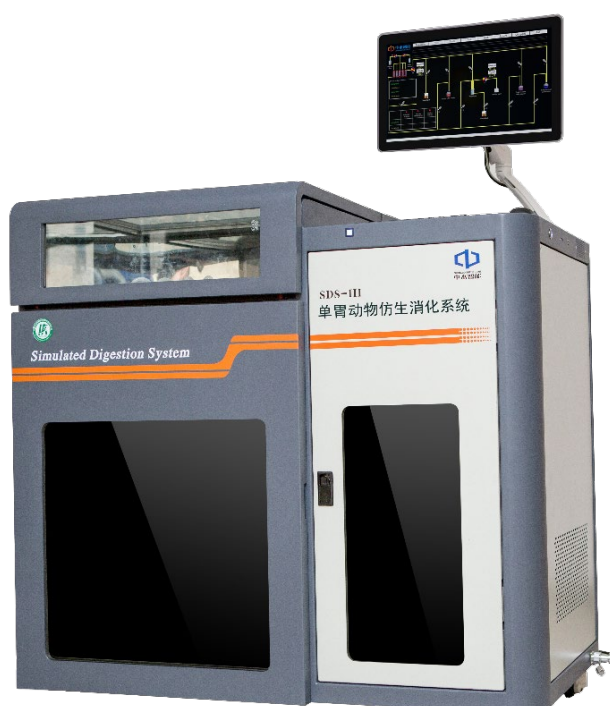




The most cutting-edge technology of  
simulated digestion for monogastric  
animals

Developed by IAS-CAAS + Zhongben

## **Simulated Digestion System (SDS III)**



**Global Marketing Partner (Overseas)**

**UniVOOK Chemical (Shanghai)**

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How to evaluate the nutritive value of feed ingredients accurately, efficiently and repeatably?

How to evaluate the enzymolysis efficacy of different single enzymes on various feed materials?

How to evaluate the compound enzyme preparations from the markets efficiently and screen the most suitable compositions of enzyme products?

Animal experimentation need a long cycle and high cost, and the experimental data are susceptible to many uncertain factors such as climatic conditions, animal body conditions, and feeding conditions. How to solve these problems?

## Simulated Digestion System (SDS III) provides reliable solutions

Simulated digestion system (SDS III) for monogastric animals has been jointly developed by Institute of Animal Science, Chinese Academy of Agricultural Sciences (IASCAAS) and Hunan Zhongben Intelligent Technology Development Co., LTD. It is a patented technical solution to simulate the digestive process of monogastric animals, based on bionic principles. SDS III includes a device that can simulate the digestion and absorption process of feed in the digestive tract, and the matching kit of simulated digestive fluid. SDS III uses feed as a substrate to simulate the digestion and absorption process of in vivo gastro-intestinal tract with high fidelity and repetition. Compared with the in vivo methods, SDS III can accurately and efficiently determine the effective energy, digestibility of amino acid and phosphorus in feed, offering 66 times higher efficiency and reducing costs by 90%, and realize the standardization, instrumentalization and automation of the simulated digestion method.



100+

Agricultural and Animal Husbandry Enterprises

150+

Serves Million Tons of Feed Production

SDS III

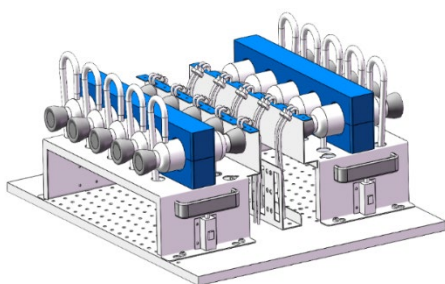
Serves Feed Industry Globally



# Automatic Simulated Digestion System (SDS III)

- **PC-based Automatic Control**
- **Dual-modules Compatibility: Vertical and Horizontal**

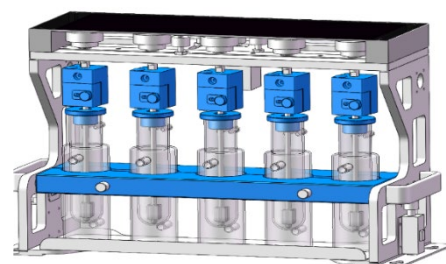
## Horizontal Digestion Module



- ✚ Automatically executes the digestion steps of stomach, small intestine and large intestine; Automatically adds simulated digestive fluid and automatically cleans the digested byproducts.
- ✚ Overcomes the residual problem of feed, eliminating the need for sample migration.
- ✚ Highly simulates the digestive condition of in vivo;
- ✚ High simulation precision: repeated tests CV < 1.5%;
- ✚ Measure the biological utilization of nutrients by simulating the digestion and absorption process of nutrients in the gastro-intestine tract of animals

