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ISOLATION AND DESCRIPTION OF ANTIMICROBIAL AND ANTI-TUMOR PRODUCED BY *ACTINOMYCES SP.*

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Abstract

Actinomyces are one of the major group of the actinomycetes , they are important in soil biodegradation by the recycling of nutrients associated with polymers such as keratin, lignocelluloses and chitin , produce several volatile substances and exhibit diverse physiological and metabolic properties , such as the production of extracellular enzymes. Many of these secondary metabolites are potent antibiotics, which has made Streptomycetes the primary antibiotic organisms exploited by the pharmaceutical industry. Members of this group are producers, in addition of clinically useful antitumor drugs such as vancomycins, peptides , aureolic acids , enedynes and antimetabolites and they exert antitumor activity by inducing apoptosis through DNA , inhibition of key enzymes involved in signal transduction like proteases or cellular metabolism and in some cases by inhibiting tumor induced angiogenesis. Detection of radio activity of the most potent actinomyces, optimization of production media of the promising bioactive compounds. Determination of the antitumor activity of the bioactive compounds of Actinomycetes against different tumors.

Introduction

Natural products have played a key role in the discovery and development of many antibiotics (Newman, D. J., and G. M. Cragg 2010). In particular, based Actinomycetes have been the source of countless drugs, such as Streptomycin, Actinomycin, Erythromycin, and Vancomycin, to name only a few (Clardy, J. 2010). One approach to the discovery of new antimicrobial agents from natural sources has been to use records to guide the collection of samples (Cordell, G. A., et.al., 2011).

Subsequent investigation demonstrated that the soil had a higher concentration of NaCl. This prompted a more in-depth examination of the effect of dilution across several soil samples to determine if this was a general trend associated with all soils. The dilution of an inhibitory compound, such as high salt, dilution would to identify the most probable number of microbes present needed to metabolize a particular substrate (Gamo, M., and T. Shoji. 2011).

Replicate profiles of different suspensions of the same soil showed variability (Haack, S. K., 2012). Further, suspended cells from a suspension may (Mayr, C., 2012) or may not (Balser, T. C., 2012) yield identical patterns of substrate utilization or particulate fraction. Thus it is important when performing Community Level Physiologic Profile (CLPP), to measure profiles of multiple suspensions (Balser, T. C., 2012) and to separate suspensions suspended and particulate fractions (Balser, T.

C., 2012). Life continued to rise in scientific research, reaching a record high of chronic diseases like heart disease, cancer, and stroke, replaced infectious diseases as major killers (Minino, A. M., 2012). Society had distanced itself from the threats of smallpox, paralytic poliomyelitis, and tuberculosis that had so impacted previous generations. Success contributed, in part to major pharmaceutical companies reducing antibiotic development programs and redirecting resources toward diseases (Culotta, E. 2009).

Isolation and identification of antimicrobial compounds from cultures of antimicrobial producing bacteria is problematic because of the low antibiotic yields (Gastaldo, L., 2009). In addition, fermentation broths may contain many compounds that could interfere with isolation and purification. A current for simplifying and speeding the isolation and purification of known antibiotics is the use of adsorbent resins (Casey, J. T., P. K. Walsh, and D. G. O'Shea. 2012). Resins offer two advantages in antibiotic discovery projects involving antibiotic-producing bacteria. Adsorbent resins selectively bind antibiotics in fermentation broths, and inclusion of adsorbent resins during growth may relieve feedback repression of antibiotic production (Falkinham, J. O., 2012). Adsorbent resins have also been shown to bind and thus recover a variety of antibiotics from fermentation broths, including Vancomycin, Streptomycin and Gentamycin (Casey, J. T., P. K. Walsh, and D. G. O'Shea. 2013), but because not all compounds in fermentation broths are bound by the resins (ideally only the active antibiotics) the level of extracellular, non-antibiotic cellular products is reduced. Adsorbent resins have also been employed to sequentially with one resin removing non-antibiotic fermentation metabolites and impurities and a second resin to selectively bind and isolate the active antibiotic (Ghosh, A. C., 2010). A key requirement of adsorbent resins is that once the antimicrobial has bound, it must be eluted from the resin and isolated. As studies of antibiotic production genes have identified linked regulatory gene sequences, it has been expected that the synthesis of the novel metabolites (e.g., antibiotics) would be subject to regulation within the cellular machinery. In many instances this would be expected to involve negative feedback by the antibiotic itself. Binding of the antibiotic to adsorbent resins would remove the antibiotic from the culture medium and thus relieve feedback repression resulting in increased production of antibiotic (Gastaldo, L., 2009).

