

Datasheet: BUF012A

BATCH NUMBER 171372

Description:	alamarBlue®
Name:	alamarBlue®
Format:	Reagent
Product Type:	Accessory Reagent
Quantity:	25 ml

Product Details

Applications

This product has been reported to work in the following applications. This information is derived from testing within our laboratories, peer-reviewed publications or personal communications from the originators. Please refer to references indicated for further information. For general protocol recommendations, please visit www.bio-rad-antibodies.com/protocols.

	Yes	No	Not Determined	Suggested Dilution
ELISA	▪			
Immunofluorescence	▪			
Functional Assays	▪			

Where this product has not been tested for use in a particular technique this does not necessarily exclude its use in such procedures. Suggested working dilutions are given as a guide only. It is recommended that the user titrates the product for use in their own system using appropriate negative/positive controls.

Product Form	Liquid
Preservative Stabilisers	None present

Product Information The cell proliferation assay reagent alamarBlue® is designed to provide a rapid and sensitive measure of cell proliferation and cytotoxicity in various human and animal cell lines, bacteria and fungi.

alamarBlue® is an indicator dye, that incorporates an oxidation-reduction (REDOX) indicator that both fluoresces and changes colour in response to the chemical reduction of growth medium, resulting from cell growth. The alamarBlue® cell proliferation assay reagent is designed to quantitatively measure the proliferation of various human and animal cell lines, bacteria and fungi.

Some variability in the absorbance may occur between batches of alamarBlue® but all batches should fall between 0.84 and 0.95AU when measured between 600nm and 602nm on a spectrophotometer.

Please view the full [cell proliferation assay instructions](#).

[Colorimetric and Fluorescence result calculators](#) are available here.

This site includes:

Frequently Asked Questions

Example calculations

Product-related references.

Test Principle

Cell proliferation assay.

- Growing cells cause a chemical reduction of alamarBlue.
- Continued growth maintains a reduced environment. (fluorescent, red).
- Inhibition of growth maintains an oxidized environment. (non-fluorescent, blue).
- Data may be collected using either fluorescence-based or absorbance-based instrumentation.
- Fluorescence is monitored at 530-560nm excitation wavelength and 590nm emission wavelength.
- Absorbance is monitored at 570nm and 600nm.

Intended Use

- Cell proliferation assays.
- The reagent can be used to establish proliferation or relative cytotoxicity in a cell proliferation assay.
- Baseline data for predicting the toxicity of related novel agents can be compared to baseline data with known *in-vivo* toxicity.
- alamarBlue is for use between pH6.8 and pH7.4.

Instructions For Use

Instructions for use can be found at www.bio-rad-antibodies.com/uploads/IFU/BUF012A.pdf.

References

1. Nakayama, G.R. *et al.* (1997) Assessment of the Alamar Blue assay for cellular growth and viability in vitro. [J Immunol Methods. 204: 205-8.](#)
2. Latham, J.P. *et al.* (2000) Prostate-specific antigen promoter/enhancer driven gene therapy for prostate cancer: construction and testing of a tissue-specific adenovirus vector. [Cancer Res. 60: 334-41.](#)
3. McCormick, A.L. *et al.* (2001) Immunization with an interferon-gamma-gp120 fusion protein induces enhanced immune responses to human immunodeficiency virus gp120. [J Infect Dis. 184: 1423-30.](#)
4. Brieger, A. *et al.* (2002) Transient mismatch repair gene transfection for functional analysis of genetic hMLH1 and hMSH2 variants. [Gut. 51: 677-84.](#)
5. Naughton, P. *et al.* (2002) Induction of heme oxygenase 1 by nitrosative stress. A role for nitroxyl anion. [J Biol Chem. 277: 40666-74.](#)
6. Scapagnini, G. *et al.* (2002) Caffeic acid phenethyl ester and curcumin: a novel class of heme oxygenase-1 inducers. [Mol Pharmacol. 61: 554-61.](#)
7. Tiwari, A. *et al.* (2002) Development of a hybrid cardiovascular graft using a tissue engineering approach. [FASEB J. 16: 791-6.](#)
8. Guo, Y. *et al.* (2002) An antiangiogenic urokinase-derived peptide combined with tamoxifen decreases tumor growth and metastasis in a syngeneic model of breast cancer. [Cancer Res. 62: 4678-84.](#)

