituent mutant of *Arthrobacter simplex*. *Agri Biol Chem* 52, 413-8.

Liu, Z. M., Tingry, S., Innocent, C., Durand, J., Xu, Z. K., Seta, P. (2006) Modification of microfiltration polypropylene membranes by allylamine plasma treatment – influence of the attachment route on peroxidase immobilization and enzyme efficiency. *Enzyme Microb Technol* 39 (4), 868–876.

Livage, J., Coradin, T. In: S. Sakka (Ed.), *Handbook of Sol–gel Science and Technology–Processing, Characterization and Applications*, vol. 1, Sol–gel Processing, Kluwer, Dordrecht, 2005, p. 485-490.

Lolekha, P. H., Srisawasdi, P., Jearanaikoon, P., Wetprasit, N., Sriwanthana, B., Kroll, M. H. (2004) Performance of four sources of cholesterol oxidase for serum cholesterol determination by the enzymatic endpoint method. *Clinica Chimica Acta* 339, 135–145

Lolekha P. H., Yaovalak Jantaveesirirat. (1992) *Streptomyces*: A superior source for cholesterol oxidase used in serum cholesterol assay. *J Clin Lab Anal*, 405-9.

- Lolekha, P.H. and Jantaveesirirat, Y. (1992) *Streptomyces* a Superior Source of Cholesterol Oxidase in Serum Cholesterol Assay. *J Clin Lab Anal* 6, 405-409.
- Lou, W., Nakai S (2001) Application of artificial neural networks for predicting the thermal inactivation of bacteria: a combined effect of temperature, pH and water activity. *Food resint* 34 (7), 573-579.
- Lyubimov, A, Y., Chen, L., Sampson, N.S., Vrieling, A. (2009) A hydrogen-bonding network is important for oxidation and isomerization in the reaction catalyzed by cholesterol oxidase. *Acta Crystallographica Section D*
- MacLachlan, J., Wotherspoon, A.T.L., Ansell, R.O., Brooks, C.J.W. (2000) Cholesterol Oxidase: Sources, Physical Properties and Analytical Applications. *J Steroid Biochem Mol Biol* 72, 169-195.
- Mahato, S.B., Garai, S. (1997) Advances in Microbial Steroid Transformation. *Steroids*, 62, 332-345.
- Martin, P.A., Gundersen-Rindal, D., Blackburn, M., Buyer, J. (2007) *Chromobacterium subtsugae* sp. nov. a betaproteobacterium toxic to Colorado potato beetle and other insect pests. *Int J Syst Evol Micobiol* 57, 993–999.
- Masoumi, H. R. F., Kassim, A., Basri, M., Abdullah, D. K., Haron, M. J. (2011) Multivariate optimization in the biosynthesis of a tri-ethanolamine (tea)-based esterquat cationic surfactant using an artificial neural network. *Molecules*, 16, 5538-49.
- Massey, V., Ganther, H. (1965) On the interpretation of the absorption spectra of flavo proteins with special reference to D-amino acid oxidase. *Biochemistry*. 4 (1965) 1161–1173.
- Massey, V., Ghisla, S. (1983) The mechanism of action of flavoprotein-catalyzed reactions. In Proceedings of the 34th Colloquium on Biological Oxidations, Mosbach Symposium (Sund H & Ullrich V eds), 114–139. Springer Verlag, Berlin, New York.
- Merchuk, J.C., Andrews, B.A., Asenjo, J. A. (1998). Aqueous two-phase systems for protein separation: Studies on phase inversion. *J Chromatogr B Analyt Technol Biomed Life Sci* 711, 285–293.
- Moghaddam, N. N., Aliahmad, M. (2013) Synthesis of maghemite (γ -Fe₂O₃) nanoparticles by thermal-decomposition of magnetite (Fe₃O₄) nanoparticles. *Materials Science-Poland*, 31(2), 264-268.

