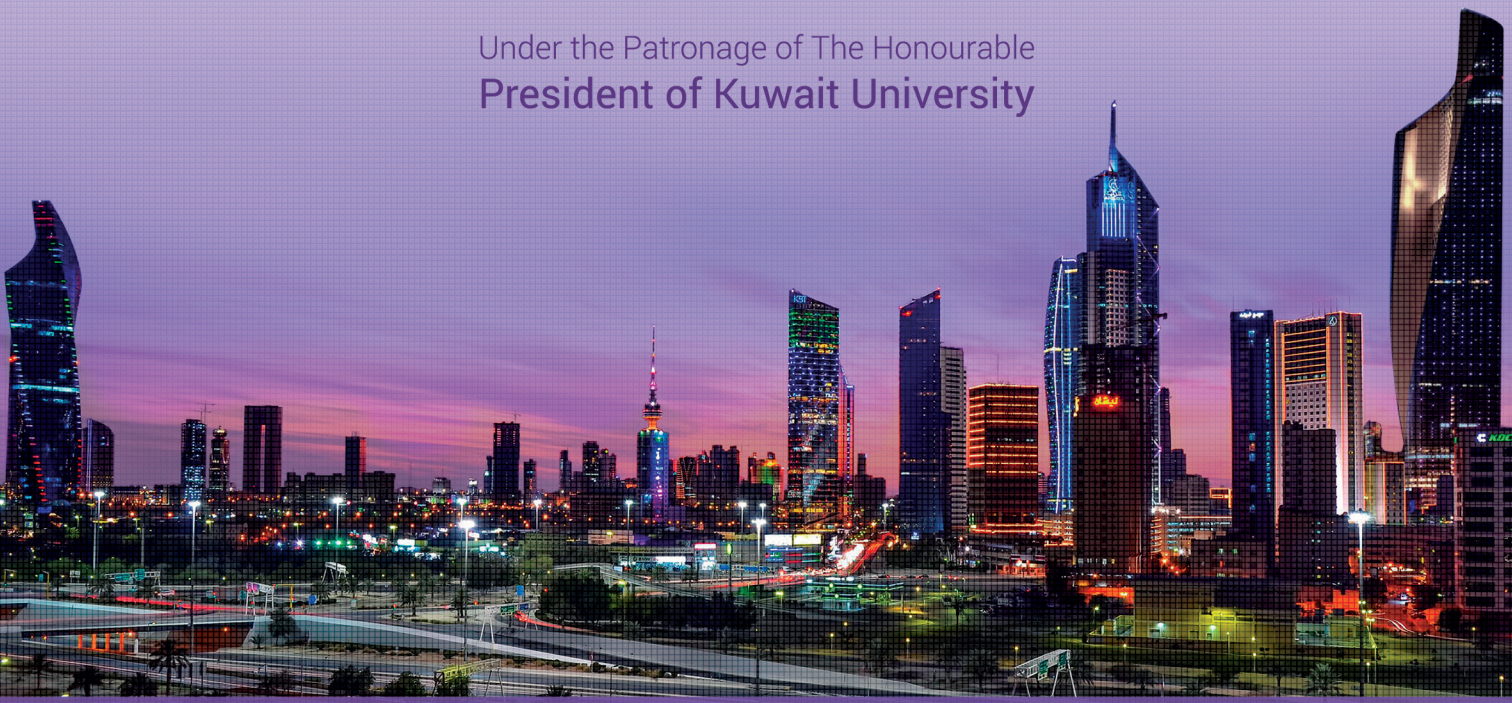
KUWAIT UNIVERSITY

مؤسسة الكويت للتقدم العلمي
Kuwait Foundation
for the Advancement of Sciences

5TH KUWAIT INTERNATIONAL PHARMACY CONFERENCE

1 - 3 FEBRUARY, 2015

Under the Patronage of The Honourable
President of Kuwait University



www.kipc2015.com
Phone: +965 24636418 / +965 24636494
Fax: +965 25318455
E Mail: kipc2015@ku.edu.kw

Venue:
Health Sciences Centre Auditorium,
Kuwait University,
Jabriya, Kuwait

KIPC 2015 Organizing Committee, Faculty of Pharmacy, Kuwait University

KUWAIT UNIVERSITY

HIS HIGHNESS

His Highness
Sheikh Sabah Al-Ahmad Al-Jaber Al-Sabah
Amir of the State of Kuwait

His Highness
Sheikh Nawaf Al-Ahmad Al-Jaber Al-Sabah
Crown Prince of the State of Kuwait

His Highness
Sheikh Jaber Al-Mubarak Al-Hamad Al-Sabah
Prime Minister of the State of Kuwait

مؤسسة الكويت للتقدم العلمي

Kuwait Foundation
for the Advancement of Sciences

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GENERAL INFORMATION

Date & Venue

Conference

1st to 3rd February, 2015
at Health Sciences Centre Auditorium, Kuwait University, Jabriya, Kuwait

Inaugural Ceremony

1st February, 2015: 9.00 am
by the Honourable President of Kuwait University

Plenary Lectures & Exhibitions

1st to 3rd February, 2015
at Health Sciences Centre Auditorium, Kuwait University, Jabriya, Kuwait

Workshops

2nd February, 2015 from 15.15 pm to 16.15 pm

Public Awareness in Cancer

3rd February, 2015 from 10.00 am to 17.30 pm

Conference Closing Ceremony

3rd February, 2015 - 19:00 - 20:00
Farewell Dinner / Closing Ceremony - Marina Hotel: Six Palms Restaurant

Registration Desk

For registration and any enquiries or assistance, please proceed to the Registration Desk near the Health Sciences Centre Auditorium, Kuwait University, Jabriya, Kuwait

CME/CEPD Credits

KIPC 2015

Registration Number:	245/Ph0/Feb15
Title of Activity:	5th Kuwait International Pharmacy Conference
Scheduling:	February 1-3, 2015
CME Provider:	Health Sciences Centre, Faculty of Pharmacy
CME Organizer:	Dr. Monerah Al-Soraj
CME/CPD Credits:	18 Credits, Category 1:

Cancer Awareness Campaign

Registration Number:	246/Ph0/Feb15
Title of Activity:	Cancer Awareness Campaign
Scheduling:	February 3, 2015
CME Provider:	Health Sciences Centre, Faculty of Pharmacy
CME Organizer:	Dr. Monerah Al-Soraj
CME/CPD Credits:	3 Credits, Category 1

COMMITTEE'S MESSAGE

Dear Colleagues,
Welcome to Kuwait!

On behalf of the Organizing and Scientific Committee for the 5th Kuwait Pharmacy International Conference 2015 (5th KIPC), "February 01-03, 2015", we cordially invite you to take full advantage of all that the 5th KIPC has to offer. Scheduled throughout the three days of the 5th KIPC, this meeting on "Advances in cancer therapeutics: From bench to bedside", comprises of a line-up of keynote address, plenary lectures, workshops and public awareness sessions. The 5th KIPC has designed a program of high quality to facilitate exchange of new information among healthcare professionals (physicians, pharmacists, medical and pharmaceutical researchers and students), on pharmaceutical care of cancer patients, cancer drug resistance and novel approaches to cancer therapeutics. We have a group of highly distinguished experts in the field of cancer patient management, and development of novel pharmaceuticals and novel approaches to cancer treatment who will engage, stimulate and challenge you in your future practice.

Cancer continues to be one of the major non-communicable diseases posing a significant threat to world health. The main goal of the 5th KIPC 2015 is to provide up-to-date knowledge in the field of cancer therapeutics, highlighting the role of pharmacists in management of cancer patients, modern translational clinical oncology research related to cancer therapeutics and novel therapeutic approaches. The KIPC is a Biannual interdisciplinary conference of the Faculty of Pharmacy, Health Sciences Centre, Kuwait University, Kuwait.

We wish you a pleasant stay in Kuwait, please, find time to look around this beautiful nation.
Enjoy your stay!

Dr. Monerah Al-Soraj
Chair of Organizing Committee

Dr. Salah Waheedi
CO- Chair of Organizing Committee

Prof. Oludotun A. Phillips
Chair of Scientific Committee

COMMITTEE

ORGANIZING COMMITTEE

Chairpersons

- Dr. Monerah Al-Soraj *(Chair)*
- Dr. Salah Waheedi *(Co- Chair)*

Scientific Committee

- Prof. Oludotun A. Phillips *(Chair)*
- Dr. Mohsen Hedaya
- Dr. Willias Masocha
- Dr. Maitham Khajah
- Dr. Dalal Al-Taweel

Review Committee

- Prof. Samuel B. Kombian
- Prof. Ladislav Novotny
- Dr. Abdel-Azim Zaghloul
- Dr. Sarah Al-Ghanem

Organizing Committee:

- Dr. Altaf Al-Romaiyan
- Ms. Nouria Al-Adwani
- Ph. Shaimaa Abdel-Meguid
- Ms. Teena Sadan
- Ms. Marwa Gouda
- Mr. Ali Bouzid

Committee for Public Awareness in Cancer

- Dr. Altaf Al-Romaiyan *(Chair)*
- Mr. Faleh Alajmi
- Ms. Reem Alghanim
- Ms. Anood Alfaraaj
- Mr. Ahmed Zainhoum

KPSS Members

- Ms. Sadika Alsualik, *5th year, Faculty of Pharmacy*
- Mr. Mohamed Alromi, *5th year, Faculty of Pharmacy*
- Ms. Sarah Althowani, *5th year, Faculty of Pharmacy*
- Ms. Fatma Alfailakawi, *5th year, Faculty of Pharmacy*
- Ms. Haya Alfailakawi, *3rd year, Faculty of Pharmacy*
- Ms. Fatma Mohsen *Dashti, 3rd year, Faculty of Pharmacy*
- Ms. Hanan Alkhabaz, *3rd year, Faculty of Pharmacy*
- Ms. Rawan Bahman, *3rd year, Faculty of Pharmacy*
- Ms. Ghadeer Alenezi, *3rd year, Faculty of Pharmacy*
- Ms. Laila Aldehemi, *2nd year, Faculty of Pharmacy*
- Mr. Bader Alonizi, *2nd year, Faculty of Pharmacy*

CHAIRPERSONS

Dr. Monerah Al-Soraj
(Chair)

Dr. Salah Waheedi
(Co- Chair)

SCIENTIFIC COMMITTEE

Prof. Oludotun A. Phillips
(Chair)

Dr. Mohsen Hedaya

Dr. Willias Masocha

Dr. Maitham Khajah

Dr. Dalal Al-Taweel

Dr. Altaf Al-Romaiyan

STUDENT COMMITTEE

Ms. Salwa Al-Mofarrih,
5th year,
Faculty of Pharmacy
Head of Students Organizing committe

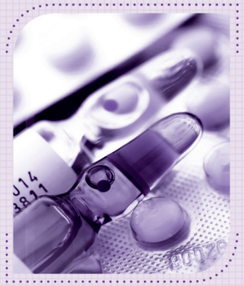
Mr. A. Rami Ayoun Al Soud,
5th year,
Faculty of Pharmacy,
Member, Students Organizing committe

Ms. Heba Kobah,
5th year,
Faculty of Pharmacy
Head of Social committe

Ms. Sadeeqa Al-Suaileek,
5th year,
Faculty of Pharmacy,
President, Kuwait Pharmacy Student Society (KPSS)

Mr. Essa Al-Harban,
3rd year,
Faculty of Pharmacy
Head of Transportation Committe

FACULTY



FACULTY

Professor Gary C. Yee, *Pharm. D., FCCP, BCOP* (Keynote Speaker)
Professor and Associate Dean
College of Pharmacy, University of Nebraska Medical Center
Nebraska Medical Center, Omaha, USA

Professor Stephan A. Grupp, *MD, Ph.D*
Department of Pediatrics , University of Pennsylvania,
Perelman School of Medicine, Children's Hospital of Philadelphia
Philadelphia, USA

Dr. Jo Anne Zujewski, *MD, MAS*
Head, Breast Cancer Therapeutics
Clinical Investigations Branch, Cancer Therapy Evaluation Program
Senior Advisor, Center for Global Health, National Cancer Institute
Maryland, USA

Prof. Arwyn T. Jones, *Ph.D*
School of Pharmacy and Pharmaceutical Sciences,
Cardiff University, Cardiff, UK

Professor Jean-François Bussières, B Pharm *MSc MBA FCSHP*
Chef, Département de pharmacie et unité de recherche en pratique pharmaceutique (URPP)
CHU Sainte-Justine
Professeur titulaire de clinique, Faculté de pharmacie, Université de Montréal

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College of Pharmacy
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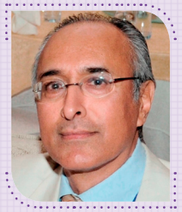
Riyadh, Saudi Arabia

Dr. Jasim Al-Barak, *MD*
Kuwait Cancer Center
Kuwait

Professor Fahd Al-Mulla, *Ph. D*
Professor/Consultant and Head of Molecular Pathology and Genomic Medicine
Kuwait University and Genatak
Kuwait



Professor Yunus Luqmani, *Ph. D*
Chairman of Pharmaceutical Chemistry
Faculty of Pharmacy
Kuwait

Dr. Maitham Khajah, *Ph. D*
Department of Pharmacology and Therapeutics
Faculty of Pharmacy
Kuwait

Dr. Khaled Orabi, *Ph. D*
Department of Pharmaceutical Chemistry
Faculty of Pharmacy
Kuwait

Dr. Mohammed Qaddoumi
Department of Pharmacology and Therapeutics,
Faculty of Pharmacy, Kuwait University

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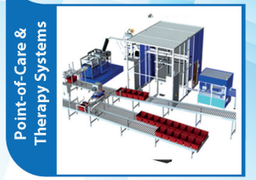

Kuwait, Salmiyah, Block 4, Salem Al Mubarak Street, C.R.: 31471

PROGRAM

PROGRAM AT A GLANCE

Sunday February 1st , 2015	Monday February 2nd , 2015	Tuesday February 3rd, 2015
08:00 am - 5.00 pm	Registration	
09.00 am - 9.30 am Opening Ceremony	09.00 am - 10.30 am Plenary Lectures	09.00 am - 10.30 am Plenary Lectures
9.30 am - 10.00 am Viewing of Exhibitions & Coffee Break		
10.00 am - 10.45 am Keynote Address	10.30 am - 10.45 am Coffee Break / Poster Viewing	10.30 am - 10.45 am Coffee Break / Poster Viewing
10.45am - 1.30 pm Plenary Lectures	10.45 am - 12.15 pm Plenary Lectures	10.45 am - 12.15 pm Plenary Lectures
1.30 pm - 2.15 pm Poster Presentations / Viewing & Lunch	12.15 pm - 01.30 pm Poster Presentations / Viewing & Lunch	12.15 pm - 01.15 pm Poster Presentations / Viewing & Lunch
2.15 pm - 3.35 pm Podium Presentations	1.30 pm - 3.00 pm Plenary Lectures	1.15 pm - 2.45 pm Plenary Lectures
3.35 pm - 3.45 pm Coffee Break / Poster Viewing	3.00 pm - 3.15 pm Coffee Break / Poster Viewing	2.45 pm - 3.00 pm Coffee Break / Poster Viewing
3.45 pm - 5.15 pm Plenary Lectures	3.15 pm - 5.15 pm Parallel Workshops	3.00 pm - 4.20 pm Podium Presentations
		4.30 pm - 5.30 pm Public Awareness in Cancer
		07.30 pm Closing Ceremony and Farewell Dinner Marina Hotel: Six Palms Restaurant

Day - 1: Sunday, 1st February, 2015

08:00 am - 05:00 pm Registration

Time	Topics & Faculty
09:00 am - 09:30 am	Opening Ceremony
09:30 am - 10:00 am	Viewing of Exhibitions & Coffee Break

Chair of the Session: Dr. Monerah Al Soraj

Time	Topics & Faculty
10:00 am - 10:45 am	Keynote Address How are we doing in the war against cancer? *Prof. Gary C Yee*

Session 1 Theme:
Novel approaches to cancer therapeutics
Chair : Prof. Ladislav Novotny / Co-Chair : Dr. Bedoor Qabazard