9. Borg, S.A. *et al.* (2003) Expression of interleukin-6 and its effects on growth of HP75 human pituitary tumor cells. [J Clin Endocrinol Metab. 88: 4938-44.](#)
10. Dawson, C.W. *et al.* (2003) Epstein-Barr virus latent membrane protein 1 (LMP1) activates the phosphatidylinositol 3-kinase/Akt pathway to promote cell survival and induce actin filament remodeling. [J Biol Chem. 278: 3694-704.](#)
11. Ferro, V.A. *et al.* (2003) *In vitro* susceptibilities of *Shigella flexneri* and *Streptococcus pyogenes* to inner gel of Aloe barbadensis Miller. [Antimicrob Agents Chemother. 47: 1137-9.](#)
12. Habtemariam, S. *et al.* (2003) *In vitro* antileishmanial effects of antibacterial diterpenes from two Ethiopian Premna species: *P. schimperi* and *P. oligotricha*. [BMC Pharmacol. 3:6.](#)
13. Roghanian, A. *et al.* (2006) Inflammatory lung secretions inhibit dendritic cell maturation and function via neutrophil elastase. [Am J Respir Crit Care Med. 174: 1189-98.](#)
14. Prakash, J. *et al.* (2006) Intracellular delivery of the p38 mitogen-activated protein kinase inhibitor SB202190 [4-(4-fluorophenyl)-2-(4-hydroxyphenyl)-5-(4-pyridyl)1H-imidazole] in renal tubular cells: a novel strategy to treat renal fibrosis. [J Pharmacol Exp Ther. 319: 8-19.](#)
15. Feder-Mengus, C. *et al.* (2007) Multiple mechanisms underlie defective recognition of melanoma cells cultured in three-dimensional architectures by antigen-specific cytotoxic T lymphocytes. [Br J Cancer. 96: 1072-82.](#)
16. Juillerat-Jeanneret, L. *et al.* (2008) Heterogeneity of human glioblastoma: glutathione-S-transferase and methylguanine-methyltransferase. [Cancer Invest. 26 \(6\): 597-609.](#)
17. Carroll, J. *et al.* (2009) Optimization of a rapid viability assay for *Mycobacterium avium* subsp. *paratuberculosis* by using alamarBlue. [Appl Environ Microbiol. 75: 7870-2.](#)
18. Wu, G. *et al.* (2010) A chimeric protein that functions as both an anthrax dual-target antitoxin and a trivalent vaccine. [Antimicrob Agents Chemother. 54: 4750-7.](#)
19. Cao, S. *et al.* (2010) Residue histidine 669 is essential for the catalytic activity of *Bacillus anthracis* lethal factor. [J Bacteriol. 192: 5799-805.](#)
20. Scotter, E.L. *et al.* (2010) Neuroprotective potential of CB1 receptor agonists in an in vitro model of Huntington's disease. [Br J Pharmacol. 160: 747-61.](#)
21. Lara, D. *et al.* (2010) Anti-trypanosomatid activity of ceragenins. [J Parasitol. 96 \(3\): 638-42.](#)
22. Xiao, P. *et al.* (2010) *Aspergillus fumigatus* flbB encodes two basic leucine zipper domain (bZIP) proteins required for proper asexual development and gliotoxin production. [Eukaryot Cell. 9: 1711-23.](#)
23. Lee, do Y. *et al.* (2010) Activation of PERK signaling attenuates Abeta-mediated ER stress. [PLoS One. 5: e10489.](#)
24. Lewis, C.S. *et al.* (2010) Local Antibiotic Delivery with Bovine Cancellous Chips. [J Biomater Appl. 26: 491-506.](#)
25. Goren, A. *et al.* (2010) Encapsulated human mesenchymal stem cells: a unique hypoimmunogenic platform for long-term cellular therapy. [FASEB J. 24: 22-31.](#)
26. Golay, J. *et al.* (2010) Possible misinterpretation of the mode of action of therapeutic antibodies in vitro: homotypic adhesion and flow cytometry result in artefactual direct cell death [Blood 116:3372-3.](#)
27. Misra, S.K. *et al.* (2010) Effect of nanoparticulate bioactive glass particles on bioactivity and cytocompatibility of poly(3-hydroxybutyrate) composites. [J R Soc Interface. 7: 453-65.](#)
28. Sagar, J. *et al.* (2010) Lowering the apoptotic threshold in colorectal cancer cells by

- targeting mitochondria. [Cancer Cell Int. 10: 31.](#)
29. Mansour, N.R. and Bickle, Q.D. (2010) Comparison of microscopy and Alamar blue reduction in a larval based assay for schistosome drug screening. [PLoS Negl Trop Dis. 4: e795.](#)
 30. Hsu, D.S. *et al.* (2010) Regulation of excision repair cross-complementation group 1 by Snail contributes to cisplatin resistance in head and neck cancer. [Clin Cancer Res. 16: 4561-71.](#)
 31. Garces, A. *et al.* (2010) EspA acts as a critical mediator of ESX1-dependent virulence in Mycobacterium tuberculosis by affecting bacterial cell wall integrity. [PLoS Pathog. 6\(6\): e1000957.](#)
 32. Genetos, D.C. *et al.* (2010) Oxygen tension modulates neurite outgrowth in PC12 cells through a mechanism involving HIF and VEGF. [J Mol Neurosci. 40: 360-6.](#)
 33. Landgraf, K.E. *et al.* (2010) Allosteric peptide activators of pro-hepatocyte growth factor stimulate Met signaling. [J Biol Chem. 285: 40362-72.](#)
 34. Rzhepishevskaya, O. *et al.* (2011) The antibacterial activity of ga3+ is influenced by ligand complexation as well as the bacterial carbon source. [Antimicrob Agents Chemother. 55: 5568-80.](#)
 35. Uitdehaag, J.C. *et al.* (2011) Multidimensional Profiling of CSF1R Screening Hits and Inhibitors: Assessing Cellular Activity, Target Residence Time, and Selectivity in a Higher Throughput Way. [J Biomol Screen. 16: 1007-17.](#)
 36. Rao, T.D. *et al.* (2011) Dual-Fluorescence Isogenic High-Content Screening for MUC16/CA125 Selective Agents. [Mol Cancer Ther. 10: 1939-48.](#)
 37. Voloshin, T. *et al.* (2011) G-CSF supplementation with chemotherapy can promote revascularization and subsequent tumor regrowth: prevention by a CXCR4 antagonist. [Blood. 118: 3426-35.](#)
 38. Arlian, B.M. and Tinker, J.K. (2011) Mucosal Immunization with a Staphylococcus aureus IsdA-Cholera Toxin A2/B Chimera Induces Antigen-Specific Th2-Type Responses in Mice. [Clin Vaccine Immunol. 18: 1543-51.](#)
 39. Lau, L.I. *et al.* (2011) The Effect of Photooxidative Stress and Inflammatory Cytokine on Complement Factor H Expression in Retinal Pigment Epithelial Cells. [Invest Ophthalmol Vis Sci. 52: 6832-41.](#)
 40. Xu, S. *et al.* (2011) Marek's disease virus type 1 microRNA miR-M3 suppresses cisplatin-induced apoptosis by targeting Smad2 of the transforming growth factor beta signal pathway. [J Virol. 2011 Jan;85\(1\):276-85.](#)
 41. Lakhkar, N. *et al.* (2011) Titanium and strontium-doped phosphate glasses as vehicles for strontium ion delivery to cells. [J Biomater Appl. 25: 877-93.](#)
 42. Suter, S.E. *et al.* (2011) FLT3 mutations in canine acute lymphocytic leukemia. [BMC Cancer. 11: 38.](#)
 43. Wilson, B.A. *et al.* (2011) High-throughput screen identifies novel inhibitors of cancer biomarker α -methylacyl coenzyme A racemase (AMACR/P504S). [Mol Cancer Ther. 10: 825-38.](#)
 44. Goetzenich, A. *et al.* (2011) The effects of metoprolol on hypoxia- and isoflurane-induced cardiac late-phase preconditioning. [Acta Anaesthesiol Scand. 55 \(7\): 862-9.](#)
 45. Tao, L. and Yu, J.H. (2011) AbaA and WetA govern distinct stages of *Aspergillus fumigatus* development. [Microbiology. 157: 313-26.](#)
 46. Alsford, S. and Horn, D. (2011) Elongator Protein 3b Negatively Regulates Ribosomal DNA Transcription in African Trypanosomes. [Mol Cell Biol. 31: 1822-32.](#)

