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Professor Fridtjof Nüsslin, Ph.D.; IOMP President

The President's Editorial

Professor Fridtjof Nüsslin, Ph.D.; IOMP President

"Cancer and Biomedical Physics"

At the start of the new term 2009 till 2012, I would first like to welcome all members of IOMP, the entire medical physics community - including those working together with medical physicists in hospitals, research institutions and industry. It is a great honour for me to serve IOMP as president. Together with the new team of Officers, Committee Chairs and Members we will do our best to move on with disseminating Medical Physics around the world. Secondly, I want to thank the previous team under the leadership of Barry Allen for their tremendous work. You all deserve the sincere gratitude of the entire organization.

Before outlining some perspectives for the new term let me briefly introduce myself:

Born in Germany, I studied physics, nuclear physics and medicine; trained in medical physics; became Professor of Medical Physics at the Medical School, Hannover, and shortly thereafter I was appointed Professor and Chair of the Section Medical Physics at the Tübingen University. Following the retirement I moved to the Technische Universität München, working there, as in most of my professional life, in radiation therapy physics but recently more and more expanding my activities to incorporate biology and

molecular imaging. As member of the research cluster 'Munich Advanced Photonics' I am currently focusing on laser technologies for medical imaging and ion beam therapy. For more than 20 years I have served different medical physics organizations such as DGMP, EFOMP and IOMP.

From the early beginning, when our profession's domain was just radiation measurement, dose computation and development of radiological instrumentation, Medical Physics was continuously expanding into all fields of medicine and cross linking with other sciences, especially with biomedical engineering and biomedical computing, resulting in the today's comprehensive armaments in health care.

About 8 million people died from cancer in the world during 2007. In the light of the recent cancer campaigns launched by several organizations, including UICC, IAEA and WHO, I feel challenged from the IOMP side to join in these initiatives by considering briefly the role of our profession in the fight against cancer.

Looking back at the time when I moved from my former Nuclear Physics world,

THE PRESIDENT'S EDITORIAL

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Secretary General's Report

Madan M. Rehani, Ph.D., Secretary-General, IOMP

Dear IOMP Colleagues,

I am very happy to communicate with you through this excellent medium of Medical Physics World that binds the medical physics community around the world. Despite the fact that the current day Internet has so much information on any subject one can dream of, focussed publications still have a major role to play. In that respect I have a feeling that Medical Physics World is getting the attention of large number of readers the world over. Thanks to the Editor and Publication Committee of IOMP for keeping the flag flying high.

As many of you already know I took over as your Secretary General only on 9th September 2009 during the World Congress on Medical Physics & Biomedical Engineering at Munich, Germany. My predecessor Peter Smith has done a wonderful job during 6 years of his tenure and I am very happy to say that he is very kindly and ably continuing to help me in the initial teething phase. I also wish to take this opportunity to thank all our medical physics colleagues for very smooth elections for electing a new team of officers, in particular Peter Smith for conducting the election and also Colin Orton and Gary Fullerton for taking on the responsibility of tellers in the election process.

What we are doing?

- Realising the need in many countries for policy statements, a working group under the leadership of Dr. K.Y. Cheung has recently finalised a policy statements on "Role and Responsibility of Medical Physicist". The statement is due for approval by the Council and will then be made available to all.
- The Task Group on International Certification Board chaired by Dr. Raymond Wu is working on professional certification of medical physicists.
- We are going to collect information on refusal of Visas to IOMP

members for participation in conferences. The information will be forwarded to International Council for Science (ICSU) for taking up matter with authorities.

- IOMP is working towards enhancing the cooperation with international organizations, notably WHO, IAEA and IRPA, and setting up formal agreements with them.
- The IOMP website is getting a face lift and the new web site is likely to be released in early 2010.
- IOMP has created an Industry Advisory Committee under the Chairmanship of the President to deal with industry.
- The 18th International Conference on Medical Physics will be held on 17-20 April, 2011 at Porto Alegre, Brazil.