Time	Topics & Faculty
10:45 am - 11:30 am	Plenary lecture 1 Cell Therapy for leukaemia crosses the activity threshold *Prof. Stephan A Grupp*
11:30 am - 12:15 pm	Plenary lecture 2 Mechanistic role of BR-DIM in human prostate cancer: Clinical experience *Prof. Fazlul H Sarkar*
12:15 pm - 01:30 pm	Plenary lecture 3 Proliposomes: A novel anticancer generator for the treatment of brain tumor *Dr. Abdelbary Elhissi*
01:30 pm - 02:15 pm	Poster presentations / Viewing & Lunch (Cafeteria: FOM)

Podium Presentations
Chair : Prof. Mohamed Abdel Hamid / Co-Chair : Dr. Naser Al-Tannak

Time	Topics & Faculty
02:15 pm - 02:35 pm	In Silico-Aided Drug Design of flavonols analogues as potent proteasome inhibitors *Ms. Samar Faggal*
02:35 pm - 02:55 pm	Selected terpenes as anticancer leads *Dr. Khaled Orabi*
02:55 pm - 03.15 pm	Identification and quantification of major structural bleomycin forms (A2, B2) in pharmaceutical and biological matrices by HPLC-Q-TOFMS method *Dr. Peter Mikus*
03:15 pm-03:35 pm	Anti-proliferative activity of 5-substituted-oxazolidinone derivatives *Mr. Omar Hedaya*
03:35 pm - 03:45 pm	Coffee break / Poster viewing

Session 2 Theme:
Pharmaceutical care of cancer patients
Chair : Dr. Jacinthe Lemav / Co-Chair : Dr. Sara Al-Ghanem

Time	Topics & Faculty
03:45 pm - 04:30 pm	Plenary lecture 4 - online Skills, functions and impacts of clinical pharmacists at the bedside in oncology *Prof. Jean-François Bussières*
04:30 pm - 05:15 pm	Plenary lecture 5 The role of the clinical pharmacist - Translating theory into practice *Ph. Sherif K Mohamed*

Day - 2: Monday, 2nd February, 2015

08:00 am - 05:00 pm Registration

Session 3 Theme:
Drug resistance in cancer
Chair: Dr. Kamal Matar / Co-Chair: Dr. Mohammed Qaddoumi

Time	Topics & Faculty
09:00 am - 09:45 am	Plenary lecture 6 CAR T cells : CD19 escape, preclinical models and novel applications *Prof. Stephan A Grupp*
09:45 am - 10:30 am	Plenary lecture 7 A novel approach for overcoming drug resistance in cancer *Prof. Fazlul H Sarkar*
10:30 am - 10:45 am	Coffee break / Poster viewing

Session 4 Theme:
Drug delivery in cancer
Chair: Dr. Mohsen Hedaya / Co-Chair: Dr. Yacoub Al-Basarah

Time	Topics & Faculty
10:45 am - 11:30 am	Plenary lecture 8 Endocytic pathways of cells as doorways for therapeutic macromolecules targeting cancer *Prof. Arwyn T Jones*
11:30 am - 12:15 pm	Plenary lecture 9 Role of drug transporters in cancer chemotherapy *Prof. William F Elmquist*
12:15 pm - 01:30 pm	Poster presentations / Viewing & Lunch (Cafeteria: FOM)

Session 5 Theme:
Pharmaceutical care of cancer patients
Chair: Prof. Samuel Kombian / Co-Chair: Dr. Salah Waheedi

Time	Topics & Faculty
01:30 pm - 02:15 pm	Plenary lecture 10 Pharmaceutical care of cancer patients: From the genomic medicine point of view - *Prof. Fahd Al-Mulla*
02:15 pm - 03:00 pm	Plenary lecture 11 Credentialing of oncology pharmacists in the United States *Prof. Gary C Yee*
03:00 pm - 03:15 pm	Coffee break / Poster viewing

Workshops: Parallel Workshops
Chair: Dr. Dalal Al-Taweel / Dr. Fatma Jeragh
Venue: HSC Auditorium

Time	Topics & Faculty
03:15 pm - 04:15 pm	Automation of chemotherapeutic agents in oncology *Ph. Zubeir A Nurgat*
04:15 pm - 05:15 pm	Patient Counselling: From Education To Community Expectation *Ph. Sherif K Mohamed*
Venue: Mini Auditorium: 1-162	
03: 15 pm – 3:45 pm	Immuno-oncology : A new paradigm in cancer management *Dr. Hesham Elmesseery*
03:45 pm - 04:15 pm	Workshop - 2

Day - 3: Tuesday, 3rd February, 2015

08:00 am - 05:00 pm Registration

Session 6 Theme:
Drug resistance in breast cancer
Chair: Prof. Oludotun Phillips / Co-Chair: Dr. Willias Masocha

Time	Topics & Faculty
09:00 am - 09:45 am	Plenary lecture 12 Endocrine resistance in breast cancer - *Prof. Yunus Luqmani*
09:45 am - 10:30 am	Plenary lecture 13 Effect of pH on endocrine resistant breast cancer cells - *Dr. Maitham Khajah*
10:30 am - 10:45 am	Coffee break / Poster viewing

Session 7 Theme:
Novel approaches to cancer therapeutics
Chair: Dr. Aly Nada / Co-Chair: Dr. Abdelazim Zaghloul

Time	Topics & Faculty
10:45 am - 11:30 am	Plenary lecture 14 Role of transporters and the treatment of brain tumors, both primary (GBM) and metastatic, especially melanoma - *Prof. William F Elmquist*
11:30 am - 12:15 pm	Plenary lecture 15 Natural products as a vital source for the discovery of cancer chemotherapeutic and chemopreventive agents - *Prof. John M Pezzuto*
12:15 pm - 01:15 pm	Poster presentations / Viewing & Lunch (Cafeteria: FOM)

Session 8 Theme:
Pharmaceutical care of cancer patients
Chair: Prof. Yunus Luqmani / Co-Chair: Dr. Abdallah Bassam

Time	Topics & Faculty
01:15 pm - 02:00 pm	Plenary lecture 16 Changing paradigms in Breast cancer therapeutics 2000-2015 - *Dr. Jo Anne Zujewski*
02:00 pm - 02:45 pm	Plenary lecture 17 The evolution of systemic therapy in metastatic colorectal cancer - *Dr. Jasem Al-Barak*
02:45 pm - 03:00 pm	Coffee break / Poster viewing

Podium Presentations
Chair: Dr. Ahmed El-Hashem / Co-Chair: Dr. Maitham Khajah

03:00 pm - 03:20 pm	Nanoemulsion delivery systems of paclitaxel for brain tumor therapy *Dr. Abdelbary Elhissi*
03:20 pm- 03:40 pm	The use of herbal preparations as complementary and alternative medicine (CAM) in a sample of patients with cancer in Jordan - *Prof. Mayyada Wazaify*
03:40 pm- 04:00 pm	Prevention of paclitaxel-induced peripheral neuropathy by semi-synthetic tetracyclines - *Dr. Willias Masocha*
04:00 pm- 04:20 pm	Targeted suicidal gene delivery systems attacking HeLa cells in space-time, visualized by atomic force microscopy - *Prof. Hosam G Abdelhady*

Session 9 Theme:
Public Awareness in Cancer
Chair: Dr. Altaf Al-Romaiyan / Co-Chair: Dr. Khaled Orabi

Time	Topics & Faculty
04:30 pm - 05:30 pm	Public awareness in cancer- *Dr. Khaled Orabi / Dr. M Qaddoumi*
07:00 pm - 08:00 pm	Farewell dinner / Closing ceremony Marina Hotel: Six Palms Restaurant

ABSTRACT

Professor Gary C. Yee, *Pharm. D., FCCP, BCOP*
Professor and Associate Dean
College of Pharmacy, University of Nebraska Medical Center
Nebraska Medical Center, Omaha, USA

How are we doing in the war against cancer?

In the early 1970s, the "war against cancer" became a national issue in the United States. The President of the United States signed the National Cancer Act in 1971 promoting the National Cancer Institute. Funding for the National Cancer Institute increased. What progress has occurred over the last 40+ years? Little change in cancer incidence and mortality occurred initially. Beginning in the early 1990s, however, the cancer-related death rate began to decline. Over the last 20 years, the cancer-related death rate in the United States has declined by about 20%, which translates into more than 1.3 million fewer cancer deaths. The decline in cancer-related death rate is due to advances in cancer prevention, detection, and treatment. The most exciting new cancer therapies are a result of advances in our understanding of cancer biology, particularly genomics.

Studies of the cancer genome have identified mutations in certain genes that allow cells to become cancer. Targeted drugs against these "driver mutations" offer the potential to selectively target cancer cells while largely sparing normal cells. Over 20 targeted drugs are currently available to treat various hematologic malignancies and solid tumors. However, except for a few cancer types, these targeted drugs have not resulted in major improvements in survival. Although these targeted drugs cause less damage to rapidly proliferating normal tissues, they are often associated with unusual and sometimes serious adverse effects. Another group of exciting new cancer therapies is immune checkpoint inhibitors. Most of these new therapies are very expensive, with many costing over $100,000 US per year. Cancer costs are currently rising faster than other sectors in medicine, and some policy makers recommend more formal consideration of the value (e.g. cost-effectiveness analysis) of new therapies. Since most of these new targeted therapies are orally administered, pharmacists working in all practice settings should be prepared to provide care for cancer patients.

Credentialing of Oncology Pharmacists in the United States

Credentials are documented evidence of professional qualifications, and they are often used to document specialized or advanced knowledge and skills. As the scope of practice of oncology pharmacists continues to expand, credentialing will become increasingly important for government officials and health care institutions. Board certification is an example of a credential. The medical specialty board movement in the United States started nearly 100 years ago to establish qualifications for specialists. Board certification is widely accepted as a way to assure patients, hospitals, and payers that physicians have the necessary education, knowledge, experience and skills to provide high quality care in a specific medical specialty. Specialization in pharmacy has occurred over the last few decades, and oncology pharmacy is an example of a specialty. In 1976, the American Pharmaceutical Association established the Board of Pharmaceutical Specialties (BPS) to recognize specialty practice areas, define skills standards for recognized specialties, and evaluate the knowledge and skills of individual pharmacy specialists. Eight specialties have been recognized by BPS, including oncology.

The education and training of oncology pharmacists have evolved in response to changes in entry-level degree requirements, availability of advanced training programs, recognition of oncology pharmacy by the BPS, and demand for board-certified oncology specialists. The first specialized oncology pharmacy residencies or fellowship were offered in the early 1980s. The approval of pharmacotherapy by the BPS in 1988 lead to increased interest in specialization, and oncology pharmacy was approved by BPS in 1996. Over 1600 pharmacists are currently board-certified in oncology, making it the third most common specialty recognized by BPS. The most common education and training pathway for oncology pharmacists in the United States is completion of a Pharm.D. degree followed by completion of a post-graduate year 1 (PGY1) pharmacy practice residency and a PGY-2 specialized oncology residency. Individuals interested in clinical and translational research usually obtain a Ph.D. degree or complete a 2-3 year fellowship after completion of their Pharm.D. degree. Board certification is preferred or required for most oncology pharmacist positions in the United States.

Professor Stephan A. Grupp, *MD, Ph.D*
Department of Pediatrics , University of Pennsylvania, Perelman School of Medicine, Children›s Hospital of Philadelphia
Philadelphia, USA

Cell Therapy for leukaemia crosses the activity threshold

Chimeric antigen receptors (CARs) combine a binding fragment (scFv) of an antibody with intracellular signaling domains. We have previously reported on CTL019 cell therapy expressing an anti-CD19 CAR. Infusion of these cells results in 100 to 100,000x in vivo proliferation, durable anti-tumor activity, and prolonged persistence in patients with B cell tumors, including sustained complete responses (CRs) in adults and children with acute lymphoblastic leukemia (ALL; Grupp et al., NEJM 2013, Maude et al., NEJM 2014). My talk will update the audience on ongoing pediatric CTL019 trials.

Trial results (from our presentation at ASH 2014): 30 children median age 10y (5-22y) with CD19+ ALL were treated. 25/30 patients had detectable disease on the day before CTL019 cell infusion, while 5 were minimal residual disease (MRD)(-). A median of 3.6x106 CTL019 cells/kg (1.1-18x106/kg) were infused over 1-3 days. There were no infusional toxicities >grade 2, although 9 patients developed fevers within 24 hrs of infusion and did not receive a planned 2nd infusion of CTL019 cells. 27 patients (90%) achieved a CR, including a patient with T cell ALL aberrantly expressing CD19+. 3 did not respond. MRD measured by clinical flow cytometry was negative in 23 responding patients and positive at 0.1% (negative at 3 months), 0.09%, 0.22%, and 1.1% in 4 patients. With median follow up of 9 months (up to 30 months), 16 patients have ongoing CR, with only 3 patients in the cohort receiving subsequent treatment such as donor lymphocyte infusion or stem cell transplantation (SCT), 6-month event free survival (EFS) measured from infusion is 63% (95% CI, 47-84%), and OS is 78% (95% CI, 63-95%). CTL019 cells were detected in the CSF of 17/19 patients and 2 patients with CNS2a disease experienced a CR in CSF. 10 patients with a CR at 1 mo have subsequently relapsed, half with CD19(-) blasts. 2/5 patients who relapsed with CD19(-) disease had previously been refractory to the CD19-directed therapy blinatumomab, and subsequently went into CR with CTL019.

All responding patients developed grade 1-4 cytokine release syndrome (CRS) at peak T cell expansion. Detailed cytokine analysis showed marked increases of interleukin 6 (IL-6) and interferon gamma. Treatment for CRS was required for hemodynamic or respiratory instability in 37% of patients and was rapidly reversed in all cases with the IL6-receptor antagonist tocilizumab, together with steroids in 5 patients. Although T cells collected from the 21 patients who had relapsed after allo SCT were median 100% donor origin, no graft-versus-host disease (GVHD) has been seen. Grade 4 CRS was strongly associated with high disease burden prior to infusion and with elevations in IL-6, ferritin (suggesting macrophage activation syndrome) and C reactive protein after infusion. Persistence of CTL019 cells detected by flow cytometry and/or QPCR, and accompanied by B cell aplasia, continued for 1-26 months after infusion in patients with ongoing responses. QPCR showed very high levels of CTL019 proliferation. B cell aplasia has been treated with IVIg without significant infectious complications. Probability of 6-mo CTL019 persistence by flow was 68% (95% CI, 50-92%) and relapse-free B cell aplasia was 73% (95% CI, 57-94%).

We conclude that CTL019 cells can undergo robust in-vivo expansion and can persist for over 2 years in patients with relapsed ALL, allowing for the possibility of long-term disease response without subsequent therapy such as SCT. This approach also has promise as a salvage therapy for patients who relapse after allo-SCT with a low risk of GVHD. CTL019 therapy is associated with a significant CRS that responds rapidly to IL6-targeted anti-cytokine treatment. CTL019 cells can induce potent and durable responses for patients with relapsed/refractory ALL. CTL019 therapy has received Breakthrough Therapy designation from the FDA in both pediatric and adult ALL, and phase II multicenter trials have been initiated.

CAR T cells: CD19 escape, preclinical models and novel applications

Relapsed/refractory leukemia, especially refractory disease, ALL in adults, and relapses after stem cell transplant, pose substantial challenges in both children and adults, with very little progress made in more than a decade. Targeted immunotherapy using chimeric antigen receptor (CAR)-modified T cells has emerged as a potent therapy with an innovative mechanism. Dramatic clinical responses, with our group observing complete remission (CR) rates as high as 90% (Maude et al NEJM 2014), have been reported using CAR-modified T cells directed against the B cell specific antigen CD19 in patients with highly refractory chronic lymphocytic leukemia (CLL) and acute lymphoblastic leukemia (ALL). Supraphysiologic T cell proliferation, a hallmark of active, T cell-engaging therapies, contributes to both efficacy and risk. The most notable toxicity is cytokine release syndrome (CRS), which poses a unique challenge for toxicity management.