47. Crilly, A. *et al.* (2011) Phosphodiesterase 4 (PDE4) regulation of proinflammatory cytokine and chemokine release from rheumatoid synovial membrane. [Ann Rheum Dis. 70: 1130-7.](#)
48. Paget, C. *et al.* (2011) Potential Role of Invariant NKT Cells in the Control of Pulmonary Inflammation and CD8+ T Cell Response during Acute Influenza A Virus H3N2 Pneumonia. [J Immunol. 186: 5590-602.](#)
49. Diril, M.K. *et al.* (2012) Cyclin-dependent kinase 1 (Cdk1) is essential for cell division and suppression of DNA re-replication but not for liver regeneration. [Proc Natl Acad Sci U S A. 109: 3826-31.](#)
50. Warrier, T. *et al.* (2012) Antigen 85C inhibition restricts Mycobacterium tuberculosis growth through disruption of cord factor biosynthesis. [Antimicrob Agents Chemother. 56: 1735-43.](#)
51. Looi, C.Y. *et al.* (2013) Induction of apoptosis in human breast cancer cells via caspase pathway by vernodalin isolated from *Centrathereum anthelminticum* (L.) seeds. [PLoS One. 8 \(2\): e56643.](#)
52. Dreidax, D. *et al.* (2013) Low p14ARF expression in neuroblastoma cells is associated with repressed histone mark status, and enforced expression induces growth arrest and apoptosis. [Hum Mol Genet. 22: 1735-45.](#)
53. Cui, Y.X. *et al.* (2013) A new methodological sequence to expand and transdifferentiate human umbilical cord blood derived CD133+ cells into a cardiomyocyte-like phenotype. [Stem Cell Rev Rep. 9 \(3\): 350-9.](#)
54. Ardakani, A.G. *et al.* (2014) Quantifying the correlation between spatially defined oxygen gradients and cell fate in an engineered three-dimensional culture model. [J R Soc Interface. 11. pii: 20140501.](#)
55. Wang, H. *et al.* (2014) Enhanced osteoblast responses to poly ether ether ketone surface modified by water plasma immersion ion implantation. [Colloids Surf B Biointerfaces. 117: 89-97.](#)
56. Deschamps, E. *et al.* (2014) Characterization of indoor dust from Brazil and evaluation of the cytotoxicity in A549 lung cells. [Environ Geochem Health. 36 \(2\): 225-33.](#)
57. Bernardini, F.P. *et al.* (2015) Superficial Enhanced Fluid Fat Injection (SEFFI) to Correct Volume Defects and Skin Aging of the Face and Periorcular Region. [Aesthet Surg J. 35 \(5\): 504-15.](#)
58. Moreira, Â *et al.* (2015) Adipocyte secreted factors enhance aggressiveness of prostate carcinoma cells. [PLoS One. 10 \(4\): e0123217.](#)
59. Bertoldi, S. *et al.* (2015) Exploiting novel sterilization techniques for porous polyurethane scaffolds. [J Mater Sci Mater Med. 26 \(5\): 182.](#)
60. Rao, T.D. *et al.* (2015) Expression of the Carboxy-Terminal Portion of MUC16/CA125 Induces Transformation and Tumor Invasion. [PLoS One. 10 \(5\): e0126633.](#)
61. Howe, G.A. *et al.* (2016) Focal Adhesion Kinase Inhibitors in Combination with Erlotinib Demonstrate Enhanced Anti-Tumor Activity in Non-Small Cell Lung Cancer. [PLoS One. 11 \(3\): e0150567.](#)
62. Botero A *et al.* (2016) *In vitro* drug susceptibility of two strains of the wildlife trypanosome, *Trypanosoma copemani*: A comparison with *Trypanosoma cruzi*. [Int J Parasitol Drugs Drug Resist. 7 \(1\): 34-41.](#)
63. Yu, H.C. *et al.* (2016) Effects of fibroblast growth factor-2 on cell proliferation of cementoblasts. [J Dent Sci. 11 \(4\): 463-7.](#)
64. Grasys, J. *et al.* (2016) Content of Soluble Factors and Characteristics of Stromal

