



# **Application Report of Schizochytrium Algae Powder (Algae DHA-rich Powder) in Dairy Cows (Ruminants)**

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## **1. Research Background**

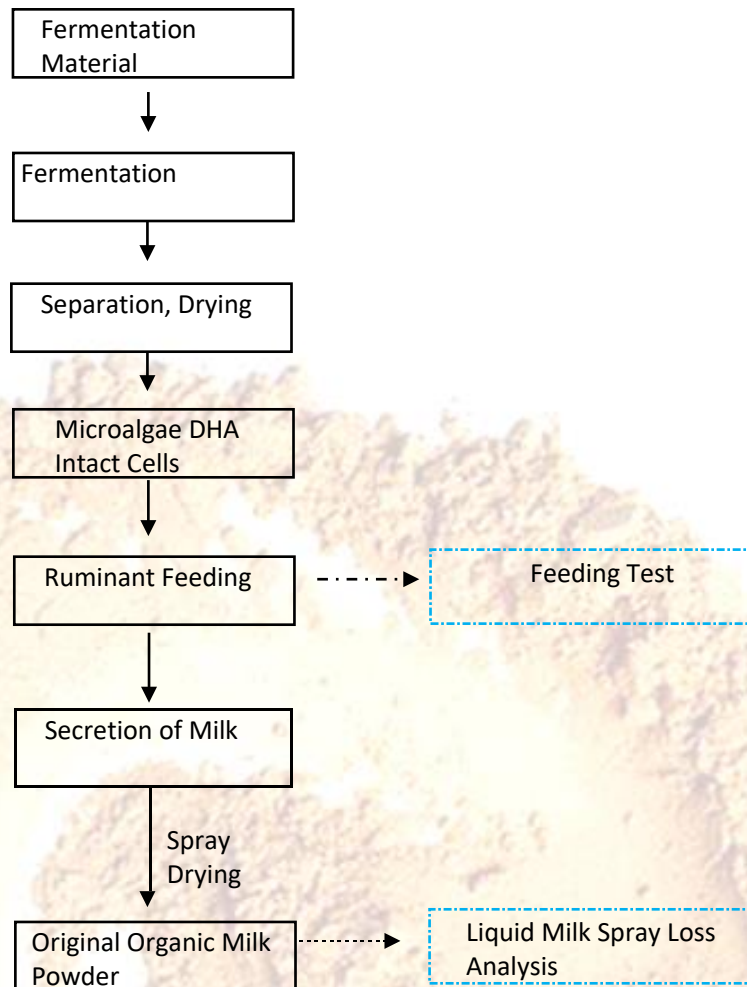
The application of docosahexaenoic acid (DHA) as a new resource food or a nutrient fortifier in foods, health products and infant formulas has been widely recognized by research institutions and consumers. However, if the product refined with docosahexaenoic acid is used in the form of docosahexaenoic acid or oil, which is formed by fermentation, extraction, refining, emulsifying and embedding, or in the form of microencapsulated powder. During the production process, there will be risks of solvents, heavy metals, microorganisms and other pollutants that need to be substituted by the process, so that enterprises and scientific research institutions can dig deeper the use of DHA products, while the microalgae DHA intact cells are only the microalgae After cell culture and water drying, it is rich in nutrients rich in various unsaturated fatty acids, proteins, nucleotides and vitamins. The unsaturated fatty acids are rich in DHA, and the milk secreted by the cows is rich in DHA. Liquid milk can be further spray dried to obtain the original ecological milk powder or DHA-rich organic milk powder.

## **2. Research Ideas**

Hubei Xinhe Biological Technology Co., Ltd. provides 10% Schizochytrium Algae Powder to the school-enterprise cooperation unit Huazhong Agricultural University Animal Science and Technology College. According to the experimental scheme discussed by both parties, Xinhe biological microalgae DHA intact cells feed product is added to the cow feeding feed. After 25 days of feeding, we tested the main ingredients in the milk production of dairy cows and calculated the conversion rate of DHA. We provided reference feeding parameters for our customer using intact cells feed products from Hubei Xinhe microalgae DHA, and also borrowed the company's existing The resources will be used to observe the DHA loss in milk after spray drying the milk, and provide supporting data for the production of pollution-free and organic milk powder for the downstream industry's entire industrial chain.

## **3. Research Process**

Microalgae DHA intact cells production and application is shown in the following flow chart:



#### 4. Microalgae DHA Intact Cells Product Quality Statement

The Schizochytrium Algae Powder produced by Hubei Xinhe meets all the indexes of the enterprise standard Q/HXH0009-2018 "Feed Material Schizochytrium Algae Powder ". The specific results are as follows:

Item	Indicator Requirements	Test Result	Result
Appearance	The product is light yellow powder, no visible debris, no agglomeration, no insect breeding.	The product is light yellow powder, no visible debris, no agglomeration, no insect breeding.	PASS
Odor	It has a light fishy smell and protein aroma, no smoldering smell, no rancidity and a bitter taste of ammonia smell.	It has a light fishy smell and protein aroma, no smoldering smell, no rancidity and a bitter taste of ammonia smell.	PASS
Impurity	No foreign impurity visible to the naked eye.	No foreign impurity visible to the naked eye.	PASS
DHA Content (%)	≥10.0		PASS
Crude Protein (%)	≥8.0		PASS
Crude Ash (%)	≤12.0		PASS
Crude Fat (%)	≥20.0		PASS
Conclusion	After inspection, all the indicators meet the requirements of the enterprise standard Q/HXH0009-2018 " Feed Material Schizochytrium Algae Powder " and passed the judgment.		

