
bio-az

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Animal Care Synbiotics

Our microbiome is directly connected to our pet's microbiome.

The problem we see..

Today, living in urban areas and confined environments, cats, dogs and horses are no longer able to hunt or forage for food as nature intended. Their diets are chosen by their well-meaning, but often unaware, owners resulting in microbiome imbalances and health challenges.

Irritated/Inflammatory Bowel Diseases – Acute or chronic diarrhea, vomiting, loss of appetite poor nutrient absorption.

Dental Problems – inflammation, gum tissue damage, bad breath

Skin allergies, skin infections and inflammation causing dull looking coat, itching and excessive shedding

Increased anxiety, depression and other behavior issues

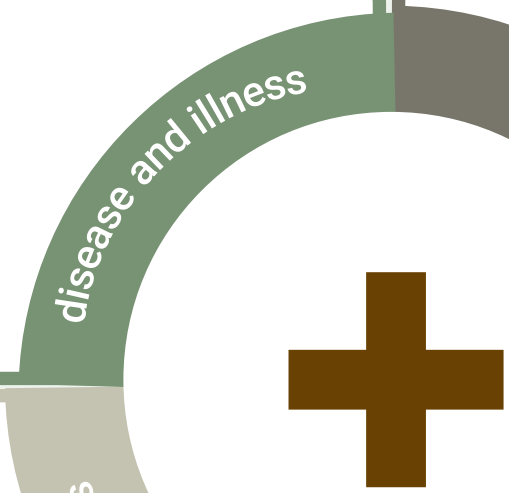
Our pet's microbiome is their first line of defense and the key to health and vitality.

Bio-az Animal Synbiotics

Synbiotic blends of non-GMO Bacillus subtilis strains and clean label, allergen free prebiotics and postbiotics.

Probiotic supplementations successfully prevent and treat acute gastroenteritis, IBD, and promote healthy skin and coats in companion animals.

Bacillus subtilis plays a fundamental role in the induction, training and function of the host metabolism, immunity and response to infection.



Bio-az synbiotics positively impact the microbiome to enhance metabolism, immunity, and behaviour.

Bacillus subtilis post biotic metabolites have a profound impact on the gut-brain axis promoting serotonin production.

Bio-az Animal : Bacillus subtilis metabolites
The Menaquinone Advantage

- The Bacillus subtilis strains in Bio-az Animal produce menaquinone-7 (Vitamin K2-MK7).
- This naturally produced form of Vit K2, acts as a cofactor to activate γ-carboxylation of osteocalcin. MK-7 has shown the highest bioavailability and the most significant effect on OC carboxylation in human and animal compared to K1 or K2-MK-4.
- Osteocalcin is a biomarker for healthy bone metabolism and plays an important role in the prevention of osteoporosis, by facilitating the transportation of calcium to improve bone density.
- Commercial animal custodians have been feeding bacillus subtilis to improve bone density for a long time.