- Vascular Fraction Cells in Lipoaspirates from Different Subcutaneous Adipose Tissue Depots. [Aesthet Surg J. 36 \(7\): 831-41.](#)
65. van Driel, P.B. *et al.* (2016) EGFR targeted nanobody-photosensitizer conjugates for photodynamic therapy in a pre-clinical model of head and neck cancer. [J Control Release. 229: 93-105.](#)
 66. Howe GA *et al.* (2016) Focal Adhesion Kinase Inhibitors in Combination with Erlotinib Demonstrate Enhanced Anti-Tumor Activity in Non-Small Cell Lung Cancer. [PLoS One. 11 \(3\): e0150567.](#)
 67. van Driel, P.B. *et al.* (2016) EGFR targeted nanobody-photosensitizer conjugates for photodynamic therapy in a pre-clinical model of head and neck cancer. [J Control Release. 229: 93-105.](#)
 68. Chauhan, S. *et al.* (2016) Cdk2 catalytic activity is essential for meiotic cell division *in vivo*. [Biochem J. 473 \(18\): 2783-98.](#)
 69. Drong, C. *et al.* (2017) Effects of monensin and essential oils on immunological, haematological and biochemical parameters of cows during the transition period. [J Anim Physiol Anim Nutr \(Berl\). 101 \(4\): 791-806.](#)
 70. Xu, S. *et al.* (2016) MicroRNA-33 promotes the replicative senescence of mouse embryonic fibroblasts by suppressing CDK6. [Biochem Biophys Res Commun. 473 \(4\): 1064-70.](#)
 71. Li, G. *et al.* (2017) Antimicrobial susceptibility and MIC distribution of 41 drugs against clinical isolates from China and reference strains of nontuberculous mycobacteria. [Int J Antimicrob Agents. 49 \(3\): 364-74.](#)
 72. Lee, Y.W. *et al.* (2017) Effects of Redox Modulation on Cell Proliferation, Viability, and Migration in Cultured Rat and Human Tendon Progenitor Cells. [Oxid Med Cell Longev. 2017: 8785042.](#)
 73. DiSpigna, G. *et al.* (2017) Human cardiac multipotent adult stem cells in 3D matrix: new approach of tissue engineering in cardiac regeneration post-infarction. [J Biol Regul Homeost Agents. 31 \(4\): 911-21.](#)
 74. Martínez-morcillo, S. *et al.* (2018) The organophosphorus pesticide dimethoate decreases cell viability and induces changes in different biochemical parameters of rat pancreatic stellate cells. [Toxicol In Vitro. 54: 89-97.](#)
 75. Calejo, I. *et al.* (2019) A Textile Platform Using Continuous Aligned and Textured Composite Microfibers to Engineer Tendon-to-Bone Interface Gradient Scaffolds. [Adv Healthc Mater. 8 \(15\): e1900200.](#)
 76. Scialla, S. *et al.* (2019) Bioactive chitosan-based scaffolds with improved properties induced by dextran-grafted nano-maghemite and L-arginine amino acid. [J Biomed Mater Res A. 107 \(6\): 1244-52.](#)
 77. Jyotsana, N. *et al.* (2019) Lipid nanoparticle-mediated siRNA delivery for safe targeting of human CML *in vivo*. [Ann Hematol. 98 \(8\): 1905-18.](#)
 78. Huber, L. *et al.* (2020) FGF Expression in HPV16-positive and -negative SCC After Treatment With Small-molecule Tyrosine Kinase Inhibitors and Everolimus. [Anticancer Res. 40 \(10\): 5621-30.](#)
 79. Perut, F. *et al.* (2020) Citrate Supplementation Restores the Impaired Mineralisation Resulting from the Acidic Microenvironment: An In Vitro Study. [Nutrients. 12 \(12\): 3779.](#)
 80. Estaras, M. *et al.* (2020) Melatonin modulates proliferation of pancreatic stellate cells through caspase-3 activation and changes in cyclin A and D expression. [J Physiol Biochem. 76 \(2\): 345-55.](#)

81. Pacheco, P.A.F. *et al.* (2020) Synthesis of new N,S-acetal analogs derived from juglone with cytotoxic activity against *Trypanosoma cruzi*. [J Bioenerg Biomembr. 52 \(3\): 199-213.](#)
82. Shechter, D. *et al.* (2020) Breast Cancer-Derived Microparticles Reduce Cancer Cell Adhesion, an Effect Augmented by Chemotherapy. [Cells. 9 \(10\) 2269.](#)
83. Gonzalez, A. *et al.* (2020) Melatonin modulates red-ox state and decreases viability of rat pancreatic stellate cells. [Sci Rep. 10 \(1\): 6352.](#)
84. Mojena-Medina, D. *et al.* (2020) Design, Implementation, and Validation of a Piezoelectric Device to Study the Effects of Dynamic Mechanical Stimulation on Cell Proliferation, Migration and Morphology. [Sensors \(Basel\). 20 \(7\): 2155.](#)
85. Ho, C.L. *et al.* (2020) Eucalyptus essential oils inhibit the lipopolysaccharide-induced inflammatory response in RAW264.7 macrophages through reducing MAPK and NF- κ B pathways. [BMC Complement Med Ther. 20 \(1\): 200.](#)
86. Gloria, A. *et al.* (2020) Customised multiphasic nucleus/annulus scaffold for intervertebral disc repair/regeneration. [Connect Tissue Res. 61 \(2\): 152-62.](#)
87. Badwelan, M. *et al.* (2020) Poly(δ -valerolactone)/Poly(ethylene-co-vinylalcohol)/ β -Tricalcium Phosphate Composite as Scaffolds: Preparation, Properties, and *In Vitro* Amoxicillin Release. [Polymers \(Basel\). 13\(1\):46.](#)
88. Wu, L. *et al.* (2020) Human airway-like multilayered tissue on 3D-TIPS printed thermoresponsive elastomer/collagen hybrid scaffolds. [Acta Biomater. 113: 177-95.](#)
89. Huang, C.L. *et al.* (2020) Antimicrobial Activity of Electrospun Polyvinyl Alcohol Nanofibers Filled with Poly[2-(tert-butylaminoethyl) Methacrylate]-Grafted Graphene Oxide Nanosheets. [Polymers \(Basel\). 28;12\(7\):1449.](#)
90. Jiménez-Holguín, J. *et al.* (2020) Strontium-Modified Scaffolds Based on Mesoporous Bioactive Glasses/Polyvinyl Alcohol Composites for Bone Regeneration. [Materials \(Basel\). 13\(23\):5526.](#)
91. Yang, P.M. *et al.* (2020) Carbon monoxide-releasing molecules protect against blue light exposure and inflammation in retinal pigment epithelial cells. [Int J Mol Med. 46 \(3\): 1096-106.](#)
92. Ansari, Z. *et al.* (2020) *In-Situ* Synthesis and Characterization of Chitosan/Hydroxyapatite Nanocomposite Coatings to Improve the Bioactive Properties of Ti6Al4V Substrates. [Materials \(Basel\). 13\(17\):3772.](#)
93. Alhuthali, H.M. *et al.* (2020) The natural alkaloid Jerantinine B has activity in acute myeloid leukemia cells through a mechanism involving c-Jun. [BMC Cancer. 20 \(1\): 629.](#)
94. Fatima, S. *et al.* (2021) Selenium Nanoparticles by Moderating Oxidative Stress Promote Differentiation of Mesenchymal Stem Cells to Osteoblasts. [Int J Nanomedicine. 16: 331-43.](#)
95. Peluso, V. *et al.* (2021) Impact of Magnetic Stimulation on Periodontal Ligament Stem Cells [International Journal of Molecular Sciences. 23 \(1\): 188.](#)
96. Hamann, M.V. *et al.* (2021) Transcriptional behavior of the HIV-1 promoter in context of the BACH2 prominent proviral integration gene. [Virus Res. 293: 198260.](#)
97. Pham, M.H. & Mancianti, F. (2021) In Vitro Antiviral Activity of Green Tea Polyphenon-60 against Avian Paramyxoviruses [Vet Med Int. 2021: 1-8.](#)
98. Kant, R. *et al.* (2021) Discovery of an Orally Efficacious MYC Inhibitor for Liver Cancer Using a GNMT-Based High-Throughput Screening System and Structure-Activity Relationship Analysis. [J Med Chem. 64 \(13\): 8992-9009.](#)
99. Caro-Briones, R. *et al.* (2021) Influence of Carbon Nanotubes Concentration on