Whatever one may do and achieve, there are always continuing challenges waiting for new team, and that is how nature has designed the world. I come from a generation that has lived and worked during a period when print media used to be the norm. However, during my lifetime I have seen a rapid transition to electronic media. With electronic media one faces the problem of plenty. Lots of information available on internet creates a situation of information pollution wherein people are looking for credible source of information. It is in this respect that international organizations have a big role to play. Sieving information from the sea of academic and other sources, putting in a palatable form for the specific audience and adding a sense of credibility is what international organizations are supposed to do. Many organizations get so bogged down with management of internal affairs that there is a wide gap with grass root. It is my wish to cater for the grass roots as much as we attend to the needs of the vertical structure in member countries.

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The President's Editorial

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investigating few-nucleon interaction phenomena, to a radiotherapy hospital as medical physicist doing dosimetry, treatment planning (manually computed hand-colored isodose plans for up to three patients a day) and QA of a single cobalt unit, throughout the next few decades I witnessed the implementation of phantastic inventions and paramount improvements aiming at a more efficient and less toxic cancer treatment. What a progress - ranging from the early cobalt era via giant leaps in dose computation, novel imaging technologies and ultimate equipment for treatment delivery, up to the futuristic tools of a laser generated carbon beam. A long chain of marvelous pearls coined with magic names as 3D-CRT, MLC, IBT, pRT, PET, MRI, IMAT, IGRT, IMRT, bART, LGK, MC, etc. mark the creativity of medical physicists and their genuine capability to cross over bridges to various disciplines and cooperate closely with other scientists in medicine, physics, engineering, informatics and computer science, biology and biochemistry. An impressive scenario; however two slightly diabolically phrased questions may be raised. If there is to be progress in cancer treatment, is it due to achievements of medical physics? and, second, if there is a future for medical physics, what are the future perspectives?

In industrial countries about 50% of all cancer patients are cured, half of them by surgery, the remainder by radiotherapy, either alone or combined with surgery or chemotherapy or both. A small minority of cancers such as lymphomas are cured by drugs alone (5%). In about 90% of all palliative treatments radiotherapy is involved. Wherever radiotherapy is applied in cancer treatment (more than 2/3), patients benefit from early cancer detection using innovative imaging methods, accurate dosimetry, individually optimized image based treatment planning, high precision treatment delivery techniques, methods of dose reduction outside the target volume, and not least all QA, safety and radiation protection measures. Sounds reasonable, but is it really more than good lobbying for Medical Physics, in particular when noticing the public perception of anticancer drug therapy as the far most important cancer treatment modality? As a matter of fact, it is the clinical evidence demonstrating the superiority of a given treatment, and in this respect advanced radiation therapy technologies are superior. Despite the enormous efforts in pharmaceutical research there is yet no data for a successful treatment of solid tumors (ca. 85% of all cancers) by drug delivery alone. On the contrary, there are data

from clinical trials (e.g. breast, uterus, prostate, lung, intestine, head & neck, sarcomas, skin) demonstrating enhanced survival rates, less toxicity and better quality of life when applying conformal irradiation techniques (e.g. IMRT) in comparison to conventional methods, let alone the much higher cost-effectiveness of any radiation treatment. A new fascinating field of research is rapidly growing - ion beam therapy - which is still in its infancy, and even more remote when based on laser generated particle sources. The laser sources are expected to mature to a less monstrous and more cost-effective design of a radiation treatment unit.

A similar impressive story, similar to the medical physics driven radiotherapy one, is the development of imaging technology such as CT, MRI and PET aiming at an ever earlier detection and hence more effective treatment of cancer. There are data demonstrating the shift from late to early cancers due to improved diagnostic methods, e.g. the 5-year survival rate of breast carcinoma patients has increased by 10% over a 10 year period. However, despite the huge progress in imaging technology, today one can still hardly detect a soft tissue tumor less than about 5 mm in diameter. However, new tools in early cancer detection, novel imaging methods, special sensors, lab-on-the-chip technologies etc. are required to have a chance of tumor eradication prior to metastasizing and hence to improve cancer cure rates significantly. Promising new frontiers in diagnostic instrumentation are phase contrast imaging with spatial resolution down to several hundred nanometers, or even less, when applying coherent light sources like lasers. Other horizons are high field MRI, highly sensitive optical imaging, e.g. Raman spectroscopic imaging with the option to simultaneously detect manifold biomarkers in-vivo, novel ultra high resolution microscopy methods, not to forget the various concepts of hybrid imagers.