This lecture will seek to inform the audience about emerging topics in modified T cell therapies. We will discuss potential other application in pediatric diseases such as acute myeloid leukemia (AML) and neuroblastoma. AML may be targeted with CARs recognizing CD33 or CD123. CD123 is also a potential ALL antigen. Neuroblastoma may be targeted with the well-characterized antigen GD2, a disialoganglioside expressed on neuroblastoma cells. Preclinical data from ongoing studies will be presented showing the potential efficacy of alternative targets that may extend this therapy outside of B cell malignancy.

We will also discuss emerging data on mechanisms of resistance to CTL019 therapy. Although overall survival and event free survival rates on our studies have been very promising, at 78 and 63% respectively, there are patients who experience disease progression after CTL019 therapy. These patients fall into two categories. Patients who lose their car T cells more rapidly than the median (i.e. prior to three months) are at risk for AOL recurrence. The use recurrences are characterized by LL cells which still express the CD19 target which CTL 019 attacks. There are also patients who experience later relapses while the cells are still present and on the hunt for disease. These patients have a LL which has escaped CTL 19 therapy by down regulating the target CD19. The mechanisms of CD19 loss are unexpected and may reveal approaches for further therapy.

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Mechanistic role of BR-DIM in human prostate cancer: Clinical experience

Background:

Castrate-resistant prostate cancer (CRPC) and subsequent metastasis (mCRPC) after androgen deprivation therapy (ADT) shows increased expression of androgen receptor (AR) splice variants, acquisition of Epithelial-to-Mesenchymal Transition (EMT) and stem cell characteristics, all of which are associated with resistance to enzalutamide. Since there is no curative treatment for prostate cancer (PCa) patients with CRPC and subsequent mCRPC, innovative treatment options are urgently needed to overcome resistance to enzalutamide and other androgen-deprivation therapy (ADT). In our recent study, we found that resistance to enzalutamide could in part be due to deregulated expression of microRNAs (miRNAs) such as miR-34a, miR-124, miR-27b, miR-320 and the let-7 family, and it appears to play an important role in regulating AR expression. We found that the expression of miR-34a, miR-124 and miR-27b was reduced, which led to increased expression of AR splice variants causing resistance to enzalutamide. The miR-320 and let-7 family inhibit the expression of stem cell markers such as Lin28B, EZH2, Nanog, Oct4 and CD44, which are associated with enzalutamide resistance, and thus could be responsible for the development CRPC and subsequent mCRPC. These preclinical findings are very encouraging which clearly suggest that it must be proven in clinical trial.

Methods:

Based on our previous and current preclinical findings, we have previously conducted a phase I clinical study in PCa patients using BioRespose 3,3'-Diindolylmethane (BR-DIM) which provided the recommended phase II dose that showed no adverse toxicity. Now we have completed a phase II clinical trial in which patients diagnosed with localized PCa were treated with BR-DIM at a dose of 225 mg orally twice daily for a minimum of 14 days. DIM levels and AR activity were measured at the time of prostatectomy. Moreover, we also assessed the level of expression of miRNAs and the expression of AR and its splice variants in the radical prostatectomy specimens and compared it with diagnostic biopsy specimens.

Results:
Out of 28 evaluable patients, 26 (93%) had detectable prostatic DIM levels, with a mean concentration of 14.2 ng/gm. The mean DIM plasma level on BR-DIM therapy was 9.0 ng/mL; levels were undetectable at baseline and in follow-up samples. AR localization in the prostate was assessed with immunohistochemistry. After BR-DIM therapy, 96% of patients exhibited exclusion of the androgen receptor from the cell nucleus. In contrast, in prostate biopsy samples obtained prior to BR-DIM therapy, no patient exhibited AR nuclear exclusion. Declines in PSA were observed in a majority of patients (71%), and the compliance and toxicity were excellent. We also found that BR-DIM treatment caused down regulation in the expression of AR, AR splice variants, Lin28B and EZH2, which appears to be mediated through the re-expression of let-7, miR-27b and miR-320 and miR-34a in human PCa specimens after BR-DIM treatment.

Conclusion:
In summary, BR-DIM treatment resulted in reliable prostatic DIM levels and anti-androgenic biologic effects at well tolerated doses. Our preclinical and phase II clinical studies provides the scientific basis for a "proof-of-concept" clinical trial in mCRPC patients treated with enzalutamide in combination with BR-DIM. This strategy could be expanded in future clinical trial in PCa patients to determine whether they achieve better treatment outcome which could in part be mediated by delaying or preventing the development of CRPC and subsequent mCRPC, and thus will have a significant impact on the management of PCa patients.

A novel approach for overcoming drug resistance in cancer

Background:
The combined annual mortality from pancreatic cancer (PC) and colon cancer (CC) is estimated to 88,170 deaths which surpasses the toll from breast and prostate cancer combined (72,280 deaths), and it represent the second leading cause of death after lung cancer (157,300 deaths), with no cure in sight, which is in part due to both intrinsic (de novo) and extrinsic (acquired) resistance to conventional therapeutics. This disappointing outcome is in part due to our inability to kill cancer cells that have undergone the Epithelial-to-Mesenchymal Transition (EMT) reminiscent of cancer stem/stem-like cells (CSCs) which are resistant to conventional therapeutics.

The aggressiveness of PC, and recurrence of CC (affects nearly 50% of patients treated by conventional therapeutics), is in part due to the re-emergence of chemotherapy-resistant CSCs. If these cells are the "root" of treatment failure, then elucidation of their intracellular signaling processes and discovering ways to target those events would be of immense importance for overcoming drug resistance especially by killing those resistant cells.

Methods:
Our working hypothesis was that treatment failure in PC and CC is primarily due to therapeutic resistance contributed by the presence or enrichment of EMT-phenotype cells or CSCs, which must be eliminated to eradicate tumor and prevent tumor recurrence. We tested our hypothesis in preclinical (in vitro and in vivo) studies using both PC and CC cells by investigating whether our newly developed small molecule CDF, derived from a natural agent-curcumin, could be useful in killing drug resistant cells. We also investigated whether specific microRNAs (miRNAs) may in part be responsible for the killing of drug resistant cells by CDF alone or in combination with conventional therapeutics.

Results:
We found that CDF could up-regulate the expression of miR-200 (low expression is the "hallmark" of CSCs and drug resistance) and reduced the expression of miR-21 (high expression is the "hallmark" of CSCs and drug resistance associated with tumor aggressiveness) in gemcitabine-resistant PC cells. Down regulation of miR-21 by CDF resulted in the induction of PTEN, an endogenous negative regulator Akt signaling. We also found decreased expression of EZH2 and increased expression of a panel of tumor-suppressive miRNAs (let-7a, b, c, d, miR-26a, miR-101, miR-146a, and miR-200b, c that are typically lost in PC) by CDF. Mechanistic investigation showed that the re-expression of miR-101 by CDF led to decreased expression of EZH2 and the killing of CSCs. We also found that CDF in combination with 5-fluorouracil and oxaliplatin (5-FU + Ox) were able to kill the CSCs derived from CC cells.

Moreover, we found that the expression of miR-34a and miR-34c was down-regulated in CC specimens compared to normal colonic mucosa and the loss of expression was consistent with data from CC cell lines.

Conclusion:
Our results suggest that deregulation of miRNAs and their targets by CDF is mechanistically associated with overcoming drug resistance in both PC and CC. Moreover, CDF could become a novel demethylating agent for restoring the expression of miR-34 family and potentially other miRNAs, and thus CDF could become a newer therapeutic agent for the treatment of both PC and CC, which could be largely due to the killing of CSCs, resulting in overcoming drug resistance and tumor recurrence.

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Proliposomes: A novel anticancer generator for the treatment of brain tumour

Introduction:
Proliposomes have emerged as smart technologies to evade the instability manifestations exhibited by liposomes. Proliposomes are phospholipid formulations that generate liposomes upon addition of aqueous phase and shaking. Paclitaxel (PTX) is an anticancer drug with wide activity against many types of cancer such as ovarian carcinoma, prostate cancer, lung cancer, breast cancer, head and neck cancers and AIDS-related Kaposi's sarcoma. Taxol® is a commercially available formulation of PTX consisting of the drug dissolved in ethanol and Cremophor EL® (polyoxyethylated castor oil) and ethanol (50:50 v/v). Unfortunately, the serious toxic effects caused by Cremophor EL® (nephrotoxicity, neurotoxicity, hypersensitivity, etc.) means that finding alternative vehicles is highly in need. In this study, we investigated proliposomes as potential vehicles for PTX.

Methods:
Ethanol-based proliposomes consisting of soya phosphatidylcholine (SPC), hydrogenated soya phosphatidylcholine (HSPC), or dipalmitoyl phosphatidylcholine with equi-mole ratio of cholesterol were prepared to act as vehicles for PTX added in a range of concentrations. Aqueous phase was added followed by probe-sonication . Liposomes were characterized in terms of size, zeta potential and morphology using dynamic light scattering, laser Doppler velocimetry and transmission electron microscopy (TEM) respectively. The entrapment efficiency of PTX was determined. Cytotoxicity study was conducted using U87-MG (grade 4 glioma) and SVG-P12 (normal glial) cell lines.

Results:
Small unilamellar liposomes (SUVs) were successfully generated from the proliposome formulations, which was confirmed by size analysis and TEM study. Zeta potential of the vesicles was neutral or slightly negative, and the surface charge tended to increase slightly by increasing the drug concentration. DPPC liposomes exhibited the highest drug entrapment (70-85%), followed by SPC liposomes (46-75%) and HSPC liposomes (26-67%). Cytotoxicity studies have shown cell viability to be dependent on formulation and cell type. PTX-DPPC liposomes had higher cytotoxicity against U87-MG cells compared to PTX-SPC and PTX-HSPC formulations. Moreover, the viability of the malignant cells was much lower than viability of normal glial cells, indicating that proliposomes have generated liposomes with desirable targeting properties.

Conclusions:
Ethanol-based proliposomes are appropriate vehicles of PTX and the resultant liposomes demonstrated promising anticancer properties against glioma cell lines.

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Skills, functions and impacts of clinical pharmacists at the bedside in oncology

Learning objectives

1. To identify key published papers
2. To highlight skills and functions to support optimal pharmaceutical care
3. To describe and comment key relevant outcomes
4. To discuss key clinical performance indicators

There are a growing number of studies published about the role and the impact of clinical pharmacists in the literature. At the same time, numerous professional societies have adopted frameworks and guidelines to support the clinical role of pharmacists throughout the drug-use and the patient care processes. Some of these publications are applicable to clinical pharmacists involved in oncology.

In the context of skills, functions and impacts of clinical pharmacists at the bedside in oncology, we will identify the key published papers to highlight skills and functions to support optimal pharmaceutical care. Key published papers will be retrieved from the current indexed databases like Pubmed and Embase but also a web platform that we developed about the role and the impact of pharmacists (http://impactpharmacie.org).

The American College of Clinical Pharmacy defines the clinical pharmacy as being the area of pharmacy concerned with the science and practice of rational medication use. They also mention that the practice of clinical pharmacy embraces the philosophy of pharmaceutical care; it blends a caring orientation with specialized therapeutic knowledge, experience, and judgment for the purpose of ensuring optimal patient outcomes. The ACCP also believe in a consistent patient care process that should describe the key steps that all clinical pharmacists will follow when they encounter a patient, regardless of the type of practice, the clinical setting, or the medical conditions

or medications involved. While both skills and functions to support optimal pharmaceutical care are being taught in the pharmacy curriculum of Faculties of pharmacy throughout the world, there should also be supported by continuous education programs.
The philosophy of pharmaceutical care should not only embrace optimal drug use but certainly focus on the achievement of optimal patient outcomes. We will also describe and comment key relevant outcomes applicable to clinical pharmacy practice in oncology. Pharmacists work in collaboration with physicians, nurses and other healthcare professionals. While it is often difficult to separate the added value of a single profession in collaborative practices, it is important to identify key outcomes on which pharmacists should focus in their practice.

Finally, we will discuss key clinical performance indicators that could be useful to clinical pharmacists involved in oncology practice. While there are many matrix and indicators that can be captured on a periodical basis, clinical pharmacists and all stakeholders involved in the organization of oncology clinical practice should identify key performance indicators that can be collected efficiently and may allow relevant benchmarking within and outside a hospital.

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Endocytic Pathways of Cells as Doorways for Therapeutic Macromolecules Targeting Cancer

Targeting Cancer with Macromolecules.

The possibility of targeting a disease process inside a cell has attracted widespread interest in the drug delivery community. The attraction is further strengthened when one considers the number individual intracellular targets that are available. This is particularly the case for cancer where most often aberrant network processes of signalling mediated by specific proteins interfere with cell function to promote cell division and inhibit apoptosis.

The concept of targeting cancer through a macromolecular therapeutic entity introduced the design and characterisation of a wide range of non-viral drug delivery vectors including those that are based on peptides, proteins, polymers and lipid. These are, most often, complexed with membrane impermeable therapeutics to deliver them, following administration, to disease sites such as tumours. The vector is then required to promote cell entry of the therapeutic and allow it to gain access to distinct intracellular locations such as the nucleus - intracellular targeting.

Targeting Cancer through Endocytic Pathways

Endocytosis is a process encompassing several different mechanisms by which reorganisation of, and budding from, the plasma membrane of cells allow for uptake of fluid and also plasma membrane components. Cell biology research has highlighted the complexity of endocytosis as almost all cell types utilise several different endocytic pathways that are each regulated by distinct proteins and lipids. For drug delivery research these pathways offer significant opportunities for internalisation of therapeutic macromolecules.

Figure 1. Early endosomes of cancer cells as seen through the eye of a confocal fluorescence microscope. A major goal in drug delivery research targeting cancer is to design a formulation

that allows cell entry of the therapeutic but also its escape from the punctate endocytic vesicles shown here. This will then give it an opportunity to reach its cellular target such as the nucleus that is also highlighted.

Analysing Endocytosis of Drug Delivery Vectors

Our research is focused on studying endocytosis and specifically on designing methods to analyse individual endocytic pathways to characterise how therapeutic macromolecules enter cells. As vectors we have paid particular attention to cell penetrating peptides and have studied their capacity to not only interact with and enter cells but also how they and their cargo reach the cytosol.

In this lecture I will describe work we have performed that focuses on design and characterization of methods to study endocytosis of drug delivery vectors such as cell penetrating peptides. Our involvement in a recent €30M FP7 Innovative Medicine Initiative (IMI) consortium (COMPACT www.compact-research.org/) will also be discussed. This represents a public-private collaboration between 14 European academic institutes, 2 biotechnology companies and 7 large pharmaceutical companies with the goal to improve the delivery biopharmaceuticals across major biological barriers of the intestine, lung, blood brain barrier, and skin.

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Natural Products as a Vital Source for the Discovery of Cancer Chemotherapeutic and Chemopreventive Agents

Throughout history, natural products have played a dominant role in the treatment of human ailments. The association of salicylates with the willow, and quinine with cinchona, are renowned examples. Similarly, the legendary discovery of penicillin transformed global existence. Traditional remedies, largely based on terrestrial plants, still dominate therapeutic practices throughout the world, and natural products comprise a large portion of current-day pharmaceutical agents, most notably in the areas of antibiotic and cancer therapies.

For the treatment of cancer, early diagnosis and definitive tumor eradication through radiation therapy or surgical resection offer greatest hope. However, when dealing with malignant, metastatic disease, it is generally necessary to resort to chemotherapy. Although the therapeutic indices of cancer chemotherapeutic agents are often poor, many of the most useful agents have resulted from the systematic investigation of nature. Notable examples include taxol, vinblastine, and camptothecin, or derivatives thereof. These structurally unique agents function by novel mechanisms of action; isolation from natural sources is the only plausible method that could have led to their discovery. In addition to terrestrial plants as sources for starting materials, the marine environment (e.g., bathymodiolamides A and B, bryostatin, ecteinascidin 743, kahalalide F, salinosporamide A), microbes (e.g., bleomycin, doxorubicin, staurosporin), and slime molds (e.g., epothilone B) have yielded remarkable cancer chemotherapeutic agents.

Irrespective of these advances, cancer remains a leading cause of death worldwide. In the United States, for example, cancer is responsible for about one in every four deaths. Given the morbidity and mortality associated with the disease, as well as the significant economic burden, there continues to be a critical need for more effective strategies.