- Mechanical and Electrical Properties of Poly(styrene-co-acrylonitrile) Composite Yarns Electrospun. [Polymers \(Basel\). 13 \(21\): 3655.](#)
100. Davidov, T. *et al.* (2021) Extracellular Matrix Hydrogels Originated from Different Organs Mediate Tissue-Specific Properties and Function. [Int J Mol Sci.22 \(21\): 11624.](#)
 101. Yano, K. *et al.* (2021) Functional Alterations of Multidrug Resistance-Associated Proteins 2 and 5, and Breast Cancer Resistance Protein upon Snail-Induced Epithelial-Mesenchymal Transition in HCC827 Cells. [Biol Pharm Bull. 44 \(1\): 103-11.](#)
 102. Cheng, S. *et al.* (2021) Pure Mg–Al Layered Double Hydroxide Film on Magnesium Alloys for Orthopedic Applications [ACS Omega. 6 \(38\): 24575-84.](#)
 103. Silva, T.B. *et al.* (2021) Synthesis and in vitro and *in silico* studies of 1H- and 2H-1,2,3-triazoles as antichagasic agents. [Bioorg Chem. 116: 105250.](#)
 104. Liu, Z. *et al.* (2021) Distinct BTK inhibitors differentially induce apoptosis but similarly suppress chemotaxis and lipid accumulation in mantle cell lymphoma. [BMC Cancer. 21 \(1\): 732.](#)
 105. Imieje, V.O. *et al.* (2021) Antileishmanial Derivatives of Humulene from *Asteriscus hierochunticus*. with *in silico*. Tubulin Inhibition Potential [Records of Natural Products. \(2\): 150-71.](#)
 106. Pagani, S. *et al.* (2021) Mechanical and *in vitro* biological properties of uniform and graded Cobalt-chrome lattice structures in orthopedic implants. [J Biomed Mater Res B Appl Biomater. 109 \(12\): 2091-103.](#)
 107. Almeshari, A. *et al.* (2022) The additive effect of iloprost on the biological properties of Mineral trioxide aggregate on mesenchymal stem cells [Journal of Dental Sciences. 17 \(1\): 225-32.](#)
 108. Cometa, S. *et al.* (2021) A 3D Printed Composite Scaffold Loaded with Clodronate to Regenerate Osteoporotic Bone: *In Vitro* Characterization. [Polymers \(Basel\). 13\(1\):150.](#)
 109. Soriente, A. *et al.* (2022) Chitosan/hydroxyapatite nanocomposite scaffolds to modulate osteogenic and inflammatory response. [J Biomed Mater Res A. 110 \(2\): 266-72.](#)
 110. Friesen, A. *et al.* (2022) Comparing α -Quartz-Induced Cytotoxicity and Interleukin-8 Release in Pulmonary Mono- and Co-Cultures Exposed under Submerged and Air-Liquid Interface Conditions. [Int J Mol Sci. 23 \(12\): 6412.](#)
 111. Chang, K. *et al.* (2022) Effects of Temoporfin-Based Photodynamic Therapy on the *In Vitro* Antibacterial Activity and Biocompatibility of Gelatin-Hyaluronic Acid Cross-Linked Hydrogel Membranes [Pharmaceutics. 14 \(11\): 2314.](#)
 112. Chianese, G. *et al.* (2022) ROS-Generating Hyaluronic Acid-Modified Zirconium Dioxide-Acetylacetonate Nanoparticles as a Theranostic Platform for the Treatment of Osteosarcoma. [Nanomaterials \(Basel\). 13\(1\):54.](#)
 113. Miles, C.E. *et al.* (2022) Polymer Texture Influences Cell Responses in Osteogenic Microparticles. [Cell Mol Bioeng. 15 \(5\): 409-23.](#)
 114. Boanini, E. *et al.* (2022) Monetite vs. Brushite: Different Influences on Bone Cell Response Modulated by Strontium Functionalization. [J Funct Biomater. 13\(2\):65.](#)
 115. Rosellini, E. *et al.* (2022) Biomimetic and Bioactive Small Diameter Tubular Scaffolds for Vascular Tissue Engineering. [Biomimetics \(Basel\). 7 \(4\): 199.](#)
 116. Alfawaz, A. *et al.* (2022) Smart Nanocarrier Based on Poly(oligo(ethylene glycol) methyl ether acrylate) Terminated pH-Responsive Polymer Brushes Grafted Mesoporous Silica Nanoparticles [Applied Sciences. 12 \(7\): 3688.](#)
 117. Aljarbou, F. *et al.* (2022) Efficacy of *Salvadora persica*. Root Extract as an Endodontic Irrigant- An *In-vitro*. evaluation [J Herb Med: 100564.](#)