Materials & Methods

Measurement of MIC of methanol extracts of microorganisms : A 0.5 gm sample of each inoculated (negative control) after 2 weeks incubation was suspended in 5

ml of methanol, vortex at the highest setting for 60 sec, and shaken per sec for 30 min at room temperature. The microorganisms were pelleted by centrifugation (5,000 × g for 10 min) and the supernatant methanol solution was collected without collecting . The methanol extract was evaporated to dryness overnight in a beaker at room temperature, and the residual extract was dissolved in 5 ml of deuterated dimethyl sulfoxide (DMSO). The dry weight of the (DMSO) solution was measured by drying 2 ml in aluminum pan overnight at 90 °C. (MIC) the minimal inhibitory concentration of the (DMSO) solutions were measured by broth microdilution in 50 well plates against *Actinomyces alkalophilus* (*HU6*), *Actinomyces formosensis* (*HU9*), *Streptomyces griseus* (*HU7*) and *Strept. fulvescens* (*HU8*) . The target microorganisms were grown and prepared for MIC measurement as described previously (Cain, C. C., 2012). The results are reported as the minimal concentration as dry weight completely inhibiting growth of the target microorganism. To serve as quality assurance standards, MIC values for known antibiotics were included (Table 2).

Enumeration, isolation, and identification of antimicrobial-producing microorganisms : Antimicrobial-producing colonies from the inoculated soils were enumerated on lawns of target microorganisms. Cultures (0.1 ml) of *Actinomyces alkalophilus* (*HU6*), *Actinomyces formosensis* (*HU9*), *Streptomyces griseus* (*Hu7*) and *Strept. fulvescens* (*HU8*), (spore suspension) grown as described (Cain, C. C., 2012) were spread on 1/10-strength melanin pigment broth. Immediately, 0.1 ml of the undiluted and diluted soil suspensions (in duplicate) were spread, the plates allowed to air dry and incubated at 30° C for 4-7 days, in addition 0.1 ml of the undiluted (supernatant) and diluted suspensions spread on copper agar (Difco) one-tenth strength, 0.04 g CaCl2 (anhydrous), 7.5 g agar, and 500 ml distilled water) and the medium was incubated at 30°C, colonies appearing on copper agar are likely to be antibiotic-producers (Cain, C. C., 2012). Colonies of Actinomyces appearing on the copper agar or colonies surrounded by zones of inhibition on the lawns were picked, and isolated colonies were used to inoculate 2 ml of strength TSB and incubated 5 days at 30°C. The antimicrobial-producing strains were identified by colony and microscopic morphology and profiles of cellular fatty acids to determine the range of antimicrobial activity of the isolates, 10 µl of a cell-free filtrate of the 2 ml cultures was spotted on the target microorganisms. Clearing of the lawn was taken as evidence of antimicrobial activity (Table 2). To determine the susceptibility of *Actinomyces HU* strains (*6* ,*9*) to the isolates, 100 µl of each cell-free filtrate or of a methanol-extract of the inoculated soils was added to 1.9 ml of Reinforced Medium (RM, Oxoid,). Each was then inoculated with 100 µl of a *Streptomyces sp.*

culture grown at 37°C for 7 days under conditions (Gas Pak, Becton Dickinson, BBL, Sparks) and after 7 days scored visually for a reduction in turbidity (Table 2) by comparison to a control.

