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2022 5th International Conference of
Chemical and Biological Engineering

2022 5th International Conference of
Food Science and Nutrition Engineering

2022 5th International Conference of
Agricultural Science and Biotechnology

May 26, 2022
Virtual Conference

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Introduction

2022 5th International Conference on Chemical and Biological Engineering (ICCBE2022), 2022 5th International Conference on Food Science and Nutrition Engineering (ICFSNE2022), and 2022 5th International Conference on Agricultural Science and Biotechnology (ICASB2022) are organized by Shanghai Laixi Conference Services Co., Ltd. According to the similarity among the topics of ICCBE2022, ICFSNE2022 and ICASB2022, ICCBE2022 is held in conjunction with ICFSNE2022 & ICASB2022 virtually on May 26, 2022.

ICCBE2022, ICFSNE2022 and ICASB2022 serve as an optimal platform for specialists, scholars and researchers in the field related to Chemical and Biological Engineering, Food Science and Nutrition Engineering, Agricultural Science and Biotechnology to facilitate academic communications and exchange ideas. The conferences offer an academic space known for its interdisciplinary approach as well as a space for academics and practitioners.

Major themes of the Conferences include:

Chemical Engineering: Supramolecular Chemistry, Thermochemistry, Supramolecular and Nanoscale Chemistry, Computational and Modeling Chemistry, Crystallography and Physical Methods, Molecular Chemistry, Inorganic Materials and Polymers, Catalysis and Organometallic Chemistry, Medicinal and Bioinorganic Chemistry, Fundamental Chemistry, etc.

Biological Engineering: Cell Engineering, Molecular Bioengineering, Nucleic Acid Engineering, Food Process Engineering, Physiological Engineering, Energy Systems Engineering, Soil and Water Engineering, Environmental Bioengineering, Bioresources and Biorefinery Engineering, Biomaterials and Tissue Engineering, etc.

Food Science: Food Engineering, Safe Food Storage, Fermentation and Bioprocess Technology, Food Packaging Technologies, Food Materials and Equipments, Food Preservation, Food Measurement and Characterization, Food Composition and Processing, Food Ingredients and Additives, Food Sensory and Flavours, etc.

Nutrition: Nutrition and Food Security, Food Nutrition and Evaluation, Food/Nutrition and Public Health, Functional Foods, Food/Nutrition Policy, Health Products and Functional Ingredients, Malnutrition, Diet and Cognition, Health Management, Nutrition Policy, etc.

Agricultural Science: Agricultural Biotechnology, Agricultural Chemistry, Agricultural Diversification, Agricultural Education, Agricultural Economics, Agroecology, Agrophysics, Animal Breeding, Animal Husbandry, Animal Nutrition, etc.

Biotechnology: Industrial Biotechnology, Nanobiotechnology, Medical Biotechnology, Agro- and Food Biotechnology, Vector Technology, Imaging Technology, Single Cell Technology, Nanobiotechnology and Biomaterials, Omics Technology, Plant Biotechnology, etc.

The abstracts that were selected had a complete peer review process. Selected papers are also published at the cooperating journals of each conference. They show the richness in interdisciplinary approaches, theories, models and applied research presented in the conference.

We would like to thank you for your scientific contribution to ICCBE2022, ICFSNE2022 and ICASB2022 and look forward to having the opportunity to showcase and disseminate your research.

Special thanks also to the organizing committee, and all the people that worked hard, to bring in light this considerable event.

Sincerely,

ICCBE2022, ICFSNE2022 and ICASB2022 Organizing Committees

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H-aggregated NIR-II Fluorophore Based Multifunctional Fluorescent Nanosystem with Tumor Vascular Endothelial Cell Targeting for Enhanced Tumor Thermochemotherapy

