بحث فساد البيض البكتريولوجى

للدكتور أ ٠ أ ٠ أحمد ولدكتور م ٠ أبو جبل والدكتور س ٠ م ٠ عنب

والدكتـــور ط ٠ ح ٠ مصطفى

الملخص

من ١٢٥ بيضة فاسدة وجد أن ٨٧ بيضة تحتوى على ميكروبات ٠ وبتحليل الميكروبات المعزولة وجد حوالى ٢١ نوع من الفطريات وخمس أنواع من البكتريا ٠ وقد نوقشت أهميـة الميكروبات المعزولة للصحة العامة كذلك أهميتها كسبب فى خسارة اقتصادية ٠

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INVESTIGATION OF MICROBIAL SPOILAGE OF HEN EGGS

(with 3 tables one figure)

By

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SUMMARY

Out of 125, inedible hen eggs, 87 (69.6%) proved to contain different types of micro-organisms.

Group analysis of isolates revealed the presence of 21 different species of fungi as well as 5 different types of bacteria. The public health importance as well as the economic losses caused by the isolated micro-organisms have been discussed.

INTRODUCTION

Eggs had been used as food by human beings since early antiquity, Its nutritive value not only is excellent for body maintenance, but also for growth, lactation and reproduction as it presents a good source of high quality animal proteins and other food elements. Therefore, eggs are incorporated into many different food stuffs that are prepared commercially on a large scale.

Nowadays, the extensive utilization of both edible and inedible eggs is presented in Figure 1.

Deterioration of hen's egg may be due to the action of different types of micro-organisms that find their way to the egg contents as a result of faulty production, handling or storage. Besides the economic losses due to such spoilage, such eggs may constitute a public health hazard.

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Fig. 1 : Total egg Production

Table eggs	Some preserved eggs	Hatching eggs
Usable Indible Spoiled Lost	. . . . .	Infertile Hatched Dead . . . . . . Lost
	Industrial uses of eggs	
Medical uses — Pharmacology — Bacteriology	Food industries — Bakery products — Ice cream — Animal feeds — Miscellaneous	Manufacturing — Leather — Dyes — Synthetics — Fertilizers — etc. . . . .

Therefore, this work was planned to investigate the different types of micro-organisms prevailing in spoiled hen eggs.

LITERATURE

In the majority of new-laid eggs from healthy hens, the egg contents are bacetriologically sterile. Contamination of egg contents occasionally occurs before the egg is laid or shortly thereafter.

PAVARINOV (1929) isolated strains of Pseudomonas fluorescens, Micrococcus roseus and Staphylococcus aureus from spoiled hen eggs. SHARP and STEWART (1936) found that dirt on the egg shell furnishes food in such large amount that mold could support themselves at unusually low humidity. MILES and HALNAN (1937) were the first to isolate proteus species causing rot in stored hen eggs. HAINES (1938) found that certain species of Pseudomonas multiply in egg, from which they synthesize a characteristic flourescent green pigments, causing rot. HAINES (1939) found that species of Proteus and Pseudomonas caused deterioration of the preserved eggs. HAINES and MORAN (1940) reported that washing the egg merely increases its vulnerability. If the washing water is colder than eggs,

the egg contents contract and water and bacteria may drawn through the shell by suction. They also added that washed eggs, dirty eggs and eggs that had been allowed to sweat, all showed a high incidence of rotting than clean untreated eggs. TANNER (1944) showed that E. coli as well as Proteus group were among the frequent contaminants found in egg yolk, while Pseudomonas species was the less frequent. WILSON (1944) stated that infertile eggs infected with S. pullorum after several days incubation, had high germ content. JUDIFIND (1947) stated that although Spullorum had formerly considered non-pathogenic for man, a number of cases of human diarrhoea from which this organism had been isolated, have been reported. ROMANOFF and ROMANOFF (1949) stated that bacterial and fungal penetration through egg shell, may readily occur if the pores are opened by the removal of the cuticle, whose protection is destroyed by abrasion, or by the presence of a mere trace of water on the shell. They also added that the growth of mold on the exterior of the egg shell depends to a large extent upon the humidity. SCOTT *et al.* (1950 — 1951) found that Pseudomonas fluorescens, Achromobacter, Coliform bacteria and Proteus species were the main types of micro-organisms causing rot in Australian eggs. FLORIAN and TRUSSEL (1957) had listed rot by different species of Pseudomonas, Alcaligenes, Proteus and E. coli among spoliage of intact shell eggs. McLAURY and MORAN (1959) found that cooling of freshly laid contaminated egg withdraw the organisms through the shell pores. SAVOV (1966) isolated 60 strains of E. coli from the yolk of 226 eggs (26.5%). FRAZIER (1967) reported that molds causing moldiness of eggs include species of Penicillium, Cladosporium, Mucor, Sporotricum, Thamnidium, Botrytis, Alternaria and other genera.

MATERIAL AND METHODS

125 hen eggs, proved to be inedible by physical examination, were collected from the market. These eggs were subjected to the following bacteriological examinations :

Preparation of sample

Each egg was placed on a metal holder, and few dops of alcohol were poured over the shell at its broad end, ignited and allowed to burn off. A sufficient area of the shell was removed around the air-space with sterile scissors.

A. *Isolation of fungi*

Procedure :

Loopfuls from yolk and white were directly streaked on Sabauroud agar medium. Inoculated plates were incubated for 48 hours at 37°C, then left at room temperature (15-20°C) for another week, before being examined.

Typing of isolates :

The isolates were left to grow on CZAPEKS medium. Aspergilli and Penicilli had been identified according to the key of THOM and RAPER (1945). Other mold fungi had been identified according to their morphological appearance as well as the microscopical criteria in the mycological literature.