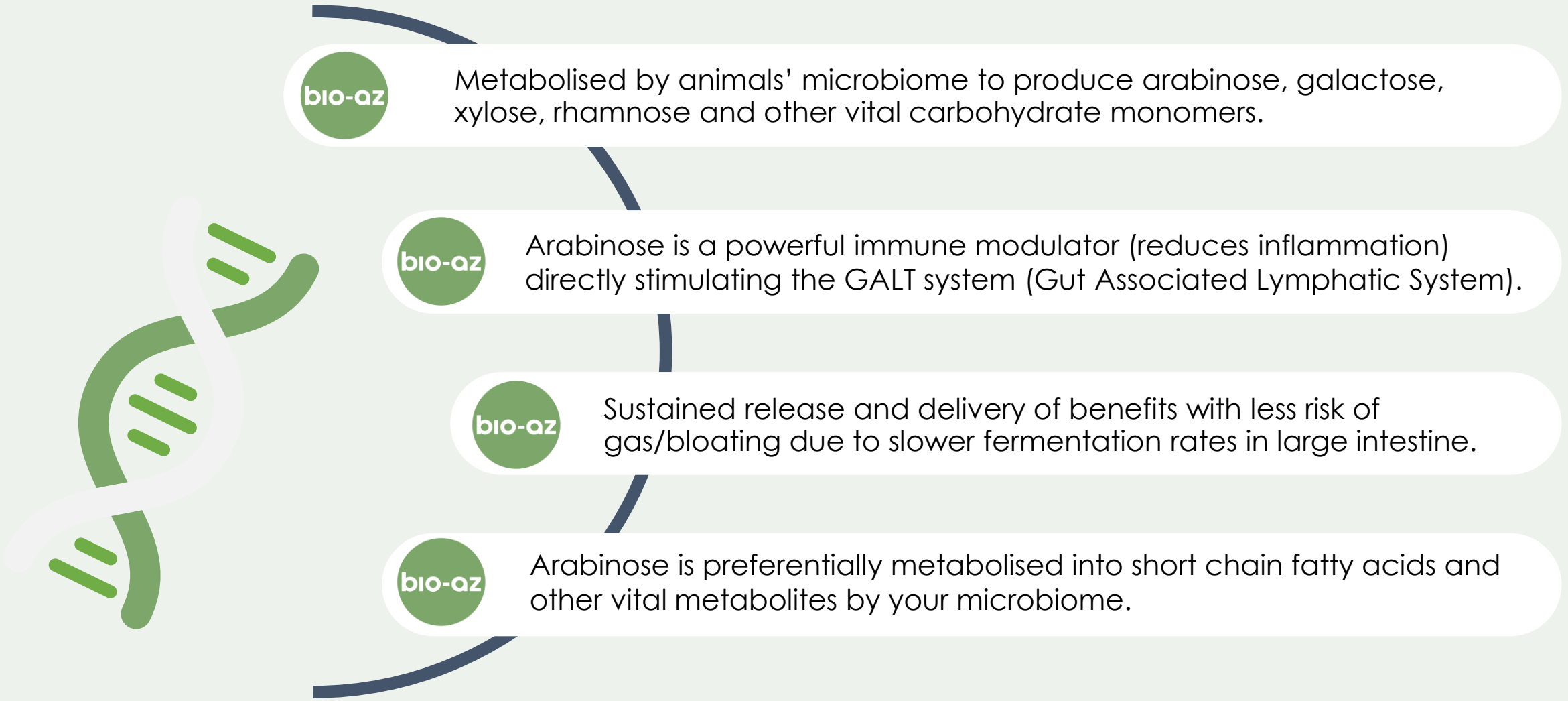
Bio-az Postbiotics

- Provides the gut with immediate beneficial metabolites.
- Anti-viral and anti microbial properties.
- Acts as a ligand to attach to toll receptors to reduce inflammation and improve immunity.
- Preferentially stimulates reproduction of beneficial microbes in the colon.

Bio-az Green Banana Resistant Starch

- Highly effectively metabolised by animals' microbiome into short chain fatty acids (specifically butyrate) to enhance gut wall and immune function.
- Preferentially metabolised by known beneficial gut microbiota such as Akermansia which is known to reduce obesity and insulin resistance.
- Reduces inflammation and upregulates intestinal villi growth through targeted apoptosis and cell replication.
- Utilised through a slow sustained fermentation throughout the large intestine which minimises bloating and gas production.