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Abstract: Photothermal therapy combined with NIR-II fluorescence imaging have received increasing attention owing to their capacity for precise diagnosis and real-time monitoring of the therapeutic effects. It is of great clinical value to study organic small molecule fluorophores with both photothermal effect and NIR-II fluorescence imaging function. In this work, we report a skillfully fluorescent lipid nanosystem, a RR9 peptide coated anionic liposomes loaded with organic NIR-II fluorophore IR-1061 and carboplatin, which is named RRIAP-C3. By changing the H-aggregation degree of NIR-II fluorophore IR-1061 in liposomes, RRIAP-C3 can not only achieve photothermal performance smaller than 808 nm excitation, but also realize NIR-II fluorescence imaging less than 1061 nm excitation. In vitro experiments prove that RRIAP-C3 can specifically targets tumor vascular endothelial cells through membrane fusion due to the surface modification of cationic peptides and the specific targeting of RGD Peptides. In vivo NIR-II fluorescence imaging shows that RRIAP-C3 clearly realizes tumor imaging and angiography with high sign-to-background ratio (SBR). Furthermore, RRIAP-C3 can effectively increase the temperature of tumor tissue in vivo, so as to cooperate with the temperature sensitive drug release of thermosensitive liposome to realize the synergistic treatment of thermochemotherapy. Therefore, the strategy of lipid nanosystem RRIAP-C3 has great potential for developing a NIR-II fluorescent probe with integrated diagnosis and treatment function.

Keywords: NIR-II Fluorescence Imaging, H-aggregation, Tumor Vascular Endothelial Cell Targeting, Fluorescent Liposome, Thermochemotherapy

Tumor Microenvironment-responsive Multi-modal Nano-delivery System for Enhanced Breast Cancer Chemoimmuno Synergistic Therapy

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Abstract: Recurrence and metastasis of breast cancer remained the primary cause of death. Chemokine receptor 4 (CXCR4)/stromal-derived factor 1α (CXCL12) biological axis and programmed cell death ligand 1/programmed cell death receptor 1 (PD-L1/PD-1) pathway for subsequent breast cancer recurrence and metastasis lay a safety hazard. Small molecule inhibitors of CXCR4 and PD-L1 have become important strategies to inhibit breast cancer metastasis and recurrence. Here, we developed a multi-modal nano-delivery system (MNS). Firstly, PLGA magnetic nanoparticles containing Fe_3O_4 and BMS-202 (a small molecule inhibitor for PD-L1) were prepared by solvent evaporation method, and MnO_2 shells were coated on the nanoparticle surfaces. Subsequently, the surface of the above nanoparticles was modified with hyaluronic acid (HA) and AMD3100 (a small molecule antagonist for CXCR4) to achieve the specificity of CD44 and CXCR4 on the surface of 4T1 cells. Based on the slightly acidic tumor microenvironment, Mn^{2+} and O_2 were generated due to the responsiveness of MnO_2 to H^+ and GSH, and promoted the release of BMS-202. Meanwhile, the Mn^{2+} could generate ·OH through Fenton-like reaction to kill tumor cells, thus realizing chemodynamic therapy (CDT). The in vivo results showed that the nano-delivery system significantly inhibited tumor growth and prevented 4T1 cells from migrating to the lungs by blocking CXCR4/CXCL12 axis, extending the survival of mice. Simultaneously, hypoxia-inducible factor (HIF-1α) and PD-L1 in tumor tissue were down-regulated, and the proportion of CD^{4+} and CD^{8+} T cells was up-regulated, which improved the effect of immunotherapy. In addition, the Fe_3O_4 and Mn^{2+} released by the nano-delivery system during the degradation provided T2-weighted and T1-weighted magnetic resonance imaging (MRI), respectively, realizing the integration of nano-theranotics.

Keywords: Multi-modal, Enhanced CDT, Metastasis, Immune Response, MRI

Development of Efficient Asphaltene Dispersant and Evaluation the Performance at Low Temperature

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Abstract: Asphaltene deposition has always been a serious problem faced by petroleum industry, which is accompanied by every step of crude oil production and processing. Asphaltenes are more likely to deposit and block tubing due to factors such as oil composition, temperature, pressure, and dissolved gas content, limiting oil production efficiency. Adding chemical is currently considered to be the faster and most efficient way to removal plugging, but the temperature drops rapidly after the tubing is blocked. Low temperature will attenuate the effects of chemical and lead to incomplete removal plugging, which will easily causing a secondary blockage of the well. Thus, a new asphaltene dispersant was developed by stirring at 60℃ for 3 h with unsaturated benzene compound as the main dissolving solvent, N-methylpyrrolidone as dispersant and C8-Alcohol as cosolvent. The aggregation and deposition behavior of asphaltene molecules was simulated by a mixture of n-heptane and crude oil with a mass ratio of 1:5, and the size of asphaltene was recorded by Zetasizer Nano-Zs device. The results showed that the asphaltene particle size decreases from 1600 nm to 385 nm (dispersion rate decreased by 75.94%) after adding 0.5 wt% asphaltene dispersant. Additionally, the dissolution rate of asphaltene dispersant is 0.048 g/min at 15℃, and the dissolution dispersion rate is 97%.