Undoubtedly, the prevention of human cancer is highly preferable to treatment. In this sense, the advent of vaccines for the prevention of hepatitis and liver cancer is probably the greatest success, and the more recent development of vaccines for the prevention of cervical cancer offers promise. Cancer chemoprevention, the use of synthetic or natural agents to inhibit, retard, or reverse the process of carcinogenesis, is another important approach for easing this formidable public health burden. In an ideal world, cancer chemoprevention would work as well as vaccines for the prevention of human ailments. Although this has yet to be accomplished, proof-of-principal has been established by seminal clinical trials conducted for the prevention of breast cancer with tamoxifen, and more recently with tamoxifen relatives such as raloxifene, and a separate class of aromatase inhibitors. Agents such as finasteride have shown promise for the prevention of prostate cancer.

Similar to cancer chemotherapeutic agents, natural products play an important role in the field of cancer chemoprevention. Through serendipity or epidemiological observations, dietary phytochemicals such as sulforaphane and phenethyl isothiocyanate (cruciferous vegetables), epigallocatechin-3-gallate (green tea), curcumin (turmeric), sulfur-containing compounds and selenium (the genus Allium), and lycopene (tomatoes) are considered positively for cancer prevention. Some clinical trials have demonstrated promise. Consequently, it is reasonable to search for new natural product cancer chemopreventive agents.

Using the approach of activity-guided fractionation with a battery of state-of-the-art in vitro assays, we have monitored the natural product purification process so as to isolate the most active agents in their pure form. New biological targets have been developed, as well as sophisticated new techniques involving LS/MS/MS. Once purified, the structures of the molecules are determined using advanced NMR, mass spec and X-ray crystallographic methods. Our group has discovered active substances from a variety of structural classes such as alkaloids, flavonoids, coumarins, triperpenoids, and withanolides. Some of the compounds have shown promise for clinical trials, such as the rotenoid, deguelin. We have also concentrated on the discovery of marine microorganism-based cancer chemopreventive agents. It logically follows that synthetic organic chemistry is an integral component the program, and some semi-synthetic compounds such as 4´-bromoflavone, oxomate (a relative of sulforaphane), and 3-amino-6-(3-aminopropyl)-5,6-dihydro-5,11-dioxo-11H-indeno[1,2-c]isoquinoline have shown promise.

One of our most notable discoveries is the structurally simple stilbene known as resveratrol. This common constituent of grapes and grape products was originally reported by us to mediate cancer

chemopreventive activity. Stimulated by this report, resveratrol is now the subject of about 5,000 manuscripts, and it has been entered into clinical trials for the prevention of colon cancer. We investigated the absorption and metabolism of resveratrol and, through crystallographic analysis, observed its interaction within the arachidonic acid binding site of the enzyme cyclooxygenase which is the target of non-steroidal, anti-inflammatory drugs. In addition, a series of resveratrol derivatives have been produced capable of demonstrating responses with much greater potency and specificity.

In sum, natural product research is powerful approach for discovering biologically active compounds with unique structures and mechanisms of action. Given the unfathomable diversity of nature, it is reasonable to suggest that chemical leads can be generated that are capable of interacting with most or possibly all therapeutic targets. With the advent of high-throughput screening, a large number of potential starting materials can be readily evaluated, so informed selections can be made for unearthing prototype ligands worthy of further development as therapeutic agents.

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Role of transporters and the treatment of brain tumors, both primary (GBM) and metastatic, especially melanoma

The blood-brain barrier has anatomical and functional barriers that limit drug delivery to the brain. Nevertheless, the importance of the blood-brain barrier in preventing the delivery of effective pharmacotherapy to primary and metastatic brain tumors has been controversial. The controversy stems from the fact that vascular endothelial cell tight junctions are sometimes disrupted in the tumor core, allowing for systemic drug delivery from the blood into some areas of the tumor. P-glycoprotein (Pgp) and breast cancer resistance protein (BCRP) actively efflux drugs from brain capillary endothelial cells into the blood. We tested the hypothesis that although the tight junctions are often «leaky» in the core of brain tumors, active efflux limits drug delivery to tumor-infiltrated "normal" brain and consequently, treatment efficacy. Microdissection of the tumor core, invasive rim, and normal brain revealed several-fold enhancement in brain concentrations of molecularly-targeted agents in transporter-deficient relative to wild-type mice.

Analysis of cellular signaling pathways showed that poor drug delivery correlated with the lack of inhibition of a signaling pathway, especially in normal brain. These data show that active efflux is a relevant obstacle to treating brain tumors and provide a plausible mechanistic basis for the clinical failure of numerous drugs that are BCRP/Pgp transport substrates. This talk will address the need to use innovative drug delivery strategies to overcome the formidable obstacle of the blood-brain barrier. New drug discovery and development paradigms are emerging that may overcome the heretofore ignored problem of drug delivery to invasive and microscopic brain tumors; important sites of tumor initiation and growth that are protected by an intact blood-brain barrier.

Role of drug transporters in cancer chemotherapy

One of the major problems in successfully treating cancer is the development of resistance. Resistance to therapy can occur by many mechanisms, particularly through target mutation and changes in regulatory pathways. Another important resistance mechanism that has been extensively studied is "multidrug resistance" due to the active efflux transport of chemotherapeutics out of the cancer cell, thereby lowering the intracellular concentrations, leading to treatment failure. Many efflux transporters have been identified; especially those in the ATP-binding cassette superfamily (ABC transporters). These transport systems can influence specific intracellular concentrations of chemotherapeutics in tumor cells (such as the "cancer stem cell" phenotype) that overexpress these transporters; however efflux transport can particularly influence the systemic pharmacokinetics of certain anti-tumor agents.

One important aspect of this is the distribution of chemotherapeutics into the central nervous system across the blood-brain or blood-CSF barriers. This talk will review the history of multidrug resistance mechanisms and the early attempts to use adjuvant therapies that inhibit the active efflux transport of cytotoxic agents, like doxorubicin. Also discussed will be how we can still make use of such adjuvant therapies in the current use of more molecularly-targeted agents, such as the kinase inhibitors, which are primarily cytostatic. The presentation will briefly touch upon the role influx transporters may play in delivery of very hydrophilic anti-cancer agents, such as the antifolate antimetabolites and the organic cation anti-tumor agents. Finally, the talk will discuss the redundancy and regulation of certain transport systems in critical tissue barriers, using the blood-brain barrier as a prototypical illustration.

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Changing Paradigms in Breast Cancer Therapeutics 2000-2015

Breast cancer is the leading cause of cancer in women world-wide. In 2000, the United States NCI conducted an NCI consensus conference on the adjuvant treatment of breast cancer. At that time, it was recommended that most women diagnosed with early stage breast cancer should receive combination chemotherapy. Those who had tumors that were hormone receptor positive should also receive hormonal therapy. Since that time, it has been recognized that breast cancer can be characterized into at least 5 different molecular subtypes based upon the gene expression profile in the tumor (luminal A, Luminal B, HER-2 enriched, basaloid, and normal).

Each subtype also exhibits marked heterogeneity. In addition molecular diagnostic tools have been developed to identify subgroups of patients for whom chemotherapy is not likely to be of benefit. In addition, major breakthroughs have occurred in the development of therapeutics targeted against Her-2. Ongoing research is focused on understanding the mechanisms of drug response and drug resistance, as well as developing agents targeted towards these aberrant pathways. In 2015, the treatment of early stage breast cancer requires a tailored approach, considering the characteristics of the tumor, host factors, and patient preferences.

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The Role of the Clinical Pharmacist: Translating Theory into Practice

The goal of this presentation is to describe our experience and the challenges of implementing Clinical Pharmacy services at 57357, the Children Cancer Hospital in Egypt (CCHE). A journey of over 15 years in the field of hospital pharmacy made us confident that the more pharmacists are prepared to play their important role in the clinical setting, the more they can save lives. We have learned that it is our duty to apply any knowledge that we have learned so that our patients will be saved. We also learned that the "best way to learn is to teach" and that as pharmacists, we chose a profession of lifelong learning, a profession that teaches you human rights, and that all individuals must be treated equally. Training pharmacists and satisfaction of patients is our strategic reward. Our primary goal is to provide the hospital with cost-effective state-of-the-art pharmaceutical services. The Department of Pharmaceutical Services (DPS) is structured to maximize team work and promote decision-making at the individual personnel level in the department.

CCHE will support the DPS through the appropriate channel to:-

1. utilize their professional judgment and extend their responsibilities, to include participation in programs dealing with the safe handling of medication throughout the hospital, whilst working with other member of the health care team;
2. participate in medication use review and patient care audits;
3. ensure safe and effective use of medicines in the hospital;
4. provide Medication Reconciliation services;
5. ensure their legitimate role in each step of medication therapy in the hospital, which includes promotion of rational therapeutics and improvement of patient care;
6. implement clinical intervention program and redefine the role of pharmacists in minimizing preventable adverse drug events and applying cost-effectiveness drug therapy.

The Dispensing Pharmacy: is responsible for dispensing medications for both the inpatient and ambulatory care. The pharmacist reviews each patient's file, revising the medications written by the physician, checking medication history, calculating doses, analyzing drug interactions and providing optimal administration instructions to the patient. In addition, the dispensing pharmacy compounds oral medications and prepares extemporaneous preparations whenever needed. The Dispensing Pharmacy dispenses an average of 60,000 medication doses with an average of 250000 items charged every month. The Central Dispensing Pharmacy on the ground floor serves the inpatient discharge medication fill, BMT clinic, hematology OPD patients, and DC take home medication fill. The dispensing pharmacist checks that medication reconciliation is done for all patients with take home medication.

The patient education pharmacist: is responsible for doing a comprehensive patient education session with all take home medications. The patient counseling pharmacist responsibility is to audit round pharmacists and day care pharmacist, and evaluate the level of patient counseling service they delivered. This service is also responsible of making patient education flyers and all surveys to evaluate patient satisfaction, adherence to treatment and quality improvement actions required or requested by the patient.

The IV Admixture Service: utilizes highly skilled staff, a high-tech clean room and laminar airflow cabinets to prepare an average of 30,000 sterile, accurate, revised, medication doses every month. By fractionating intravenous medications, batch compounding and recycling returned medications, the medication compounding department saves about 30% of all drugs dispensed by the hospital. The Pharmacokinetic Lab: carries out therapeutic drug monitoring on an average of 900 samples every month using EMIT, FPIA and HPLC techniques, for inpatients, outpatients and out of hospital patients. Monitored drugs include methotrexate, vancomycin, aminoglycosides, digoxin, phenytoin, valproic acid, cyclosporine and mycophenolic acid.

All lab results are accompanied by clinical recommendations centered on evidence-based, updated information. Quality control analysis is carried out by the lab on both compounded and extemporaneous preparations of drugs to ensure the highest level of drug safety and efficacy. We also provide scientific aid to researchers both from inside or outside the hospital. We are now working with the Egyptian Medication Audit Authority to analyze Anticancer Medication.

For every 10 inpatients in the hospital, there is a dedicated pharmacist responsible for every aspect of their drug therapy. The pharmacist rounds daily with the physician, actively participating

in the therapeutic decisions, calculating drug doses, monitoring patient response, watching for drug adverse effects, and making sure all drugs are administered under optimal conditions. Every drug written by the physician has to be checked by the pharmacist for dosage, interactions and suitability before being prepared and administered to the patient. The round pharmacist is an integral part of the patient's medical team and an integral part the clinical decision making process. We have the first ICU Pharmacist, BMT Pharmacist, OR pharmacist and ID Pharmacist in Egypt, and there is also one full time Pharmacist for Patient Education with an allocated special room for this activity. Pharmacists also are consulting with physicians in the pediatric oncology clinic and the Multispecialty clinics.

The DPS DIPRS is a proactive approach to improve the provision of pharmaceutical services to our patients. The **Drug Information** Center is the main drug resource for all medical staff, answering medication inquiries ranging from drug protocols and dosing to drug interactions and adverse effects. The drug information center also provides routine publications and alerts concerning any new drug developments. With a dedicated pharmacist and the power of the internet, no question is left unanswered. We agreed to allocate a pharmacist to be the one responsible for answering without allocation a specialized room, so that this pharmacist will be living around with other healthcare team, to improve the communication.

Drug Use Evaluation (DUE): is a continuous review process used primarily as a means to detect irrational, inappropriate, and unnecessarily costly drug therapy. It is performed by the medical staff as a criteria-based, ongoing, planned and systematic process designed to continuously improve the appropriate and effective use of drugs.

Finally, We should not forget that this whole paradigm shift in the 57357 model, is directed towards transforming the people and investing in people as human capital. For the 57357 model to survive and flourish, we need your everybody's effort to serve the sick and to assist students and researchers.

Dr. Jasim Al-Barak, *MD*
Kuwait Cancer Center
Kuwait

The Evolution of Systemic Therapy in Metastatic Colorectal Cancer

The past decade has witnessed unprecedented advances in the treatment of metastatic colorectal cancer (mCRC). Although mCRC is a rarely curable entity and the treatment is mainly of palliative intent, systemic therapy can have a remarkable impact on patients' quality of life and survival. The main classes of drugs with significant anti-tumor activity in mCRC include: Chemotherapeutic agents (Fluoropyrimidines, Irinotecan and Oxaliplatin), Antiangiogenesis therapy (Bevacizumab, Aflibercept, Regorafenib) and Anti- Epidermal Growth Factor Receptor (EGFR) therapy (Cetuximab and Panitumumab). Testing tumors for the RAS mutational status permits the selection of individuals with unmutated or "wild-type RAS" tumors who are expected to benefit from Anti-EGFR therapy. Identifying biologic and molecular markers predictive of response to conventional chemotherapy and antiangiogenic agents and the optimal way of combining and sequencing active systemic therapy agents remain to be an active area of research.

In our modern era, an approach that emphasizes an individualized treatment strategy and exposure to all applicable active drugs has resulted in a significant impact on clinical outcomes and over-all survival that exceeds two years has been observed.

Prof. Fahd Al-Mulla, *Ph. D*
Professor/Consultant &
Head of Molecular Pathology and Genomic Medicine
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Kuwait

Pharmaceutical care of cancer patients: From the Genomic medicine point of view

Fahd A-Mulla1*, Makia Marafie2, Abdullah Ali3 and Ahmad J. AlSarraf3
1Kuwait University, Faculty of Medicine Department of Pathology, Molecular Pathology Unit; 2Kuwait Medical Genetics Center; 3 Kuwait Cancer Center

Background

Similar diseases behave differently and respond variably to treatment in different patients. Perhaps the most important milestone of recent time is the deciphering of the human genome and the realization of its complexity. The utilization of high throughput technologies, such as microarrays, proteomics and complex functional techniques has allowed us to explore reasons behind the variations seen in disease expressivity and treatment responses. Moreover these technologies and advances are allowing us to identify genetic and epigenetic causes of complex diseases in an impressive speed and ingenuity.

We gained complex tools to match and decipher complex disorders, which enhanced our diagnostic and therapeutic efficacies tremendously. In my talk, I will introduce the term 'Genomic Medicine' and present evidence of it clinical utility and validity. I will also discuss how our collaboration with the Kuwait Medical Genetics Center and Kuwait Cancer Center supporting the use of Next generation sequencing (NGS) improved disease prediction, diagnosis and treatment. I will emphasize the importance of local and international collaboration in providing evidence-based reports. Caveat of NGS will also be highlighted.

Prof. Yunus Luqmani, *Ph. D*
Chairman, Department of Pharmaceutical Chemistry
Faculty of Pharmacy
Kuwait

Endocrine resistance in breast cancer

Although an essential hormone, estrogen becomes a woman's worst enemy when she develops a breast malignancy, causing tumour growth and proliferation, through increased transcriptional activation effected through an over-expressed estrogen receptor (ER). Current therapeutic strategies are two-fold: i), reduction of circulating ovarian estrogen (in case of premenopausal women) by ovariectomy or chemical blockade of pituitary stimulation (with LHRH analogues such as goserelin), or of peripherally produced estrogen (in postmenopausal women) with aromatase inhibitors (such as anastrazole and letrazole) and ii), application of selective estrogen receptor modulators (SERMS), such as tamoxifen, raloxifene and fulvestrant for pharmacological receptor blockade.