Bio-az Sprouted Yellow Pea Fibre



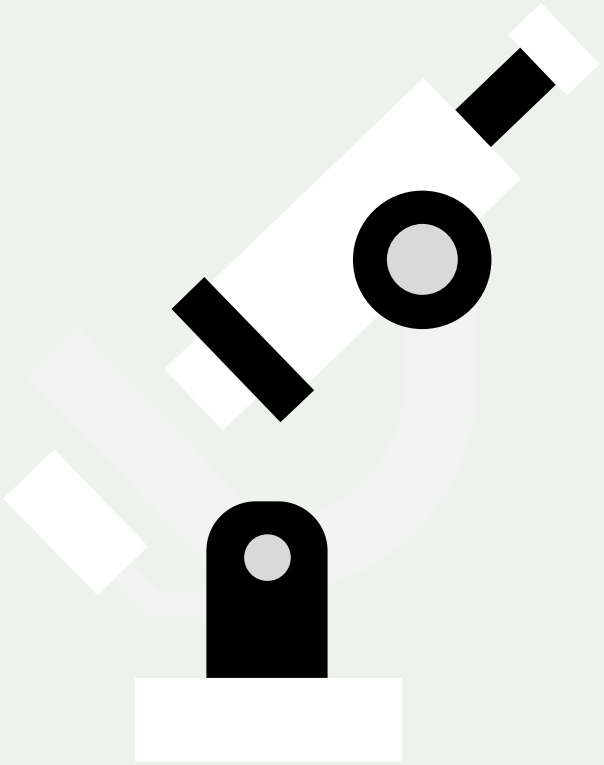
- Metabolised by animals' microbiome to produce arabinose, galactose, xylose, rhamnose and other vital carbohydrate monomers.
- Arabinose is a powerful immune modulator (reduces inflammation) directly stimulating the GALT system (Gut Associated Lymphatic System).
- Sustained release and delivery of benefits with less risk of gas/bloating due to slower fermentation rates in large intestine.
- Arabinose is preferentially metabolised into short chain fatty acids and other vital metabolites by your microbiome.

Bio-az Inulin from Chicory Root

- Promotes healthy gastrointestinal flora
- Stimulates the production of short chain fatty acids
- Reduces inflammation and improves immunity
- Improves insulin resistance

Bio-az Canine Oral

Synbiotic combination TBC subject to customer requirements



1. Positively stimulates the immune system to reduce inflammation and improve function, orally and via ingestion.
2. Promotes and maintains healthy oral microbiome with antimicrobial properties which assist the prevention of caries and bad breath.
3. Protects the oral cavity from caries by producing beneficial biofilms and reduces adhesion of pathogenic organisms.
4. Adjusts oral flora, activates activate gingival fibroblast cells and induces cytokine production.

Ingredient Advantages

Guaranteed Probiotic Survival: 100% survival rate right through to time of purchase and consumption.

Guaranteed Functional Prebiotics: Prebiotic oligosaccharides (short & long chain) blends per serve to feed your pets' microbiome.

Guaranteed Stability: Shelf Stable Fridge Free for 24 months at ambient temperatures in FMCG products with high water activity.

Simple & Effective CIP: Bio-az CIP Protocol – Common cost-effective food grade products that easily perform in existing CIP systems.

Proven Stability, Efficacy and Quality

RESILIENCE: Most probiotic strains aren't robust enough to survive the rigors of aseptic manufacturing processes.	**bio-az**: Our blend of microbes have a proven tolerance to very high heat and a wide pH range.
STABILITY: Impossible to have stability in most FMCG products with high water activity when combining a prebiotic, postbiotic and probiotic.	**bio-az** : Proven Shelf Stability (>24 months) at ambient temperatures in high water activity FMCG applications.
EFFICACY: Most probiotics are processed for FMCG application are not alive or functional at time of consumption, even if refrigerated.	**bio-az**: Proven efficacy and delivery to the colon time of consumption. CFU on the label equals CFU upon consumption.
RAW AND FINISHED GOODS STROAGE: Most ingredients and finished good containing live probiotics require refrigeration, have limited shelf life or both.	**bio-az CIP Program**: Bio-az ingredients are shelf stable for 2 years as a raw material and then 24 months in finished goods at temperatures below <30°c
PLANT CONTAMINATION: Most bacteria will permanently contaminate manufacturing lines.	**bio-az CIP Program**: Proven, Food Safe, simple, low-cost CIP protocol completely cleans manufacturing lines.