Keywords: Asphaltene Dispersant, Low Temperature Performance, Dissolve Effect, Plugging

Responses of Microbial Community to Seasonal Oxygen Depletion in Bohai Sea Water

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Abstract: With the extending of hypoxia in world oceans and coastal regions, better understanding of the microbial variations under oxygen depletion is essential for deciphering the biogeochemical cycling in ecosystems. In this study, a time-scenario sampling was designed along one transect from inshore to offshore in the seasonally-formed oxygen depletion zone of the northwestern Bohai sea from June to August in 2018 at a twenty days interval. Aiming to investigate the microbial responses, the diversity and distribution of bacteria were revealed by high-throughput sequencing. In general, the surface and middle-layer water were dominated by Cyanobacteria, while heterotrophic bacteria became dominant in the bottom layers. Based on the sampling time scenario, distinct distribution pattern of community composition was observed for June and July, but overlapped in some degree for the two August samples. The vertical pattern displayed a more stable stratification along with the proceeding of oxygen depletion. Environmental parameters including depth, salinity, *Chla*, nitrite and pH are impacting the distribution significantly, while in oxygen depleted August as well as the bottom samples, dissolved oxygen and nitrite are the main impacting factors ($p<0.05$). Although the dominant bacteria had a variety of origins based on phylogeny with known species, the highly site specification of bacteria in the studied area could be concluded by similar community composition with connecting area but totally different from adjacent water in Bohai Bay. Our study provides a continuous inspection into the bacterial variations with the depletion of dissolved oxygen in Bohai Sea water, which further in help with understanding the consequence of biogeochemical cycling under anthropogenic impact.

Keywords: 16S rRNA Gene, Bohai Sea, Community Composition, High-throughput Sequencing, Oxygen Depletion

Effects of Light Intensity and Salinity on Growth and Photosynthesis of Marine Green Alga *Chaetomorpha Spiralis*

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Abstract: At present, the marine pollution is becoming more and more serious. And harmful ecological phenomena such as green tide caused by it often occur in the coastal waters. Marine green alga *Chaetomorpha spiralis* is one of the green tide species widely distributed worldwide in temperate and subtropical waters. Environmental factors affect the occurrence and development of the green tidal alga. Therefore, this study explored the effects of light intensity and salinity on the growth and photosynthesis of C. spiralis. Its sample was cultured in a constant temperature incubator for 15 days, measured fresh weight with an analytical balance. The photosynthetic parameters such as Fv/Fm, NPQ and Y (II) were measured with PAM every three days. The results showed that the two factors had a significant impact on the growth and photosynthesis of C. spiralis. Its growth rate (SGR) and photosynthetic rate were the highest under the conditions of light intensity 72μmol·m^{-2} s^{-1} and salinity 30, respectively. C. spiralis is more adaptable to low light. And the average peak growth rates of samples under different light intensity were 17.89%day^{-1} (36μmol·m^{-2} s^{-1}), 23.56% day^{-1} (72μmol·m^{-2} s^{-1}) and 15.77% day^{-1} (108μmol·m^{-2} s^{-1}), respectively. The Fv/Fm and Y (II) values under strong light were significantly lower than those under optimal light intensity, while the NPQ values were significantly higher than those under optimal light intensity. At 108μmol·m^{-2} s^{-1}, the values of the chlorophyll fluorescence parameters Fv/Fm, NPQ and Y (II) were 0.618, 1.50 and 0.27, respectively. With the increase of seawater salinity, the growth rate of C. spiralis firstly increased and then decreased, and the peak values of average growth rate of samples under different salinity conditions were 11.71%day^{-1} (20), 17.28% day^{-1} (25), 23.56% day^{-1} (30), 19.77% day^{-1} (35) and 13.40% day^{-1} (40) respectively. The Fv/Fm and Y (II) values under low salinity were significantly lower than those under optimal salinity, while the NPQ values were significantly higher than those under optimal salinity. The values of the chlorophyll fluorescence parameters Fv/Fm, NPQ and Y (II) measured at the salinity of 20 were 0.583, 1.45 and 0.25, respectively. The results can provide a theoretical basis for marine ecological restoration and marine pollution control using the species.

