

# CONTENT OF CADMIUM AND LEAD IN CHICKEN SAMPLES OF NAKHON SI THAMMARAT FRESH-FOOD MARKET

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**Abstract:** The analysis of cadmium and lead was investigated, in chicken samples randomly obtained from fresh-food market, in Nakhon Si Thammarat, the South of Thailand. The studied samples collected from four local markets in (Mueng district, Thungsong district, Sichol district and Huasai district) were evaluated. The chicken samples were prepared according to the microwave before analysis by atomic absorption spectrophotometry. The results revealed that cadmium was found in the range of 0.01 - 0.04, 0.01 - 0.03, 0.01 - 0.02 and 0.01 mg/L, respectively. It was also found that lead content was found to be 0.01 - 0.04, 0.02 - 0.07, 0.01 - 0.04 and 0.01 mg/L, respectively. This research study can use as database for food safety.

## 1. Introduction

Meat and meat products are important for human diet because they provide a great part of nutrients, including the necessary trace elements. [1]

Nowadays, poultry meat is a major component of diet and source of protein. It is also used in the production such as Maggi, Knorr chicken flavor cubes and product of meat chicken in Thailand. Therefore, the high demand of poultry meat has also influenced their production and has been enhanced extensively by several technological inputs. Accumulation of toxic substance such as heavy metals in poultry feeds, on the other hand, it is a major source of heavy metal intake. [2].

Due to the fact that high demand of poultry meat in recent years influences their production significantly and alongside is the increased production and extensive modifications of poultry feeds to meet these demands. However, in view of the fact that poultry feeds, whether it is natural or locally sourced or the improved modifications from special manufacturing processes have been reported to be affected by the content of heavy metals in poultry feeds. [1-2]

Heavy metals from manmade pollution sources are continuously released into aquatic and terrestrial ecosystems and therefore, the concern about the effect of anthropogenic pollution on the ecosystems is growing. Contamination with heavy metals is a serious

threat because of their toxicity, bioaccumulation and biomagnifications in the food chain. [3, 6]

The contamination of heavy metals is a severe health of human hazard since they are toxic, bioaccumulate in the food chain, which is the principal route of heavy metals intake into the tissues of poultry, is through the feeds.

The determination of heavy metals in tissue and organs of poultry animals has therefore received serious attention the foremost among toxic metals which accumulate in food chains and have a cumulative effect are lead, chromium, cadmium, mercury and arsenic.

The toxic effects of lead, on people exposed to lead in the course of their work. Short-term exposure to high levels of lead can cause brain damage, paralysis (lead palsy), anaemia and gastrointestinal symptoms. Longer-term exposure can cause damage to the kidneys, reproductive and immune systems in addition to effects on the nervous system. The most critical effect of low-level lead exposure is on intellectual development in young children and, like mercury, lead crosses the placental barrier and accumulates in the foetus. Infants and young children are more vulnerable than adults to the toxic effects of lead, and they also absorb lead more readily. Even short-term, low-level exposures of young children to lead is considered to have an effect on neurobehavioural development. Consumption of food containing lead is the major source of exposure for the general population. [4-6].

The principal toxic effect of cadmium is its toxicity to the kidney, although it has also been associated with lung damage (including induction of lung tumours) and skeletal changes in occupationally exposed populations. Cadmium is relatively poorly absorbed into the body, but once absorbed is slowly excreted, like other metals, and accumulates in the kidney causing renal damage. The kidney of food animals is a major source of cadmium in the diet although lower levels are found in many foods. [4].

This study aims to analyze heavy metals such as cadmium and lead that contaminated in chicken samples of fresh-food market, Nakhon Si Thammarat, the southern part of Thailand. The chicken was collected from market in Mueng district, Thungsong district, Sichol district and Huasai district.

## 2. Materials and Methods

### 2.1 Sample collection

The chicken samples were collected (February - September 2012 ) from fresh-food markets, in Nakhon Si Thammarat, the southern part of Thailand, in Mueng district, Thungsong district, Sichol district and Huasai district.

### 2.2 Sample preparation

This method utilizes the acid digestion of chicken samples in a closed vessel using pressure controlled microwave heating for the determination of metals by spectroscopic methods (note a).

Reagents: HNO<sub>3</sub> (70 %)

Procedure:

1. Weigh 0.5 g of sample into each vessel. Add 10 mL HNO<sub>3</sub> (70 %) to each vessel.
2. Seal all vessels except the one to be used for pressure (note b).
3. Seal the control vessel with a modified cap assembly.
4. Place the vessels into the turntable. Connect the vent tubes from the vessels to the collection vessel.
5. Place the turntable into the system. Connect the pressure sensing line to the control vessel.
6. Program as follows in Table 1.

Table 1: The Program of Microwave sample Preparation

Stage	1	2	3	4	5
%POWER*	60	60	60	60	0
PSI	20	40	85	135	0
TIME	10:00	10:00	10:00	10:00	0:00
TAP	5:00	5:00	5:00	5:00	0:00
TEMP					
FAN	100	100	100	100	100
SPEED					

\* This is for a nominal 630 watt system. For a nominal 950 watt system, multiply percentage power by 0.66.

