**Contribution**

* **Improvement of Existing Part**
* On the basis of the previous part BSH(BBa\_K3838666) and IsmA( BBa\_K4348001) , we introduced a new part coding gene BCoAT(BBa\_K4788003), and achieved more complex, rich, and excellent cholesterol regulation effects by connecting these genes to make IsmA-BSH (BBa\_K4788005),IsmA-BCoAT (BBa\_K4788006) and IsmA-BSH-BCoAT (BBa\_K4788007). The triplet genes formed by the combination of these genes exhibit better performance in the characterization of IsmA.
* **New Part for E. coli**
* In order to introduce more diverse cholesterol regulation methods, we have introduced a new Part BCoAT(BBa\_K4788003), which can promote the production of short chain fatty acids to indirectly regulate cholesterol.
* In order to achieve dynamic recognition and response control of oleic acid in the system, we have introduced FadBA (BBa\_K4788000), FadO (BBa\_K4788004), FadR (BBa\_K4788001) as the basic part of the oleic acid inducer.
* We will connect the basic parts FadBA (BBa\_K4788000), FadO (BBa\_K4788004), and FadR (BBa\_K4788001) as FadR-FadBA-FadO to create an oleic acid inducer (BBa\_K4788002). The FadR gene can express the FadR protein, which can bind to the FadO operator to inhibit the initiation of the FadBA promoter, while the presence of oleoyl CoA metabolized from oleic acid can relieve this inhibition. This system can respond to oleic acid induction and has been proven to have a gradient response to oleic acid, giving it the potential for dynamic detection.
* We connected mRFP after the oleic acid inducer and obtained FadR-FadBA-FadO-mRFP(BBa\_K4788008) composite components, achieving characterization and detection of the oleic acid inducer.
* **Introduction of new design ideas for control systems**
* We have introduced an idea for establishing an intelligent oleic acid induction system. By modifying the FadO operator sequence in the Oleic acid inducer, we can change the threshold of oleic acid concentration that can cause the expression of the promoter. Through the verification of experiments and modeling plates, we can obtain the appropriate induction threshold interval, by matching the content of oleic acid in high fat diet defined according to different human constitution, conforming to the starting element is obtained, which can respond to oleic acid gradient.
* **The Expandable Model Providing Guidance and Interpretation for Experiments**
  + The mathematical model we constructed this time thoroughly models the molecular mechanism of the oleic acid inducer and offers various directions for expansion, while demonstrating its theoretical superiority. We first validated the sensitivity of the oleic acid inducer by comparing it with the native circuit. Then, through simulation, we confirmed the expandability of precisely controlling the reaction threshold by adding the FadO operator at the experimental level. Additionally, we combined the model with real wet-lab data for parameter estimation, and the stability and sensitivity analysis of the model also hold referential value.
  + It's worth noting that the mathematical simulation of adding the FadO operator fully exemplifies the collaboration between the dry and wet lab teams. This expansion operation was initially proposed by the wet-lab team as a quantitative operational plan to adapt to different human environments. Subsequently, the dry-lab team modeled this operation, validating the expected effect of reducing the activation time of the oleic acid inducer by adding the FadO operator and estimating the values of various variables over time. This, in turn, guided the selection of further experimental schemes, which can be described as highly successful.
* **Include you and include all**

在去年2022LZU-CHINA的基础上，我们进一步拓展了包容性工作的范围，从调查人们对于转基因的态度，到促进边远地区，少数民族及妇女教育的公平，我们持续为消除偏见做出努力。除开上面所提到的，我们在去年针对LGBTQ群体调研的基础上进一步延申，关注到了性少数群体在食品健康问题上可能面临的肥胖与饮食失调情况高发的现况，并为此做出了调研与宣传。工作远不止如此，在针对年龄偏见，歧视残疾，与不同地区与民族之间饮食差异及其可能导致的饮食健康风险上，我们都投入了关注并为之做出了努力。想要了解更多我们的工作？可以关注我们的包容性界面

* **Education package**

SynBio Hourstory is a science popularizationof synthetic biology history jointly initiated by eight iGEM teams from University of Chinese Academy of Sciences, Lanzhou University, Beijing Normal University, Hainan University, Ocean University of China, Wuhan University, Tianjin University and Guangxi University. The aim is to use the simple and beautiful form of cartoons to educate the public about the development of synthetic biology.