Keywords: *Chaetomorpha spiralis*, Light Intensity, Salinity, Photosynthetic Parameters, Marine Ecological Restoration

Organic Photovoltaic Device Enhances the Neural Differentiation of Rat Bone Marrow Mesenchymal Stem Cells

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Abstract: Electric stimulation is known to be involved in stem cell differentiation, particularly neural differentiation. Various electric stimulation systems and devices have been developed for neural tissue engineering. The organic photovoltaic materials PM6 and Y6 have attracted attention due to their high-power conversion efficiency. In this study, we used PM6 and Y6 to develop an organic photovoltaic device (OPD) to supply electric stimulation. We tested the growth and neural differentiation potential of rat bone marrow-derived mesenchymal stem cells (BMSCs) under light induced photocurrent. The cell morphology suggested that photoelectric stimulation significantly increased the neurite length and the number of extremities. In addition, genes of neurons marker and neurotrophic factors were upregulated when BMSCs under photoelectric stimulation. Furthermore, the calcium influx of differentiated cells responding to acetylcholine and the phosphorylation of extracellular-signal-regulated kinase (ERK) 1 and 2, protein kinase B (AKT) and mammalian target of rapamycin (mTOR) were significantly increased under photoelectric treatment. These findings demonstrate that PM6:Y6 based OPD could provide photoelectric stimulation to promote BMSCs neuronal differentiation, which might be an alternative approach to electrically manipulate stem cells differentiation into mature and functional neural cells in vitro.

Keywords: Organic Photovoltaic Device, Mesenchymal Stem Cells, Electrical Stimulation, Neuron, Differentiation

The Synthesis of Weakly Entangled UHMWPE and the in-situ Reinforcement of HDPE Matrix

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Abstract: From the perspective of the separation of the active sites of heterogeneous catalysts, POSS blockers were supported on the Ziegler-Natta catalysts surfaces to achieve the weakly entangled UHMWPE resins at high temperature and high activity. The evolution of the entanglement density of the heterogeneous Z-N catalyst was also investigated. Besides, tailored polyethylene reactor blends with the in-situ embedding of weakly entangled UHMWPE were synthesized by the POSS modified ZN catalysts using two-stage cascade polymerization technique. Holistic improvement of the strength/stiffness/toughness was realized by the common injection modeling, owing to the enhanced formation of orientated structure which was verified by the patterns of 2D-SAXS, 2D-WAXD, as well as the fracture morphology. 30 wt% of the less entangled UHMWPE was successfully incorporated into the HDPE matrix to achieve the synchronously increased tensile strength (52.4 MPa, +97.7%), Young's modulus (604.2 MPa, +43.6%), and impact resistance (74.4 kJ/m^2, +675%), compared with those of the bench marked HDPE. However, the dissipation of shish-kebab structure was pronounced in depth direction of the HDPE spline reinforced with the disentangled UHMWPE. [1-2] This dissipation was proved to scarify the strength and stiffness. Finally, branched UHMWPE additives with the further reduced entanglements were readily embedded around the linearly disentangled UHMWPE, which were realized by the polymerization of POSS modified Ti/V bimetallic catalyst. This branched UHMWPE intensified the formation of oriented structure in the HDPE matrix, elevating the amounts of shish-kebab structure and partially orientated crystal. [3] Thus, the balance of strength/stiffness/toughness was synergistically improved, particularly in the strength and stiffness. [4]

Keywords: UHMWPE, Weakly Entangled, Orientation, Relaxation

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Confining Ultra-small Pt-Zn Clusters in Silicalite-1 Zeolite for Efficient Propane Dehydrogenation