- Mohamad, N. R., Marzuki, N. H. C., Buang, N. A., Huyop, F., Wahab, R. A. (2015) An overview of technologies for immobilization of enzymes and surface analysis techniques for immobilized enzymes. *Biotechnol Biotech Eq*, 29, 205–220.
- Mohamed, S. A., Malki, A. L. A., Kumosani, T. A., Shishtawy, R. M. E. (2013) Horseradish peroxidase and chitosan: activation, immobilization and comparative results. *Int J Biol Macromol* 60, 295-300.
- Monier, M., Ayad, D. M., Wei, Y., Sarhan, A. A. (2010) Immobilization of horseradish peroxidase on modified chitosan beads. *Int J Biol Macromol* 46 (3), 324–330.
- Montgomery, D. C. Design and analysis of experiments. 8th ed. New York (NY): John Wiley & Sons; 1991.
- Moradpour Z, Ghasemian A, Safari A, Mohkam M, Ghasemi Y. (2013) Isolation, molecular identification and statistical optimization of culture condition for a new extracellular cholesterol oxidase-producing strain using response surface methodology. *Ann Microbiol* 63, 941-950.
- Motteran, L., Pilone, M. S., Molla, G., Ghisla, S., Pollegioni, L. (2001) Cholesterol oxidase from *Brevibacterium sterolicum*. The relationship between covalent flavinylation and redox properties. *J Biol Chem* 276, 18024–18030.
- Muller, F., Mayhew, S. G, Massey, V (1973) On the effect of temperature on the absorption spectra of free and protein-bound flavines. *Biochemistry* 12, 4654–4662.
- Murooka, Y., Ishizaki, T., Nimi, O., Maekawa, N. (1986) Cloning and expression of a *Streptomyces* cholesterol oxidase gene in *Streptomyces lividans* with plasmid pIJ 702. *Appl Environ Microbiol* 52, 1382–1385
- Murugaiyan, S. B., Ramasamy, R., Gopal, N., Kuzhandaivelu, V. (2014) Biosensors in clinical chemistry: An overview. *Advanced Biomedical Research* 3, 67.
- Naganagouda, K., Mulimani, V.H. (2008) Aqueous two Phase Extraction (ATPE): An attractive and economically viable technology for downstream processing of *Aspergillus oryzae* α -galactosidase. *Process Biochemistry*, 43, 1293-1299.
- Naggar, N. E. A. E., Moawad, H., Shweihy, N. M. E., Ewasy, S. M. E. (2015) Optimization of culture conditions for production of the anti-leukemic glutaminase free L-Asparaginase by newly isolated *Streptomyces olivaceus* NEAE-119 using response surface methodology. *Biomed Res Int* 627031

Naggar, N.E.A.El., Deraz, S.F., Soliman, H.M., Deeb, N.M.El., Shweihy, N.M.El. (2017) Purification, characterization and amino acid content of cholesterol oxidase produced by *Streptomyces aegyptia* NEAE 102. *BMC Microbiol* 17, 76.

National Committee for Clinical Laboratory Standards: Evaluation of the linearity of Quantitative Measurement Procedures: A Statistical Approach; Approved Guideline. Document EP6-A. Wayne, PA, NCCLS; 2003.

National Research Council, Diet and health implications for reducing chronic disease risk, National Academy Press, Washington, DC, 1989.

Nene, S., Varma, R. (2003) Biosynthesis of cholesterol oxidase by *Streptomyces lavendulae* NCIM 2421. *Enzyme Microb Technol* 33 286–291.

Nishiya, Y., Harada, N., Teshima, S. I., Yamashita, M., Fujii, I., Hirayama, N., Murooka, Y. Improvement of thermal stability of *Streptomyces* cholesterol oxidase by random mutagenesis a structural interpretation. *Protein Eng* 10, 231–235.

Niwas, R., Singh, V., Singh, R., Tripathi, D., Tripathi, C. K. M. (2013) Production, purification and characterization of cholesterol oxidase from a newly isolated *Streptomyces* sp. *World J Microbiol Biotechnol* 29, 2077–2085

Noriyaku, D., Rikizo, A. (1998) Preparation of extracellular cholesterol oxidase with high activity in presence of organic solvent from *Pseudomonas species* strain ST-2000. *Appl Environ Microbiol* 64, 1929-32.

Ohta, T., Fujishoro, K., Yamaguchi, K., Tamura, Y., Aisaka, K., Uwajima, T., Hasegawa, M. (1991) Sequence of gene choB encoding cholesterol oxidase of *Brevibacterium sterolicum*: comparison with choA of streptomyces sp. *Gene*, 103, 93-96.

Pandey, S.K., Banik, R.M. (2011) Extractive fermentation for enhanced production of alkaline phosphatase from *Bacillus licheniformis* MTCC 1483 using aqueous two phase systems. *Bioresource Technol*, 102, 4226-4

Patel, R. N (2018) Biocatalysis for synthesis of pharmaceuticals. *Bioorg Med Chem*, 26 (7):1252-1274.