Synbiotic Animal Product Applications

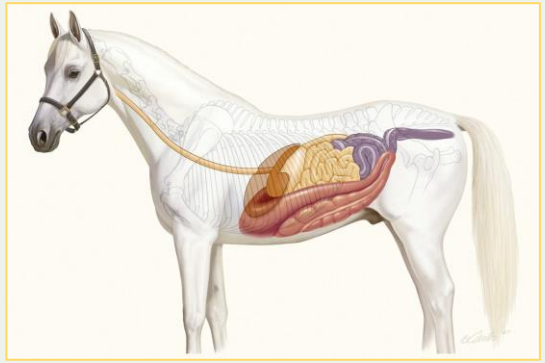
Formulated Supplements

Chews and Treats

Oral Care

Extruded pet food

Functional Pet Beverages



Equine Whole Health

Research & Development

Dr. Peter Valtchev (Right)

Bio-az has developed a highly skilled Research and Development team that is focussed on continuing to develop the company's unique biotechnology and opportunities for future ingredients and pet product applications.

The Bio-az team has developed relationships with multiple Universities and Private Research Institutions to ensure it remains at the forefront of prebiotic, probiotic and postbiotic science and technology.

Bio-az is currently developing biotechnology that customises synbiotic formulations to target specific health outcomes.

New innovation will significantly increase the range of probiotics commercially available to the market whilst increasing viability, shelf life and commercial applications.

Thank you

References

Abdelmonen, H. M., Khashaba, O.H., Al-Daker, M.A., Darwidh Moustafa, M. Effects of Aloe Vera Gel as an Adjunctive Therapy in the Treatment of Chronic Periodontitis: A Clinical ad Microbiological Study. Mansoura Journal of Dentistry 2014;1(3):11-19.

Alexander, B. Oral Health Benefits of Cranberry: A Review January 2019. IOSR Journal of Dental and Medical Sciences 18 (1):41-44. https://doi:10.9790/0853-1801024144

AlGburi, A., Volski, A., Cugini, C., Walsh, E.M., Chistyakov, V.A., Mazanko, M.S., Bren, A. B., Dicks, L.M.T., Chikindas, M.L., Safety Properties and Probiotic Potential of Bacillus subtilis KATMIRA1933 and Bacillus amyloliquefaciens B-1895. Advances in Microbiology > Vol.6 No.6, May 2016. https://doi10.4236/aim.2016.66043

Alkaya, B., Laleman. I., Keceli, S., Ozcelik, O., Cenk Haytac, M., Teughels, W. Clinical effects of probiotics containing Bacillus species on gingivitis: a pilot randomised controlled trial. Journal of Periodontal Research, Vol 52, Issue 3 P 497 – 504. Wiley Online Library. https://doi.org/10.1111/jre.12415

Amargianitakis, M., Antoniadou, M., Rahiotis, C., Varzakas, T. Review Probiotics, Prebiotics, Synbiotics and Dental Caries. New Perspectives, Suggestions and Patient Coaching Approach for a Cavity-free Mouth. Applied Sciences MDPI. 2021, 11, 5472. https://doi.org/103390/app11125472

Awad, S.M., Ahmed, M.A. Antibacterial effect of Aqueous and Alcoholic Ginger Extracts on Periodontal Pathogen Porphyromonus Gingivalis (In Vitro Study) International Journal of Advanced Biological Research Vol. 7 (1) 2017: 65-71. ISSN 2250-3579

Australian Institute of Health and Welfare. https://www.aihw.gov.au/reports/dental-oral-health/oral-health-and-dental-care-in-australia/contents/introduction
Bouassida, M., Fourati N., Krichen, F., Zouari, R., Ellouz-Chaabouni, S., Ghribi, D. Potential applications of Bacillus subtilis SPB1 lipopeptides in toothpaste formulation. Journal of Advanced Research. Elsevier.com/locate/jare. 19 April 2017 http://dx.doi.org/10.1016/j.jare.2017.04.002

Cherry, R. Article online: Should you Switch to a Prebiotic or Probiotic Toothpaste? 21 Sept 2018. https://www.shape.com/lifestyle/mind-and-body/should-you-switch-prebiotic-or-probiotic-toothpaste