118. Pakamwong, B. *et al.* (2022) Identification of Potent DNA Gyrase Inhibitors Active against *Mycobacterium tuberculosis*. [J Chem Inf Model. 62 \(7\): 1680-90.](#)
119. Taler, M. *et al.* (2022) Complex Effects of Sertraline and Citalopram on *In Vitro*. Murine Breast Cancer Proliferation and on *In Vivo*. Progression and Anxiety Level. [Int J Mol Sci. 23 \(5\): 2711.](#)
120. Kelleher, S. (2022) Loss-of-function SLC30A2 mutants are associated with gut dysbiosis and alterations in intestinal gene expression in preterm infants [Gut Microbes 14 \(1\): 2014739.](#)
121. Srivastava, G.K. *et al.* (2022) Factors influencing mesenchymal stromal cells in in vitro cellular models to study retinal pigment epithelial cell rescue. [Hum Cell. 35 \(4\): 1005-15.](#)
122. Mariani, E. *et al.* (2023) Pure Platelet and Leukocyte–Platelet-Rich Plasma for Regenerative Medicine in Orthopedics—Time- and Preparation-Dependent Release of Growth Factors and Effects on Synovial Fibroblasts: A Comparative Analysis [Int J Mol Sci. 24 \(2\): 1512.](#)
123. Liu, J. *et al.* (2022) Ibrutinib Inhibits Angiogenesis and Tumorigenesis in a BTK-Independent Manner. [Pharmaceutics. 14\(9\):1876.](#)
124. Tuna, T. *et al.* (2023) Effect of Hydrogen Peroxide on the Surface and Attractiveness of Various Zirconia Implant Materials on Human Osteoblasts: An *In Vitro* Study [Materials. 16 \(3\): 961.](#)
125. Alharbi, Z. *et al.* (2023) The LipoDerm Method for Regeneration and Reconstruction in Plastic Surgery: A Technical Experimental *Ex Vivo* Note [Medical Sciences. 11 \(1\): 16.](#)
126. Alanazi, S. (2022) Antineoplastic and Antitrypanosomal Properties of Propolis from *Tetragonula biroi* Friese. [Molecules.27 \(21\): 7463.](#)
127. Al-Hamoudi, F. *et al.* (2022) Bioactive Composite for Orbital Floor Repair and Regeneration. [Int J Mol Sci. 23\(18\):10333.](#)
128. Habita Habit A.H. *et al.* (2023) Evaluation of synergistic bioinhibitory effect between low-level laser irradiation and gold nanoparticles on MCF-7 cell line [J Nanopart Res. 25, 44](#)
129. Lee, T.Y. *et al.* (2023) Anti-microRNA-1976 as a Novel Approach to Enhance Chemosensitivity in XAF1(+) Pancreatic and Liver Cancer. [Biomedicines. 11 \(4\): 1136.](#)
130. Machado, I. *et al.* (2023) Marine Gelatin-Methacryloyl-Based Hydrogels as Cell Templates for Cartilage Tissue Engineering. [Polymers \(Basel\). 15 \(7\): 1674.](#)
131. Hsiao, L.C. *et al.* (2014) Murine cardiosphere-derived cells are impaired by age but not by cardiac dystrophic dysfunction. [Stem Cells Dev. 23 \(9\): 1027-36.](#)
132. Justin, A.W. *et al.* (2023) Densified collagen tubular grafts for human tissue replacement and disease modelling applications [Biomaterials Advances. 145: 213245.](#)
133. Kamsri, B. *et al.* (2023) Bioisosteric Design Identifies Inhibitors of *Mycobacterium tuberculosis* DNA Gyrase ATPase Activity. [J Chem Inf Model. 63 \(9\): 2707-18.](#)
134. Pablos, J.L. *et al.* (2023) New Photocrosslinked 3D Foamed Scaffolds Based on GelMA Copolymers: Potential Application in Bone Tissue Engineering. [Gels. 9 \(5\): 403.](#)
135. Radwan, A.B. *et al.* (2023) Evaluation of the Influence of Eggshell (ES) Concentration on the Degradation Behavior of Mg-2.5Zn Biodegradable Alloy in Simulated Body Fluid. [ACS Biomater Sci Eng. 9 \(5\): 2376-2391.](#)
136. Muthurangan, M. *et al.* (2023) Transient downregulation of NR4A1 leads to impaired osteoblast differentiation through the TGF- β pathway, and Elesclomol (STA-4783) rescues this phenotype. [Cell Biochem Funct. 41 \(5\): 590-8.](#)