So, my personal answer to the above two questions is simple: it is evident that medical physics has contributed enormously in combating cancer and is still facing new challenges to initiate further progress both in diagnostics, by creating more sensitive and high resolution detection methods, as well as in therapy by more extensively integrating imaging and treatment instrumentation and providing novel cost-effective radiation sources. Accordingly, the medical physicist from the cobalt era will benefit from a much wider horizon: he will be forced to interact significantly more with other professions from the life sciences; in particular he will more deeply dive into biology and bio-

chemistry to cope with the trend of closer entanglement of multi modality imaging and treatment instrumentation. Medical Physics will open up to Biomedical Physics (note this term is yet more and more used for designating current research and education programs as well as in university institutes worldwide).

Finally, what is the role of IOMP to foster this maturation process of our profession? Three aspects emphasized in the IOMP mission statement seem to me most important:

- (1) Advancing Medical Physics in science, i.e. to support any actions in promoting Medical Physics as a branch of Applied Physics. The IOMP Science Committee will develop appropriate initiatives. Furthermore, through the membership of our International Commission of Medical Physics (ICOMP), IOMP is linked to the International Union of Pure and Applied Physics (IUPAP) and the International Union of Pure and Applied Biophysics (IUPAB) which provides an attractive platform for a scientific dialogue.
- (2) Fostering the educational and professional development of medical physicists: the fast growing of new methods and equipment requires appropriate education and training. IOMP through its Education & Training Committee, as well as through its Professional Committee, aims to establish proper measures for harmonizing the great world wide imbalances in the availability of properly trained Medical Physicists to provide highest quality service for all patients.
- (3) Disseminating Medical Physics knowledge and expertise, particularly in the developing countries: to identify the needs and to take forward adequate actions in disseminating Medical Physics progress throughout the world. In particular, we will strengthen the already started initiatives in Africa and Latin America to establish appropriate structures for Medical Physics. Accordingly, key action of IOMP during the forthcoming term will be closer cooperation with the WHO and the IAEA.

In conclusion, with confidence in the future of Medical Physics, or after what has been said before, Biomedical Physics, and with great enthusiasm, I am pleased to embark on my journey as your president. Please share your views and ideas with me during the forthcoming term and provide me with your support on the way forward so can together advance our profession. ●

Spotlight on Radiobiology

Jolyon Hendry D.Sc., Member IOMP Science Committee

In the updated definition for a medical physicist provided by the IOMP¹, one of the functions of a medical physicist is: "Advising and consulting with physicians on the physical and radiobiological aspects of patients' treatments, and the development of treatment plans in such applications as use of ionising radiation in diagnosis, therapy, treatment planning with externally delivered radiation as well as use of internally implanted radioactive sources given the state of technology." There is the question of how wide-ranging and important are these radiobiological aspects?

In the area of radiation oncology, many medical physicists are involved in calculating modifications to standard radiotherapy schedules, using the linear-quadratic biomathematical model. This is based on radiobiological principles but uses parameter values derived from an increasing amount of clinical data². Examples are the recurring practical problems of the compensation for interruptions in radiotherapy treatments, where the compensations now have guidelines supported on a radiobiological basis, and the proposed greater use of hypofractionated treatments for the particular common cancers of breast, cervix

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¹ Medical Physics World, December 2008, page 21.

² Radiobiological modelling in radiation oncology. Editors: RE Dale, B Jones. Published by British Institute of Radiology, pages 1-392, 2007.

and prostate, especially in resource-limited situations. Also, many medical physicists and radiobiologists are working with particular techniques in preclinical studies that have become a well established feature of the development of new radiotherapy treatments. A few well known examples of these are the different forms of IMRT intended to reduce the amount of normal tissue irradiated so that the tumor dose can be escalated; the attempt to get PET assessments of radioresistant hypoxic regions of tumors usefully into treatment planning algorithms; the use of ion beams with beneficial Bragg peak characteristics to eradicate tumors at depth; and the improved targeting of radiation to tumor cells using radionuclides. Also, the whole expanding field of molecular imaging in radiation oncology requires radiobiological knowledge of the importance of the particular molecules being imaged, in the radiation response of the tissue or tumor.