Chatterjee, A., Saluja, M., Agarwai, G., Alam, M. Green tea: A boon for periodontal and general health. Journal Indian Society Periodontology. April-Jun 2012; 16(2): 161-167 http://doi:10.4103/0972-124X.99256

Chugh, P., Dutt, R., Sharma, A., Bhagat, N., Dhar, M.s. A critical appraisal of the effects of probiotics on oral health. Journal of Functional Foods 70 30 April 2020 103985 Elsevier. https://doi.org/10.1016/j.jff.2020.103985

Dewhirst, F.E., Chen, T., Izard, J., Paster, B.J., Tanner, A.C., Yu, W.H., et al. (2010). The human oral microbiome. Journal of Bacteriology, 192(19), 5002-5017. https://doi.org/10.1128/JB00542-10

Devine, D.A., Marsh, P.D. Prospects for the development of probiotics and prebiotics for oral applications. Journal of Oral Microbiology, 1:1, 1949, https://doi.org/10.3402/jom.v1i0.1949

Frencken, J.E., Sharma, P., Stenhouse, L., Green, D., Laverty, D., * Dietrich, T. (2017) Global epidemiology of dental caries and severe periodontitis – A comprehensive review. Journal of Clinical Periodontology, 44(Suppl. 18), s94-s105. https://doi.org/10.1111/jcpe.12677.

Future Market Insights. Oral Care Market Forecast 2021–2031. https://www.futuremarketinsights.com/reports/oral-care-market

Gheisar, A. I.Z., Mahmood, R., Harri shivanantham, A., Liu, J., Lieffers, J.R.L., Papagerakis, P., Papagerakis, S. The Clinical, Microbiological, and Immunological Effects of Probiotic Supplementation on Prevention and Treatment of Periodontal Diseases: Systematic Review and Meta-Analysis. MDPI Nutrients 2022, 4, 1036. https://doi.org/10.3390/nu14051036

Grazia, C.M., Cinzia, M. Long-term efficacy of Magnolia Bark Extract and Xylitol administered through chewing gums on caries in adults: A 2-year randomised controlled intervention trial. IRIS Institutional Research Information System – AIR Archivio Istituzionale della Ricerca. http://hdl.handle.net/2434/7/19440

Griffen, A.L., Becker, M.R., Lyons, S.R., Moeschberger, M.L., Leys, E.J. Prevalence of Porphyromonas gingivalis and Periodontal Health Status. Journal of Clinical Microbiology Nov 1998. Vol. 36, No. 11, p. 3239 - 3242 0095-1137/98/$04.00+0

Hafiz Arzim, Mohd. Dr., A new synbiotic-based oral care product comprising probiotic and prebiotic for promoting good oral health was successfully developed through collaborative efforts by Cluster for Oral Cancer Research Initiative IIUM (COCRII), and NFA Technologies Sdn. Bhd. https://www.asiaresearchnews.com/content/synbiotic-mouthwash-helps-maintain-oral-health-1

Han-seung., Hyungjae Lee. Purification and Biochemical Characterisation of Bacteriolytic Enzyme from Bacillus subtiils YU-1432 Active against Porphyromonas gingivalia.. April 7 2011. Department of Bio-Food Materials, College of Medical and Life Sciences, Silla University, Busan 617-736, Republic of Korea.

Haukioja, A. (2010). Probiotics and oral health. European Journal of Dentistry, 4(3), 348-355

Hayashim, M., Haapasalo, M., Imazoto, S., Lee, S., Momoi, Y.,, Murakami, S., Whelton, H., Wilson, N. Dentistry in the 21st century: challenges of a globalising world
Wilson. https://doi.org/10.1111/idj.12132.