Patnaik, P.R. (2006) Synthesizing cellular intelligence and artificial intelligence for bioprocesses. *Biotechnol Adv* 24, 129-133.

Petrova, L. Y. A., Glubkovskaya, O. I., Possukhina, G. M., Selezneva, A.A (1981). Study of the conditions and properties of cholesterol oxidase from *Actinomyces lavendulae*. *Biokhimiya* 46, 1570-5.

Pollegioni, L., Wels, G., Pilone, M. S., Ghisla, S (1999) Kinetic mechanisms of cholesterol oxidase from *Streptomyces hygroscopicus* and *Brevibacterium sterolicum*. *Eur J Biochem* 264, 140–151.

Purcell, J.P., Greenplate, J. T., Jennings, M. G., Ryerse, J. S., Pershing, J. C, Slims, S. R., Prinsen, M. J., Corbin, D. R., Tran, M., Sammons, R. D., Stonard, R. J. (1993) Cholesterol oxidase: A potent insecticidal protein active against bollweevil larvae. *Biochem Biophys Res Commune* 196, 1406 –1413.

Purcell, J.P., Grenplate, J.T., Jennings, M.G., (1993) Cholesterol oxidase: a potent insecticidal protein active against Boll weevil larvae. *Biochem Biophys Res Commun* 196, 1406-1413.

Qian, B., Song, Z., Hao, L., Wang, W., Kong, D. (2017) Self-Healing Epoxy Coatings Based on Nanocontainers for Corrosion Protection of Mild Steel. *J Electrochem Soc* 164 (2), C54-C60.

Qiaocui, S., Tuzhi, P., Yunu, Z., Yang, C. F. (2005) An Electrochemical Biosensor with Cholesterol Oxidase/ Sol-Gel Film on a Nanoplatinum / Carbon Nanotube Electrode. *Electroanalysis* 17, 857-861.

Querol, E., Perez P. J. A., Mozo-Villarias, A. (1996) Analysis of protein conformational characteristics related to thermostability. *Protein Eng*, 9, 265-271.

Rafigh, S. M., Yazdi, A. V, Vossoughi, M., Safekordia, A. A., Ardjmand, M. (2014) Optimization of culture medium and modeling of curdlan production from *Paenibacillus polymyxa* by RSM and ANN. *Int J Biol Macromol*, 70, 463-473.

Rahimpour, F., Kaul, R.H., Mamo, G. (2016) Response surface methodology and artificial neural network modelling of an aqueous two-phase system for purification of a recombinant alkaline active xylanase. *Process Biochem*, 51, 452–462.

Rajesh, A. K., Grover, S. K., Malhotra, B. D, (2000) Co-immobilization of cholesterol oxidase and horse radish peroxidase in sol–gel films. *Anal Chim Acta* 414, 43–50.

Ram, M. K., Bertocello, P., Dinng, H., Paddeu, S. (2001) Cholesterol biosensor prepared by layer-by-layer technique. *Biosens Bioelectron* 16, 849-856.

- Rathi, P., Saxena, R., Gupta, R. (2001) A novel alkaline lipase from *Burkholderia cepacia* for detergent formulation. *Process Biochem*, 37, 187-192.
- Rhee, H. I., Jeong, K. J., Park, B.K., Hoi, Y.S., Lee, S.Y. (1991) One step purification of cholesterol oxidase from culture broth of a *Pseudomonas sp.* using a novel affinity chromatography method. *J Gen Microbiol* 137, 1213-1214.
- Richmond, W. (1973) Preparation and properties of a bacterial cholesterol oxidase from *Nocardia sp.* and its application to enzyme assay of total cholesterol in serum. *Clin Chem* 19, 1350-1356.
- Rose, G., Shipley, M.J. (1980) Plasma lipids and mortality a source of error. *Lancet* 8, 523-6.
- Rosen-Margalit, I., Rishpon, J. (1993) Biosensor for direct determination of glucose and lactate in undiluted biological fluids *Biosens Bioelectron* 8, 315-323.
- Rosen-Margalit, I., Rishpon, J. (1993) Biosensor for direct determination of glucose and lactate in undiluted biological fluids. *Biosens Bioelectron* 8, 315-323.
- Ruan, C., Li, Y. (2009) Detection of zeptomolar concentrations of alkaline phosphatase based on a tyrosinase and horse-radish peroxidase bienzyme biosensor. *Talanta* 54, 1095-1103.
- Sahu, S., Shera, S. S., Banik, R. M. (2019) Artificial Neural Network Modeling to Predict the Non-Linearity in Reaction Conditions of Cholesterol Oxidase from *Streptomyces olivaceus* MTCC 6820. *J Biosci Med*, 7, 14-24.
- Salama A. Ouf, Abdulaziz Q. Alsarrani, Amira A. Al-Adly, Mohammed K. Ibrahim and Mahasen H. Ismail. *African Journal of Microbiology Research*.Vol. 6 (7), 1509-1519 (2012).
- Salinas, E., Rivero, V., Torriero, A. A. J., Benuzzi, D., Sanz, M. I., Raba, J. (2006). Tetra ethyl orthosilicate film modified with protein to fabricate cholesterol biosensor. *Talanta* 69, 700-705.
- Salva, J. G. T., Liserre, A. M., Moretto, A.L., Zullo, M. A. T., Ventrucci, G., Menezes, T. J. B. (1999) Some enzymatic properties of cholesterol oxidase produced by *Brevibacterium sp.* *Revista de Microbiologia* 30, 315-323.