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Abstract: Propylene is scarce and in high demands with the rise of shale gas, which is the most significant raw materials for acrylonitrile, propylene epoxide, polypropylene, etc. Propane dehydrogenation (PDH) is a promising method to increase the propene output to meet the increasing demand for propene. However, the Pt-based catalysts always suffer from nanoparticles sintering and coke formation due the harsh reaction conditions, which cause the catalysts to permanently deactivate. Zeolites with ordered porous structures and excellent thermal stability are ideal carriers for supporting metal species. However, conventional impregnation methods usually lead to uneven metal particles with poor dispersion and nanoparticles tend to agglomerate due to high specific surface energy. Here, Pt-Zn clusters confined in silicalite-1 (S-1) zeolite with perfect dispersion is prepared by one-pot synthesis strategy. Metal species distribute well in S-1 and no obvious sintering nanoparticles are observed in TEM. The doping of Zn species obviously enhanced activity and stability of the catalyst. 0.5Pt0.75Zn@S-1 shows the best activity with an initial propane conversion of 43.65% and a propene selectivity of 96.59%. After 20 h on propane feed, no obvious deactivation was observed and the catalyst still has a propane conversion of 43.93% and a propene selectivity of 98.8%. The catalyst with Pt-Zn clusters confined in S-1 has provided an original way to construct efficient catalysts for PDH.

Keywords: Propane Dehydrogenation, Pt-Zn Clusters, Silicalite-1

Effect of Alkali Treatment on Physicochemical Properties of Alecular Sieve and Its Catalytic Performance for Methanol Aromatization

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Abstract: Based on ZSM-5 molecular sieve matrix obtained by hydrothermal synthesis method, a series of ZSM-5 molecular sieves with hollow structure were prepared by alkali post-treatment method. The effects of different alkali treatments on the physicochemical properties and the catalytic performance for methanol to aromatization of hollow ZSM-5 molecular sieves were systematically investigated by means of XRD, TEM, N_2 adsorption and desorption, Py-IR, NH_3-TPD etc. characterization analysis and the experimental evaluation. The characterization results showed that all the ZSM-5 molecular sieves modified here had obvious hollow structure, and the mesoporous ratio of molecular sieves could be increased by alkali treatment. The experimental evaluation results under atmospheric pressure, 450 ℃ and 5 h^{-1} of methanol LHSV showed that the aromatics yield was increased three percentage points over No P-3 ZSM-5 sample obtained by mixed alkali (TPAOH + NaOH) post-treatment, and the aromatics yield was still increased slightly after 7 hours reaction run, but the aromatics yield over other samples decreased obviously under the same conditions. These results indicated that the No P-3 ZSM-5 sample with appropriate hollow structure and suitable acid properties made it have the better catalytic performance and performance stability for methanol to aromatization.

Keywords: ZSM-5 Zeolite, Alkali Treatments, Hollow Structure, Methanol to Aromatization

Design, Synthesis and Biological Evaluation of Novel Coumarin Derivatives as Multifunctional Agents Against Alzheimer's Disease

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Abstract: With the increasing aging of the population, the rational treatment of Alzheimer's disease (AD) has become a more serious matter. Based on the multi-target design strategy, three coumarin derivatives were designed, synthesized and characterized by ^{1}H NMR, ^{13}C NMR and MS. The biological results showed that they had strong inhibitory effect and selectivity on acetylcholinesterase (AChE). Compound 3a had the strongest inhibitory effect on AChE (IC_{50}, 4.28±0.22 μM for eeAChE). And all compounds could inhibit the self-induced and Cu^{2+}-induced aggregation of β-amyloid ($A\beta_{1-42}$), and especially compound 3a had a good inhibitory effect on the self-aggregation of $A\beta_{1-42}$ (IC_{50}, 64.27%±4.70 at 10 μM). Docking studies showed that compound 3a could interact with both the catalytic active site (CAS) and the peripheral anion site (PAS) of acetylcholinesterase. In addition, all compounds showed good antioxidant activity, which might be related to their hydroxyl groups. In cyclic voltammetry, all compounds showed the ability to scavenge superoxide anion. The compounds had certain metal chelating ability, and can selectively chelate Cu^{2+}, Al^{3+}, Fe^{3+}, Fe^{2+}, Zn^{2+} ions. For example, UV spectrum showed that when copper ions were added into the compound, there was an obvious red shift phenomenon at 269 nm. Furthermore, compounds had good blood brain barrier (BBB) penetration in silico prediction. Overall, compound 3a showed the best activity and might be a promising compound for the treatment of AD.

