No. 1002.2/2169

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15 February B.E. 2562 (2019)

Dear Madam,

Subject: Submission of Information on synthetic biology and nomination of experts to participate in the Open-ended Online Forum on Synthetic Biology

Kindly refer to your notification SCBD/CP/DC/MA/MW/87791 dated 14 December 2018 inviting us to nominate experts to participate in the Open-ended Online Forum on Synthetic Biology, and provide the Executive Secretary with relevant information to contribute to the work of the AHTEG.

In this regard, we are pleased to inform you the information on synthetic biology as attached herewith. We also would like to confirm our existing experts to participate in the Open-ended Online Forum on Synthetic Biology. They can be reached at the following address:

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Thank you very much for your kind cooperation.

Yours sincerely,

P. Saiyasitpanich

Phiruni Saiyasitpanich
Deputy Secretary-General
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Attachment

Thailand Submission of Information on Synthetic Biology
[Ref.: SCBD/CP/DC/MA/MW/87791]

(a) The relationship between synthetic biology and the criteria set out in decision IX/29, paragraph 12, in order to contribute to the completion of the assessment requested in decision XII/24, paragraph 2, building on the preliminary analysis prepared by the Executive Secretary in document SBSTTA/22/INF/17;

Regarding the preliminary analysis prepared by the Executive Secretary in document SBSTTA/22/INF/17, although synthetic biology relevance to the three objectives of CBD, most living organisms developed through synthetic biology fell under LMOs might be regulated by the Cartagena Protocol with some updated and adapted methodologies and guidance.

However the definition of synthetic biology by the AHTEG comprises a broad range of technology, and these technology is developing rapidly, it might be some new techniques against the criteria of new and emerging issues, as set out in paragraph 12 of decision IX/29. In the meantime, Thailand supports horizon scanning of the development of synthetic biology for reviewing new information regarding the criteria.

(b) New technological developments in synthetic biology since the last meeting of the Ad Hoc Technical Expert Group in December 2017, including the consideration, among other things, of concrete applications of genome editing if they relate to synthetic biology, in order to support a broad and regular horizon scanning process;

We would like to submit the examples of synthetic biology development in Thailand since 2017 for supporting a horizon scanning process as follows;

- Bowornsakulwong, T., Charoensapsri, W., Rattanarojpong, T. and Khunrae, P. (2017). The expression and purification of WSSV134 from white spot syndrome virus and its inhibitory effect on caspase activity from *Penaeus monodon*. Protein Expression and Purification. 130: 123-128.
- Jeennor, S., Veerana, M., Anantayanon, J. Panchanawaporn, S., Chutrakul, C. and Laoteng, K. (2017). Diacylglycerol acyltransferase 2 of *Mortierella alpina* with specificity on long chain polyunsaturated fatty acids: a potential tool for reconstituting lipids with nutritional value. Journal of Biotechnology. 263: 45-51.
- Khaksar, G., Treesubsuntorn, C. and Thiravetyan, P. (2017). Effect of exogenous, methyl jasmonate on airborne benzene removal by *Zamioculcas zamiifolia*: The role of cytochrome P450 expression, salicylic acid, IAA, ROS and antioxidant activity. Environmental and Experimental Botany. 138: 130-138.
- Mjos, S., Werner, H.M.J., Birkeland, E., Holst, F., Berg, A., Halle, M.K., Tangen, I.L., Kusonmano, K., Mauland, K.K., Oyan, A.M., Kalland, K.H., Lewis, A.E., Mills, G.B., Krakstad, C., Trovik, J., Salvesen, H.B. and Hoivik, E.A. (2017). *PIK3CA* exon9 mutations associate with reduced survival, and are highly concordant between matching primary tumors and metastases in endometrial cancer. Scientific Reports. 7: 10240.
- Ruangnam, S., Wanchana, S., Phoka, N., Saeansuk, C., Mahatheeranont, S., de Hoop, S.J., Toojinda, T., Vanavichit, A. and Arikit, S. (2017). A deletion of the gene encoding amino aldehyde dehydrogenase enhances the "pandan-like" aroma of winter melon (*Benincasa hispida*) and is a functional marker for the development of the aroma. Theoretical and Applied Genetics. 130(12): 2557–2565.