Cytotoxicity assay of NHP: The cytotoxicity activity was determined by Cell Counting Kit-8 (CCK-8) assay (Institute of Biotechnology - Al Azhar University). Human liver hepatocellular carcinoma cell line HepG2, human lung adenocarcinoma epithelial cell line $A_5$49, human colon adenocarcinoma cell line HCT-116 and human ovarian cancer cell line COC1 were used in the assay. The cells were seeded in a 96-well culture plate (4× 103 cells per well) with 100 of Dulbecco's modified Eagle's medium (DMEM) containing 10% FBS, penicillin (100 U/ml) and streptomycin (100 mg/ml). Cells were incubated at 37 °C in a 5% CO2 incubator for 24 h. Then the test samples at different doses were added to each well. The plates were then incubated at 37°C or 1.5 h. Cisplatin and media were used as the positive and negative control, respectively. The OD was measured at 450 nm.

Detection of enzymatic activity : Protease (Chavira, R., 2009), lipase (Lonon, M. K., 2010), and alkaline phosphatase activities (Von tigerstrom, R. G. 2011) were measured in untreated and boiled cell-free culture filtrates and inorganic and aqueous fractions of chloroform-methanol (1:1) extracts of representative isolates. The cultural properties of strain Actinomyces were performed as described by SP (Streptomyces Project of Agriculture - Ein Shams University) on 10 different media including three SP media (Waksman), Starch nitrate agar medium (containing 2% soluble starch, 0.051% K2HPO4, 0.025% MgSO4, 0.001% FeSO4 and 2% Agar B, pH 7.2–7.4), Inorganic salts starch agar medium (containing 0.1% K2HPO4, 0.05% CaCO3, 0.03% MgCO3, 0.02% NaCl, 0.1% KNO3, 0.001% FeSO4, 1.5% Agar B and 2% glucose, pH 7.2–7.4). Potato dextrose agar medium (containing 3% sucrose, 1.5% Agar B, 0.001% FeSO4, 0.2% NaNO3, 0.1% K2HPO4, 0.05% MgSO4·7H2O and 0.05% KCl, pH 7.2–7.4). The strain of Actinomyces was inoculated on these media and incubated at 28°C for 7–15 days, and the plates examined daily for growth conditions.

Detection of antimicrobial activity of organic extracts of isolates : Isolates were grown, extracted, and tested for antimicrobial activity using a modification of procedures described previously (Cain, C. C., 2012). Briefly, isolates were grown to 500 ml volumes in strength TSB+S broth, frozen, thawed, and the entire culture was freeze-dried. The resultant powder was extracted by stirring overnight in either methanol or chloroform: methanol (1:1). The resultant slurry was filtered to remove solids, and the solvent was removed in vacuo. This extract was then partitioned

between chlorofom:methanol : H2O (4:1:5). The organic fraction (lower portion) was removed and dried in vacuo. A measured aliquot of this fraction was dissolved in 1 ml of DMSO, and the antimicrobial activity was measured as described previously (Alali, F. Q., 2012).