The success of these interventions, which are significantly superior to the less-specific alternatives of general cytotoxic agents, is limited by the variable but persistent onset of acquired resistance, and also by intrinsic refractiveness which manifests despite adequately expressed levels of the target ER, in about 50% of patients with advanced metastatic disease. Loss of functional ER has been shown in cell lines to lead to endocrine insensitivity, loss of cellular adhesion and polarity, and increased migratory potential due to a trans-differentiation of the epithelial cancer cells into a more motile mesenchymal-like phenotype (EMT).

Multiple mechanisms contributing to this therapeutic failure have been proposed, the most likely of which are i), loss or modification in ER expression including by epigenetic mechanisms ii), agonistic actions of SERMS that may be enhanced through increased expression of ER co-activators iii), attenuation of tamoxifen metabolism through expression of genetic variants of P450 cytochromes that leads to more or less active metabolites iv), increased activity of growth factor signaling pathways particularly of EGFR/erbB2 including MAPK, PI3K and mTOR v), interaction of protein kinase/c-junNH2 complex to increase transcriptional activity vi), activation of pathways involving

KGF, PDGF/abl and NF B. In addition to these mechanisms, the small non-coding microRNAs, that have been recently recognized as critical gene regulators, have been found to exhibit differential expression in tamoxifen sensitive vs resistant cell lines, and are now the subject of intense scrutiny. In consequence of the heterogeneity of mutated phenotypes as well as the multiplicity of factors controlling cellular proliferation, identification of a common underlying cause of endocrine resistance, if indeed such exists, is still proving elusive. The goal of re-sensitising tumour cells, with the aim of re-gaining efficacy of endocrine agents, may be re-orientated to reversing the aggressive metastatic phenotype by reversal of the EMT.

Dr. Maitham Khajah, *Ph. D*
Department of Pharmacology and Therapeutics
Faculty of Pharmacy
Kuwait

Effect of pH on endocrine resistant breast cancer cells

Resistance to endocrine-based therapies in breast cancer occurs in parallel with cell transition from epithelial to mesenchymal phenotype (EMT), which is associated with enhanced proliferative and invasive potential, and presents a significant therapeutic challenge. The pH surrounding the tumour microenvironment is thought to be acidic, and play a role in enhancing cell invasion and metastasis, and it has been claimed that alkaline-based therapy can reduce tumour size and metastasis. In our laboratory, we have established several endocrine insensitive breast cancer cell lines by shRNA induced depletion of estrogen receptor (ER) by transfection of MCF-7 cells, which all exhibit EMT.

In examining the behaviour of these cells under different pH conditions, we have observed that brief exposure of specifically ER-ve breast cancer cells to extracellular alkaline (but not acidic) pH results in cell rounding and segregation (termed contractolation), formation of bleb-like actin-rich structures on the outer membrane, and enhanced invasive potential. Our finding suggest that the effect of pH on the microenvironment of endocrine resistant breast cancer cells maybe be different when compared to other tumours, and caution against indiscriminate application of alkalinising drug therapy.

Ph. Zubeir A. Nurgat, *BPharm, MSc, BCOP*
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Automation of chemotherapeutic agents in oncology

Objectives & Aims of the workshop:

1. To describe the utilization of an automated robotic solution for antineoplastic preparations
2. To compare the productivity of the robot with a manual preparation process;
3. Assess and explore challenges and the most efficient way of incorporating the robot into the daily operational workflow.
4. To discuss the pros and cons for automation vs manual preparations.

Brief introduction of the workshop: e.g. define drug automation in oncology and the significance of this. State some practical applications of this.

Automation is now a practice norm in hospital pharmacies of all sizes due to the surge in technological developments. The focus of attention on new automation and technology in pharmacy has been the use of intravenous (i.v.) preparation robots, and in particular, the preparation i.v. anti-neoplastic medications. The surge in technological advances in robotics offers the possibility of a paradigm shift in the practice of pharmacy, particularly in the preparation of i.v. hazardous medications; improving safety, accuracy, and efficiency.

The accuracy of manual i.v. preparations for anesthesiology and chemotherapy has been reported to have a higher rate of discrepancy outside the designated range. A recent study suggests that the accuracy of volumetric technique in the preparation of chemotherapy doses, reported that 71.7% of the doses prepared within ± 5% and 87.4% within ±10% of the ordered dose, and 'the process of volumetric technique alone is not sufficient to accurately prepare chemotherapy doses.

One of the unique features of the Chemotherapy-Compounding Robot which offers a significant advantage over manual preparations is the use of gravimetric method to precisely weigh the anti-neoplastic medications with the other products to prepare the dose. The Chemotherapy-

Compounding Robot accuracy parameters are pre-determined within ± 5% and will fail any product that deviates from this margin. This level of accuracy and reproducibility is more stringent than that of the United Sates Pharmacopeia (USP)chapter 795 standards for compounded products which allow a variance of ± 10%.6 The accuracy of manual i.v. preparations has been reported to have a much higher rate of discrepancy outside the designated range of acceptability of ± 10%. The Chemotherapy-Compounding Robot ensures sterility of the anti-neoplastic preparations since it operates in an aseptic ISO class 5 environment and prevents drug cross-contamination by using sterile syringes for each transfer. In addition, the compounding process involves numerous safety verification checks. The Chemotherapy-Compounding Robot robot's photographs the barcode on the label and compares it against the barcode in its database. The Chemotherapy-Compounding Robot labels every preparation it makes; minimizing the potential for errors.

The data captured during the compounding process is retrievable and provides an important tool for quality control purposes. Finally, the robotic compounding environment of i.v. anti-neoplastic medications has the additional advantage of minimizing the occupational exposure of healthcare professionals to anti-neoplastic drugs which are hazardous and requires careful, safe handling.

Summarize planned activities during the workshop:

Gravimetric Vs Volumetric measurements of medications

References:

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Children's Cancer Hospital
Egypt

Patient Counselling: From Education To Community Expectation

Objectives:

1. Participants will be introduced to the basic counseling structure.
2. Participants will be introduced to importance of patient counseling.
3. Participants will be introduced to gather information from a patient and document patient information.
4. Participants will be introduced to information providing.
5. Participants will have practice on interpersonal communication skills
6. Participants will have practice on role play .
7. Participants will perform patient-centered interviewing.
8. Participants will effectively communicate medication-related information to patients and other health care professionals.
9. Participants will learn how to document patient care.

Patient counseling is defined as providing medication information orally or in written form to the patients or their representatives on directions of use, advice on side effects, precautions, storage, diet and life style modifications.

During this workshop participants will discuss the objectives of patient counseling and the patient counseling stages, and each one will practice performing the following activities:

- Introduce him/herself.
- Explain purpose of counseling.
- Obtain drug related information such as allergies, use of herbals etc. from the patient.
- Assess the patients understanding of the reasons for therapy.
- Assess any actual and/or potential concerns or problems of importance to the patient.

The participants will practice how to deal with barriers involved in the counseling process and will learn how to create an environment that is conducive to proper interaction between patient and pharmacist.

The participants will apply the knowledge learned in the theoretical session and apply it in a simulated pharmacy practice environment.

Summary of activities:

1. Greeting and Introduction: (Aim : Building Rapport)
   - Greeting
   - Introduce yourself (name, position).
   - Identify patient (name, MRN, birth date).
   - Introduce the concept of counseling.
   - Provide privacy and ensure confidentiality.

2. Information Gathering :
   - Patient health information: allergies (medicinal/ environmental), medical conditions (chronic, diagnoses)/ duration, control
   - Medication history : Rx, OTC, herbal
   - Patient lifestyle information
   - Pharmacist comments

3. Providing Information :
    - Name (generic)
    - Intended use and expected action
    - Route, dosage form, dosage and administration schedule
    - Special directions for preparation, storage or administration
    - Precautions to be observed while taking
    - Common side effects, how to avoid or action required if they occur
    - Techniques for self monitoring of drug therapy
    - Potential interactions or therapeutic contraindications
    - Refills
    - What to do if you miss a dose
    - Any other information the patient may need to ensure safe use
    - Non drug options

PRESENTATIONS

PODIUM PRESENTATIONS

Sunday, February 1st, 2015

Ms. Samar Faggal (02:15 pm - 02:35pm)
In Silico-Aided Drug Design of flavonols analogues as potent proteasome inhibitors

Dr. Khaled Orabi (02:35 pm – 02:55pm)
Selected terpenes as anticancer leads

Dr. Peter Mikus (02:55pm – 03:15pm)
Identification and quantification of major structural bleomycin forms (A2, B2) in pharmaceutical and biological matrices by HPLC-Q-TOFMS method

Tuesday, February 3rd, 2015

Dr. Abdelbary Elhissi (03:00 pm - 03:20 pm)
Nanoemulsion delivery systems of paclitaxel for brain tumour therapy

Prof. Mayyada Wazaify (03:20 pm - 03:40 pm)
The use of herbal preparations as complementary and alternative medicine (CAM) in a sample of patients with cancer in Jordan

Dr. Willias Masocha (03:40 pm - 04:00 pm)
Prevention of paclitaxel-induced peripheral neuropathy by semi-synthetic tetracyclines

Prof. Hosam G Abdelhady (04:00 pm - 04:20 pm)
Targeted suicidal gene delivery systems attacking HeLa cells in space-time, visualized by atomic force microscopy.

1.
*Faggal S, Abaza MS, ElSayed KA, Elnagar AY, Orabi KY: In Silico-Aided Drug Design of Flavonols Analogues as Potent Proteasome Inhibitors

2.
*Orabi KY, Abaza MS, Kurien SS: Selected Terpenes as Anticancer Leads

3.
*Mikus P, Novotny L: Identification and quantification of major structural bleomycin forms (A2, B2) in pharmaceutical and biological matrices by HPLC-Q-TOFMS method

4.
*Hedaya OM, Mathew PM, Hassan F, Phillips OA, Luqmani YA: Anti-proliferative activity of 5-substituted-oxazolidinone derivatives

5.
Afifi FU, *Wazaify M, Jabr M, Treish E: The use of herbal preparations as complementary and alternative medicine (CAM) in a sample of patients with cancer in Jordan

6.
Najlah M, Kadam A, Wan K-W, Ahmed W, *Elhissi AM : Nanoemulsion delivery systems of paclitaxel for brain tumour therapy

7.
Parvathy SS, *Masocha W: Prevention of paclitaxel-induced peripheral neuropathy by semi-synthetic tetracyclines

8.
*Abdelhady HG: Targeted Suicidal Gene Delivery Systems Attacking HeLa cells in Space-Time, Visualized by Atomic Force Microscopy.

POSTER PRESENTATIONS

9
*Al-Hasawi NA, Amine SA: Inhibition of PSA expression in kelly neuroblastoma cell line by non-polar constituents of ashwaganda herb

10
*Al Tannak NF: Comparative LC-MS Stability Indicating Assays of Ondansetron Hydrochloride / Naloxone Hydrochloride and Metoclopramide Hydrochloride/Naloxone Hydrochloride Used in Palliative Care

11
Hassan F, Khajah M, Mathew P, Luqmani YA: Involvement of voltage-gated sodium channels (VGSCs) in the metastatic behaviour of endocrine resistant breast cancer cells

12
*Majdalawieh AF, Carr RI: Immunomodulatory and NK Anti-Tumor Activities of Black Pepper (Piper nigrum) and Cardamom (Elettaria cardamomum)

13
Mhaidat NM, *Ismail WW: Correlation between Noxa and Puma single nucleotide polymorphisms and chemotherapy response in Jordanian patients with colorectal cancer

14
*Nada A, Bandarkar F, Albasarah Y: Ibuprofen Nanoparticles: An approach to enhance drug dissolution for effective pain management

15
*Nada A, Zaghloul A, Hedaya M, Khattab I: Development of novel tocopherol formulations to enhance its protective effect against photocarcenogenic factors

16
*Sary HG, Ayoub NA, Singab AB, Orabi KY: Acroptilin, a Cytotoxic Guaianolide from Centaurea aegyptiaca

17
Soman S, Parvathy SS, Masocha W*: Targeting the GABAergic system for treatment of paclitaxel-induced peripheral neuropathic pain

ABSTRACTS
PODIUM PRESENTATIONS

ABSTRACTS - PODIUM PRESENTATIONS

1: Oral

In Silico-Aided Drug Design of Flavonols Analogues as Potent Proteasome Inhibitors

*Faggal S1, Abaza MS2, ElSayed KA3, Elnagar AY 4, Orabi KY1
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Introduction:
Growing understanding of the molecular events that mediate tumor growth and metastases has led to the development of rationally designed therapeutics. Promising strategies include proteasome inhibition. This report accounts on the design and synthesis of anti-proteasome flavonols analogues with predetermined binding affinity developed using in silico molecular modeling.

Objectives: This work is aiming at rationally develop novel semisynthetic analogues of natural flavonols with enhanced activities as proteasome inhibitors.

Methods:
Using Schrodinger docking program, the docking affinities of quercetin and myricetin and their proposed analogues to 20 S proteasome were studied. These results were compared with the one generated from the authentic proteasome inhibitor, bortezomib. Analogues with high binding scores were considered for synthesis using standard chemical procedures. Their identities were revealed by different spectral analyses including 1D and 2D NMR.

Results:
Several 3-O-derivatives of quercetin and myricetin were proposed, docked and, as an introductory work, two derivatives with high docking scores from each series were synthesized. 3-O-Carboxymethylquercetin and 3-O-(2-hydroxyethyl)quercetin showed the highest docking scores (-8.4 and -7.1, respectively), in comparison with -7.4 for bortezomib, and were synthesized. Likewise, 3-O-carboxymethylmyricetin and 3-O-(2-hydroxyethyl) myrircetin were docked and, subsequently, synthesized.
Conclusions:

The present study culminated several virtual 3-O-substituted flavonols as potential inhibitors of proteasome enzyme, where the influence of oxygenated aliphatic substitution at C-3 was important in improving binding score to the active site of the proteasome enzyme. Also, routes for efficient synthesis of selected derivatives using protection/deprotection chemistry allowing selective substitution on C-3 hydroxyl groups are shown.

Acknowledgement. This project was supported by Kuwait University Research Grant SL02/10. Spectral analyses were carried out at Science General Facility, Faculty of Sciences, Kuwait University, supported by grant No. GS01/03.

Key Words: Quercetin; Molecular Modeling; Proteasome

2: Oral

Selected Terpenes as Anticancer Leads

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Introduction:
Background: Compounds from nature play significant roles in modern medicine. Plants were in the past and still are serving as a good source for providing lots of bioactive compounds including cytotoxic phytochemicals. Doxorubicin, vinca alkaloids and paclitaxel are just few examples.

Objectives: This work is aiming at isolating and elucidating the identity of pure saudinolide (1), plectranthone (2) and psiadin (3) from the dried aerial parts of Cluytia richardiana, Plectranthus cylindraceus, and Psiadia arabica, respectively. The isolated pure compounds are to be evaluated for their potential antiproliferative activities.

Methods:
Chromatographic isolation and purification was employed to afford the needed pure compounds. Their identities were elucidated through comparing their spectral data with those previously published. The cytotoxic activities of these compounds were evaluated on colorectal and hepatocellular cancer cell lines, in comparison with normal human breast cells. The shown activities were confirmed by monitoring the morphological changes by inverted microscopy and by inhibition of colony formation. Furthermore, the anticancer effects of the promising hits were compared to the anticancer activities of standard chemotherapeutic drugs.

Results:
Plectranthone (2) and psiadin (3) exhibited marked growth inhibition on colorectal and hepatocellular cancer cell lines in time- and dose-dependent manner with minimal cytotoxicity against normal human breast cells. The anticancer effects of psiadin on both colorectal and hepatocellular cancer cells were higher than that produced by plectranthone. Saudinolide (1) showed very little antimitogenic effects. Comparison with standard antineoplastic drugs indicated that the effects of 2 and 3 were comparable or even better than the tested cytotoxic drugs including 5FU, doxorubicin, camptothecin and ellipticine.

Conclusions:
Plants continue to serve as a reservoir for chemo- and bio-diverse unique compounds that are hard to obtain by other avenues. The results clearly indicated that plectranthone and psiadin are promising active leads for drug development for cancer therapy.

Acknowledgement: This project was supported by Kuwait University Research Grant No. PC01/12. Spectral analyses were carried out at Science General Facility, Faculty of Sciences, Kuwait University, supported by grant No. GS01/03.