Keywords: Alzheimer's Disease, Coumarin Derivatives, Acetylcholinesterase, Antioxidant, Aβ-aggregation Inhibitors

Association of Plasma Iron with the Risk of Incident Cancer in Chinese Adults with Hypertension: A Nested Case-control Study

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Abstract: Iron is an essential element for organismal health but excessive iron is potentially toxic. However, few observational studies link plasma iron (PI) concentrations and cancer risk, and the results are inconsistent. This study aimed to explore the associations of PI concentrations with cancer risk in Chinese adults with hypertension. We conducted a nested case-control study, including 223 pairs of incident cancer and matched controls from the China Stroke Primary Prevention Trial who had no history of cancer and had PI levels tested at the time of recruitment. The median time between blood sample collection and subsequent cancer event occurrence was 2.13 years. Odds ratios (ORs) and 95% confidence intervals (CIs) for the risk of cancer by PI were estimated from multivariable conditional logistic regression models. There was a U-shaped association between PI concentration and the risk of total cancer. When compared with participants in tertile 2 of PI (114.1 to <150.4 μg/dL), the ORs of total cancer were 2.17 (95% CI: 1.25, 3.85) and 1.29 (95% CI: 0.77, 2.19) in participants in PI tertile 3 (≥150.4 μg/dL) and tertile 1 (<114.1 μg/dL), respectively. Furthermore, higher PI was associated with higher digestive system cancer risk (OR=3.25, 95% CI=1.29, 8.90), while lower PI was associated with increased risk of non-digestive system cancer (OR=3.32, 95% CI=1.39, 8.71). In a sensitivity analysis, the increases in total cancer risk or digestive system cancer risk were still observed with higher PI after the first year of cancer cases were excluded. In conclusion, our results showed an increased risk of cancer- related to higher PI or lower PI in Chinese patients with hypertension.

Keywords: Iron, Cancer, Hypertension, Nested Case-control Study

Comparison of Interindividual Microbial Conversion of Acetyldeoxynivalenols in Human Intestinal Tract

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Abstract: In order to evaluate the potential differences between 3-Ac-DON and 15-Ac-DON in human intestinal microbial metabolism, human fecal samples were anaerobic cultured in vitro. Quantitative fecal microbiota characteristics were obtained by 16S rRNA sequencing, and the data revealed several genera that may be relevant for the transformation of the acetylated DONs. Significant differences in the level of 3-Ac-DON and 15-Ac-DON conversion were observed among microbiota from different human individuals. 3-Ac-DON could be rapidly hydrolyzed, a 10-fold difference was observed between the highest and lowest in vitro conversion after 4 h. However, 15-Ac-DON was not fully transformed in the 4 h culture of all the individual samples. In all cases, the conversion rate of 3-Ac-DON was higher than that of 15-Ac-DON, and the conversion rate of 3-Ac-DON into DON varied from 1.3- to 8.4-fold that of 15-Ac-DON. Based on in vitro conversion rates, it was estimated that 45 - 452 min is required to convert all 3-Ac-DON to DON, implying that deacetylation of 3-Ac-DON is likely to be completely in all human individuals during intestinal transit. However, for conversion of 15-Ac-DON, DON formation was undetectable at 4 h incubation in 8 out of the 25 human samples, while for 7 of these 8 samples conversion to DON was detected at 24 h incubation. The conversion rates obtained for these 7 samples indicated that it would take 1925- 4805 min to convert all 15-Ac-DON to DON, while the other 17 samples required 173-734 min. From these results it followed that for 8 of the 25 individuals conversion of 15-Ac-DON to DON was estimated incomplete during the 1848 min intestinal transit time. The results thus indicate substantial interindividual as well as compound specific differences in the deconjugation of acetylated DONs. A spearman correlation analysis showed a statistically significant relationship between deconjugation of both acetyl-DONs at 4 h and 24 h incubation. Based on the in vitro kinetic parameters and their scaling to the in vivo situation, it was concluded that for a substantial number of human individuals the deconjugation of 15-Ac-DON may not be complete upon intestinal transit.