Isolation of actinomycin from isolate 14-2-1 : A culture of isolate 14-2-1 was extracted as described above. The organic fraction, showing antimicrobial activity, was purified further using a Varian Prostar HPLC systems (Walnut Creek, CA,) equipped with 210 pumps and a 330 photodiode array detector (PDA), with data collected and analyzed using Star Chromatography Workstation software (version 5.52), via an ODS-A column (250 × 25 mm, id., 5 μm; YMC, Wilmington, NC); the CH3CN:H2O gradient solvent system initiated at 1:1 and increased to 8:2 linearly over 70 min. Two major compounds were isolated that eluted between approximately 40 and 50 min, and these were identified via the below experiments as *Actinomyces HU6* and *Actinomyces HU9,* respectively. These assignments were deduced via H- and C-NMR using a Varian Unity Inova-500 instrument broad-band inverse probe with gradient. They were confirmed by high resolution mass spectrometry performed on a Finnigan MAT 95Q hybrid-sector instrument (Thermo Finnigan; San Jose, CA), where compound (1.5 mg) yielded a molecular ion that correlated with *Actinomyces HU6* and where compound (3.0 mg) yielded a molecular ion that correlated with *Actinomyces HU9.* Finally, these assignments were verified by comparison to *Actinomyces HU9* reference standards. Compound 1- eluted with the same retention time (8.75 min) and same UV spectrum as *Actinomyces HU6* and compound 2- eluted with the same retention time (10 min) and same UV spectrum as *Actinomyces HU9* ; both were measured using the aforementioned HPLC system with a gradient solvent system of CH3CN:H2O that initiated at 60:40 and increased linearly to 80:20 over ten min on an ODS-A column (150 × 4.6 mm, id., 5 μm; Wilmington, NC). Actinomycete, designated strains, was isolated from a sample collected, and maintained in the incubator at −20 °C. Isolation of the strain was done at 20°C by employing dilution technique on Starch nitrate agar medium (containing 2% soluble starch, 0.051% K2HPO4, 0.025% MgSO4, 0.001% FeSO4, 2% Agar B and 2% disteled water, pH 7.0–7.2) based on its psychrophilic propensity. The single colony picked from the primary culture was purified for 2 times and the primary strain kept in slant cultures at − 20°C for further experiments.

Isolation of DNA from cultures : DNA isolation from inoculated microorganisms immediately following inoculation and after 2 wks incubation was carried out using the Fast DNA SPIN Kit from Q.BIO gene (Carlsbad, CA). DNA isolation from all

cultures was carried out using the Ultra Clean Microbial DNA Isolation Kit from Mo Bio Laboratories, Inc (Solana Beach, CA).

PCR amplification of rRNA internal transcribed spacer (ITS) sequence and acrylamide gel electrophoresis : PCR amplification of the ITS sequences was performed in 50 µl reaction volumes using GoTaq from Promega Corp. (Madison, WI) following the manufacturer's directions. Primer L (5'-GCTGGATCACCTCCTTTCT-3') and Primer R(5'-CTGGTGCCAAGGCATCCA-3') were used for all reactions (Leblond-Bourget, N., 2009). Acrylamide gels (10 %) were with a 5 mm prepared from a 40% acrylamide/bis (29:1) stock solution (VWR International, West Chester, PA).

Results and Discussion

Table 1. Variation in (+ /-) response per substrate (delta) and number of (+) wells for different soil homogenization methods.

Soil Type	Mixing Method	delta	Positive Responses
Residence 1 Clumpy Clay	Shaker	15	11.0 ± 1.50
	Vortex	11	21.1 ± 2.21
	Blend	3	25.0 ± 1.55
Residence 2 Loose Top Soil	Shaker	12	10.5 ± 2.45
	Vortex	5	17.1 ± 2.54
	Blend	11	21.0 ± 2.11

Table 2. Antimicrobial activity of methanol extracts before and after inoculation with *Ac. formosensis* (*HU9*) and *Strept. griseus* (*HU7*).

Sample	MIC (Fold Increase) [a]			
	(*HU6*)	(*HU9*)	(*HU7*)	(*HU8*)
Ac. formosensis (*HU9*)				
Before inoculation	> 0.50	> 0.52	> 0.53	> 0.35
2 Weeks Later	0.005	0.036	0.21	0.052
Strept. griseus (*HU7*)				
Before inoculation	> 0.30	> 0.32	> 0.34	> 0.35
2 Weeks Later	0.010	0.010	0.150	0.052
Positive Controlb	0.0001	0.000 6	0.021	ND

[a] Values are reported in mg/ml (fold- increase).
b positive control data (from left to right) are for streptomycin, actinomycin, erythromycin and vancomycin .