Kerr, J.E. and Wang B.Y. Genetic diversity in the oral pathogen Porphyromonas gingivalis: molecular mechanisms and biological consequences. Review. Future Microbiology 2013 8 (5), 607-620. ISSN 1746-0913

Kojima, Yukako., Ohshima, Tomoko., Seneviratne, C.J., Maeda, N. Combining prebiotics and probiotics to develop novel synbiotics that suppress oral pathogens. Elsevier. Journal of Oral Biosciences Vol 58, Issue 1, February 2016 Pages 27-32. https://doi.org/101016/j.job.2015.08.004

Koopaie, M., Fatahzadeh, M., Jahangir. S., Bakhtiari, R. Comparison of the effect of regular and probiotic cake (Bacillus coagulans) on salivary pH and Streptococcus mutans count. National Library of Medicine. Doi: 10.17219/dmp/99757

Kosaka, T., Maeda, T., Nakada, Y., Yukawam M., Tanaka, S. Effects of Bacillus subtilis spore administration on activation of macrophages and natural killer cells in mice. Elsevier. Veterinary Microbiology Laboratory of Veterinary Surgery, School of Veterinary Medicin, Nihon University, Kameino, Fujisawa, Kanagawa, 252, Japan 26 February 1997.

Lalwani, V., Koneru, A., Vanishree, M., Vardendra, M., Hunasgi, S., Surekha, R., Anti-microbial activity of Punica granatum on streptococcus in dental caries patients and healthy individuals: A comparative study. Journal of Advanced Clinical & Research Insights(2014), 1, 94-98. https://doi:10.15713/ins.jcri.24

Lee H.J., Lee, D.R., Choi, B.K., Yang, S.H. Antiperiodontitis Effects of Magnolia biondii Extract on Ligature-Induced Periodontitis in Rats. Nutrients MDPI. 25 April 2019.

Lopez-Santamarina, A., Miranda, J.M., Mondragon, del Carmen Mondragon, A., Lamas, A., Cardelle-Cobas, A., Franco, M.c., Cepeda, A., Potential Use of Marine Seaweeds as Prebiotics, A Review. Molecules, MDPI. 24th February 2020

Maekawa, S., Onizuka, S., Katagiri, S., Hatasa, M., Ohsugi, Y., Sasaki, N., Watanabe, K., Ohtsu, A., Komazaki, R., Ogur, K., Miyoshi-Akiyama, T., Iwata, I., Nitta, H., Izumi, Y. RNA sequencing for ligature induced periodontitis in mice revealed important role of S100A8 and S100A9 for periodontal destruction Scientific Reports 9, Article number: 1466311 October 2019.

Maden, E.A., Altun, c., Ozmen, B., Basak, F., Antimcrobial Effect of Toothpastes Containing Fluoride, Xylitol, Xylitol-Probiotic on Salivary Streptococcus mutans and Lactobacili in children. 2018. Nigerian Journal of Clinical Practice. https://doi:10.4103/ncp.ncp_320_16

Mazkour, S., Shekarforoush, S .S., Basiri, S., Nazifi, S., Yektaseresht, A., & M. Honarmand) Effects of two probiotic spores of Bacillus species on hematological, biochemical and inflammatory parameters in Salmonella Tyhimurium infected rats. Scientific Reports 10, Article number: 8035. 15 May 2020.

Nadelma, P. Mango, M., Farias da Cruz, M., Gomes da Cruz, A., Pithon, M., Fonseca-Goncalves, A., Maia, L. The Effects of Probiotics on Oral Health. 30 January 2020. Wiley Online Library. https://doi.org/10.1002/9781119618973.ch12

Nayak, P. A., Nayal, U.A., Khandwlwai, V. The effects of xylitol on dental cries and oral flora. National Library of Medicine PMC PubMed Central 2014. https://doi:10.2147/CCIDE.S55761

Nazir, Muhammad Ashraf. Prevalence of periodontal disease, its association with systemic diseases and prevention. Int J Health Sci (Qassim). 2017 Apr-Jun; 11 (2): 72-80. NIH PMCID: PMC5426403

Palmer, R.J. (2014). Composition and development of oral bacterial communities. Periodontology, 64(1), 20-39. https://doi.org/10.1111/j.1600-0757.2011.00453.x.

