I-2 Current production situation of Carnitine in China

I-2.1 Summary of manufacturers

.

In China, there are some L-Carnitine products including DL-Carnitine, L-Carnitine 50% & 10% grade, special for feed use, which are mainly prepared by feed manufacturers, so in this report, these sorts of products are considered as feed products and not taken into consideration when calculating the output or capacity. The data of capacity and output are all converted into L-Carnitine base.

Table I-2.1-1 Basic info of L-Carnitine producers in China, 2008

No.	English name	Abbreviation	Location
III-1			Liaoning
III-2			Liaoning
III-3			Zhejiang
III-4			Hubei
III-5			Liaoning
III-6			Jiangsu
III-7			Guangdong
III-8			Liaoning
III-9			Hubei
III-10			Hubei
III-11			Shanghai
III-12			Shanghai

Table I-2.1-2 Capacity and output of L-Carnitine producers in China, 2008

	Z. i Z Gapaoky and s	Capacity	Total		Acetyl-L	L-Carnitine	L-Carnitine	L-Carnitine
No.	Name	claimed '08(t/a)	output L-Carnitine '07 (t)	-Carnitine-	Fumarate	Tartrate	HCI	
III-1				√	√	√	√	V
III-2				V			√	V
III-3				√	√	√	√	√
III-4				V	√	√	√	√
III-5				V	√	√	√	√
III-6				$\sqrt{}$	√		√	V
III-7		150		$\sqrt{}$			√	
III-8		120		$\sqrt{}$	√	√	√	V
III-9				$\sqrt{}$	√	√	√	
III-10				$\sqrt{}$		√	√	
III-11				$\sqrt{}$	√	√	√	$\sqrt{}$
III-12				V	√		√	V

I-4 Production technology of Carnitine in China

1-4.1 Production technology

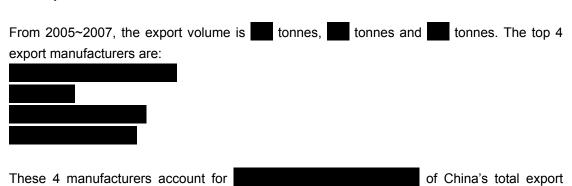
There are many methods to produce Carnitine, including extracting from foods (meat or milk), chemical method, enzymatic conversion, microbial fermentation, etc. Currently, asymmetric synthesis of L-Carnitine is hot in the research of production technology.

Items Chemical **Enzymatic** Microbial Asymmetric synthesis fermentation synthesis conversion Raw materials **Production process** Yield **Chiral separation** R&D investment Pollution **Market situation Development trend**

Table I-4.1-1 Comparison of production technologies of Carnitine in China

I-7 Import and export of Carnitine and its derivatives in the recent three years

I-7.2 Export situation of Carnitine and its derivatives



volume in 2005, 2006 and 2007.

From 2005~2007, the price was relatively stable. The lowest price appeared in 2005 and 2006.

The major export destinations are		. The
are both the major destinations always	avs since 2005.	

Table I-7.2-3 Export price of Carnitine in 2007 (Quantity (kg); Price (USD/kg))

Month	L-Carnitine	Carnitine Fumarate		artrate	L-Carnitine base		L-Carnitii	ne HCI	Acetyl-L-Carn	itine HCI
WOITH	Quantity	Price	Quantity	Price	Quantity	Price	Quantity	Price	Quantity	Price
Jan										28.00
Feb										23.12
Mar										27.69
Apr										28.00
May										
Jun										
Jul										
Aug										
Sep										
Oct										
Nov										
Dec										
Total										

I-8.1 Consumption pattern

Table I-8.2-1 List of some L-Carnitine end users in food area in China, 2008

No.	English Name	Product	Carnitine specie used, per 100g	Comment
1			L-Carnitine 35.3g	
2			L-Carnitine tartrate 17.6g	
3			L-Carnitine 13.0g	
4			L-Carnitine Tartrate	
5			L-Carnitine Tartrate	
6			L-Carnitine 6.0mg~9.0mg	
7			L-Carnitine Tartrate	
8			L-Carnitine 190mg	
9			L-Carnitine 4.8g	

10		L-Carnitine 7.11g	
11		L-Carnitine 48.5g	
12		L-Carnitine 12.95g	
13		L-Carnitine 10.2g	
14		L-Carnitine 17.6g	
15		L-Carnitine 20g	
16		L-Carnitine Tartrate	
17		L-Carnitine	
18		L-Carnitine	
19		L-Carnitine	
20		L-Carnitine	
21		L-Carnitine	
22		L-Carnitine	
23		L-Carnitine	
24		L-Carnitine	
25		L-Carnitine	
26		L-Carnitine	

II Benchmarking of Carnitine

II-3.1.2 Profit estimation of Carnitine

- Raw material costs estimation

Based on the information mentioned above, we understand that NEPG produce L-Carnitine from DL-intermediate and its production process of L-Carnitine is similar to our model 2. We made some emendations of the model and the raw material costs are shown in the following table.

Table II-3.1.2 -1 Estimation on raw material consumption of L-Carnitine in NEPG in July 2008

No.	Materials	Consumption, kg / kg	Price, RMB/kg	Unit Cost, RMB/kg
1			16.00	
2			2.85	
3			0.65	
4			3.50	
5			6.30	
6			36.50	
7			4.40	
8			0.0025	
9	Calcium Carbonate		14.00	
10	Calcium Chloride		4.00	
	Total			

- Estimation of manufacturing costs

Table II-3.1.2-2 Estimation on manufacturing cost of L-Carnitine in NEPG in July 2008

No	Ite	em	Unit Cost RMB / kg L-Carnitine
1	Raw Materials		
		Water	
2	Utilities	Electric power	
		Steam	
3	Labor		
4	Packing		
5	Manufacturing d	irect + indirect*	
	Total		