Key Words: Terpenes; Colorectal; Colony Formation Inhibition

3: Oral

Identification and quantification of major structural bleomycin forms (A2, B2) in pharmaceutical and biological matrices by HPLC-Q-TOFMS method

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Introduction:
Background: Bleomycin, being used as first-line treatment for many cancers, is present in the clinical administration as a mixture of structurally related glycopeptide antibiotics, namely bleomycin A2 (55-70 %, w/w) and bleomycin B2 (25-32 %, w/w), plus other minor sub-fractions. For better understanding of the mechanism action of different bleomycin fractions, a development of the powerful analytical method with the reliable identification and quantitation of bleomycin in pharmaceutical and biological matrices is of a high importance.

Methods:
Among methods used for the analysis of bleomycin A2 and B2, the approaches based on HPLC-UV with an ion-pair reagent have been applied recently. The use of ion-pair reagent, however, precludes a combination of HPLC and mass spectrometry (MS). Therefore, in this work, an HPLC method based on HILIC (hydrophilic interaction chromatography) principles was proposed for the separation, identification and determination of both major bleomycin fractions when using an on-line combined MS detection (Q-TOFMS).

Results:
The performance parameters of the HPLC-Q-TOFMS method showed high reliability, selectivity and sensitivity of the method with ng/ml-pg/ml LOD and determination of the accurate molecular weight of the analytes. The applications involved (i) determination of the bleomycin A2 and B2 fractions in the commercial pharmaceuticals (Bleomedac infusions), (ii) identification of bleomycin A2 and B2 in model plasma samples.

Conclusions:
The proposed HPLC-Q-TOFMS method is a powerful tool for the separation, identification and determination of two major bleomycin fractions, A2 and B2. A possibility to determine an accurate molecular weight of these fractions in the samples is an additional benefit of the developed method, enabling their exact characterization/recognition as well as simple, sensitive and reliable monitoring in variable multicomponent matrices (e.g. in quality drug control, biodistribution study).
Key Words: Bleomycin fractions (A2, B2); Hydrophilic interaction chromatography

4: Oral

Anti-proliferative activity of 5-substituted-oxazolidinone

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Introduction:
In the face of increasing resistance to existing antibiotics, oxazolidinones, exemplified by linezolid, have been developed as promising agents. In this study we investigated selected 5-triazolylmethyl- and 5-acetamido-morpholino and N-substituted-piperazino oxazolidinone derivatives for antiproliferative activity against breast cancer and normal cells.

Methods:
MTT assay, validated by cell counting, was used to assess the effect of 12 derivatives (concentrations from 100nM to 10μM) on the proliferation of MCF7 breast cancer cells. The three most active compounds were then tested on MDA231 breast cancer cells and HBL100 normal breast cells. Cytotoxicity of those selected was determined by assessing the extent of apoptosis by flowcytometry. The anti-metastatic potential of these compounds was assessed on MDA231 by the wound healing and agarose invasion assay.

Results:
The 5-triazolylmethyl piperazino-oxazolidinone derivatives containing 4-N-(2-chlorocinnamoyl), 4-N-(4-nitrobenzoyl) and 4-N-methylsulfonyl moieties showed the most potent cytostatic activity against the cancer and normal cells, inhibiting proliferation by up to 70%, in the same order of their reported antibacterial activity against S. aureus, but at much higher concentrations. Unexpectedly, there was a significant stimulation of proliferation at 100nM, well below their antibacterial MIC. The compounds also retarded motility and invasion of MDA231 cells.

Conclusions:
Nine of the derivatives tested showed no effect on any of the eukaryotic cell lines, which also shows their preferential activity against bacteria. Three compounds however exhibited potent cytostatic activity against both normal and cancer cells. Their bi-phasic response suggests multiple targets on eukaryotic cells. Used solely to treat bacterial infection they may encounter unwanted side effects. However at >10 μM these may be further studied as anti-cancer agents because of their anti-metastatic properties.

Key Words: Oxazolidinones; Anticancer; Breast cancer

5: Oral

The use of herbal preparations as complementary and alternative medicine (CAM) in a sample of patients with cancer in Jordan

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Introduction:
Background: In Jordan, like in many developing countries, plants (as complementary and alternative medicine (CAM) plant based over the counter (OTC) products, food supplements, nutroceuticals and in traditional folk medicines) are widely utilized in the treatment of minor ailments as well as chronic diseases. This study sought to describe the type, frequency, purpose and pattern of herbal preparation use as complementary medicine in a sample of patients with cancer in Jordan.

Methods:
The study took the form of a cross-sectional semi-structured interviewing of patients attending the outpatient departments at King Hussein Cancer Centre (KHCC), a specialist cancer centre in Amman. Interviewees were approached while awaiting their prescriptions at the KHCC pharmacy. Where patients were younger than 16 years of age or unable to interact, the next of kin (NOK) was interviewed. The vast majority of the questions had preformulated answers. Interviews took approximately 20 min to complete. Responses were coded and entered into SPSS_ for Windows, version 17, for statistical analysis. Multivariate analysis and 2 X2 contingency tables were used to compare groups. Chi-square and Fisher exact tests were used to test for significant differences between groups.

Results:
A total of 1138 patients with cancer were interviewed, out of which 404 (35.5%) reported using botanicals based CAM primarily bought from Jordan (85.1%) and used in the crude form as infusions (73.3%). Only 6.8% used herbal products in a dosage form. Most of CAM users were female (67.0%) and above 40 years of age (63.1%). More than half of CAM users (n= 235, 58.1%) believed that theherbal preparations would play a role in curing their diseases. Recommendation of a friend was the main factor that prompted them to use CAM (41.8%).

Conclusions:
This study revealed that CAM use is common among patients with cancer in Jordan, many of which are on chemotherapy or radiotherapy.

Key Words: Cancer; Herbs; Jordan

6: Oral

Nanoemulsion delivery systems of paclitaxel for brain tumour

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Introduction:
Lipid nanoemulsions have been increasingly used as carriers for poorly soluble drugs owing to their biocompatibility and biodegradability. Paclitaxel (PTX) is an anticancer drug with wide activity against many types of cancer. However, the poor solubility in water is a serious limitation of this drug. Taxol® is an established marketed formulation of PTX, which represents the drug dissolved in a vehicle consisting of ethanol and Cremophor EL® (polyoxyethylated castor oil). Unfortunately, the toxic effects of Cremophor EL® (nephrotoxicity, neurotoxicity, hypersensitivity, etc.) represent a significant drawback. In this study, we investigated commercially available lipid nanoemulsions, namely Intralipid 20% (Fresenius Kabi, Germany) and Clinoleic 20% (Baxter Healthcare, USA) nanoemulsions as vehicles for PTX and studied the efficacy of formulations against glioma cell lines and normal glial cells.

Methods:
PTX was loaded into the nanoemulsions via vortex-mixing for 5 min followed by bath-sonication for 2 h at 40°C (final drug concentrations of 0-6 mg/ml). Particle size and zeta potential were analyzed using dynamic light scattering and electrophoretic mobility respectively. The entrapped fraction of PTX was calculated using UV by subtraction of the unentrapped fraction from the total drug amount after forcing the emulsions through 400 nm syringe filters and quantifying the drug retained in the filter (i.e. the unentrapped fraction). MTT studies were conducted to investigate the cytotoxicity of the formulations against U87-MG (grade 4 glioma) and SVG-P12 (normal glial) cell lines.

Results:
Size was highly dependent on nanoemulsion type, being in the range of 254 – 264 nm for Clinololeic and 283 – 295 nm for Intralipid, depending on PTX concentration. Zeta potential values were negative for both emulsions with more intense charge for the Clinoleic formulations. Drug entrapment values were in the range of 70 – 80% and 44 – 57% using for the Clinoleic and Intralipid formulations respectively. PTX-loaded Clinoleic decreased the viability of U87-MG glioma cells to

6.4%, compared to only 21.29% using PTX-loaded Intralipid nanoemulsion. Both nanoemulsions were less toxic to the normal glial cells (SVG-P12), indicating the selectivity of the lipid emulsions against malignant cells.

Conclusions:
Nanoemulsions are applicable vehicles for solubilizing PTX and acting selectively against malignant glioma cells.

Key Words: Lipid; Nanoemulsion; Paclitaxel

7: Oral

Prevention of paclitaxel-induced peripheral neuropathy by semi-synthetic tetracyclines

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Introduction:
Background: Development of peripheral neuropathy, which can present as painful neuropathy or loss of sensation, sometimes limit the use of paclitaxel in the treatment of solid tumors such as breast cancer. Minocycline, a semi-synthetic tetracycline, has been reported to protect against the development of paclitaxel-induced neuropathy.

Methods:
BALB/c mice were treated for 5 consecutive days with paclitaxel (2mg/kg, intraperitoneally), paclitaxel plus minocycline (50 mg/kg intraperitoneally), paclitaxel plus chemically modified tetracycline-3 (COL-3; 4, 20 or 40 mg/kg, orally) or their vehicles for 5 consecutive days. The reaction latency to thermal stimuli (hot plate test) was recorded before and after treatment. An automated flinch detection system for the formalin test (20µl of 5% formalin injected subcutaneously into the paw dorsum) was used to evaluate chemical nociception in mice.

Results:
Treatment with paclitaxel reduced reaction latency time to thermal stimuli (thermal hyperalgesia) for 4 weeks, with maximum effect at day 7 and 10. Co-administration of paclitaxel with minocycline or COL-3 prevented the development of paclitaxel-induced thermal hyperalgesia. Injection of formalin resulted in biphasic paw flinches; phase 1 (1-9 minutes) and phase 2 (10-40 minutes). Treatment with paclitaxel reduced cumulative flinches in both phases 1 and 2 at day 7. Co-administration of paclitaxel with minocycline prevented development of paclitaxel- induced hyposensitivity to chemical nociception.

Conclusions:
The results of this study indicate paclitaxel induces chemical hyposensitivity and thermal hyperalgesia in mice that can be prevented by minocycline or COL-3. Therefore, these drugs warrant further research as potential candidates to be used in combination with paclitaxel to prevent the development of peripheral neuropathy.

Key Words: Chemotherapy-induced neuropathy; Paclitaxel; Minocycline

Roche

ABSTRACTS
POSTER PRESENTATIONS

ABSTRACTS - PODIUM PRESENTATIONS

9: Poster

Inhibition of PSA expression in kelly neuroblastoma cell line bynon-polar constituents of ashwaganda herb

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Introduction:
Several studies demonstrated the re-expression of the embryonic glycan polysialic acid (PSA) in progressive stages of metastatic tumours. This study aimed to inhibit PSA expression by treating a model of kelly human neuroblastoma cell line with extracts of Withania somnifera (ashwaghanda), a popular Indian medicinal herb with various therapeutic effects.

Methods:
Constituents of ashwaghanda roots were extracted in Water (W), Ethanol (E), DMSO (D), Hexane (H) and Chloroform (C). Extracts were re-suspended at concentrations of 100 mg/ml. Quantitative inhibition of PSA expression was carried out by treating kelly cells with diluted herbal suspensions in 96-well flat bottom plates. After which ELISA was applied using anti PSA-NCAM and absorbances of colourimetric solutions were measured by plate reader. To ensure that a decrease in PSA signal is not due to the herbal cytotoxic effect, ELISA was paralleled with MTT assay. Confirmation of herbal potential activity was achieved by subjecting treated cells to dot blot.

Results:
Treatments with W extract resulted in reduction in % survival of cells with a correlative % reduction in PSA expression. Herbal extracts E, D and C exerted a cytotoxic effect associated with very low PSA signal. On the other hand, treatments with 0.5 and 2.5 mg/ml of H extract lacked cytotoxicity with % survival of 123±8.5 and 113.8±16.4, respectively, correlated with reductions in PSA expression to % of 82.9±31.5 and 70.3±16.2, respectively. However, at concentration of 5.0 mg/ml, H extract was cytotoxic. This potential activity was further confirmed in dot blot, where treatment of cells with 0.5 mg/ml of H extract resulted in abolished dots against controls.

Conclusions:
Non-polar constituents of ashwaghanda herb have the potentiality to inhibit PSA expression in kelly cell line.

Key Words: Polysialic acid; Kelly cell line; Ashwaghanda herb

10: Poster

Comparative LC-MS Stability Indicating Assays of Ondansetron Hydrochloride / Naloxone Hydrochloride and Metoclopramide Hydrochloride/Naloxone Hydrochloride Used in Palliative Care

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Introduction:
Naloxone hydrochloride is commonly used to partially or completely reverse respiratory depression induced by opioids use. Ondansetron hydrochloride is a new serotonin receptor antagonist, whereas Metoclopramide hydrochloride is a part of dopamine receptors antagonist antiemetic class.

Methods:
Thus, subcutaneous injection of ondansetron hydrochloride (4 mg/ml) and intravenous injection of metoclopramide hydrochloride (2 mg/Kg) are used in palliative care units to prevent or treat opioids side effects during management of moderate to severe pain in cancer patients. Although the combinations of ondansetron hydrochloride/ naloxone hydrochloride and metoclopramide hydrochloride/ naloxone were reported to be physically and chemically stable and compatible at 4oC, the chemical stability of the combinations wasn't compared and investigated at higher storage temperature and hot climate. Thus, a method was required to indicate and compare the compatibility and chemical stability of both combinations at higher temperatures. A high performance liquid chromatography-mass spectrometry (LC-MS) analytical method was established to investigate the chemical stability of the combinations. The extemporaneously prepared injections containing ondansetron hydrochloride (4 mg/ml)/ naloxone hydrochloride (0.2 mg/ml) and metoclopramide (2 mg/ml)/ naloxone hydrochloride (0.2 mg/ml) in 0.9% sodium chloride were stored at 3 different temperatures (4, 22, 370C) for 8 days. Aliquot samples (10 µL) were analyzed at zero time, 4, 24, 48, 96 and 192 hours by LC-MS.

Results:
Metoclopramide hydrochloride and naloxone hydrochloride concentrations remain above 90% of their initial concentration under all storage conditions for 192 hours, while ondansetron hydrochloride losses up to 2.83%, 4.12% and 15.03% of its initial concentration when stored for 192 hours at fridge (4oC), room temperature (22oC) and at 37oC respectively. Therefore, the disappearance of ondansetron hydrochloride was correlated with the appearance of degradant peak.

Conclusions:
In conclusion, metoclopramide hydrochloride and naloxone hydrochloride admixture is more stable and preferred to ondansetron hydrochloride and naloxone hydrochloride admixture under all storage conditions

Key Words: Liquid chromatography-mass spectrometry; Stability indicating assay

11: Poster

Involvement of voltage-gated sodium channels (VGSCs) in the metastatic behaviour of endocrine resistant breast cancer cells

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Introduction:
Voltage-gated sodium channels (VGSCs) are membrane proteins, composed of a pore-forming alpha subunit and an auxiliary beta subunit, that are an essential component of excitable cells. Interestingly, they have also been reported to be expressed in non-excitable cells of several neoplasms. In breast cancer, the SCN5A gene expressing the Nav1.5 alpha subunit was found to be abundantly expressed and is believed to be involved in cell invasion and migration. We recently reported that brief exposure of estrogen receptor (ER) silenced breast cancer cells to alkaline pH, induced morphological changes and enhanced their invasive potential towards various serum components and growth factors, which was blocked by inhibitors of ion channel proteins (Na+/H+ and Na+/K+). In this study, the effect of VGSC blockade in various functions of endocrine responsive (ER +ve) and resistant (ER –ve) cell lines was examined.

Methods:
The expression profile of VGSCs (Nav1.5) in ER+ve (MCF-7) and ER-ve (pII) cell lines at various pH conditions was determined using immunofluorescence. Cell invasion (under-agarose assay), motility (scratch assay) and proliferation (MTT assay) were assessed in pII cells in response to VGSC blockers [phenytoin (PHT) and tetrodotoxin (TTX)] and siRNA-mediated knockdown of the Nav1.5. Total matrix metalloproteinase (MMP) activity was determined using an assay kit from Abcam. The expression level/activity of Nav1.5, ERK1/2 and Akt were determined by western blotting.