In addition, medical physicists are often the radiation protection officers in their hospitals, and they are involved in the implementation of the new recommendations on dose limits from the International Commission on Radiological Protection (ICRP).

SPOTLIGHT ON RADIOLOGY (Continued on page 9)

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EDITOR'S CHOICE

E. Ishmael Parsai, Ph.D., MPW Editor

In the following paragraphs you will read a summary of some of the latest news and technological advancements in Medical Physics related areas. For any questions or comments, please contact the MPW editor, Dr. Parsai, at: e.parsai@utoledo.edu.

STEREOTACTIC RADIOTHERAPY OFFERS NONINVASIVE, EFFECTIVE TREATMENT FOR LUNG CANCER PATIENTS:

— Stereotactic body radiation therapy (SBRT) should be considered a new standard of care for early-stage lung cancer treatment in patients with co-existing medical problems, according to results from a national clinical trial...

At the 51st annual meeting of the American Society for Therapeutic Radiology and Oncology (ASTRO) recently held in Chicago, Dr. R. Timmerman, of radiation oncology at UT Southwestern and principal investigator of the Radiation Therapy Oncology Group (RTOG) 0236 study reported on 55 patients who were diagnosed with early stage non-small-cell lung (NSCL) cancer and were treated with SBRT during three noninvasive outpatient treatments. These patients were unable to have their tumors surgically removed because of unrelated medical morbidities were treated with SBRT during three noninvasive outpatient treatments.

The most recent findings, presented in ASTRO show that the primary lung cancer did not recur 98 percent of the time. Despite their extreme frailty, more than half of these patients -- 56 percent -- were alive three years after diagnosis, while less than 20 percent ultimately died of metastatic lung cancer.

"These findings have changed the standard of care for lung cancer in patients with serious medical problems like emphysema, heart disease and strokes," said Dr. Timmerman. SBRT delivers multiple

high-dose radiation beams to a tumor in a concentrated, extremely precise manner. Each of these beams is relatively weak and causes very little damage when traveling through the patient's body, but when all the beams converge at the target their cumulative effect delivers an extremely potent dose aimed at destroying the target cells with great precision.

"Despite the high potency of the treatment, less than 20 percent of these extremely frail patients experienced a serious health decline," said Dr. Timmerman, considered one of the top international experts on stereotactic radiotherapy.

Dr. Timmerman said the study results were better than researchers had expected and are similar to the risks for healthier patients who undergo radical surgery -- the standard treatment for early-stage NSCL cancer for the past century.

"The findings support the ongoing clinical research in healthier patients who currently undergo surgery for early-stage NSCL cancer," Dr. Timmerman said. "SBRT is fast, convenient and very effective."

Dr. Timmerman and his team, hoping to find out if the treatment indications might be expanded in a new trial, currently are conducting clinical studies using SBRT in healthier patients who would otherwise be candidates for surgery.

MOLECULAR BREAST IMAGING IDENTIFIES OCCULT CANCER

Breast-Specific Gamma Imaging (BSGI) is shown to be an effective method of identifying mammographically and clinically occult (hidden) breast cancer. BSGI is a molecular breast imaging technique that can see lesions independent of tissue density and discover very early stage cancers. According to findings presented at the annual meeting of the Radiological Society of North America (RSNA) in this study of women where breast cancer was already suspected via mammogram or physical exam, BSGI identified additional suspicious lesions in 29 percent of the patients and found a previously unsuspected cancer in 9 percent of women.

"BSGI is an emerging technology that goes beyond mammography as an effective imaging procedure for early breast cancer detection," said Dr. R. Brem, Director of Breast Imaging and Intervention at George Washington University Medical Center in Washington, D.C. In this study, a retrospective review was performed on the records of all patients who had BSGI examinations over a three-year period. Among these, 159 women who had only one suspicious or cancerous breast lesion on a physical exam and/or mammography,

underwent BSGI to evaluate additional cancerous lesions in the breasts, and were proven by pathology to have one or more areas of breast cancer.

BSGI detected an additional suspicious lesion, previously undetectable by mammogram and physical exam, in 46 women (29%). BSGI identified clinically and mammographically hidden cancer in 15 of 39 women who had a biopsy or prophylactic excision due to BSGI findings (36%) and in 15 women who underwent BSGI in this study (9%), including nine women in whom the hidden cancer was present in the same breast as the indicated lesion (6%) and six women in whom the undetectable cancer was found in the opposite breast (3%).