Radaic, A., Kapila, L.Y. The oralome and its dysbiosis: New insights into oral microbiome-host interactions. Science Direct Elsevier. Computational and Structural Biotechnology Journal. VOLUME 19, 2021, PAGES 1335-1360 https://doi.org/10.1016/j.csbj.2021.02.010

Ratna, M. Sudha.M., Neelamraju, J., Sirendra Reddy, M., Kumar, M. Evaluation of the Effect of Probiotic Bacillus coagulans Unique IS2 on Mutans Streptococci and Lactobacilli Levels in Saliva and Plaque: A Double-blinded, Randomised Placebo-controlled Study in Children. National Library of Medicine National Centre for biotechnology information NIH. PMC PubMed Central. Doi: 10.1155/2020/8891708

Rosier, B.T., Buetas, E., Moya-Gonzalvez, E.M., Artacho, A., and Mira, A. Nitrate as a potential prebiotic for the oral microbiome. Nature Research Scientific Reports. 30 July 2020. https://doi.org/10.1038/s41598-020-69931-x

Salvin, J. Fibre and Prebiotics: Mechanisms and Health Benefits. National Library of Medicine PMC Pub Med Central. https://doi:10.3390/nu5041417

Savarni, K., Suchetha, A., Mundinamame, D.B., Bhat, D., Chandran, N., Rajeshwari, H.R., Plant products in dental and periodontal disease. International Journal of Medical and Dental Sciences. 8 July 2015. https://doi.org/1018311/ijmds/2015/19729

Shunya, O. Bacillus subtilis Var. Natto Can Contribute to the Treatment of Dental Caries. International Association for Dental Research IADR. (The Nippon Dental University, Nigata, Japan Year 2018)

Shunya, O. Bacillus subtilis Var. Natto Can Contribute to the Treatment of Dental Caries. International Association for Dental Research IADR. (The Nippon Dental University, Nigata, Japan Year 2018)

Soffriti, I., D'Accolti, M., Fabbri, C., Passaro, A., Manfredini, R., zuliani, G., Libanore, M., Franchi, M., Contini, C., Caselli, E. Oral Microbiome Dysbiosis Is Associated With Symptoms Severity and Local Immune/Inflammatory Response in COVID-19 Patients: A Cross-Sectional Study. Frontiers in Microbiology June 2021, Vol 12. Article 687513. https://doi10.3389/fmicb.2021.687513

Syafiee. Jardin Health Blog. https://jardinpharma.com.my/2022/01/03/orosyntm-is-believed-to-protect-against-oral-illnesses/.

Tsubura, S., Mizunuma, H., Ishikawa, S., Oyake, I., Okabayashi, M., Katoh, K., Shibata, M., Iizuka, T., Toda, T. Probiotic effect of Bacillus subtilis tablets on Peridontopathic oral bacteria.. European Journal of Clinical Microbiology & Infectious Disease vol 28 Article number: 1353 (2009)

Van Dijken, J.W.V., Koistinen, S., Ramberg, P. a randomised controlled clinical study of the effect of daily intake of Ascophyllum nodosum alga on calculus, plaque, and gingivitis. Randomised Controlled Trial, Clin Oral Investig. July 2015; 19(6):1507-18. National Library of Medicine, PubMed.gov. https://doi10.1007/s00784-014-1383-2

Viuda-Martos, M., Fernandez-Lopez, J., Perez-Alvarex, J.A., Pomegranate and its Many Functional Components as Related to Human Health: A Review. 25 June 2010. Comprehensive REVIEWS in Food Science and Food Safety. https:////doi:10.1111/j.1541-4337.2010.00131.x

Xiang, S., Ye, K., Li, M., Ying, J., Wang, H., Han, J., Shi, L., Xiao, J., Shen, Y., Feng, X., Bao, X., Zheng, Y., Ge, Y., Zhand, Y., Liu, C., Chen, J., Chen, Y., Tian, S., Zhu, X. Xylitol enhances the synthesis of propionate in the colon via cross-feeding of gut microbiota. Microbiome Journal. BMC 18 March 2021.