137. Vozovyyk, K. *et al.* (2023) Effect of Cryoprotective Solutions on Metabolic Activity of *Chlorococcum dissectum* and *Dunaliella salina* Cell Cultures [Problems of Cryobiology and Cryomedicine. 33 \(1\): 14-24.](#)
138. Lin, K.M. *et al.* (2023) Upregulation of IQGAP2 by EBV transactivator Rta and its influence on EBV life cycle. [J Virol. 97 \(8\): e0054023.](#)
139. Itoh, Y. *et al.* (2023) Discovery of Selective Histone Deacetylase 1 and 2 Inhibitors: Screening of a Focused Library Constructed by Click Chemistry, Kinetic Binding Analysis, and Biological Evaluation. [J Med Chem. Oct 17 \[Epub ahead of print\].](#)
140. Jiménez-Holguín, J. *et al.* (2024) Osteogenic-angiogenic coupled response of cobalt-containing mesoporous bioactive glasses *in vivo*. [Acta Biomater. S1742-7061\(24\)00003-5.](#)
141. Hur, J.Y. *et al.* (2020) The innate immunity protein IFITM3 modulates γ -secretase in Alzheimer's disease. [Nature. 586 \(7831\): 735-40.](#)
142. Alhamoudi, H.F. (2024) The role of fabrication methods and the impact of hydroxyapatite content on PU/HA scaffolds for tissue regeneration [Journal of Materials Research. \[Epub ahead of print\].](#)
143. Whitcomb, A. *et al.* (2024) Response Surface Methodology Optimizes Selenium Inhibition of Prostate Cancer PC-3 Cell Viability [Journal of Trace Elements in Medicine and Biology. : 127414.](#)
144. Habita Habit, H, A. *et al.* (2023) Evaluation of synergistic bioinhibitory effect between low-level laser irradiation and gold nanoparticles on MCF-7 cell line [Journal of Nanoparticle Research. 25 \(3\) 28 Feb \[Epub ahead of print\].](#)
145. Cooper, E. *et al.* (2023) Elucidating the cellular uptake mechanisms of heptamethine cyanine dye analogues for their use as an anticancer drug-carrier molecule for the treatment of glioblastoma. [Chem Biol Drug Des. 101 \(3\): 696-716.](#)
146. Kasprzak, A. *et al.* (2023) Oxidation-derived anticancer potential of sumanene-ferrocene conjugates. [Dalton Trans. 53 \(1\): 56-64.](#)
147. Hou, Z. *et al.* (2024) Plasma bias homopolar sputtering technology and its application to enhance bioactivity of polyetheretherketone surface [Surfaces and Interfaces. : 104249.](#)
148. Wong, W. *et al.* (2024) Antcin-H, a natural triterpene derived from *Antrodia cinnamomea*, ameliorates dextran sulfate sodium-induced colitis in mice by inhibiting the NLRP3 inflammasome [Journal of Traditional and Complementary Medicine. 30 Mar \[Epub ahead of print\].](#)
149. Deken, M.M. *et al.* (2020) Nanobody-targeted photodynamic therapy induces significant tumor regression of trastuzumab-resistant HER2-positive breast cancer, after a single treatment session. [J Control Release. 323: 269-81.](#)
150. Madadi-Goli, N. *et al.* (2024) The importance of heteroresistance and efflux pumps in bedaquiline-resistant *Mycobacterium tuberculosis* isolates from Iran. [Ann Clin Microbiol Antimicrob. 23 \(1\): 36.](#)
151. Huang, S. *et al.* (2024) Cellular experimental study and mechanism of surface modification of 3D printed titanium materials to modulate the sealing and antimicrobial properties of oral implants [European Journal of Inflammation. 7 May \[Epub ahead of print\].](#)
152. Novello, E. *et al.* (2024) Synthesis, Characterisation, and *In Vitro* Evaluation of Biocompatibility, Antibacterial and Antitumor Activity of Imidazolium Ionic Liquids [Pharmaceutics. 16 \(5\): 642.](#)
153. Huang, S. *et al.* (2024) Cellular experimental study and mechanism of surface modification of 3D printed titanium materials to modulate the sealing and antimicrobial properties of oral implants [Eur J Inflamm. 22; 7 May \[Epub ahead of print\].](#)

154. Knowles, H.J. *et al.* (2023) Mature primary human osteocytes in mini organotypic cultures secrete FGF23 and PTH1-34-regulated sclerostin. [Front Endocrinol \(Lausanne\). 14: 1167734.](#)
155. García-Lamas, L. *et al.* (2024) In vivo behavior in rabbit radius bone defect of scaffolds based on nanocarbonate hydroxyapatite. [J Biomed Mater Res B Appl Biomater. 112 \(2\): e35391.](#)
156. Novello, E. *et al.* (2024) Synthesis, Characterisation, and In Vitro Evaluation of Biocompatibility, Antibacterial and Antitumor Activity of Imidazolium Ionic Liquids. [Pharmaceutics. 16 \(5\): 642.](#)
157. Su, A-J.A. *et al.* (2023) Fibrous polypeptide based bioscaffold delivery of minocycline hydrochloride for nerve regeneration [Materials Chemistry and Physics. 305: 127974.](#)
158. Chen, Y.C. *et al.* (2024) Human platelet lysate-cultured adipose-derived stem cell sheets promote angiogenesis and accelerate wound healing via CCL5 modulation. [Stem Cell Res Ther. 15 \(1\): 163.](#)
159. Salamanna, F. *et al.* (2024) A Pilot Study on Circulating, Cellular, and Tissue Biomarkers in Osteosarcopenic Patients. [Int J Mol Sci. 25 \(11\): 5879.](#)
160. Lev, R. *et al.* (2024) Development of a local controlled release system for therapeutic proteins in the treatment of skeletal muscle injuries and diseases. [Cell Death Dis. 15 \(7\): 470.](#)
161. Niazy, A.A. *et al.* (2024) FTY720 Reduces the Biomass of Biofilms in *Pseudomonas aeruginosa* in a Dose-Dependent Manner [Antibiotics. 13 \(7\): 621.](#)
162. Pakamwong, B. *et al.* (2024) Ligand-Based Virtual Screening for Discovery of Indole Derivatives as Potent DNA Gyrase ATPase Inhibitors Active against *Mycobacterium tuberculosis* and Hit Validation by Biological Assays. [J Chem Inf Model. Jul 12 \[Epub ahead of print\].](#)
163. Wong, W. *et al.* (2024) Antcin-H, a natural triterpene derived from *Antrodia cinnamomea*, ameliorates dextran sulfate sodium-induced colitis in mice by inhibiting the NLRP3 inflammasome [J Trad Comp Med. 30 Mar \[Epub ahead of print\].](#)
164. Kim, H.Y. *et al.* (2024) CD150-dependent activation of EBV-transformed B cells induces the differentiation of peripheral blood monocytes via the secretion of multiple cytokines. [Int J Mol Med. 54 \(3\): 79.](#)
165. Silingardi, F. *et al.* (2024) Regulation of osteogenesis and angiogenesis by cobalt, manganese and strontium doped apatitic materials for functional bone tissue regeneration. [Biomater Adv. 163: 213968.](#)
166. Huber, L. *et al.* (2024) Influence of Tyrosine Kinase Inhibitors and Everolimus on TGFβ1 and TGF-β Receptor 2 in Squamous Cell Carcinoma Cells. [Anticancer Res. 44 \(8\): 3287-94.](#)
167. Higuchi, M. *et al.* (2024) Antimicrobial effects of epigallocatechin-3-gallate, a catechin abundant in green tea, on periodontal disease-associated bacteria [Archives of Oral Biology. : 106063. 31 Jul \[Epub ahead of print\]](#)
168. Yang, P.M. *et al.* (2021) Sulforaphane inhibits blue light-induced inflammation and apoptosis by upregulating the SIRT1/PGC-1α/Nrf2 pathway and autophagy in retinal pigment epithelial cells. [Toxicol Appl Pharmacol. 421: 115545.](#)
169. Zhu, Z.J. *et al.* (2021) Virus-encoded miR-155 ortholog in Marek's disease virus promotes cell proliferation via suppressing apoptosis by targeting tumor suppressor WWOX. [Vet Microbiol. 252: 108919.](#)
170. Alanazi, S. & Alenzi, N.D. (2024) Phytochemical profiling and characterization of