BSGI for the study was conducted using a Dilon 6800 Gamma Camera, a high-resolution, small field-of-view gamma camera, optimized to perform breast imaging. There are a number of articles published recently on new technologies for the early diagnosis of breast cancer and BSGI.

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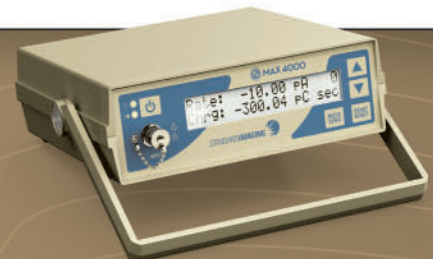
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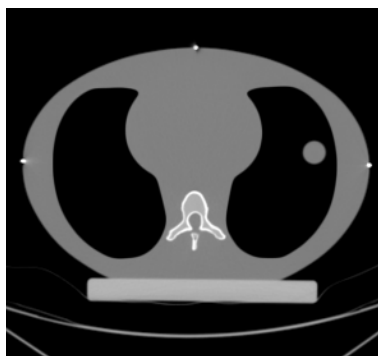
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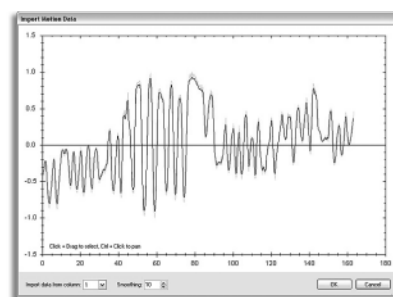
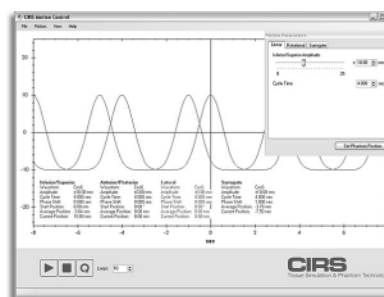
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Spotlight on Radiobiology

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These are underpinned by an increasing amount of epidemiological and radiobiological knowledge.

International organisations are involved in all these issues, more than is often recognised. A Handbook on Radiation Oncology Physics³, which includes a Chapter on Radiobiology, has been published by the International Atomic Energy Agency (IAEA), and a separate Handbook on Radiobiology is under production. Also there is a Distance Learning Course on the Applied Sciences of Oncology⁴. The 3000 screens cover 71 training modules on 8 topics, including 9 modules on radiobiology and 19 on physics and radiation technology. The International Commission on Radiation Units and Measurements (ICRU) and the IAEA have been involved in developing 'Dose prescribing, reporting and recording guidelines for particle beam therapies', namely for protons⁵ and now, in progress^{6,7}, also for carbon ions. These guidelines include the physics and radiobiology of such beams. For ion treatments, the radiobiology is crucial, because the biological effectiveness changes with dose per fraction and depth, and radiobiological models are used in the planning of the dose distributions and schedules for treatment.

Teaching and training activities in radiobiology appear to be expanding. Some regional radiation oncology organisations have developed international activities, particularly in radiobiology. The European Society for Therapeutic Radiology and Oncology (ESTRO) runs a radiobiology teaching course each year in a different country, and this is usually oversubscribed. 2007 marked an ESTRO radiobiology teaching course in Beijing which was its first outside Europe. The fourth edition of the textbook based on this course was published recently⁸. The American Society for Therapeutic Radiology and Oncology (ASTRO) has radiobiology teaching material on its website, and in 2007 it gave a course in radiobiology at the Association of Latin American Radiotherapy and Oncology (ALATRO) Congress in Montevideo, Uruguay. Also, the IAEA has organised and sponsored occasional regional courses in radiobiology. In Europe there is a Master's course in Radiation Biology, based in London but using a consortium of European institutes. Another Master's course in Radiation Biology will start this year⁹ in the recently-established Gray Institute for Radiation Oncology and Biology at the University of Oxford. From Clatterbridge UK, there is an annual course¹⁰ in 'Radiobiology and radiobiological modelling in radiotherapy', which has a strong emphasis on physics-related applications.

