Archive of SID.ir

DOI:10.31557/APJCB.2026.11.1.49

RESEARCH ARTICLE

The Effect of EPS of Biofilm on Expression of Bax and Bcl-2 Genes in Human Cervical Carcinoma Cell Line (HeLa)

Iman A. Bachay, Talib A. Alboslemy, Roaa Abdulla Sabeeh, Sheyma A. Bachii

Department of Biology, College of Science, University of Basrah, Basrah, Iraq.

Abstract

Background: The third most common malignancy in women is cervical carcinoma (CC). worldwide and remains a major reason of cancer-related losses. between females. Even though the availability of conventional therapies, their efficacy is often limited, which has encouraged the search for novel agents that selectively target cancer cells. Recent studies suggest that bacterial biofilms may possess anticancer activity. **Objective:** Establish exopolysaccharides (EPS) as promising candidates for natural, cost-effective, and biologically compatible cancer therapies. **Methods:** In this study, the cytotoxic influence of extracellular polymeric substances (EPS) derived from *Pseudomonas aeruginosa* biofilms was assessed on HeLa cervical cancer cells via the methyl thiazolyl tetrazolium (MTT) test to calculate the IC_{50}, or half-maximal inhibitory concentration. Following EPS treatment, apoptotic markers were analyzed by real-time PCR. **Results:** EPS exposure led to a significant, dose-dependent inhibition of HeLa cell proliferation matched to Vero cells ($p<0.05$). Furthermore, cervical cancer cells treated with EPS exhibited a marked rise in the expression of the pro-apoptotic gene Bax and a concomitant reduction in the expression of the anti-apoptotic gene Bcl-2 ($p<0.05$). **Conclusion:** These outcomes indicate that EPS can induce apoptosis in HeLa cells, as reflected by the upregulation of Bax and the downregulation of Bcl-2. This highlights the potential of EPS such as a promising candidate for the development of novel anticancer therapies for cervical cancer.

Keywords: Apoptosis- Bax- Bcl-2- Biofilm- HeLa cells- *P. aeruginosa*

Asian Pac J Cancer Biol, **11 (1)**, 49-56

Submission Date: 09/14/2025 Acceptance Date: 12/02/2025

Introduction

Approximately 70% of cervical cancers originate from abnormal cellular growth within the cervical epithelium, often beginning at the transformation zone near the top of the cervix, which makes early detection challenging. Multiple factors are associated with a heightened threat of growing cervical cancer, such as human papillomavirus (HPV) sickness tobacco use, compromised immune function, and early sexual activity, particularly involving multiple partners [1]. Although significant progress in surgical techniques, radiotherapy, and chemotherapy has led to improved survival rates, and monoclonal antibody treatments, a significant proportion of patients still face the danger of recurrence or mortality [2]. In recent years, bacteria-mediated malignant tumor therapy has emerged such as a promising field of interest due to its unique advantages [3].

The therapeutic use of bacteria against tumors has been investigated for more than a century [4]. As early as 1923, William B. Coley, a pioneer bone surgeon, reported tumor regression in sarcoma patients following injections of heat-inactivated Streptococcus pyogenes, laying the foundation for bacteriotherapy in oncology [5, 6]. The levels of apoptotic expression regulatory proteins, including Bcl-2 and Bax have recently been identified as a critical factor in the induction of apoptosis in cancer cells [7]. Proteins belonging to the Bcl-2 family serve a central role in governing programmed cell death and are essential for maintaining tissue homeostasis; alterations or mutations in these proteins are frequently associated with tumor development [4, 5]. Modulating the cell cycle through the regulation of Both the pro-apoptotic and anti-apoptotic proteins within the Bcl-2 family.

Corresponding Author:
Dr. Iman A. Bachay
Department of Biology, College of Science, University of Basrah, Basrah, Iraq.
Email: imankadhim28@gmail.com

Archive of SID.ir