Salva, J. G.T., Liserre, A. M., Moretto, A.L., Zullo, M. A. T., Ventrucci, G., Menezes, T. J. B (1999). Some enzymatic properties of cholesterol oxidase produced by *Brevibacterium* sp. *Revista de Microbiol* 30:315–323.

Sarika, D., Ashwin, K. P. S. S., Arshad, S., Sukumaran, M. K. (2015) Purification and evaluation of horseradish peroxidase activity. *Int J Curr Microbiol App Sci*, 4, 367-375.

Sasaki, I., Gotoh, H., Yamamoto, R., Tanak, H., Takami, K., Yamashita, K., Yamashita, J. and Horio, T. (1982) Hydrophobic-ionic chromatography: its application to microbial glucose oxidase, hyaluronidase, cholesterol oxidase and cholesterol esterase. *Journal of Biochemistry*, 91, 1555-61.

Schatz, A., Savard, K., Pintner, I. J. (1949) The ability of soil microorganisms to decompose steroids. *J Bacteriol* 58, 117-125.

Sellmyer, D., Skomski, R. (2006) *Advanced magnetic nanostructures*, Springer, New York
Sharma M., 2014. *Actinomycetes: Sources, Identification and their Applications*. *Int J Curr. Microbiol App Sci*, 3, 801-832.

Sheldon, R. A.; Woodley, J. M. (2017) Role of biocatalysis in sustainable chemistry. *Chem Rev*, 118, 801–838.

Shera SS, Sahu S, Banik RM. Preparation of drug-eluting natural composite scaffold using response surface methodology and artificial neural network approach. *Tissue Eng Regen Med* 2018; 15(2): 131-43.

Sherry, B., Abeles, R. H. (1985) Mechanism of action of methanol oxidase, reconstitution of methanol oxidase with 5-deazaflavin, and inactivation of methanol oxidase by cyclopropanol. *Biochemistry* 24, 2594–2605.

Shirokane, Y., Nakamura, Mizusawa, K. (1977) Purification and some properties of an extracellular 3 β -hydroxysteroid oxidase produced by *Corynebacterium cholesterolicum*, *Journal of Fermentation Technology* 55, 337-345.

Shirshova, G. A., Muntayen, L. N., Nazarova, T. S., Nikitin, L. E. (1992) Comparative study of cholesterol oxidase biosynthesis of two strains of *Streptomyces lavaendulae*. *Prikl BioKhim Mikrobiol* 28 711-5.

Shirshova, G.A., Muntayen, L.N., Nazarova, T.S. and Nikitin, L.E. (1992) Comparative Study of Cholesterol Oxidase Biosynthesis of Two Strains of *Streptomyces lavaendulae*. *Prikladnaia Biokhimiia i Mikrobiologiya*, 28, 711-715.