Table 3. Effect of resin binding on concentration of antimicrobial activity of *Ac. formosensis* (*HU9*).

Material	Minimal Inhibition Conc. (μg/mL)			
	Ac.alkalophilu (*HU6*)	*Ac. formosensis* (*HU9*)	*Strept. griseus* (*HU7*)	*Strept.fulvesc.* (*HU8*)
Cell free culture filtrate.	110	190	95	95
XAD-7HP-treated cell free culture filtrate	> 450	> 450	> 450	> 450
Acetonitrile: Water eluate.	25	45	15	45

The antimicrobial agents bound to resin XAD-7HP could be eluted by 50:50 acetonitrile: water eluate (Table 3). The antimicrobial activity of the resin-eluate was substantially higher (lower MIC) than that of the untreated cell-free culture filtrate (Table 3). Antimicrobial activity was not detected in every resin-treated culture filtrate, resin beads placed on a lawn of the target microorganisms after elution lacked any inhibitory activity as well. As antimicrobial activities could be eluted from XAD-7HP, we chose to use it for all large volume cultures.

Table 4. Increase in antibiotic-producing microorganisms following inoculation microorganisms.

Sample	Incubation Period	Predators/g (Fold Increase) [a] Against (*HU6*)	(*HU9*)	(*HU7*)	(*HU8*)
Ac. alkalophilus (*HU6*)	7 days	3.0×10^5	1.0×10^7	8.7×10^4	2.1×10^5
	15days	6.5×10^5 (2.0)	2.0×10^7 (2.0)	2.5×10^5 (3.0)	7.2×10^5 (3.2)
Ac. formosensis (*HU9*)	7 days	2.2×10^6	1.0×10^6	2.1×10^5	2.1×10^5
	15days	9.0×10^7 (3.5) c	8.5×10^6 (8.5) c	8.9×10^5 (4.1)	2.6×10^6 (10) c
Strept. griseus (*HU7*)	7 days	3.1×10^5	3.1×10^5	NDb	ND
	15days	1.1×10^6 (3.2)	3.2×10^6 (9.0) c	ND	ND
Strept. fulvescens (*HU8*)	7 days	7.5×10^5	4.1×10^5	ND	ND
	15days	1.2×10^6 (1.5)	1.1×10^6 (2.5)	ND	ND

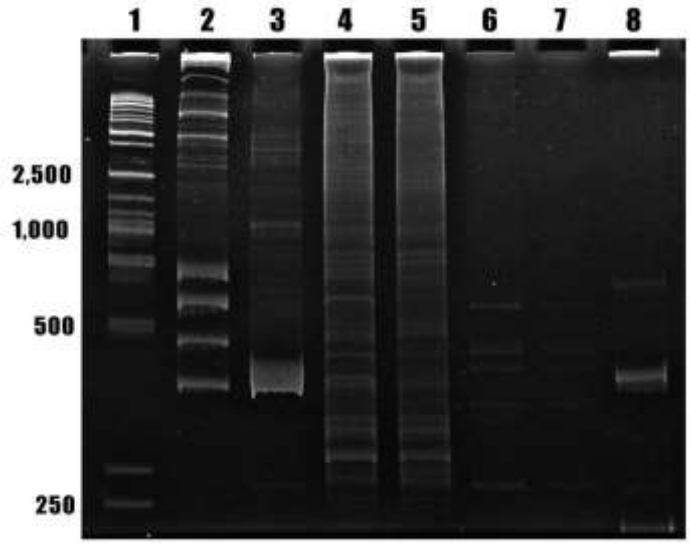

Fig. 1. Acrylamide gel electrophoresis of products of PCR amplification of bacterial internal transcribed spacer (ITS) sequences of *Ac. formosensis* (*HU9*) and *Strept. griseus* (*HU7*) Lane 1, molecular weight markers Lane 2, *Strept. griseus* (*HU7*) Lane 3, *Ac. formosensis* (*HU9*) Lane 4, inoculated with *Ac. formosensis* (*HU9*) and *Strept. griseus* (*HU7*) (immediately after inoculation) Lane 5, inoculated with *Ac. formosensis* (*HU9*) and *Strept. griseus* (*HU7*) (incubated 2 wk) Lane 6, While Lane 7 *Ac. alkalophilus (HU6)* & Lan 8 *Strept. fulvescens (HU8)* no data (ND) .