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¹¹ ICRP, 2008. 2007 Recommendations of the International Commission on Radiological Protection, Publication 103. Ann ICRP 37 Issues 2-4 pp 1-332.

¹² www.who.int/ionizing_radiation/pub_meet/ir_pubs/en/index.html

Radiation Protection activities are governed by many regulations and recommendations. Organisations like the International Commission on Radiological Protection (ICRP) and the US National Council on Radiation Protection and Measurements (NCRP) have put a lot of effort into reviewing and evaluating the biological basis to radiological protection practices. ICRP Committee 1 on Biological Effects considers the risk of induction of cancer and heritable disease ('stochastic effects') together with the underlying mechanisms of radiation action; also, the risks, severity, and mechanisms of induction of tissue/organ damage and developmental defects (called 'tissue reactions' or 'deterministic effects'). The 2007 ICRP Recommendations contain a substantial Annex¹¹ on 'Biological and epidemiological information on health risks attributable to ionising radiation: a summary of judgements for the purposes of radiological protection of humans'. Two of the future ICRP Task Group reports are 'The role of stem cells in radiation risk', and 'Tissue reactions and other non-cancer effects of radiation' which includes the controversial topic of the threshold dose for cardiovascular disease and for cataracts. Regarding the latter, the 2006 report on the 'Health effects from Chernobyl' published by WHO¹², included both medical and biological effects. It was largely the study of cataracts in the clean-up workers, supported by other recent studies, which prompted the re-evaluation of dose limits for the lens. Alongside these publications are those from the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR), which are authoritative reviews on particular topics including radiobiological aspects. Following the 2006 Report on 'Effects of ionising radiation', two biologically-orientated Annexes to appear shortly are 'Non-targeted and delayed effects of exposure to ionizing radiation' and 'Effects of ionizing radiation on the immune system'.

Many of the above topical issues were discussed at the World Congress on Medical Physics and Biomedical Engineering in Munich (WC 2009), Germany, in September 2009, within three of the Congress Themes, on 'Radiation oncology' (Theme 1), on 'Diagnostic imaging' (Theme 2) and on 'Protection and dosimetry, biological effects of ionizing and non-ionizing radiation' (Theme 3). Also, the IOMP Science Committee organized two joint Focus Sessions: an IOMP/ISR (International Society of Radiology) Session on 'Radiological risk communication' within Theme 2 and an IOMP/ICRP Session on 'The new ICRP recommendations' within Theme 3. In addition, the IOMP SC organized a Symposium on 'Medical physics research' and a Workshop jointly sponsored with the EFOMP on 'Nanotechnology in cancer therapy', both of these within Theme 13 - Special topics and Workshops. These sessions were highly interesting and stimulating, from the various physics, radiobiology and clinical points of view. ●

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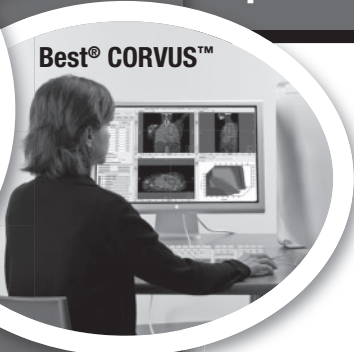
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Comparative Analysis of ^{60}Co Intensity-Modulated Radiation Therapy