- Shirshova, G.A., Muntayen, L.N., Nazarova, T.S., Nikitin, L.E., (1992) Comparative study of cholesterol oxidase biosynthesis of two strains of *Streptomyces Ivaendulae*. *Prikl BioKhim Mikrobiol* 28, 711-5.
- Shumyantseva, V., Deluca, G., Bulko, T., Carrara, S., Nicolini, C., Usanov, S. A., Archakov, A. (2004) Cholesterol amperometric biosensor based on cytochrome P450. *Biosens Bioelectron* 19, 971-976.
- Sim, J. H. Kamaruddin, A. H. (2008) Optimization of acetic acid production from synthesis gas by chemolithotrophic bacterium *Clostridium aceticum* using statistical approach. *Bioresource Technol* 99, 2724-35.
- Singh, J., Verma, N. (2010) Partition of glucose oxidase from *Aspergillus niger* in aqueous two phase systems based on salt and polyethylene glycol. *Braz arch biol technol*, 53, 1051-1056.
- Singh, P. and Banik, R.M. (2012) Partitioning studies of L-glutaminase production by *Bacillus cereus* MTCC 1305 in different PEG-salt/dextran. *Bioresource Technol*, 114, 730-734.
- Singh, P., Banik, R.M. (2014) Optimization of Reaction Conditions of L-Glutaminase from *Bacillus cereus* MTCC 1305 Using RSM and ANN Model. *International Journal of Basic and Applied Biology*, 2, 57-64.
- Singh, P., Shera, S. S., Banik, J., Banik, R. M. Optimization of cultural conditions using response surface methodology versus artificial neural network and modeling of L-glutaminase production by *Bacillus cereus* MTCC 1305. *Bioresource Technol*, 2013, 137, 261-269.
- Singh, V., Kumari, K. (2014) Synthesis and Characterization of Chitosan–Starch Crosslinked Film For Controlled Drug Release. *International Journal of Materials and Biomaterials Applications*, 4(1), 7-13.
- Smith, A. G., Brooks, C. J. W. (1976) Cholesterol oxidases: properties and applications. *J Steroid Biochem* 7 (1976) 705–713.
- Smith, M., Zahnley, J., Pfeifer, D., Goff, D. (1995) Growth and cholesterol oxidation by *Mycobacterium* species in Tween 80 medium. *Appl Environ Microbiol* 59, 1425-1429.
- Song, L., Huang, C., Zhang, W., Ma, M., Chen, Z., Gu, N., Zhang, Y. (2016) Graphene oxide-based Fe₂O₃ hybrid enzyme mimetic with enhanced peroxidase and catalase-like activities. *Colloids and Surfaces A: Physicochem Eng Aspects*, 506, 747–755.

- Souza, R.L., Ventura, S. P., Soares, C. M., Coutinho, J. A., Á. S. Lima, A. S. (2015) Lipase purification using ionic liquids as adjuvants in aqueous two-phase systems. *Green Chem*, 17, 3026–3034.
- Srisawasdi, P., Jearanaikoon, P., Wetprasit, N., Sriwanthana, B., Kroll, M. H., Lolekha, P. H. (2006) Application of *Streptomyces* and *Brevibacterium* cholesterol oxidase for total serum cholesterol assay by the enzymatic kinetic method. *Clinica Chimica Acta* 372, 103–111.
- Stadtman, T.C., Cherkes, A., Anfinsen, C. B. (1954) Studies on the microbiological degradation of cholesterol. *J Biol Chem* 206, 511-523.
- Stredansky, M., Svorc, R., Sturdik, E., Dercova, K (1993) Repeated batch α -amylase production in aqueous two phase system with *Bacillus strains*. *J Biotechnol*, 27, 181, 1993.
- Stredansky, M., Sturdik, E., Monosik, R. (2012) Application of Electrochemical Biosensors in Clinical Diagnosis. *J Clin Lab Anal*, 26, 22–34.
- Sun, H., Zhang, H., Ang, E. L., Zhao, H (2017). Biocatalysis for the synthesis of pharmaceuticals and pharmaceutical intermediates. *Bioorg Med Chem*, 1–10.
- Sun, J. H., Yu, J. T., Tan, L. (2015) The Role of cholesterol metabolism in Alzheimer's disease. *Mol Neurobiol* 51, 947–95.
- Swoboda, B. E., Massey, V. (1965) Purification and properties of the glucose oxidase from *Aspergillus niger*. *J Biol Chem* 240, 2209–2215.
- Tabatabaei, Y. M., Kamranpour, N., Zahraei, M., Aghaepour, K. (1995) Production of cholesterol oxidase from *Streptomyces fradiae*. *J Sci IR* 10, 151–156.
- Tabatabaei, Y.M., Zahraei, M., Aghaepour, K. and Kamranpour, N. (2001) Purification and Partial Characterization of Cholesterol Oxidase from *Streptomyces fradiae*. *Enzyme Microb Technol*, 28, 410-414.
- Tahri, K., Crociani, J., Ballongue, J., Schneider, F. (1995) Effects of three strains of *Bifidobacteria* on cholesterol. *Lett Appl Microbiol* 2, 149 –151.
- Tan, X, Cai, P., Luo, I., Zou, X. (2006) An amperometric cholesterol biosensor based on multiwalled carbon nanotubes and organically modified sol-gel/chitosan hybrid composite film. *Anal Biochem* 337, 111-120.