Results:
A perinuclear expression pattern of Nav1.5 was observed in both MCF-7 and pII cell lines at pH 7.4. Upon cell exposure to pH 8.3, numerous bleb-like structures were observed at the outer membrane of pII (but not MCF-7) cells which were mainly composed of F-actin. Nav1.5 was expressed inside the newly formed blebs. Treatment with PHT, TTX and siRNA significantly reduced pII cell invasion in part through reduced total MMP activity. Cells motility was inhibited by PHT, while proliferation was not affected by both inhibitors. PHT and TTX reduced ERK1/2 phosphorylation level, while siRNA transfection decreased pAkt.

Conclusions:
VGSCs play a significant role in breast cancer cell invasion and in the morphological/functional changes associated with exposure to alkaline pH conditions. This is in part through modulating the activity of key signaling molecules important for cell motility and invasion as well as via enhancement of MMP activity. Blockers of VGSCs may serve as potential anti-metastatic therapy for breast cancer.

Key Words: Voltage-gated sodium channels; Cell invasion; Motility

12: Poster

Immunomodulatory and NK Anti-Tumor Activities of Black Pepper (Piper nigrum) and Cardamom (Elettaria cardamomum)

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Introduction:
BACKGROUND, OBJECTIVES: Immunonutrition represents a dynamic interplay between nutrition & immunity. This study aims at investigating the potential immunomodulatory effects of Piper nigrum & Elettaria cardamomum in light of splenocyte proliferation, macrophage function, and NK anti-tumor activity.

Methods:
Splenocyte proliferation was assessed by [3H]-thymidine incorporation. ELISA was performed to assess cytokine secretion, and Griess assay was performed to evaluate NO production by macrophages. Using YAC-1 lymphoma cells, the potential of the indicated extracts to promote the cytotoxic activity of NK cells was also examined by JAM assay.

Results:
Both extracts significantly enhance splenocyte proliferation in a dose-dependent, synergistic fashion. Piper nigrum & Elettaria cardamomum extracts significantly enhance & suppress Th1 cytokine release by splenocytes, respectively. Conversely, Th2 cytokine release by splenocytes is significantly suppressed and enhanced by Piper nigrum and Elettaria cardamomum extracts, respectively. Based on IL-6 and TNFα release as well as NO production by macrophages, experimental evidence suggests that Piper nigrum and Elettaria cardamomum extracts exert pro-inflammatory and anti-inflammatory roles, respectively. Experimental evidence indicates that both extracts significantly enhance NK cytotoxic activity against YAC-1 tumor cells, suggesting that the documented anti-tumor effects of Piper nigrum and Elettaria cardamomum may be attributed to enhanced NK anti-tumor activity.

Conclusions:
Our data present Piper nigrum and Elettaria cardamomum as traditionally used herbs with potent immunomodulatory, anti-inflammatory, and anti-tumor properties. We anticipate that active ingredients of these herbs may be employed as effective therapeutic agents in the regulation of diverse immune reactions implicated in various diseases including cancer.

Key Words: Herbal Medicine; Immunomodulation; Anti-Tumor

13: Poster

Correlation between Noxa and Puma single nucleotide polymorphisms and chemotherapy response in Jordanian patients with colorectal cancer

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Introduction:
Background: colorectal cancer (CRC) is one of the most common malignancies around the world. In Jordan, it's considered to be the first most common cancer among males and the second after breast cancer among females. Apoptosis is one major type of cell death that maintains cells homeostasis by planned cell death. Apoptosis is regulated by Bcl-2 family proteins which either stimulate or inhibit apoptotic signals in cells. PUMA and NOXA are proteins that induce apoptosis by either counteracting or inhibiting the effect of the antiapoptotic proteins, so any change in their structure will affect the process of apoptosis. Our study aims to detect the frequencies of four single nucleotides polymorphisms (SNPs) in PUMA and NOXA genes in Jordanian patients, and to investigate the correlation between these polymorphisms and the response of CRC to chemotherapy and other clinical outcomes.

Methods:
A total of 70 paraffin embedded tissues from CRC patients and 25 blood samples from healthy individuals were taken to detect the PUMA SNPs, rs2032809, rs3810294, and NOXA SNPs, rs4558496 and rs3826598, using polymerase chain reaction- restriction fragment length polymorphism (PCR-RFLP). All required data about both CRC patients and health volunteers were collected after signing the consent form.

Results:
A statistical significance was seen in distribution of rs2032809 genotypes between CRC patients and healthy individuals (P= 0.000). Also, statistical significance is seen between different genotypes of rs2032809 and gender (P= 0.035). Significance was measured with a P value of 0.021 between tumor metastasis and different genotypes of rs2032809. Additionally, tumor recurrence was statistically correlated to rs2032809 genotypes (P= 0.013), rs3810294 genotypes (P= 0.040) and to rs3826598 genotypes (P= 0.013).

Conclusions:
Certain functional SNPs of PUMA and NOXA might affect the tumor response to chemotherapy and on disease metastasis rates. However, larger studies are needed to validate our results.

Key Words: Colorectal cancer; Apoptosis; SNPs

14: Poster

Ibuprofen Nanoparticles: An approach to enhance drug dissolution for effective pain management

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Introduction:
In recent years, nanoparticle engineering processes have become promising approaches for enhancing dissolution rate of hydrophobic drugs. The objective of the present work was to prepare ibuprofen (IBU) -PVP K30 nanoparticles using ultra homogenization technique in order to enhance the dissolution rate of IBU.

Methods:
Phase solubility study with increasing PVP K 30 concentrations was done to investigate the effect of polymer concentration on solubility of IBU. Nano-suspensions were prepared using different drug : polymer ratios by an optimized high pressure ultra-homogenization technique and were evaluated for particle size and zeta potential. The suspensions were then lyophilized and studied for drug content and dissolution. DSC and FTIR studies were also performed to identify the physicochemical interaction between the drug and the polymer. An additional series of nanosuspensions was also prepared using different concentrations of drug, polymer and tween 80 (a non-ionic surfactant) for further size reduction.

Results:
Phase solubility study indicated a linear increase in IBU solubility with increasing PVP K30 concentration. The saturation solubility of IBU (particle size - 60 µm) was found to be only 47 µg/ml. IBU-PVP K30 nanosuspensions were successfully prepared by an optimized ultra-homogenization technique (50 cycles gradually increased from 500 to 1500 bar were found to be optimum). Increase in polymer concentration, number of homogenization cycles and pressure resulted in decrease in particle size up to 527±31 nm. The suspensions also exhibited zeta potential values above - 30 mV which is a pre-requisite for physically stable nanosuspensions. The lyophilized nanoparticles derived from these suspensions showed 100% drug release as compared to micronized IBU (53.06±4.79%) after 60min. DSC endotherms demonstrated mutual interaction between IBU and PVP K30 which was further confirmed by FTIR. Nanosuspensions containing tween 80 showed excellent re-dispersibility and further reduction in particle size up to 127 nm.

Conclusions:
This study reveals the potential of formulating IBU-PVP nanosuspensions/ nanoparticles by an optimized ultra-homogenization technique with improved aqueous solubility and dissolution rate. These factors can enhance drug bioavailability, decrease gastric irritancy and thus improve patient safety. Also, as IBU is known to enhance the anti-cancer activity of cisplatin in lung cancer cells, further studies can be done to formulate combination products with increased efficacy.
Funding Agency: Kuwait University (Grant No. PP02/13)

Key Words: ibuprofen; nanoparticles; ultra-homogenization

15: Poster

Development of novel tocopherol formulations to enhance its protective effect against photocarcenogenic factors

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Introduction:
Background: Vitamin E (tocopherol) is a lipid-soluble antioxidant which plays key roles in protecting cell membranes from lipid peroxidation by free radicals. Vitamin E significantly reduces photocarcinogenesis, acting primarily as a lipophilic radical-scavenging antioxidant and suppresses chain initiation and/or chain propagation steps by donating its 6-phenolic hydrogen to the oxygen radicals. Vitamin E can therefore, reduce DNA damage and keratinocytes death. Enhancing Vit E permeation across the skin can significantly improve its protective effect against photocarcenogenic factors. Tocopherol represents a big challenge for transdermal permeation owing to its extreme hydrophobicity and large molecular weight. In the present study we aimed to develop α-tocopherol (T) topical formulations and evaluate the ex vivo and in vivo permeation.

Methods:
Seven gel formulations and 21 liquid formulations were investigated regarding physical stability, viscosity and permeation of T. Analysis of T was performed by a validated HPLC method using UV detector. Franz diffusion cells were used for the ex vivo permeation, and for the in vivo we used neonatal rats.

Results:
The ex vivo permeation from gel and emulsion formulations was very poor (0.001-0.015%). The highest permeation was observed from monophasic liquid formulations containing dimethyl sulfuxide (DMSO), tocopheryl polyethylene glycols (TPGs), propylene glycol, ethanol, and 9.5% T. The in vivo results demonstrated higher retention in the epidermis, compared to the subcutaneous tissues; 1377 and 1.13 µg/g , respectively. Increasing T concentration from 4.8 to 9.5% did not increase the amount permeated or %-retained of T.

Conclusions:
Formulations containing simple solutions of T in presence of DMSO and TPGs are more promising systems for effective transdermal permeation and superior protective effect; compared to gel, emulsion or oleaginous systems.

Key Words: tocopherol topical formulations; ex vivo and in vivo skin permeation

16: Poster

Acroptilin, a Cytotoxic Guaianolide from Centaurea aegyptiaca

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Introduction:
Background: Cancer is a disease, where treatment can be as debilitating as the disease itself. A major challenge in cancer therapy is drug resistance that limits the effectiveness of existing treatment options and, subsequently, intensifies the urgent need for continuous search for new anticancer leads.

Objectives: this work is aiming at isolation, identification and cytotoxic activity evaluation of potential cytotoxic agents from Centaurea aegyptiaca.

Methods:
The dried aerial parts of Centaurea aegyptiaca were coarsely powdered and extracted with ethylacetate. The extract was subjected to chromatographic separation on a flash silica gel column gradually eluted with an increasing concentrations of methanol in chloroform to yield a compound that was identified using different spectroscopic methods. Moreover, its cytotoxic activity was evaluated against larynx, liver, and breast carcinoma cell lines. IC50 (µM) values were determined using doxorubicin as a positive control.

Results:
The guaianolide sesquiterpene lactone, acroptilin (chlorohyssopifolin C) was isolated and identified. It exhibited a cytotoxic activity against larynx and liver carcinoma cell lines with IC50 values of 16.41and 9.62 µM, respectively. However, the most potent cytotoxic activity was against breast carcinoma cell line with IC50 value of 8.87 µM.

Conclusions:
Phytochemical investigation of Centaurea aegyptiaca ethylacetate extract led to the isolation and identification of the guaianolide sesquiterpene lactone, acroptilin. Moreover, this compound showed potential cytotoxic activity against larynx, liver and breast carcinoma cell lines.
Acknowledgement. Spectral analyses were carried out at Science General Facility, Faculty of Egypt. Science, Kuwait University, supported by grant No. GS01/03.

Key Words: Centaurea aegyptiaca; Larynx; Liver; Breast carcinoma; Acroptilin

17: Poster

Targeting the GABAergic system for treatment of paclitaxel -induced peripheral neuropathic pain

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Introduction:
Paclitaxel is fundamental in the treatment of breast cancer and other solid tumors. However, its use is hampered by the development of dose-limiting peripheral neuropathic pain. Currently, there is a dearth of effective drugs to treat this neuropathic pain because its pathophysiology is not well understood. The gamma-aminobutyric acid (GABA) neurotransmitter system has been implicated in the pathogenesis of neuropathic pain.

Methods:
BALB/c mice were treated for 5 consecutive days with paclitaxel (2 mg/kg,) i.p) or its vehicle. Gene expression of GABAergic system molecules and glial fibrillary acidic protein (GFAP-a marker of astrocytes) in the anterior cingulate cortex (ACC) of mice brains was examined using real time PCR on day 7, when the mice had developed neuropathic pain, because this area is involved in pain perception and modulation that might contribute to neuropathic pain. The reaction latency to thermal stimuli (hot plate test) was recorded before and after treatment with paclitaxel, or its vehicle; and after treatment with a selective GABA transporter-1 (GAT-1) inhibitor NO-711, amitriptyline and gabapentin.

Results:
Paclitaxel treatment resulted in thermal hyperalgesia and increased GAT-1 mRNA expression but not that of other GABA transporters or GABAergic enzymes in the ACC compared to vehicle treatment. The mRNA levels of GFAP were elevated in the ACC of paclitaxel-treated mice. NO-711 produced better antinociceptive activities than amitriptyline and gabapentin in mice with paclitaxel-induced thermal hyperalgesia.

Conclusions:
These data show that during paclitaxel- induced neuropathic pain there is significant increase in GAT-1 expression in the ACC possibly due to astrocyte activation. GAT-1 is the main transporter of GABA from the synapse, thus its increased expression possibly results in less GABA at the synapse and dysregulation of the GABAergic system. GAT-1 is a potential therapeutic target for managing paclitaxel-induced neuropathic pain.

Key Words: Chemotherapy-induced painful neuropathy; Paclitaxel; Minocycline

CANCER AWARENESS CAMPAIGN

Cancer Awareness Campaign

Faculty of Pharmacy is planning to run a "Cancer Awareness" campaign on 3rd February 2015 alongside the 5th Kuwait International Pharmacy Conference-2015 (5th KIPC 2015 from 1-3 February) that is entitled "Advances in Cancer Therapeutics from Bench to Bedside". This Campaign is going to take place in Faculty of Pharmacy and it is going to be directed to the HSC students and the public. It will include the following events:

Chair: Dr. Altaf Al-Romaiyan

Time	Topics & Faculty
10.00 am - 6.00 pm	Booths for Charities including Bait Abdullah, CAN, AlSedra Club and The Kuwait Society for preventing Smoking and Cancer (KSSCP)
	Health Check will be provided by a mobile van offered by CAN
	Booths displaying the most common forms of cancers such as Breast cancer, prostate cancer, Lung cancer and Leukemia
	There will be also other services including smoking cessation aids
	Booth about the role of DIC in cancer awareness

Time	Topics & Faculty
03:30 pm - 06:00 pm	Booth about the role of DIC in cancer awareness A booth discussing diet and its relation to the prevention of cancer *Dr. Dalal AlTaweel*
03:00 pm - 03:30 pm	A public talk entitled "Cancer between prevention and treatment" *Dr. Nada Al-Regam,* ***Dietician***
03:30 pm - 04:30 pm	A public talk given by cancer surviving patients *Dr. Nada Al-Regam,* ***Dietician***
04:30 pm - 05:30 pm	The public lecture by Faculty members *Ms. Zahra Al-Khargi, and Shoq Aljuwaihel*
04:30 pm - 04:50 pm	Herbs as anticancer agents: Facts & Fiction *Dr. Khaled Orabi*
04:50 pm - 05:10 pm	The role of pharmacist in pharmaceutical care of cancer patients *Dr. Mohamed Qaddoumi*

AUTHOR INDEX

KEYWORD

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ACCREDITATION & ENDORSEMENT

CME/CEPD Credits

KIPC 2015

Registration Number:	245/Ph0/Feb15
Title of Activity:	5th Kuwait International Pharmacy Conference
Scheduling:	February 1-3, 2015
CME Provider:	Health Sciences Centre, Faculty of Pharmacy
CME Organizer:	Dr. Monerah Al-Soraj
CME/CPD Credits:	18 Credits, Category 1:

Cancer Awareness Campaign

Registration Number:	246/Ph0/Feb15
Title of Activity:	Cancer Awareness Campaign
Scheduling:	February 3, 2015
CME Provider:	Health Sciences Centre, Faculty of Pharmacy
CME Organizer:	Dr. Monerah Al-Soraj
CME/CPD Credits:	3 Credits, Category 1

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مؤسسة الكويت للتقدم العلمي
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تمتلك مؤسسة الكويت للتقدم العلمي سجلاً تاريخياً حافلاً يمتد نحو 37 عاماً من دعم وتعزيز التقدم العلمي والتكنولوجي في دولة الكويت. وفي عام 1976، تلقى قادة القطاعات الاقتصادية في البلاد توجيهاً سامياً من المغفور له بإذن الله الشيخ جابر الأحمد الجابر الصباح (ولي العهد ورئيس مجلس الوزراء آنذاك) يتعلق بإنشاء مؤسسة الكويت للتقدم العلمي. وبناء عليه، تم نشر مرسوم أميري في الجريدة الرسمية «الكويت اليوم» في 12 ديسمبر 1976، بإنشاء المؤسسة وتحديد شروطها المرجعية، كمؤسسة خاصة غير ربحية، تهدف في المقام الأول إلى دعم البحث العلمي على أعلى المستويات، وتشجيع الباحثين.

