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A
THESIS
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**STUDY ON NITRITES, NITRATES AND
SOME BIOGENIC AMINES IN CERTAIN
FOOD PRODUCTS**

Submitted by

Hanan Fawzy Ahmad

Food Technology Research Institute, Agricultural Research Center
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**TITLE OF THESIS: STUDY ON NITRITES, NITRATES AND
SOME BIOGENIC AMINES IN CERTAIN FOOD PRODUCTS**

Name of the Candidate: Hanan Fawzy Ahmed

This Thesis has been approved for submission by the supervisor:

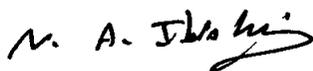
Prof. Dr.: *Mohamed Abd El Gawad Zayed*

Signature:



1. Prof. Dr.: *Nabih Abd El Hamid Ibrahim*

Signature:



Prof. Dr.: Sadek. E. Abdou

**Chairman of Chemistry Department,
Faculty of Science, Cairo University.**

ABSTRACT

Name: **Hanan Fawazy Ahmed**

Title of Thesis: **Study on nitrites, nitrates and some biogenic amines in certain food products.**

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This work has been carried out to determinate nitrite and nitrate using the modified HPLC method, which is more accurate and precise than that using spectrophotometer especially at low concentrations of added nitrite and nitrate.

The study showed that presence of nitrite and nitrate in higher amounts than those permitted by the Egyptian standard. In addition, nitrite and nitrate were found in some meat products where they should be absent.

Reducing the amount of nitrite, which added to the meat products and study the effect of nitrite on biogenic amines.

Key words: Nitrites, Nitrates, Biogenic amines, Meat products, Luncheon Histamine, Cadaverine, Tyramine, Puterscine, Tryptamine,

Supervisors:

Prof. Dr.: ***Mohamed Abdel Gawad Zayed***

Prof. Dr.: ***Nabih Abdel Hamid Ibrahim***

Prof. Dr.: Sadek. E. Abdou

Chairman of Chemistry Department,
Faculty of Science, Cairo University.

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INTRODUCTION

Introduction

Nitrate and nitrite are added as curing agents during the manufacture of meat products such as luncheon and sausage. Principal function of these salts is the food preservation as they provide highly effective protection against the food poisoning microorganisms of which *Clostridium botulinum* is of particular concern (Roberts and Ingram, 1977). Nitrate and nitrite also confer upon cured meats their characteristic color (Giddings, 1977) and organoleptic properties (Paquette *et al.*, 1980). Nitrite is chemically highly reactive when added to a meat matrix (Casseas *et al.*, 1977) and is largely responsible for a number of properties associated with cured meats. Nitrate is much more stable but can undergo microbial reduction to nitrite and in effect act as a reservoir for this ion. Nitrate is naturally taken up by plants from soil and the use of nitrogen based fertilizers to stimulate plant growth artificially increases soil nitrate and may indirectly lead to higher its concentrations in crops (Yeart *et al.*, 1999). Food is the main source of exposure to nitrate with drinking water making a smaller contribution (Packer *et al.*, 1995). A limit of 50 mg/l for nitrate in drinking water has been introduced in the European Union (European Community, 1998). Moreover, excessive of nitrite and nitrate in the diet may cause toxic effects since methaemoglobinaemia is produced by oxidation of hemoglobin by nitrite (Chan, 1996).

According to the published survey, most of the nitrate intake in our diet is derived from vegetables, which contribute 75-80% of the total daily intake (MAFF, 1987 and Walker, 1990). The Acceptable Daily Intake (ADI) for nitrite allocated by the Joint FAO/WHO Expert

Committee on Food Additives is 0-0.06 mg/kg body weight/day, expressed as nitrite ion (FAO/WHO, 1996 and Massey, 1997). Based on similar criteria, the ADI for nitrate is recommended to be 0-3.7 mg/kg body weight/day (expressed as nitrate ion), which is equivalent to 219 mg/day for a 60 kg adult (European Commission 1997). Daily dietary exposures to nitrate and nitrite in Egypt are 296 mg/day (Saleh *et al.*, 1998). Nitrite and nitrate after being metabolized or reduced to nitrite, can react with amine to form N-nitroso compound (Magee, 1982) some of which have been shown to be potent carcinogens in animals (Tannenbaum, 1987).

Cassens, (1997) reported that residual nitrite content of cured meat at retail is approximately 10 ppm which represents approximately 80% reduction from the 1970s. This change has undoubtedly resulted from lowered in going nitrite.

It has recently been shown that diet rich in amine-containing foods (such as fish) combined with a high intake of nitrate can lead to increased formation of N-nitrosamines (Vermeer *et al.*, 1998). However, there is no firm epidemiological evidence linking gut, brain, and esophageal and nasopharyngeal cancers to dietary exposure to nitrate or its metabolites (Barrett *et al.*, 1998, Eichholzer and Gutzwiller, 1998). In addition, nitric oxide formation in the stomach from dietary nitrate has been postulated to have antimicrobial effects on gut pathogens and to play a role in host defense (Mc Knight *et al.*, 1997).

Biogenic amines are low molecular weight organic bases, can be formed and degraded as a result of normal metabolic activity in animals, plants and microorganisms. In the latter case, biogenic amines may be