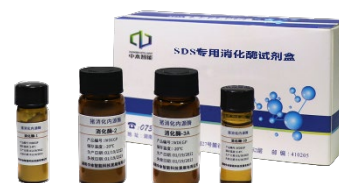
## Vertical Digestion Module

- ✚ With an independent motor, the mixing speed is adjustable; Automatically executes the digestion steps of stomach, small intestine and large intestine; Automatically adds simulated digestive fluid
- ✚ Double glass structure reaction tube, circulating water constant temperature, comparable digestive condition to those of in vivo;
- ✚ High simulation precision: repeated tests CV < 1.5%;
- ✚ Suitable for in vitro digestion evaluation of feed enzymes;



## • Simulated Digestive Kits for Swine and Poultry

- ✚ Growing pig feed enzyme hydrolysate energy value Kit;
- ✚ Rooster feed enzyme hydrolysate energy value Kit;
- ✚ Duck feed enzyme hydrolysate energy value kit;
- ✚ Total digestible carbohydrate determination kit for pig feed;
- ✚ Total digestible carbohydrate determination kit for chicken Feed



# Outstanding Application

## Explore the Application of SDS III

- Evaluating availability of energy and amino acid in feed.
- Accurate measurement of effective phosphorus content in feed.
- Screening of enzymatic properties and profiles for feed enzymes.
- Research on products oriented to improve feed nutrient digestion and testing the efficacy.
- Development of feeding standards including dynamic nutritional requirement.
- Other fields related to nutrient digestion in feed.
- Nutritive value evaluation for pet food.
- Nutritive value evaluation for human food.