Keywords: Acetyl-DONs, Gut Microbiota, Deacetylation

Interannual Changes of Fish Community Structure and Keystone Species in the Waters off Southern Shandong Peninsula

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Abstract: In order to grasp the structure characteristics and changing trends of fishery resources in the sea area of Shandong Peninsula under the background of large-scale proliferation and release, based on the survey of fishery resources in the waters of the southern Shandong Peninsula from 2016 to 2018 and the literature data of fishery species, the key species of fishery resource community were taken as the breakthrough point, and through Food web topology and social network analysis methods have analyzed the structure of fishery resources and the interannual changes of key species in the waters of the southern Shandong Peninsula. A total of 20~22 fish species were involved in the food web of the waters off Southern Shandong Peninsula, covered 59~65 prey-predator relationships, with little interannual variation. Based on the dominance analysis, it was found that the dominance of *Larimichthys polyactis*, *Trichiurus lepturus*, and *Scomberomorus niphonius* increased significantly in 2018 after the summer moratorium of marine fishing the density of food web topology ranged from 0.3048 to 0.3684, and the interspecies connectivity was 0.1451 to 0.1634; the key species of the community were *Engraulis japonicus* and *Lophius litulon*. *E. japonicus* as a key predator, *L. litulon* as a key predator, both in 2016-2018 is the dominant species, but the dominance of *E. japonicus* decreases year by year, *Liparis tanakae* from 2017 to become the dominant species. The food web structure of the southern Shandong Peninsula is more stable, and the key species is stable, but the energy flow and information transfer in the community gradually evolves from high trophic level species to low trophic level species.

Keywords: Community Structure, Keystone Species, Food-web Topological Structure, Network Analysis, The Waters off Southern Shandong Peninsula

The Vascular Tone in Establishing Rat Model of Embolic Middle Cerebral Artery Occlusion: The Production of Thrombotic Animal Model

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Abstract: Objective: To improve the method of establishing embolic middle cerebral occlusion (eMCAO) rat model, the modified PE50/PE10 tubes and vascular tone were used in this research. Method: Twenty Sprague-Dawley rats (SPF grade) were used to establish the rat eMCAO model, the modified PE tubes (outside diameter: 0.34cm) were fixed and inserted by using the vascular tone with single person. Result: The modified PE tube which carries the embolis was inserted, by dissolving into the three directions of the carotid vessels, the embolis were injected into the brain. The key technics include the direction of injection of the embolis, the branches of the carotid vessels, and the vascular tone when the PE tubes fixed to the specific site of the brain vessel branches. The brain slices by 2,3,5-Triphenyltetrazolium chloride (TTC) staining showed that the patterns of the brain infarction involving cortical, sub-cortical, and basal ganglia regions. The average time of making the eMCAO model was 30 min, 90% of the rats was successfully made of eMCAO model. Conclusion: The vascular tone can be used in the model making of rat eMCAO with reducing the time and labor cost, in the purpose of evaluation of thrombolysis/hemorrhagic transformation (HT) therapy. While indicates the mechanism of embolis leading to different patterns of brain infarctions.

Keywords: Vascular Tone, Embolic Middle Cerebral Artery Occlusion, Rat

Effects of Rumen Fluid Treatment on the Fermentation Quality and Aerobic Stability of Sweet Sorghum