Table 5 . IC50 of NHP against cancer cells .

NHP	Cancer cells			
	HepG2 cell	A549 cell	HCT-116 cell	COC1 cell
IC50 (µg/ml)	38.30	35.50	25.80	25.10

From the view of Zoology Depart.: NHP was high cancer cell cytotoxicity against human liver hepatocellular carcinoma cell line HepG2, human lung adenocarcinoma epithelial cell line $A_5$49, human colon adenocarcinoma cell line HCT-116 and human ovarian cancer cell line COC1 (Table 5, Fig. 2). As seen in Table 5, NHP showed the highest cytotoxicity against HCT-116 with IC50 value of 25.80 g/ml.

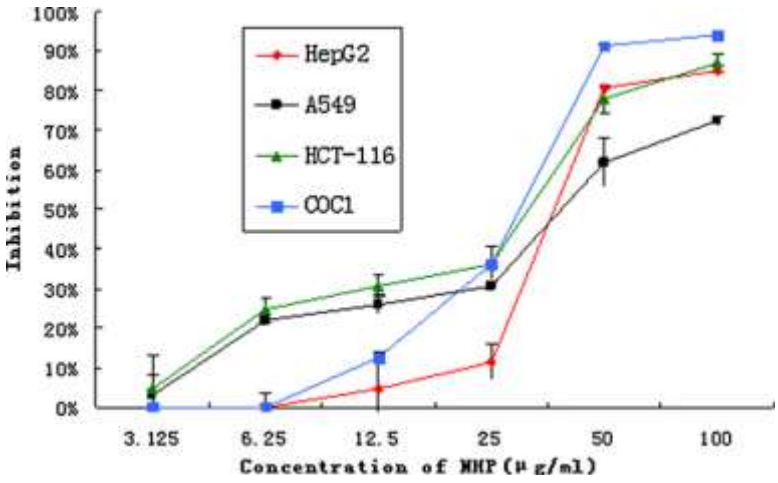

Figure 2. Cytotoxicity spectrum of NHP against cancer cells in vitro conditions.

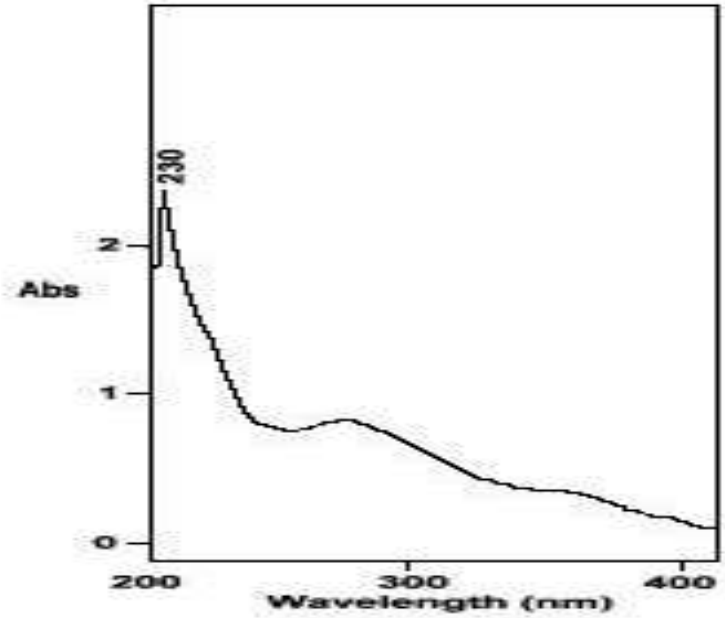

Figure 3. Ultraviolet absorbance of antimicrobial agent produced by *Strept. griseus* (*HU7*).