- Temoçin, Z., Yiğitoğlu, M. (2009) Studies on the activity and stability of immobilized horseradish peroxidase on poly (ethylene terephthalate) grafted acrylamide fiber. *Bioprocess Biosyst Eng.*, 32, 467.
- Tomassetti, M., Martini, E., Campanella, L., Favero, G., Carlucci, L., Mazzei, F. (2013) Comparison of three immunosensor methods (surface plasmon resonance, screen-printed and classical amperometric immunosensors) for immunoglobulin G determination in human serum and animal or powdered milks. *J Pharm Biomed Anal*, 73, 90–8.
- Tomioka, H., Kagawa, M., Nakamura, S (1976) Some enzymatic properties of 3 β -hydroxysteroid oxidase produced by *Streptomyces violascens*. *J Biochem* 79, 903–915.
- Turfitt, G. E. (1946) The microbiological degradation of steroids, Part III. *Biochem J* 40 79-81.
- Turfitt, G.E. (1994) The microbiological degradation of steroids. Part II: Oxidation of cholesterol by *Proactinomyces spp.* *Biochem J* 38, 49-62.
- Umar, A., Ahmad, R., Hwang, S.W., Kim, S.H., Hajry, A. Al., Hahn, Y.B. (2014) Development of Highly Sensitive and Selective Cholesterol Biosensor Based on Cholesterol Oxidase Co-immobilized with α -Fe₂O₃ Micro-Pine Shaped Hierarchical Structures. *Electrochimica Acta*, 135, 396–403.
- Uwajima, T., Yagi, H., Nakamura, S., Terada, O. (1973) Isolation and crystallisation of extracellular 3 β -hydroxysteroid oxidase of *Brevibacterium sterolicum*. *Agr Biol Chem* 37, 2345-2350.
- Uwajima, T., Yagi, H., Terada, O. (1974) Properties of crystalline 3-beta-hydroxysteroid oxidase of *Brevibacterium sterolicum*. *Agric Biol Chem* 38, 1149–1156.
- Varma, R., Nene, S. (2003) Biosynthesis of Cholesterol Oxidase by *Streptomyces lavendulae* NCIM 2421. *Enzyme Microb Technol*, 33, 286-291.
- Vidal, J. C., Espuelas, J., Garcia, R. E., Castillo, J. R. (2004) Amperometric cholesterol biosensors based on the electropolymerization of pyrrole and the electrocatalytic effect of Prussian-Blue layers helped with self-assembled monolayers. *Talanta* 64, 655-664.
- Vineh, M. B., Saboury, A. A., Poostchi, A. A., Mamani, L. (2018) Physical adsorption of horseradish peroxidase on reduced graphene oxide nanosheets functionalized by amine: a good system for biodegradation of high phenol concentration in wastewater. *Int J Environ Res*, 12 (1), 45-57.