#### 5. Test Sample Preparation and Sample Analysis

According to the sample demand of Huazhong Agricultural University, Hubei Xinhe prepares fresh 10% schizochytrium algae powder products and dispatch them to the designated test farm with 1kg aluminum foil bag vacuum nitrogen filling package.

After sampling, the farm was quickly dispatch to Hubei Xinhe for analysis by the low-temperature storage method of the ring-opening aseptic self-sealing bag provided by Hubei Xinhe.

#### 6. Analysis of Test Results

Different diets were used (represented by A, B, C), group A was the contrast group, and fed the basic diet. Group B was the experimental group, the feed was basic diet +100g algae DHA-rich powder (a cow/day). Group C is the basic diet + 200g algal DHA-rich powder (a cow/day). The test was divided into three phases, each of which lasted for 14 days (the first 7 days is the slow refueling phase of the diet, it' s the pre-test period. The last 7 days is the formal period, it' s the sampling period). The specific scheme is designed as follows:



	First Period	Second Period	Third Period
Group A	A	C	B
Group B	B	A	C
Group C	C	B	A

The specific test data for milk yield and DHA content in milk are as follows:

a) Milk production data

No.	Test Group	1 <sup>st</sup> Day	2 <sup>nd</sup> Day	21 <sup>st</sup> Day	22 <sup>nd</sup> Day
1	Contrast Group (A)	19.6kg	20.2kg	20.8kg	20.4kg
2		20.4kg	20.8kg	20.5kg	21.7kg
3		20.5kg	20.6kg	20.3kg	20.8kg
4	B	21.4kg	21.6kg	20.5kg	20.9kg
5		20.8kg	20.5kg	20.8kg	21.7kg
6		19.7kg	21.1kg	21.5kg	21.3kg
7	C	19.9kg	20.3kg	21.4kg	20.6kg
8		20.5kg	20.9kg	20.6kg	20.4kg
9		20.6kg	22.6kg	21.5kg	21.8kg

b) The test results of the indicators in milk are as follows:

Fed Day	Test Group	Cattle No.	Fat(%)	Protein(%)	Total Fat (g/L)	DHA (mg/L)
1 <sup>st</sup> Day	Sample test before the test	01	2.74	2.24	39.82	5.49
1 <sup>st</sup> Day		02	2.91	2.19	41.31	6.13
1 <sup>st</sup> Day		03	3.13	2.61	38.72	5.58
1 <sup>st</sup> Day		04	3.19	2.45	37.98	5.34
1 <sup>st</sup> Day		05	3.15	2.68	36.82	7.39
1 <sup>st</sup> Day		06	3.21	2.33	37.91	6.38
1 <sup>st</sup> Day		07	3.17	2.49	36.29	6.57
1 <sup>st</sup> Day		08	2.96	2.54	37.65	6.29
1 <sup>st</sup> Day		09	2.99	2.68	38.79	5.97
21 <sup>st</sup> Day	Contrast Group ( A )	01	3.05	2.72	37.41	6.45
21 <sup>st</sup> Day		02	3.16	2.53	36.98	6.91
21 <sup>st</sup> Day		03	3.59	2.64	38.75	6.24
21 <sup>st</sup> Day	B	04	3.49	2.49	39.98	86.86
21 <sup>st</sup> Day		05	3.58	2.57	42.37	94.31
21 <sup>st</sup> Day		06	3.71	2.38	41.78	92.41
21 <sup>st</sup> Day	C	07	3.84	2.29	43.29	178.68
21 <sup>st</sup> Day		08	3.57	2.37	42.76	186.58
21 <sup>st</sup> Day		09	3.68	2.39	43.17	195.66



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By feeding 100g of algae DHA-rich powder (containing 10% DHA) per cow per day, the cow's biotransformation rate could reach 8% to 20%, that is 10g DHA per day, about 0.8~1.2g pure DHA was biotransformed into liquid milk. Each cow in the test produces 20L milk per day, which means that the DHA content per 100ml milk can reach 8~18mg.



## 7. DHA loss test during further drying of original ecology liquid milk (ie fresh milk after feed the Algae DHA-rich powder)

In order to verify the change of DHA content in the process of powder milk drying, the DHA content of the three groups before and after the drying was tested. The details were as follows:

	Liquid Milk	Dry Substance	Powder after the Evaporation
Test 1	2L	12.31%	135g
Test 2	10L	12.17%	1.11kg
Test 3	1000L	12.26%	62.3kg

The DHA content changes as follows:

DHA Content				
	Liquid (mg/L)	Powder (mg/Kg)	DHA Changes (mg/kg)	DHA Retention (%)
Test 1	112.85	861.01	-55.72	93.92
Test 2	113.05	869.53	-59.39	93.61
Test 3	112.64	851.06	-67.70	92.63

**Note :** DHA Changes=DHA content in powder milk-DHA content in liquid milk / dry substance.

DHA Retention = DHA content in powder milk÷(DHA content in liquid milk / dry substance).

Through the above three small experiments, it can be concluded that the DHA content would reduce after liquid milk spray drying, but the retention was above 90%. From test 1 to 3, the DHA retention rate decreases as the amount of spray drying increases, probable lost the liquid milk DHA content when waited for the spray drying process, and may also be related to the spray drying process parameters, this required further experimental verification.





## 8. Summary

In the green, healthy and nutritious environment, the nutrients we need become the intrinsic ingredients of food, and there is a big improvement in both the taste and the internal indicators. The above experimental data shows that the algae DHA-rich powder is used as a cow (ruminant) feed additive can increase the DHA content in milk. These test conclusions can be used as references for users, Hubei Xinhe also welcomes our customers to do the test with our products, and we can help with the analysis due to we have all kinds of test equipments. This can better eliminate the deviation of test results caused by different factors such as different regions and different feed categories.