After thorough blending of the samples using a commercial food blender, the variation between replicates is still present (Table 1). While blending did reduce the amount of variation in some cases we feel it most likely that microbial

heterogeneity, that cannot be overcome by thorough mixing and homogenization, is likely responsible for the variation in substrate utilization profiles. (Matsumoto *et al*. 2012) observed differing in microorganisms aggregates while looking at both the surface and inside of the aggregates after blending. They observed the inside of the aggregate after dispersion using an ultrasonic processor. This could be used to further homogenize the sample but it still may not eliminate.

The ability to kill would be expected to be magnified by the production of extracellular antimicrobial compounds (Table 2), there was broad spectrum antimicrobial activity in the methanol extracts obtained after 2 weeks incubation (Table 2). The methanol extracts of both inoculated soils also exhibited antibiotic activity (Table 2), a member of the normal microflora of skin implicated in dermal infections , although the MIC values for the methanol extracts are moderate (i.e., 0.005 – 0.150 mg/ml, Table 2) compared to pure antibiotics, it is to be understood that the values are for crude extracts, not purified compounds, and antibiotics are subject to adsorption thereby difficult to extract (Haas, D., and C. Keel. 2012). These data provide use microorganisms for the treatment of skin infections, including diaper rash. In the absence of any inherent, abiotic antibiotic activity as *Strept. griseus* (*HU7*) is a normal inhabitant of human skin microbiota (Gao, Z.,2012), we hypothesize that application of microorganisms to an infected area of skin (i.e., inoculation) leads to the proliferation of bacteria that produce antibiotic compounds, killing the infecting skin. This is similar to the killing of *Salmonella paradysenteriae* by a colicin-producing strain of *E. coli* following co-infection in the peritoneal cavity of mice (Friedman,D.R., and S. P. Halbert.2000). *Salmonella* killing coincided with the multiplication of the *E. coli* strain and an increase in colicin (antibiotic) concentration (Friedman, D. R., and S. P. Halbert.2000), killing is probably not restricted to the infecting microorganisms, because inoculation of samples with either *Ac. formosensis* (*HU9*) and *Strept. griseus* (*HU7*) led to the appearance of antimicrobial activity (Table 2).

Antimicrobial activity was not detected in every resin-treated culture filtrate, resin beads placed on a lawn of the target microorganisms after elution lacked any inhibitory activity as well as antimicrobial activities could be eluted from XAD-7HP, obtaining these antimicrobial compounds in a manner that was both as efficient and simple as possible, we use it for all large volume cultures, It may also be possible to use a sequence of resins in order to remove compounds with no activity from the culture material before removing the antimicrobial in an effort to obtain purer material (Table 3).

The data suggest that the killing of inoculated *Ac. formosensis* (*HU9*) and *Strept. griseus* (*HU7*) were due to the proliferation of antibiotic-producing namely Actinomycetes and their production of antimicrobial compounds, which synthesizes at least a pair of antibiotic compounds of the Actinomycin structural class. Likewise, the absence of the three extracellular enzyme activities of the Actinomycete, coupled with the presence of antimicrobial activity in the boiled cell-free culture filtrates and the organic and fractions of methanol extracts, argues strongly that the antimicrobial activity of the Actinomycete was due to production of compounds rather than enzymes that exhibit antimicrobial activity. Although there were only modest increases in the number of colonies surrounded by zones of inhibition after incubation of the inoculated samples (Table 4). This is likely due to the proliferation of a spectrum of microorganisms producing of antimicrobial compounds (Tables 4) only a few of the increases were significantly higher as indicated in the (Table 4), there were no differences in the number of colonies producing zones of inhibition over the course of the incubation period. The data in (Table 4) were obtained from experiments where *Ac. formosensis* (*HU9*) and *Strept. griseus* (*HU7*) separately inoculated to demonstrate that the increase in zones of inhibition against both *Ac. formosensis* (*HU9*) and *Strept. griseus* (*HU7*) occurred when just one was inoculated, almost identical results were obtained from experiments where both inoculated. The surviving CFU/g of both *Ac. formosensis* (*HU9*) and *Strept. griseus* (*HU7*) were significantly below those of corresponding inoculum densities after 7 and 15 days of incubation ($P < 0.05$ by one-tailed T-test). Separate or combined inoculation of the two microorganisms yielded the same results.