- Vrielink, A., Lloyd, L. F. Blow, D. M. (1991) Crystal structure of cholesterol oxidase from *Brevibacterium sterolicum* refined at 1.8 Å resolutions. *J Mol Biol* 219, 533–554.
- Wahid Z, Nadir N. Improvement of one factor at a time through design of experiments. *World Appl Sci J* 2013; 21: 56-61.
- Wang, J., Song, L., Yukun, Q., Xiaolin, C., Rong, X., Huahua, Y., Kecheng, L., Pengcheng, L. (2017) Preparation and characterization of controlled-release fertilizers coated with marine polysaccharide derivatives. *Chinese Journal of Oceanology and Limnology*, 35, 1086-1093.
- Wang, S., Ge, L., Song, X., Yu, J., Ge, S., Huang, J., Zeng, F. (2012) Based chemiluminescence ELISA: lab-on-paper based on chitosan modified paper device and wax-screen printing. *Biosens Bioelectron*, 31, 212–218.
- Watanabe, K., Shimizu, H., Aihara, H., Nakamura, R., Suzuki, K., Komagata, K. (1986) Isolation and identification of cholesterol degrading *Rhodococcus* strains from food and animal origin and their cholesterol oxidase activities, *Appl Microbiol* 32, 137-147.
- Wilmanska, D., Sedlaczek, L. (1988) The kinetics of biosynthesis and some properties of an extracellular cholesterol oxidase produced by *Arthrobacter sp.* *IM 79. Acta Microbiol Polon* 37, 45-51.
- Wolfbeis, O. S., Oehme, I., Papkovskaya, N., Klimant, I. (2000) Sol-gel based glucose biosensors employing optical oxygen transducers, and a method for compensating for variable oxygen background. *Biosens Bioelectron* 15, 69-76.
- Xavier, L., Freire, M. S., Tato, I. V., Álvarez, J. G. (2015) Application of aqueous two phase systems based on polyethylene glycol and sodium citrate for the recovery of phenolic compounds from Eucalyptus wood. *Maderas Ciencia Y Tecnología*, 17, 345–354.
- Xiea, X., Luo, P., Han, J., Chen, T., Wang, Y., Cai, Y., Liu Q. (2019) Horseradish peroxidase immobilized on the magnetic composite microspheres for high catalytic ability and operational stability. *Enzyme Microb Technol*, 122, 26-35.
- Xu, Z., Guo, Z., Dong, S. (2005) Electrogenerated chemiluminescence biosensor with alcohol dehydrogenase and tris (2,2'-bipyridyl)ruthenium (II) immobilized in sol-gel hybrid material. *Biosens Bioelectron* 21, 455-461.
- Yadav, A. K., Malik, H., Chandel, S. S. (2014) Selection of most relevant input parameters using WEKA for artificial neural network based solar radiation prediction models. *Renew Sustain Energy Rev* 31, 509-19.

Yamashita, M., Toyama, M., Ono, H., Fujii, I., Hirayama, N., Murooka, Y. (1998) Separation of the two reactions, oxidation, and isomerization catalyzed by *Streptomyces* cholesterol oxidase. *Protein Eng* 11, 1075-1081.

Yamashita, M., Toyama, M., Ono, H., Fujii, I., Hirayama, N., Murooka, Y. (1998) Separation of the two reactions, oxidation and isomerization, catalyzed by *Streptomyces* cholesterol oxidase. *Protein Eng* 11, 1075–1081.

Yang, M., Yang, Y., Yang, Y., Shen, G., Yu, R. (2005) Microbiosensor for acetylcholine and choline based on electropolymerization/sol-gel derived composite membrane. *Anal Chim Acta* 530, 205-211.

Yang, S., and Zhang, H., (2012) Optimization of cholesterol oxidase production by *Brevibacterium sp.* employing response surface methodology. *Afr J Biotech* 33, 8316-8322.

Yazdi. M. T., Zahraei, M., Aghaepour, K., Kamranpour, N. (2001) Purification and partial characterization of cholesterol oxidase from *Streptomyces fradiae*. *Enzyme Microb Technol*, 28, 410-414.

Yehia, H.M., Hassanein, W.A., Ibraheim, S.M. (2015) Purification and characterisation of the extracellular cholesterol oxidase enzyme from *Enterococcus hirae*. *BMC Microbiol*, 15, 178

Yin, Y., Sampson, N. S., Vrieland, A., Lario, P. I. (2001) The presence of a hydrogen bond between asparagine 485 and the pi system of FAD modulates the redox potential in the reaction catalyzed by cholesterol oxidase. *Biochemistry* 40 (2001) 13779–13787.

Yoo, E.H., Lee, S.Y. (2010) Glucose Biosensors: An Overview of Use in Clinical Practice. *Sensors*, 10, 4558-4576.

Yu, B., Cheng, H., Zhuang, W., Zhu, C., Wu, J., Niu, H., Liu, D., Chen, Y., Hanjie, Y. (2019) Stability and repeatability improvement of horseradish peroxidase by immobilization on amino-functionalized bacterial cellulose. *Process Biochem*, 79, 40-48.

