



## NOTE

### Determination of Seven Kinds of Trace Elements in Different Organs of Beijing Black Pig

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Beijing black pig is a specialty in Beijing, but the contents of its meat and organs are still unknown. The muscle, liver and kidney were sampled in Beijing market and determined the contents of seven kinds of trace elements (Zn, Cu, Mn, Pb, Cd, Cr and Fe) by ICP-MS. The recoveries ranged from 90.4-106.3 %, limits of detection range from 0.02-0.23 ng mL<sup>-1</sup> and relative standard deviations (RSD) range from 1.5-5.2 %. The results showed that the contents of beneficial elements Zn, Cu, Mn, Fe in liver of Beijing black pig were mostly much higher than that in common pig, the contents of Cd and Pb in meat of Beijing black pig were lower than that in common pig from Qinghai province, so Beijing black pig is a nutritious food. As for different organs, the contents of beneficial elements and heavy metals in different organs are all significantly different, the descending order is liver > kidney > muscle, which is consistent to the organs of bovine.

**Key Words:** Beijing black pig, Trace elements, Liver, Kidney, ICP-MS.

Meat and meat products are important sources of trace elements in human diet which include heavy metals and beneficial elements. The trace element is an important indicator to evaluate the quality of meat and meat products<sup>1,2</sup>.

Beijing black pig is the only existing local cultivar in Beijing, which has certain population size and development value. Beijing black pig has many advantages, such as moderate lean meat percentage, good adaptability, strong resistance to disease, good meat, which is a leading brands in Beijing high-quality meat market<sup>3</sup>.

Although Beijing black pig has been consumed many years in Beijing, but the contents in its meat and other organs are still not studied until now. ICP-MS is a good method which can determine many elements simultaneously<sup>4,5</sup>. In this paper, Beijing black pig meat from Beijing market were determined the contents of ten kinds of trace elements to evaluate its quality.

**Sample preparation and instruments:** The samples were bought from Chaoshifa supermarket. Weigh 1 g sample minced in 70 % nitric acid 10 mL, digested, the microwave digestion conditions was referred to Wang's methods. After cooling, the supernatant was the extraction solution.

ICP-MS: Agilent7500 (Agilent company of USA), MARS X System: high pressure microwave digestion system (CEM company of USA), Zn, Cu, Mn, Pb, Cd, Cr, Fe multi-element standard solution.

**Detecting methods:** Diluting standard solution into gradient concentrations with 1 % HNO<sub>3</sub> as the standard series of working fluid to detect the concentrations of Zn, Cu, Mn, Pb, Cd, Cr and Fe. The operating conditions of ICP-MS were showed in Table-1.

**Accuracy and precision:** Seven kinds of trace elements (Zn, Cu, Mn, Pb, Cd, Cr and Fe) were detected by ICP-MS. Their recoveries ranged from 90.4-106.3 %, limits of detection range from 0.02-0.23 ng mL<sup>-1</sup> and relative standard deviations (RSD) range from 1.5-5.2 % (Table-2), which proved that this method is accurate and precise.

**Content of trace elements in Beijing black pig organs from Beijing market:** The results showed that the contents of beneficial elements Zn, Cu, Mn, Fe in liver of Beijing black pig were much higher than that in common pig from Dalian region of Liaoning province and Nantong region of Jiangsu province<sup>6,7</sup>, but the contents of Cu and Zn in liver of common pig from Qixia region of Jiangsu province were higher than

TABLE-1  
PARAMETERS OF ICP-MS

Parameters	RF power (W)	Carrier gas flow (L min <sup>-1</sup> )	Cooling gas flow (L min <sup>-1</sup> )	Atomization temperature (°C)	Repeats
Value	1350	1.0	12.5	2.0	6

TABLE-2  
RESULT OF THE STANDARD SAMPLES (n = 6)

Elements	Recovery (%)	Relative standard deviation (%)	Detection limits (ng mL <sup>-1</sup> )
Cu	98.6	2.7	0.11
Pb	90.4	5.2	0.23
Zn	106.3	4.7	0.08
Cd	102.7	2.6	0.02
Cr	100.5	1.6	0.02
Fe	99.8	1.5	0.05
Mn	98.7	2.4	0.08

that of Beijing black pig, which could be relative to the feed or additives<sup>8</sup>. So Beijing black pig is a good food according to its contents of beneficial elements (Table-3).

TABLE-3  
CONTENT OF TRACE ELEMENTS IN BLACK PIG FROM BEIJING MARKET (n = 3)

Elements	Muscle	Liver	Kidney
Cu (mg/kg)	2.55 ± 0.74a	80.85 ± 10.37c	31.87 ± 5.36b
Pb (µg/kg)	27.09 ± 1.56a	176.42 ± 10.09c	146.35 ± 15.22b
Zn (mg/kg)	133.69 ± 10.78a	185.98 ± 24.88c	143.31 ± 11.49b
Cd (µg/kg)	5.99 ± 0.76a	16.32 ± 1.59c	27.35 ± 1.98b
Cr (µg/kg)	69.37 ± 5.62a	186.77 ± 13.25c	147.51 ± 9.78b
Fe (mg/kg)	60.64 ± 7.31a	1001.37 ± 89.33c	354.01 ± 40.76b
Mn (mg/kg)	1.31 ± 0.27a	8.63 ± 1.54c	11.68 ± 1.36b

Note: Different letters represent significant differences between different organs.

About heavy metals, the contents of Cd and Pb in meat of Beijing black pig were lower than that in common pig from Qinghai province<sup>9</sup>, especially the contents of heavy metals in muscle and meat of Beijing black pig fully comply with the nation standard (Table-3)<sup>10</sup>.

Except the comparison with common pig, the contents of beneficial elements and heavy metals in different organs are all significantly different ( $p < 0.05$ ), the descending order is liver > kidney > muscle, which is consistent to the organs of bovine<sup>11</sup>.

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