To complement the results of colony counts, internal transcribed spacer (ITS) were chosen as a culture-independent means for assessing both disappearance of prey microbes and emergence of antibiotic-producing bacteria. Although there could be differences in the total amount of DNA extracted, the decrease in intensity of the *Ac. formosensis* (*HU9*) and *Strept. griseus* (*HU7*) bands in parallel with the decrease in colony counts coupled with the increase of other bands (Figure 1) demonstrates the feasibility of this approach. The DNA was subjected to rRNA ITS analysis using PCR and products were separated by electrophoresis in polyacrylamide gels as described. Bands representing the amplified ITS products for individual strains (as markers) and inoculated are shown in Figure 1. The *Ac. formosensis* (*HU9*) and *Strept. griseus* (*HU7*) strains and the three antibiotic-producing isolates yielded multiple ITS bands (Figure 1, lanes 2, 3, 4, 5 and 6) in agreement with variation in length of internal spacers reported for bacteria, while lane 7 & 8 no data (Jensen, M. A., J. A. Webster, and N. Straus. 2011).

From the view of Zoology Department: NHP showed both high antimicrobial activity and high cancer cell cytotoxicity. Additionally, NHP is a small molecule, which can permeate the tissues and organs easily (Wu et al. 2011) and can affect more than one pathway or interact with multiple targets (Maheshwari et al. 2012). Therefore, NHP might be a special attractive candidate for chemoprevention and have potential applications both in clinical treatment and certain industrial processes as a broad antibacterial substance.

The ultraviolet (UV) absorption spectrum recorded a maximum absorption peak at 225 and 321 nm produced by *Streptomyces sp*. Fig. 3 (Dharumaduari, D.,2013).

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الملخص العربى

عزل وتوصيف لمضادات الميكروب والاورام المنتجة من الاكتينوميسيز

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قسم النبات والحيوان - كلية العلوم- جامعة بنى سويف - وقسم البحوث الصحية الاشعاعية ، المركز القومى لبحوث وتكنولوجيا الاشعاع ، هيئة الطاقة الذرية .

تعتبر الاكتينوميسيتات من البكتيريا الخيطية الشكل الواسعة الانتشار وخاصة فى التربة وهى تلعب دور هام فى تدوير المواد العضوية عن طريق تكسير المركبات المعقدة فى النباتات والمواد الحيوانية والفطرية .

وهى تلعب دور هام فى تحلل التربة واعادة تدوير المواد الغذائية مثل الكرياتين واللجنوسيليلوز و الكيتين

كما انها تظهر العديد من الخواص الفسيولوجية والايض كانتاج الانزيمات خارج الخلية .

وتنتج الاكتينوميسيز من المضادات الحيوية الفعالة وهى تستغل كمنتج اساسى للمضادات الحيوية فى صناعة الادوية .

بالاضافة الى انتاج المواد المضادة للاورام المفيدة اكلينيكيا مثل الفانكوميسين ، والببتيدات وحمض الاوليك ومضادات الاورام المنتجة والتى تقوم بقتل الخلية من خلال تكسير الحمض النووى بواسطة تثبيط انزيم الايزوميريز وتثبيط نفاذية الميتوكوندريا .

وكذلك الانزيمات المشاركة فى نقل الاشارة مثل البروتييز او الايض الخلوى او بعض حالات تكوين الاوعية الدموية للاورام .