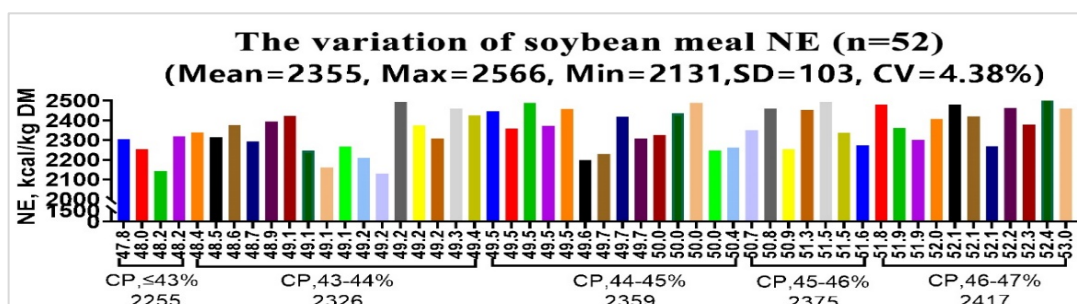


# Technical Standards

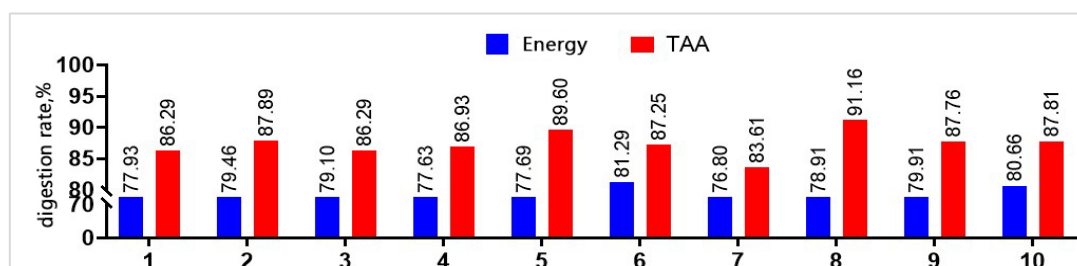
1. Gastro-intestinal simulation device is based on the in vivo digestive system.
  - *Using computer program control, the enzyme activity, pH and hydrolysis environment in digestive fluid; are simulated to match the physiological conditions of the stomach, small intestine and large intestine;*
  - *Simulates enzymatic digestion processes of the stomach, small intestine and large intestine;*
  - *Simulates the secretion of digestive fluid in the body;*
  - *Simulates the ambient temperature and chyme mixing processes in the digestive tract.*
2. Ability to perform simulating digestion based on the analysis of digestive substances.
  - *Simulates the mixing of chyme in the digestive tract through shaking and stirring; The stirring speed can be precisely controlled;*
  - *After the entire digestion process, the liquid evaporation volume of the reaction system is maintained at less than 1.0% (vertical digestion module);*
  - *A computer program-controlled system regulates digestive fluid secretion, maintains constant temperature, and controls digestive process.*
3. Able to perform simulating digestion and absorption based on analysis of undigested substances.
  - *Simulates the digestion and absorption of nutrients in the gastro-intestinal tract;*
  - *Overcomes the issue of filtration in traditional methods, eliminating the need for sample transfer after loading;*
  - *Automatically performs various stages of digestion in the stomach, small intestine and large intestine;*
  - *Automatically cleans products and reduces system errors caused by manual operations;*
  - *A Computer program-controlled system regulates digestive fluid secretion, cleans hydrolysates, maintains constant temperature, and controls the digestion process.*
4. The coefficient of variation (CV) for the determination of 5 repeated samples does not exceed 1.5%.
5. Using a constant temperature water bath and a constant temperature air bath to simulate the environmental temperature of the digestive organs. The temperature variation can be precisely controlled within 0.4°C, ranging from 30 to 45°C.
6. The shaking frequency can be controlled within the range of 100 to 200 rpm, with an accuracy of  $\pm 5$  rpm.
7. The flow rate of buffer solution and water for product cleaning can be controlled within 100 to 500 mL/min, with an accuracy of  $\pm 20$  mL/min.
8. The flow rate of digestive fluid can be controlled within 0.5 to 10 mL/min, with an accuracy of  $\pm 0.1$  mL/min.
9. The loading capacity of the simulated digester: vertical digestion module  $\geq 0.5$ g; horizontal digestion module  $\geq 1.0$ g. Each digestion experiment can analyze 2 samples simultaneously, with each sample providing 5 repeated test data.
10. Features automatic cleaning of the digested products.

# Application Cases

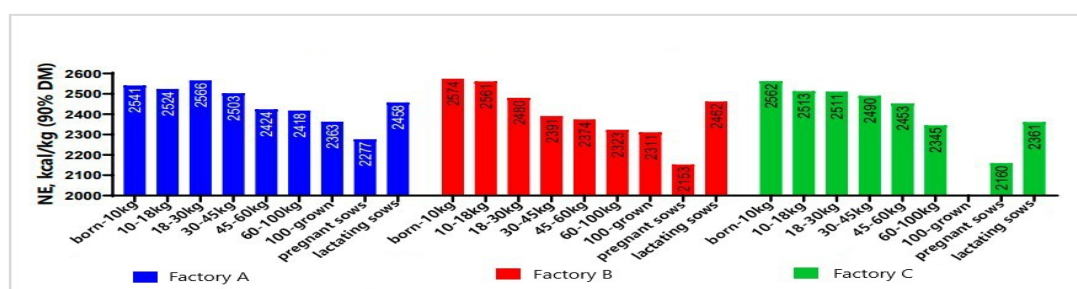
- Establishment of Dynamic Database for Feed Ingredients



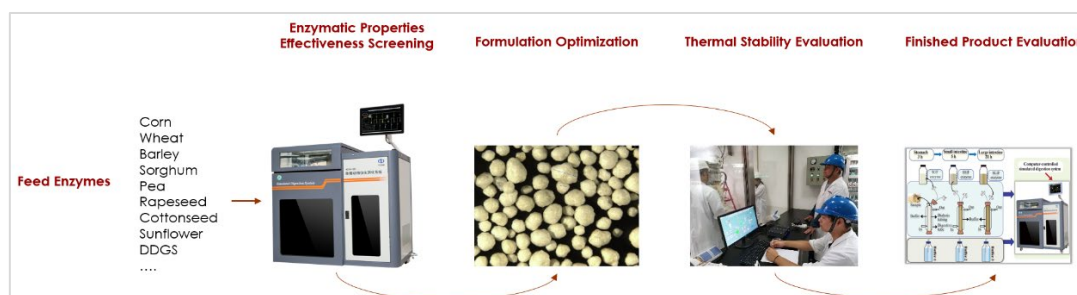
- Quality Monitoring of Feed Ingredients



- Nutritional Quality Monitoring of Complete Diet



- Efficacy Evaluation of Feed Enzymes





**Together With SDS III System**

**Explore Your Future Successes**



**Jointly Developed By:**



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