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Abstract: In this experiment, sweet sorghum straw was selected as raw material to study the effects of rumen juice pretreatment and anaerobic solid-state fermentation time on sweet sorghum sensory quality analysis, fermentation quality analysis, microbial quantity analysis and aerobic stability, so as to provide data support for the rational development and utilization of forage resources of herbivorous livestock. One control group (CK, 0% rumen fluid, 0 mL/100g) and three rumen fluid groups (R1, 10% rumen fluid, 10 mL/100g; R2, 20% rumen fluid, 20 mL/100g; R3, 30% rumen fluid, 30 mL/100g), sterile distilled water was mixed evenly with rumen fluid and added into straw, and the modulated water was about 75%. After continuous anaerobic fermentation for 45 days, the samples (3 time points×4 treatments×3 replicates, 36 bags in total) were sampled and analyzed on the 0 d, 15 d and 45 d after fermentation, respectively. The results showed that: 1) With the extension of the anaerobic fermentation time and the increase of the amount of rumen fluid, the smell, structure, color and total score of the sweet sorghum straw showed an overall upward trend, and the difference was not significant (P>0.05), and with the extension of the anaerobic fermentation time, the difference between the odor and the total score was significant (P<0.05); the same fermentation time, the same level of each treatment group was the same, and the different fermentation time and the same treatment group grade were good, excellent and excellent. 2) With the extension of anaerobic fermentation time and the increase of rumen fluid addition, the pH, ammonia nitrogen (AN) content, ammonia nitrogen/total nitrogen (AN/TN) and water-soluble carbohydrate (WSC) content of sweet sorghum decreased as a whole (P<0.05). 3) With the extension of anaerobic fermentation time and the increase of rumen fluid, the contents of lactic acid (LA) and acetic acid (AA) in sweet sorghum increased as a whole, and the contents of lactic acid/acetic acid (LA/AA) decreased as a whole (P<0.05). 4) With the prolongation of anaerobic fermentation time and the addition of rumen fluid, the content of lactic acid bacteria (LAB) in sweet sorghum straw showed an overall upward trend, while the content of yeast and mold showed a downward trend; the content of lactic acid bacteria was significantly different (P<0.05); The yeast content and mold content decreased significantly in the later stage of fermentation, resulting in no detection. 5) On the 0 d, 3 d, 6 d, and 9 d of aerobic exposure, the pH showed an overall upward trend, and the differences were all significant (P<0.05). The addition of rumen fluid effectively slowed down the increase of pH; DM content the overall trend was decreasing, and the differences were all significant (P<0.05). The addition of rumen fluid effectively accelerated the decline rate of DM. In conclusion, under the same anaerobic fermentation time and conditions, the addition ratio of rumen fluid in R3 (30% rumen fluid, 30 mL/100 g) can significantly improve the sweet sensory quality, improve the fermentation quality, increase the number of beneficial bacteria and microorganisms and prolong the aerobic stability. It can provide theoretical and experimental basis for the rational development and utilization of crop straw such as sweet sorghum.

Keywords: Sweet Sorghum Straw, Rumen Fluid, Sensory Quality, Fermentation Quality, Number of Microorganisms, Aerobic Stability

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The Function of γ-aminobutyric Acid (GABA) in the Responses to Multiple Stresses in Apple Plants

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Abstract: Apple is one of the major fruits in the world and plays an important role in China's agricultural production. However, apple plants often suffer from abiotic and biotic stresses, such as drought, *Marssonina* blotch in apple, and *Glomerella* leaf spot in apple during production, which restrict the green safety and high-quality development of apple industry. γ -aminobutyric acid (GABA) is a four-carbon non-protein amino acid widely distributed in nature. In plants, GABA has been shown not only to be a metabolite of carbon and nitrogen, but also to play an important role in abiotic and biotic stresses. In our study, we investigated the functions of GABA in various stress responses of apple under cadmium (Cd) stress, drought stress, *Marssonina* blotch, and *Glomerella* leaf spot in apple, and analyzed its mechanism. We found that GABA had a positive regulation effect on Cd stress in apple seedlings, and exogenous GABA and *MdGAD1* overexpressed roots could reduce Cd^{2+} uptake flux in root tip. GABA responded to drought stress in apple seedlings, and exogenous GABA activated the abscisic acid (ABA) signal pathway to increase ABA accumulation, which regulated stomatal closure of leaves in apple seedlings under short-term drought. In addition, exogenous GABA enhanced the GABA shunt to increase the accumulation of GABA and organic acids in tricarboxylic acid cycle, and induced the high expression of genes related to the synthesis of lignin and cellulose, resulting in more accumulation of lignin and cellulose. These improved the ability of apple seedlings to adapt to long-term drought stress. We verified that GABA responded to biotic stresses including *Marssonina* blotch, and *Glomerella* leaf spot in apple. Under pathogen inoculation, exogenous GABA promoted the synthesis and accumulation of phenols, activated the activity and gene expression of chitinase and β-1, 3 glucanase, and improved the accumulation of salicylic acid, which enhanced the resistance of apple to *Marssonina* blotch in apple. In addition, exogenous GABA could also improve the resistance of apple to *Glomerella* leaf spot in apple.

Keywords: Apple, γ-aminobutyric Acid (GABA), Cadmium Stress, Drought Stress, *Marssonina* Blotch in Apple, *Glomerella* Leaf Spot in Apple

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