B. *Isolation of bacterial contaminants*

Procedure :

Loopfuls from the egg contents were directly streaked on McCONKEY'S agar medium. The inoculated plates were incubated at 37°C for 24 hours before examined.

Typing of isolates :

Representative colonies were picked from each plate and isolated in pure culture on agar slopes to be identified according to KAUFFMANN (1954) ; SMITH and CONANT (1960).

RESULTS AND DISCUSSION

Out of the 125, inedible and spoiled, hen eggs examined, 87 (69.6%) proved to be spoiled with different types of micro-organisms (Table 1). Group analysis of isolates proved that 60 contaminants belonging to 21 different types of fungi as well as 58 contaminants belonging to 5 different types of bacteria could be detected (Tables 2 and 3).

TABLE 1 : **Incidence percentage of hen eggs spoiled with microbial agents**

Examined eggs	Contaminated eggs		Sterile eggs	
	Number	Percentage	Number	Percentage
125	87	69.6	38	30.4

TABLE 2 : Isolated fungi from the spoiled hen eggs

Type	Number of isolates	Percentage
Aspergillus niger	12	20.0
Cladosporium	6	10.0
Cephalosporium acremonium	5	8.3
Mucor	5	8.3
Aspergillus flavus	4	6.6
Alternaria	3	5.0
Aspergillus minor	3	5.0
Fusarium	3	5.0
Aspergillus glaucus	2	3.3
Aspergillus fumigatus	2	3.3
Penicillium species	2	3.3
Chrysosporium panorum	2	3.3
Sterile mycel	2	3.3
Geotrichum candidum	2	3.3
Aspergillus candidum	1	1.6
Aspergillus terreus	1	1.6
Cladosporium wernecki	1	1.6
Dematecoe	1	1.6
Phytomycetes	1	1.6
Botrytis cinarium	1	1.6
Stemphylium	1	1.6
	60	

TABLE 3 : Isolated bacteria from the spoiled hen eggs

Type	Number os isolates	Percentage
Escherichia coli	28	48.3
Proteus species	17	29.3
Pseudomonas species	7	12.3
S. pullorum	5	8.6
Streptococcus faecalis	1	1.7
	58	

The percentage distribution of fungi given in Table 2, shows that Aspergillus niger was the most prevalent (20%), Aspergillus candidum, Aspergillus terreus, Cladosporium werneckei, Dematеacoe, Phytomycetes, Botrytis cinarium, and Stemphylium were the least (1.6 % each), while the incidence percentage of Cladosporium, Cephalosporium acremonium, mucor, Aspergillus flavus, Alternaria, Aspergillus minor, Fusarium, Aspergillus glaucus, Aspergillus fumigatus, Penicillium, Chrysosporium, Sterile mycel and Geotrichum candidum lied inbetween.

The results given in Table 3, reveal that E. coli was the most prevalent bacteria isolated (48.3%), while species of Proteus and Pseudomonas were found in 29.3 and 12.7%, respectively. S. pullorum and Strept. faecalis were detected in 8.6 and 1.7%, respectively.

The different types of isolates, fungi or bacteria, reported here, substantiate the findings reported by PAVARINOV (1929), MILES and HALNAN (1937), HAINES (1938 — 1939), TANNER (1944), SCOTT *et al.* (1950 — 1951), FLORIAN and TRUSSEL (1957) and FRAZIER (1967).

Although the contents of newly laid egg from healthy fowls are usually sterile, yet the shell soon becomes contaminated from different sources by various types of micro-organisms which can grow and penetrate through the intact shell contaminating the egg contents. The rate of penetration of such organisms depends mainly on both humidity and storage temperature at which eggs are produced and stored (SHARP and STEWART, 1936 ; HAINES and MORAN, 1946 and ROMANOFF and ROMANOFF, 1949).

From the economic point of view, penetration of such different micro-organisms to egg interior lead to economic losses through spoilage of eggs on the market.

Also, the hatchability percentage of such eggs is lowered through increased dead-in-shell embryoes.

Besides, contaminated eggs may spread infection among the farm flocks. Aspergillosis among poultry, especially the acute type, may lead to considerable losses in young birds. Also, the serious role played by infected eggs in spreading white diarrhoea, should not be over-looked.

From the public health point of view, members of bacterial isolates have been implicated in cases of enteritis, epidemic or summer diarrhoea in infants, urinary infection, food poisoning and other intestinal disorders (BRAY, 1945 ; JUDIFIND, 1947 ; FURGUSON and JUNE, 1952 ; SMITH and CONANT, 1960 ; McCKIE and McCARTNEY, 1962 and FRAZIER, 1967).

Inedible eggs posses certain physical and chemical properties that make them useful as basic ingredients of many manufactured goods as leather industry and fertilizers. Many inedible eggs from various sources are utilized in leather tanning (tanner yolk). For the sake of convenience, the public health importance of fungal isolates will be discussed separately.

— Aspergillus fumigatus has been often increminated as a causative agent in many infections in man involving the ethmoid, maxillary, sphenoid sinuses and the orbit (ADAM *et al.*, 1965) as well as some pulmonary infections (SKOBEL, 1965). Also, localized and disseminated skin forms of Aspergillosis in man are well known (JANKE, 1965).

— Cephalosporium has been often isolated from both superficial as well as deep mycotic lesions in man. The infection is mostly through skin abrasions (JANKE and ROHRSCHNEIDER, 1951).

Owing to the continuous consumers demand for fresh eggs and egg-products, it is extremely necessary not only to increase egg production, but also to guard against their infection through application of farm hygiene programms and better handling and storage methods.

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