- flavonoid derivatives from propolis sample and investigation of cytotoxic and antiprotozoal activities. [Sci Rep. 14 \(1\): 21295.](#)
171. Chen, Y.Y. *et al.* (2024) High-glucose impact on UVB responses in human epidermal keratinocytes: Insights on diabetic skin's resistance to photocarcinogenesis. [Life Sci. : 123083.](#)
172. Amoli, M.S. *et al.* (2024) Protocol for 3D bioprinting of nanoparticle-laden hydrogels to enhance antibacterial and imaging properties. [STAR Protoc. 5 \(4\): 103393.](#)
173. Lee, T.Y. *et al.* (2024) *Bacillus amyloliquefaciens* CU33 Fermented Feather-Soybean Meal Product Improves the Crude Protein Digestibility, Diarrhea Status, and Growth Performance of Goat Kids. [Animals \(Basel\). 14 \(19\)Sep 29 \[Epub ahead of print\].](#)
174. Sartori, M. *et al.* (2024) Biological Characterization of Ti6Al4V Additively Manufactured Surfaces: Comparison Between Ultrashort Laser Texturing and Conventional Post-Processing. [Adv Healthc Mater. : e2402873.](#)
175. Maurer, S. *et al.* (2024) Glutathione has cell protective and anti-catabolic effects in articular cartilage without impairing the chondroanabolic phenotype [Heliyon. 10 \(22\): e40368.](#)
176. Łaska, G. *et al.* (2024) Evaluating the impact of Xanthoparmelia conspersa extracts on signaling in HeLa cells and exploring their diverse biological activities. [Sci Rep. 14 \(1\): 28531.](#)
177. Alanazi, S. & Alenzi, N.D. (2024) Evaluation of the antitrypanosomal activity, cytotoxicity and phytochemistry of red Brazilian propolis. [PLoS One. 19 \(11\): e0313987.](#)
178. McGahon, J. *et al.* (2024) Non-ionic surfactant vesicles exert anti-inflammatory effects through inhibition of NFκB. [J Inflamm \(Lond\). 21 \(1\): 49.](#)
179. Trufanova, N.A. *et al.* (2024) Hypothermic Storage of Mesenchymal Stromal Cell-based Spheroids at a Temperature of 22°C [Probl Cryobiol Cryomed 34 \(2\): 186-200.](#)
180. Dodig, M. *et al.* (2024) Insulin increases type I collagen synthesis in hepatic stellate cells via α5β1 integrin [Metabolism and Target Organ Damage. 4: 49.](#)
181. Trufanova, N. *et al.* (2024) Metabolic Mode of Alginate-Encapsulated Human Mesenchymal Stromal Cells as a Background for Storage at Ambient Temperature. [Biopreserv Biobank. Dec 26 \[Epub ahead of print\].](#)
182. Łaska, G. *et al.* (2024) Evaluating the impact of Xanthoparmelia conspersa extracts on signaling in HeLa cells and exploring their diverse biological activities. [Sci Rep. 14 \(1\): 28531.](#)
183. Muthurangan, M. *et al.* (2023) Transient downregulation of NR4A1 leads to impaired osteoblast differentiation through the TGF-β pathway, and Elesclomol (STA-4783) rescues this phenotype. [Cell Biochem Funct. 41 \(5\): 590-8.](#)
184. Hosseini, S. *et al.* (2024) Investigation of Oxidative-Stress Impact on Human Osteoblasts During Orthodontic Tooth Movement Using an In Vitro Tension Model. [Int J Mol Sci. 25\(24\):13525.](#)
185. Trufanova, N. *et al.* (2024) Bioengineering of Mesenchymal-Stromal-Cell-Based 3D Constructs with Different Cell Organizations [Eng. Proc 81\(1\): 8](#)
186. Zhou, J. *et al.* (2025) Constructing Hydroxylated Graphite-Like Film with Protein Regulation on PEEK for Integrated Bone-Soft Tissue Therapy [Advanced Functional Materials. 2423821 \[Epub ahead of print\]](#)
187. Romanczuk, P. *et al.* (2025) Multi-Organ-on-Chip approach to study the impact of inter-organ communication on the efficacy and side effects of cancer therapy. [Chem Biol Interact. 413: 111460.](#)

188. Shultz, D.J. *et al.* (2023) Design and development of raw clay-based formulations emulsions loaded with ascorbyl glucoside, *in vitro* evaluations on topical delivery and cell viability. [J Dispers Sci Technol. 45 \(4\): 731-742.](#)
189. García-Perdiguero, J.C. *et al.* (2025) Unraveling the role of calcium in the osteogenic behavior of mesoporous bioactive glass nanoparticles [Acta Biomaterialia. 198: 482-496.](#)

Further Reading	1. Rampersad SN (2012) Multiple applications of Alamar Blue as an indicator of metabolic function and cellular health in cell viability bioassays. Sensors (Basel). 12 (9): 12347-60.
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Acknowledgements	Manufactured for Bio-Rad by Trek Diagnostic System. U.S. patent 5,501,959.
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Printed on 12 Aug 2025