Zaura E., Twetman, S. Critical Appraisal of Oral Pre- and Probiotics for Caries Prevention and Care. Review Article. Caries Research 2019;53:514-526. https://doi:10.1159/000499037

Zhang, X., Al-Dossary, A., Hussain. M., Setlow. P., Li, J. Applications of Bacillus subtilis Spores in Biotechnology and Advanced Materials. 18 August 2020. Appl Environ Microbiol 86:e01096-20. Https://doi.org/10.1128/AEM.01096-20.

Zeng, L., Zhong, G., Jia, J., Bi., H. A phosphopantetheine transferase gene restricted to Porphyromonas. Research in Microbiology Vol 173, Issue 4-5 May-June 2022, 103940. https://doi.org/10.1016/j.resmic.2022.103940

Swaroop Pendyala, J. M. (2012). A High Fat Diet is Associated With Endotoxemia That Originates From The Gut . *Gut Gastroenterology*, 1100-1101.

Massimo Marzorati, P. V. (2021). Treatment with a spore-based probiotic containing five strains of Bacillus induced changes in the metabolic activity and community composition of the gut microbiota in a SHIME® model of the human gastrointestinal system . *Food Research International Volume 149*, 110676 .

Prof John F Cryan PhD, K. J. (2020). The gut microbiome in neurological disorders. *The Lancet Neurology*, 179-194.

Sinderend, C. M. (2009). Bacterial vitamin B2, B11 and B12 overproduction: An overview. *International Journal of Food Microbiology*, 1-7.

Aydin Berenjian, R. M. (2011). Efficient media for high menaquinone-7 production: response surface methodology approach
New Biotechnology, 665-672.

Toshiro Sato, N. I. (2020). MK-7 and Its Effects on Bone Quality and Strength. *Nutrients MDPI*, 965.

Gregory J. Grosickia, B. L. (2020). Self-reported sleep quality is associated with gut microbiome composition in young, healthy individuals: a pilot study. *Sleep Medicine*, 76-81.

Development of a menaquinone-7 enriched functional food Yanwei Maa, Pui Ting Prudence Tanga, Dale D. McClurea, Peter Valtcheva, John F. Ashtonb, Fariba Dehghania, John M. Kavanagha,∗ aThe University of Sydney, School of Chemical and Biomolecular Engineering, NSW 2006, Australia bSanitarium Development and Innovation, Cooranbong, Australia

Sandra R. B. Ruiz Sella, Tarcila Bueno,
Angelo A. B. de Oliveira, SusanGrace Karp & Carlos Ricardo Soccol (2021) *Bacillussubtilis* natto as a potential probiotic in animal nutrition, *Critical Reviews in Biotechnology, 41:3, 355-369, DOI: 10.1080/07388551.2020.1858019*

Cohabiting family members share microbiota with one another and with their dogs *Se Jin Song1, Christian Lauber2, Elizabeth K Costello3, Catherine A Lozupone4†b, Gregory Humphrey2, Donna Berg-Lyons2, J Gregory Caporaso5,6, Dan Knights7,8, Jose C Clemente4†a , Sara Nakielny9 , Jeffrey I Gordon10, Noah Fierer1,2 , Rob Knight11,12**

Martín Ivan Wah-Suáreza Manuel Alejandro Martínez ,8,11,Vázquez, F. J.-P. (2021). Inflammatory bowel disease: The role of commensal microbiome in immune regulation. *Gastroenterología y Hepatología*, 008.

Wu J, W. K. (2021). The role of the gut microbiome and its metabolites in metabolic diseases. . *Protein Cell.* , 360-373. .

Anna Strzępa, F. M.-S. (2018). Antibiotics and autoimmune and allergy diseases: Causative factor or treatment? *International Immunopharmacology* , 328-341.