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# التوثيق الالكتروني والميكروفيلم

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# جامعة عين شمس

## التوثيق الإلكتروني والميكروفيلم

# قسم

## نقسم باللّه العظيم أن المادة التي تم توثيقها وتسجيلها
## علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات

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## تحفظ هذه الأقراص المدمجة بعيدا عن الغبار

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# لم ترد بالأصل

# Post Irradiation Effect On Some Antiphagocytic Substances Produced by Pathogenic Microorganisms

*A Thesis*

**Submitted In Partial Fulfillment of**

**The Requirements for The Master Degree of Science**

**In**

**Botany**

**(Microbiology)**

**By**


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*(B.Sc. In Microbiology)*


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Botany Department

Faculty of Science

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2002

**APPROVAL SHEET**

**Title of the M.Sc. Thesis**

# POST IRRADIATION EFFECT ON SOME ANTIPHAGOCYTIC SUBSTANCES PRODUCED BY PATHOGENIC MICROORGANISMS


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***Mona Kamal***

# Dedication

*To My Roots*

*My Mother and Father*

*To the Delicate Flowers*

*My Sole Sister & her Family and My Sole Brother*

*The Kind understanding and great support of every member of my family helped me to get through this study*

*So,*

*Many Thanks to All of You*

*Mona*

**This thesis has not been previously submitted for any degree at this or at any other university.**

## Note:

Beside the work carried out in the thesis the author has attended and passed successfully the following post – graduate courses:

**1- Virology.**

**2- Bacteriology.**

**3- Tissue culture.**

**4- Radiobiology.**

**5- Hydrobiology.**

**6- Host – Parasite relationship.**

**7- Soil Microbiology.**

**8- Applied Microbiology.**

**9- Biostatistical Analysis.**

**10- Instrumental Analysis.**

**11- German Language.**

# Contents

# Abstract

Some clinically isolated microorganisms can produce antiphagocytic virulence substance. In this study 43 bacterial strains were isolated from cervix of 50 patients. ***Escherichia coli*** was the most common species isolated (39.53%) followed by ***Klebsiella pneumoniae*** (23.26), ***Pseudomonas aeruginosa*** (11.63%), ***Proteus mirabilis*** (9.30%), ***Klebsiella oxytoca*** (4.65%), ***Staphylococcus warneri*** (4.65%), ***Klebsiella* group 47** (2.33%), ***Morganella morganii*** (2.33%) and ***Staphylococcus hominis*** (2.33%). Four yeast fungal organisms were isolated in this study. ***Candida albicans*** was the only ***Candida*** species isolated representing 8.51% of total number of pathogenic bacteria and yeast fungi isolated. Radiotherapy of these cancer patients had many effects on the microbial cells. The tested isolates were exposed to *in-vivo* multiple fractionated doses 10 – 50 Gy and *in-vitro* single equivalent dose 7.04 – 20 Gy.

The isolated strains were tested for antimicrobial agent susceptibility using 18 different antibiotics for bacterial isolates and nystatin for ***Candida albicans.*** The effect of bacterial and yeast fungal virulence factors on neutrophil phagocytosis and antimicrobial activity was examined. Disk susceptibility testing suggested that, the isolated producer strains which were positive for extracellular proteinase enzyme and/or for slime production that correlate with infectivity were resistant to erythromycin, streptomycin, neomycin, kanamycin, tetracycline, cephalothin and sulphamethoxazol / trimethoprim and rarely susceptible to amoxicillin /clavulanic acid and cefotaxime. In contrast, many non-producer strains were susceptible to most of the tested anibiotics with marked variability among species. In case of ***Candida albicans*** all the tested strains were susceptible to the tested antimycotic agent used before and after *in-vitro* irradiation at a dose level of 20 Gy. It was found that slime substance and / or proteinase enzyme reduced the phagocytic activity of the leukocytes against the producer bacterial strains. *In-vivo* irradiation at 10, 30 and 50 Gy, decreased the phagocytosis by human polymorphonuclear leukocytes (PMNs) of the irradiated bacterial strains. The ability of the tested bacterial isolates to

produce slime was changed after *in-vitro* irradiation in about 50% of the producer strains from positive to weak positive or negative, this increased phagocytosis in some cases, while the percentage of the antibiotic resistance was increased.

In case of ***Candida albicans***, the isolated strains were grown on medium containing bovine serum albumin (BSA) as the sole nitrogen source for enzyme production. Proteinase enzyme production was detected by agar plate method. The majority 75% of the isolated strains were proteinase enzyme producer before irradiation, whereas, 25% only were enzyme producer after *in-vitro* irradiation. The enzyme activity before irradiation was greater than that after irradiation where, the mean proteinase activity of all isolates was ($8.17 \pm 4.9$) before irradiation compared with ($2.33 \pm 3.8$) after irradiation, P-value = 0.0001 was highly statisticaly significant. A dose level of 20 Gy resulted in decrease of slime production in 25% of ***Candida albicans*** isolated strains from positive reaction to negative reaction comparing to the pre-exposure results. Phagocytosis by polymorphonuclear leukocytes (PMNs) of the *in-vivo* irradiated ***Candida albicans*** strains were decreased comparing to non-irradiated strains, the mean phagocytic index (PI) was $4.89 \pm 1.00$ and $7.19 \pm 0.49$ respectively (P-value = 0.0029). Whereas, marked decrease in phagocytosis were detected after *in-vitro* irradiation than that of *in-vivo* and non-irradiated strains, the mean (PI) after *in-vitro* irradiation was $0.67 \pm 0.28$ with P-value = 0.0004. This study clearly shows that microbial virulence is a function of many factors working jointly to overcome the host defences.

***Key Words:*** $^{60}$Co gamma radiation, antiphagocytic substances, extracellular polysaccharide slime production, extracellular proteinase enzyme production, pathogenic bacteria, pathogenic yeast fungi, cancer cervix, phagocytosis, polymophonuclear leukocytes (PMNs), antimicrobial agents.