7. Run the heating program to completion.
8. Cool the samples for a min, of 5 min, vent the control vessel and remove the pressure sensing line. Remove the turntable from the system.
9. Manually vent (note c) and open the vessels. Transfer the solution to a flask, with a filtration step, if needed, prior to analysis.

Note a: This procedure is a reference point for sample digestion using the CEM Microwave sample Preparation System and may need to be modified or changed to obtain the required results on your sample. [7]

Note b: The pressure control vessel must contain the largest and most reactive sample. [7]

Note c: Manual venting of CEM close vessels should only be performed when wearing hand, eye and

body protection and only when the vessel contents are or below room temperature to avoid the potential for chemical burns. Always point the vent hole away from the operator and toward the back of a fume hood. [7]

### 2.3 Elemental analysis of samples

Cadmium and lead in Chicken samples were determined directly after preparation (section 2.2) and used atomic absorption spectrophotometry (SPECTRAA, 6402 VARIAN) equipped with graphite furnace. The instrument parameters analysis of cadmium and lead show in Table 2 and Table 3, respectively.

Table 2: The instrument parameters analysis of cadmium.

Lamp Current	4 mA
Spectral Bandwidth	0.5 nm
wavelength	228.8 nm
Maximum bsorbance	0.7
MSR%	87 %

Table 3: The instrument parameters analysis of lead.

Lamp Current	5 mA
Spectral Bandwidth	0.5 nm
wavelength	283.3 nm
Maximum bsorbance	1.4
MSR%	92 %

## 3. Results and Discussions

Table 4: The determination of Cd and Pb in chicken samples of Mueng district.

sample	Cd (mg/L)	Pb(mg/L)
T1	0.01	0.01
T2	0.01	0.02
T3	0.01	0.02
T4	0.02	0.02
T5	0.02	0.03
T6	0.04	0.04
% recovery	80-105	85-100

The chicken was collected from six main market in Mueng district, in Nakhon Si Thammarat. The results (Table 4) showed that cadmium (Cd) content was at 0.01 to 0.04 mg/L, lead (Pb) content was in the range of 0.01 to 0.04 mg/L. The percentage recovery was 80 to 105 and 80 to 100 for cadmium and lead analyses, respectively.

Table 5: The analysis of Cd and Pb Chicken samples Thungsong district.

sample	Cd(mg/L)	Pb (mg/L)
T7	0.01	0.07
T8	0.01	0.03
T9	0.01	0.02
T10	0.03	0.04
% recovery	80-105	85-100

The chicken was collected from four main market in Thungsong district, in Nakhon Si Thammarat. It was found that cadmium content was detected in the range 0.01 - 0.03 mg/L, lead content was in the range of 0.02 - 0.07 mg/L. The percentage recovery was detected at 80 to 105 and 85 to 100 for cadmium and lead analyses, respectively. (Table 5)

Table 6: The Cd and Pb residues in chicken samples of Sichol district.

sample	Cd(mg/L)	Pb(mg/L)
T11	0.01	0.01
T12	0.02	0.04
% recovery	80-105	80-95

The chicken was collected from Two main market in Sichol district, in Nakhon Si Thammarat. According to Table 6, cadmium content was found at 0.01 to 0.02 mg/L, lead content was in the range of 0.01 to 0.04 mg/L. The percentage recovery was detected at 80 to 105 and 80 to 95, for cadmium and lead analyses, respectively.

Table 7: The content of Cd and Pb found in chicken samples of Huasai district.

sample	Cd (mg/L)	Pb (mg/L)
T13	0.01	0.01
T14	0.01	0.01
% recovery	80-102	83-100

The chicken was collected from two main market in Huasai district, in Nakhon Si Thammarat. Cadmium content was found at the same amount of 0.01 mg/L, and Lead content was found at 0.01 mg/L. The percentage recovery was found at 80 to 102 and 83 to 100, for cadmium and lead analyses, respectively. (Table 7)

Table 8: The analysis of *Salmonella* spp. in chicken samples.

District	sample	Salmonella spp.
Mueng district	T1	N.D.
	T2	N.D.
	T3	N.D.
	T4	N.D.
	T5	N.D.
	T6	N.D.
Thungsong district	T7	N.D.
	T8	N.D.
	T9	N.D.
	T10	N.D.
Sichol district	T11	N.D.
	T12	N.D.
Huasai district	T13	N.D.
	T14	N.D.

N.D. = Non detectable

In this research, the analysis of *Salmonella* spp. in chicken samples also investigated. No contamination

by *Salmonella* spp. was found in any samples units. (Table 8)

#### 4. Conclusions

In this study, the analysis of cadmium and lead for the studied chicken samples of fresh-food markets in Nakhon Si Thammarat, the south in Thailand was successful evaluated. The amount of cadmium and lead contaminated in the samples was lower than the maximum residues limit as established by ACFS for standard measurement of food products, which for cadmium at 0.05 mg/L, and lead at 0.1 mg/L. Thus, it concerned that the chicken samples was safe for consumption

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