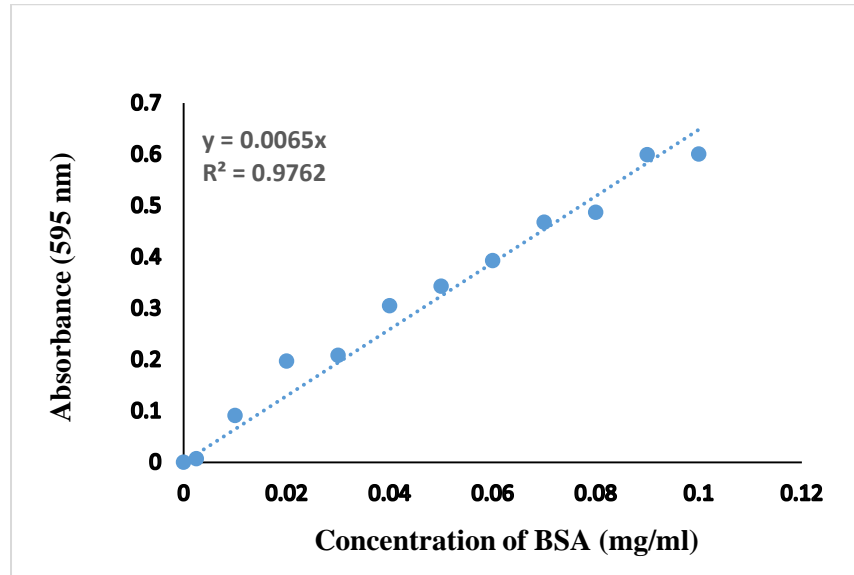
Zhang, H., Yang, S. (2012) Optimization of cholesterol oxidase production by *Brevibacterium sp.* employing response surface methodology. *Afr J Biotechnol*, 11, 8316-8322.

Zhang, J., Zhang, F., Yang, H., Huang, X., Liu, H., Zhang, J., Guo, S. (2010) Graphene Oxide as a Matrix for Enzyme Immobilization. *Langmuir*, 26 (9), 6083-6085.

Zhang, L., Zhu, X., Zheng, S., Sun, H. (2009) Photochemical preparation of magnetic chitosan beads for immobilization of pullulanase. *Biochem Eng J*, 46, 83–87.

Zhao, C., and O'Connor, P.B. (2007) Removal of polyethylene glycols from protein samples using titanium dioxide. *Anal. Biochem*, 365 (2), 283-285.

APPENDIX-1



INSTITUTE OF MEDICAL SCIENCES

BANARAS HINDU UNIVERSITY

ECR/Bhu/Inst/UP/2014/Re-registration-2017 dt. 31.01.2017

No. Dean/2019/EC/ 1003

Dated: 18.01.2019

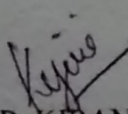
Prof. R M Banik
School of Biochemical Engineering
Indian Institute of Technology
Banaras Hindu University

Dear Sir,

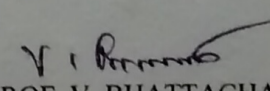
The Ethical Committee meeting was held on 18.01.2019 at 3.00 PM in the Chamber of the Dean, Faculty of Medicine, IMS to review the progress of the project 2016-17 as per the details given below::

| | |
|---------------------|--|
| Name of the Student | Mrs. Shraddha Sahu |
| Synopsis Title | Studies on microbial production of Cholesterol oxidase and its medical application |
| Suggestions | |
| Remarks | The Synopsis is approved by the Institute Ethical Committee |

This is for your information and necessary action at your end.


(DR. KIRAN GIRI)
MEMBER SECRETARY

Yours sincerely,


(PROF. V. BHATTACHARYA)
CHAIRPERSON OF THE ETHICAL COMMITTEE

List of publications

- [1].**Shraddha Sahu**, Shailendra Singh Shera and Rathindra Mohan Banik. Optimization of Process Parameters for Cholesterol oxidase Production by *Streptomyces olivaceus* MTCC 6820. *The Open Biotechnology Journal*. **2019**, 13:47-58.
- [2].**Shraddha Sahu**, Shailendra Singh Shera and Rathindra Mohan Banik. Enhanced reusability of horseradish peroxidase immobilized onto graphene oxide/magnetic chitosan beads for cost effective cholesterol oxidase assay. *The Open Biotechnology Journal*. **2019**, 13:93-104.
- [3].**Shraddha Sahu**, Shailendra Singh Shera, and Rathindra Mohan Banik. Artificial Neural Network Modeling to Predict the Non-Linearity in Reaction Conditions of Cholesterol Oxidase from *Streptomyces olivaceus* MTCC 6820. *Journal of Biosciences and Medicines*. **2019**, 7, 14-24.
- [4].**Shraddha Sahu**, Kshitij Agarwal, Swati Vashishth, Shailendra Singh Shera, and Rathindra Mohan Banik. Partitioning of Cholesterol Oxidase Produced by *Streptomyces olivaceus* MTCC 6820 in Different PEG-Salt-Water Aqueous Two Phase Systems. *International Journal of Innovative Research in Science, Engineering and Technology*, **2019**, 8: 2, 1041-1048.