ويأتي إنشاء المؤسسة من الشعور العميق بالتقدير والعرفان نحو الوطن، ويعد إنشاء المؤسسة دليلاً على روح الخير المتأصلة في الشعب الكويتي ودعمهم للتقدم العلمي وتشجيعهم للعلماء.

ويدير المؤسسة مجلس إدارة، يترأسه صاحب السمو أمير البلاد، الشيخ صباح الأحمد الجابر الصباح، حفظه الله ورعاه. وتتلقى المؤسسة الدعم المالي من الشركات المساهمة الكويتية، التي تقدم كل منها مساهمة سنوية للمؤسسة بواقع 1% من صافي ربحها.

ويتمثل أحد أهم أهداف المؤسسة في ترويج وتعزيز تطوير العلوم في دولة الكويت من خلال دعم المشروعات العلمية، والمجتمع العلمي والبنية التحتية العلمية في البلاد.

وعلى الرغم من أن مؤسسة الكويت للتقدم العلمي، والمؤسسات العلمية المرتبطة بها في الكويت، قد حققت الكثير من الإنجازات، فأنه لا يزال هناك الكثير الذي يجب القيام به. فقد شهدت دولة الكويت نمواً متسارعاً نتيجةً لإيراداتها النفطية المتزايدة على نحو ثابت، واليوم، يزيد نصيب القطاع العام عن 70% من الناتج المحلي الإجمالي، وتشكل الكوادر الوطنية أكثر من 85% من القوى العاملة في هذا القطاع. وهناك إجماع بين الجهات المساهمة في المؤسسة على أن هذا النمو غير مستدام على المدى الطويل، وأن هناك حاجة الى وضع استراتيجيات وطنية بديلة للتنمية ترتكز على بناء اقتصاد تكميلي من القطاع الخاص يتسم بالكفاءة والمنافسة.

وإدراكاً لهذه الضرورة، تفضل حضرة صاحب السمو، أمير البلاد، الشيخ صباح الأحمد الجابر الصباح، حفظه الله ورعاه، بتكليف لجنة منتقاة من نخبة من الخبراء، تسمى «اللجنة العليا لتطوير البحث العلمي في دولة الكويت» في عام 2007 لمراجعة تنظيم وأداء عمليات البحث والتطوير، ورفع التوصيات فيما يتعلق بإعادة هيكلة مجالات العلوم والتكنولوجيا والإبداع، وتقدمها في دولة الكويت.

وقامت اللجنة بإصدار عدد من التوصيات لتعزيز وتقوية المنظومة والثقافة الشاملة للعلوم والتكنولوجيا والإبداع في كل أرجاء الكويت، متضمنةً الارتقاء بالقدرات، وفي بعض الحالات إعادة توجيه مسار أنشطة عدة مؤسسات تعمل في مجالات العلوم والتكنولوجيا والإبداع، بما فيها مؤسسة الكويت للتقدم العلمي، وجامعة الكويت، ومعهد الكويت للأبحاث العلمية، والهيئة العامة للتعليم التطبيقي والتدريب، والشركة الوطنية لمشاريع التكنولوجيا، والنادي العلمي الكويتي.

وإدراكاً لدور مؤسسة الكويت للتقدم العلمي المتفرد في نطاق المنظومة الوطنية للعلوم والتكنولوجيا والإبداع في الكويت، واستجابةً للتوصيات الواردة في تقرير اللجنة العليا لتطوير البحث العلمي في دولة الكويت، والتقييم والنتائج التي توصل إليها الخبراء العالميون والمحليون، قامت إدارة المؤسسة في عام 2009 بعملية إعداد الخطة الاستراتيجية الجديدة. وتمت دراسة وتصميم آليات وخطوات الإعداد بعناية. وتمثلت أولى الخطوات في عملية الإعداد في تقييم الوضع الراهن، تلتها خطوات أخرى تضمنت وضع

الشروط والمتطلبات الأساسية، وتحديد القطاعات المستهدفة، وتعديل الرؤية والرسالة، وتحديد الأهداف الرئيسية للاستراتيجية والنتائج المتوقعة، وتم إلقاء نظرة فاحصة على البرامج والأنشطة القائمة والمقترحة، وتم تحديد المشكلات وتحليلها ووضع الحلول لكل برنامج بعناية، بالإضافة إلى تحديد المتطلبات والترتيبات المؤسسية اللازمة لتحقيق أهداف الخطة الاستراتيجية. وتضمنت آخر خطوة للتوصل إلى مجموعة من مؤشرات الأداء الرئيسية لقياس درجة النجاح بمرور الوقت وعلى كل المستويات.

الاستراتيجية لمؤسسة الكويت للتقدم العلمي (2012 – 2016)

لقد جاءت الاستراتيجية للمؤسسة نتيجةً للاجتماعات واللقاءات المكثفة والمداخلات من جانب فريق الإدارة لدى المؤسسة ومراكزها، وهي تعكس أحدث نتاج فكري حول احتياجات العلوم والتكنولوجيا والإبداع في الكويت، والدور المناسب للمؤسسة ومراكزها في تلبية جزء من تلك الاحتياجات، إضافة إلى تحديد أسلوب أكثر انتظاماً لاستحداث البرامج الممولة بما يسهم في استيفاء احتياجات المستقبل لمنظومة العلوم والتكنولوجيا والإبداع في الكويت. وكذلك دعم قدرات البحث والتطوير في المجالات ذات الأولوية الوطنية مثل المياه، والطاقة البديلة والبيئة ونشر الثقافة العلمية والتقنية والابداع في دولة الكويت.

الرؤية:

"منظومة وثقافة وطنية فاعلة للعلم والتكنولوجيا والإبداع، ساهمت المؤسسة في تطويرها، تشكل دعامةً لتنمية مستدامة"

ويعكس هذا النص الجديد لرؤية المؤسسة عدة مفاهيم على درجة كبيرة من الأهمية ويرتكز على الخبرة السابقة لمؤسسة الكويت للتقدم العلمي وفكرها الراهن. ويمتد النص ليغطي سائر النطاق الوطني، مع توجيه كل الموارد نحو تعزيز الوضع التنافسي في الاقتصاد العالمي المرتكز على المعرفة في المستقبل.

الرسالة:

تحفيز ودعم والاستثمار في تنمية القدرات البشرية وفي مبادرات تساهم في بناء قاعدة صلبة للعلم والتكنولوجيا والإبداع وتعزيز البيئة الثقافية الممكنة لذلك.
تشمل تلك المبادرات تطوير ونشر الثقافة العلمية، وتقوية قدرات البحث والإبداع، وتعزيز البيئة الثقافية الممكنة لذلك، ودعم الموهوبين والمتميزين، وترجمة المعرفة إلى ابتكارات، وتشجيع تطوير القدرات التكنولوجية لدى القطاع الخاص.

تعرّف الرسالة الجديدة المعدلة بشكل أفضل دور مؤسسة الكويت للتقدم العلمي وطموحاتها التي شكلت القوة المحركة للاستراتيجية التي ورد عرض لها أدناه.
تعرف الرسالة الجديدة بشكل أفضل دور مؤسسة الكويت للتقدم العلمي وطموحاتها، التي شكلت القوة المحركة للاستراتيجية التي سيرد عرضها ادناه. فهي تعيد تعريف المؤسسة كجهة تمويل في الدرجة الاولى. ونظراً إلى مواردها المحدودة مقارنةً بالتمويل الكلي للعلوم والتكنولوجيا والإبداع على المستوى الوطني، فإنه بمقدور المؤسسة رصد موارد استثماراتها من خلال الجهات المساهمة والمتبرعة وأداء دورها بكفاءة أكبر كمحفز لتحقيق أهدافها.

المحاور الاستراتيجية للخطة:

تشمل الخطة على أربعة محاور استراتيجية تعالج التنمية واحتياجات الموارد البشرية لمنظومة العلوم والتكنولوجيا والابداع في توزيع الموارد المتاحة من المؤسسة والجهات المعنية. كما تم التركيز على توزيع الموارد المتوفرة من المؤسسة سنويا لتحقيق افضل النتائج.

المحور الاستراتيجي الأول - نشر الثقافة العلمية:

الإسهام في تطوير ونشر وتعلم العلوم، ودعم الموهوبين والمتميزين والمساعدة في تطوير الثقافة العلمية والبيئة الممكنة لذلك في دولة الكويت

المحور الاستراتيجي الثاني - دعم البحوث العلمية:

دعم قدرات البحث العلمي في المؤسسات العلمية الوطنية وتعزيز التعاون والتكامل فيما بينها

المحور الاستراتيجي الثالث - الإبداع و الابتكار:

دعم الإبداع والمساعدة على تطوير الروابط اللازمة للتطبيقات التجارية في إطار منظومة للعلم والتكنولوجيا

المحور الاستراتيجي الرابع - الشركات و الابداع:

تحفيز تطوير القدرات العلمية والتكنولوجية للقطاع الخاص والمشاركة في بناء اقتصاد المعرفة

Introduction and Background

Kuwait Foundation for the Advancement of Sciences (KFAS) has a 37 year history of supporting the advancement of science and technology in Kuwait. In 1976, a visionary call by the late Amir of Kuwait, Sheikh Jaber Al- Ahmad Al-Jaber Al-Sabah, then Crown Prince and Prime Minister of Kuwait, was favourably embraced by the Chamber of Commerce and leaders of the economic sector in the country. It resulted in the establishment of the Kuwait Foundation for the Advancement of Sciences by an Amiri Decree on 12th December 1976; stating its mandate as a private non-profit organization devoted to supporting scientific research today. The Foundation's work is overseen by a Board of Directors, chaired by H.H. the Amir, Sheikh Sabah Al-Ahmad Al-Jaber Al-Sabah. It is financially supported by Kuwaiti private sector companies who have made generous contributions throughout the years, the contribution is currently set at 1% of their net annual profit.

One of the foremost goals of KFAS is to promote scientific development in the State of Kuwait by supporting scientific projects, the scientific community, and the country's scientific infrastructure.

While much has been accomplished by KFAS and related scientific institutions in Kuwait, there is much still to be sought after. The State of Kuwait has grown rapidly in terms of population and economy, the latter as a result of steadily increasing oil revenues. Today, the public sector accounts for more than 70% of the GDP and employs more than 85% of the national workforce. The consensus among the majority of stakeholders is that this growth is not structurally sustainable in the long run and that alternative national development strategies, based on building a complimentary, efficient and competitive private sector economy, are urgently needed.

Recognizing this need, H.H. the Amir of Kuwait, Sheikh Sabah Al-Ahmad Al Jaber Al-Sabah, commissioned in 2007 a "blue-ribbon panel"; the Kuwait Research Review Panel (KRRP), which was tasked to review the organization and the performance of Research and Development and make recommendations for restructuring and advancing Science, Technology and Innovation (STI) in Kuwait.

The panel presented a number of recommendations aimed at strengthening the overall STI system and culture throughout Kuwait, i.e. improving the capabilities and in some cases redirecting the activities of several STI institutions including KFAS, Kuwait University (KU), Kuwait Institute for Scientific Research (KISR), Public Authority for Applied Education and Training (PAAET), National Technology Enterprises Company (NTEC), and the Kuwait Science Club (KSC).

Recognizing its unique role within the national STI system in Kuwait and responding to the recommendations in the panel's report, KFAS conducted an extensive assessment of its historical performance by benchmarking itself against similar institutions in the region and on a global level. KFAS consulted with representatives from its key stakeholders and worked closely with recognized leading international and domestic experts in Research and Development (R&D), policy, and STI evaluation to support this assessment.

Based on the KRRP's recommendations and external assessment and findings in 2009, KFAS management embarked on developing a new strategic plan that would help meet the future needs of Kuwait's STI system. The preparatory steps were carefully designed.

The first step was the evaluation of current situation (status quo), followed by numerous steps like the determination of the basic requisites, identification of the targeted sectors, revision of vision and mission, defining the primary goals of the strategy and the expected results. An examination of the on-going and proposed programs and activities were then made.

Problem and solution trees for each program were carefully prepared and analysed, and the institutional requirements and arrangements to achieve the goals of the strategic plan were identified. The last step was to come up with a set of key performance indicators to measure the degree of success over the years at all levels.

KFAS Strategy (2012 – 2016)

The strategy is a result of intensive consultation through numerous meetings lead by the management team at KFAS and its centers. It reflects the latest thinking on the STI needs of Kuwait, the proper role of KFAS and its centers in meeting part of those needs, and a more systematic approach to formulating and selecting programs for KFAS funding.
KFAS programs in the strategy are directed towards contributing tangibly to the development of an effective STI system and culture in Kuwait.
In addition to supporting R&D capacity and activities in priority fields, such as water, energy, the environment, and the development and the dissemination of STI culture, the plan puts further emphasis on STI capacity building of the private sector and strengthening of innovation system.

Vision:

"An Effective Science, Technology and Innovation System and Culture, to which KFAS has contributed, that underpins the sustainable development of the State of Kuwait"

This vision statement reflects several important concepts based on the Foundation's past experience and current philosophy. It is nationally-focused and draws on valuable resources to successfully position Kuwait to compete in a knowledge-based economy in the future.

Mission:

Stimulate, support, and invest in initiatives and human resources that contribute to the building of a strong STI system and culture and fostering an enabling environment. The initiatives include improving public understanding of science; strengthening innovation and research capacity and enhancing the enabling cultural environment; supporting the gifted and talented; translating knowledge into innovation; and encouraging private technology capabilities.

This mission statement defines KFAS' role and ambitions driving the strategy outlined below. It primarily redefines KFAS as a funding institution. Given its modest annual resources, when compared to the overall STI funding by public institutions at the national level; KFAS will need to effectively leverage its targeted investments and efficiently execute its role as a catalyst to achieve its goals.

Strategic Thrust Areas

In developing the strategy, four thrust areas were identified. They address the development and human resource needs of the Science, Technology and Innovation System by leveraging the resources of KFAS and other stakeholders. Distribution of KFAS' available resources was given great consideration to ensure maximum impact.

Strategic Thrust 1 – Advocacy of Scientific Culture:

Contribute to the development of a strong advocacy for science including science education, support the gifted and talented, and to help advance scientific culture and the enabling environment in Kuwait

Strategic Thrust 2 – Scientific Research:

Enhance and integrate Research and Development capacity in and among Kuwaiti Scientific Institutions to address national development priorities

Strategic Thrust 3 – Innovation in Science and Technology:

Support innovation and assist in developing the required links to commercialization within a framework of an integrated Science, Technology and Innovation (STI) system

Strategic Thrust 4 – Innovation and Enterprise:

Supporting the development of the Private Sector's scientific and technological capacities and participate in building a knowledge economy

تأسست سنة ١٩٧٤

Est 1974

الجمعيـة الصيدليـة الكويتيـة

تتعـاون الجمعيـة مـع وزارة الصحـة وكليـة الصيدلـة بجامعـة الكويـت فـي المجـالات التاليـة :-

أ- إعـداد الدراسـات والبحـوث المتعلقـة بتطويـر الخدمـات الدوائيـة والمسـاهمة فـي إعـداد الخطـط والعمـل علـى إنجاحهـا.

ب- تقييم المؤهلات الصيدلانية ومستويات التخصص في فروع المهنة المختلفة.

ج- تنظيـم مزاولـة مختلـف المهـن الصيدلانيـة فـي القطاعيـن الحكومي و الأهلي والإشـراف علـى حسـن تطبيـق القوانيـن.

د- المسـاهمة فـي تنظيـم المؤتمـرات داخـل وخـارج دولـة الكويـت وورش العمـل التـي مـن شـأنها الارتقـاء بمهنـة الصيدلـة.

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