- Sae-Lee, N., Kerdchoechuen, O., Laohakunjit, N., Thumthanaruk, B., Sarkar, D. and Shetty, K. (2017). Improvement of Phenolic Antioxidant-linked Cancer Cell Cytotoxicity of Grape Cell Culture Elicited by Chitosan and Chemical Treatments. HortScience. 52(11): 1577–1584.
- Toopaang, W., Phonghanpot, S., Punya, J., Panyasiri, C., Klamchao, K., Wasuwan, R., Srisuksam, C., Sangsrakru, D., Sonthirod, C., Tangphatsornruang, S., Tanticharoen, M. and Amnuaykanjanasin, A. (2017). Targeted disruption of the polyketide synthase gene *pks15* affects virulence against insects and phagocytic survival in the fungus *Beauveria bassiana*. Fungal Biology. 121(8): 664-675.
- Daudzai, Z., Treesubsuntorn, C. and Thiravetyan, P. (2018). Inoculated *Clitoria ternatea* with *Bacillus cereus* ERBP for enhancing gaseous ethylbenzene phytoremediation: Plant metabolites and expression of ethylbenzene degradation genes. Ecotoxicology and Environmental Safety. 164: 50-60.
- Klanchui, A., Dulsawat, S., Chaloemngam, K., Cheevadhanarak, S., Prommeenate, P. and Meechai, A. (2018). An Improved Genome-Scale Metabolic Model of *Arthrospira platensis* C1 (*i*AK888) and Its Application in Glycogen Overproduction. Metabolites. 8(84).
- Mahajan, S.P., Meksiriporn, B., Waraho-Zhmayev, D., Weyant, K.B., Kocer, I., Butler, D.C., Messer, A., Escobedo, F.A. and DeLisa, M.P. (2018). Computational affinity maturation of camelid single-domain intrabodies against the nonamyloid component of alpha-synuclein. Scientific Reports. 8 (17611).
- Mata, W., Putita, C., Dong, H.T., Kayansamruaj, P., Senapin, S. and Rodkhum, C. (2018). Quinolone-resistant phenotype of *Flavobacterium columnare* isolates harbouring point mutations both in *gyrA* and *parC* but not in *gyrB* or *parE*. Journal of Global Antimicrobial Resistance. 15: 55-60.
- Phithakrotchanakoon, C., Puseenam, A., Wongwisansri, S., Eurwilaichitr, L., Ingsriswang, S., Tanapongpipat, S. and Roonsawang, N. (2018). CRISPR-Cas9 enabled targeted mutagenesis in the thermotolerant methylotrophic yeast *Ogataea thermomethanolica*. FEMS Microbiology Letters. 365(11).
- Poonlapdecha, W., Seetang-Nun, Y., Wonglumsom, W., Tuitemwong, K., Erickson, L.E., Hansen, R.R. and Tuitemwong, P. (2018). Antibody-conjugated ferromagnetic nanoparticles with lateral flow test strip assay for rapid detection of *Campylobacter jejuni* in poultry samples. International Journal of Food Microbiology. 286: 6-14
- Puseenam, A., Kocharin, K., Tanapongpipat, S., Eurwilaichitr, L., Ingsriswang, S. and Roongsawang, N. (2018). A novel sucrose-based expression system for heterologous proteins expression in thermotolerant methylotrophic yeast *Ogataea thermomethanolica*. FEMS Microbiology Letters, 365(20).
- Siripong, W., Wolf, P., Kusumoputri, T.P., Downes, J.J., Kocharin, K., Tanapongpipat, S. and Runguphan, W. (2018). Metabolic engineering of *Pichia pastoris* for production of isobutanol and isobutyl acetate. Biotechnology for Biofuels. 11(1).
- Sutthibutpong, T., Rattanarojpong, T. and Khunrae, P. (2018). Effects of helix and fingertip mutations on the thermostability of xyn11A investigated by molecular dynamics simulations and enzyme activity assays. Journal of Biomolecular Structure & Dynamics. 36(15): 3978-3992.
- Trianti, I., Akeprathumchai, S., Mekvichitsaeng, P., Rachdawong, S. and Poomputsa, K. (2018). Recombinant neuraminidase pseudotyped baculovirus: a dual vector for delivery of Angiotensin II peptides and DNA vaccine. AMB Express. 8(170).
- Wongin, S., Waikakul, S., Choti
arnwong, P., Siriwatwechakul, W. and Viravaidya-Pasuwat, K. (2018). Effect of Cell Sheet Manipulation Techniques on the Expression of Collagen Type II and Stress Fiber Formation in Human Chondrocyte Sheets. Tissue Engineering Part A. 24(5-6).
- Wongwilaiwalin, S., Mhuantong, W., Champreda, V., Tangphatsornruang, S., Panichnumsin, P., Ratanakhanokchai, K. and Tachaapaikoon, C. (2018). Structural and metabolic adaptation

of cellulolytic microcosm in co-digested Napier grass-swine manure and its application in enhancing thermophilic biogas production. RSC Advances. 8: 29806-29815.

- Holst, F., Werner, H.M.J., Mjos, S., Hoivik, E.A., Kusonmano, K., Wik, E., Berg, A., Birkeland, E., Gibson, W.J., Halle, M.K., Trovik, J., Cherniack, A.D., Kalland, K.H., Mills, G.B., Singer, C.F., Krakstad, C., Beroukhim, R. and Salvesen, H.B. (2019). *PIK3CA* Amplification Associates with Aggressive Phenotype but Not Markers of AKT-MTOR Signaling in Endometrial Carcinoma. Clinical Cancer Research. 25(1).

(c) The current state of knowledge by analysing information, including but not limited to peer-reviewed published literature, on the potential positive and negative environmental impacts, taking into account human health, cultural and socioeconomic impacts, especially with regard to the value of biodiversity to indigenous peoples and local communities, of current and near-future applications of synthetic biology, including those applications that involve organisms containing engineered gene drives, taking into account the traits and species potentially subject to release and the dynamics of their dissemination; and

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(d) Living organisms developed thus far through new developments in synthetic biology that may fall outside the definition of living modified organisms as per the Cartagena Protocol.

Since synthetic biology covers many ongoing novel developing techniques, it's unlikely to identify non LMOs from synthetic biology by the types of organisms and techniques. It might be more appropriate to develop the criteria for identification especially the clarification of the definition of LMOs as per the Protocol such as "possess novel combination of genetic material" and "overcome natural physiological reproductive or recombination barriers and that are not techniques used in traditional breeding and selection".