Fox C, Romeijn HE, Lynch B, Men C, Aleman DM and Dempsey JF

Phys Med Biol. 2008 Jun 21;53(12):3175-88

In this study, we perform a scientific comparative analysis of using (60)Co beams in intensity modulated radiation therapy (IMRT). In particular, we evaluate the treatment plan quality obtained with (i) 6 MV, 18 MV and (60)Co IMRT; (ii) different numbers of static multileaf collimator (MLC) delivered (60)Co beams and (iii) a helical tomotherapy (60)Co beam geometry. We employ a convex fluence map optimization (FMO) model, which allows for the comparison of plan quality between different beam energies and configurations for a given case. A total of 25 clinical patient cases that each contain volumetric CT studies, primary and secondary delineated targets, and contoured structures were studied: 5 head-and-neck (H&N), 5 prostate, 5 central nervous system (CNS), 5 breast and 5 lung cases. The DICOM plan data were anonymized and exported to the University of Florida optimized radiation therapy (UFORT) treatment planning system. The FMO problem was solved for each case for 5-71 equidistant beams as well as a helical geometry for H&N, prostate, CNS and lung cases, and for 3-7 equidistant beams in the upper hemisphere for breast cases, all with 6 MV, 18 MV and (60)Co dose models. In all cases, 95% of the target volumes received at least the prescribed dose with clinical sparing criteria for critical organs being met for all structures that were not wholly or partially contained within the target volume. Improvements in critical organ sparing were found with an increasing number of equidistant (60)Co beams, yet were marginal above 9 beams for H&N, prostate, CNS and lung. Breast cases produced similar plans for 3-7 beams. A helical (60)Co beam geometry achieved similar plan quality as static plans with 11 equidistant (60)Co beams. Furthermore, 18 MV plans were initially found not to provide the same target coverage as 6 MV and (60)Co plans; however, adjusting the trade-offs in the optimization model allowed equivalent target coverage for 18 MV. For plans with comparable target coverage, critical structure sparing was best achieved with 6 MV beams followed closely by (60)Co beams, with 18 MV beams requiring significantly increased dose to critical structures. In this paper, we report in detail on a representative set of results from these experiments. The results of the investigation demonstrate the potential for IMRT radiotherapy employing commercially available (60)Co sources and a double-focused MLC. Increasing the number of equidistant beams beyond 9 was not observed to significantly improve target coverage or critical organ sparing and static plans were found to produce comparable plans to those obtained using a helical tomotherapy treatment delivery when optimized using the same well-tuned convex FMO model. While previous studies have shown that 18 MV plans are equivalent to 6 MV for prostate IMRT, we found that the 18 MV beams actually required more fluence to provide similar quality target coverage.

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An Independent Comment

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Krishnan Suthanthiran
krish@teambest.com

BIPM REPORT

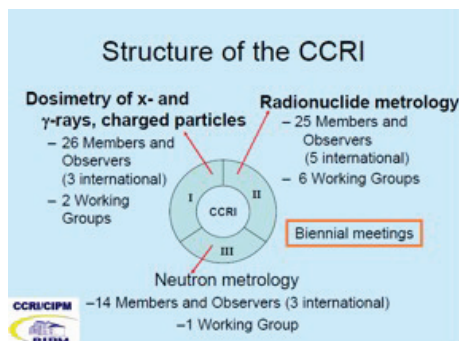
Cari Borrás, D. Sc.; Past Chair, IOMP Science Committee

The Consultative Committee for Ionizing Radiation of the International Bureau of Weights and Measures, celebrated its 50th Anniversary in Paris, France on June 19th, 2009.

Introduction: The International Bureau of Weights and Measures (BIPM) was set up by the Metre Convention and has its headquarters near Paris, France. Its mandate is to provide the basis for a single, coherent system of measurements throughout the world, traceable to the International System of Units (SI). The principal activities of the BIPM in the field of ionizing radiation are to maintain the international reference standards for dosimetry and activity measurements. These standards are used in the “BIPM key comparisons” and their development and improvement is a major part of the research and development program. The section also undertakes calibrations for national laboratories, and participates in international comparisons under the auspices of the Consultative Committee for Ionizing Radiation (CCRI). The CCRI was set up in 1958 under the name of Comité consultatif pour les étalons de mesure des rayonnements ionisants, CCEMRI. Its name was changed to CCRI by the International Committee for Weights and Measures (CIPM) in 1997.

Present CCRI activities concern matters related to the definitions of quantities and units, standards for x-ray, γ -ray, charged particle and neutron dosimetry, radioactivity measurement and the international reference system for radionuclides, and advice to the CIPM on matters related to ionizing radiation standards. The CCRI structure, taken from <http://www.bipm.org/utis/en/>

pdf/23report_ccri.pdf, is shown below:



The CCRI celebrated its 50 years of existence on June 19th, 2009 and held a meeting to report on current progress and future plans.

CCRI (I)

As the figure shows, Section I is in charge of dosimetry of x and gamma rays as well as of charged particles. It is chaired by Dr. P. Sharpe, from the National Physical Laboratory, in the United Kingdom, and it has three working groups, one on accelerator dosimetry, one on brachytherapy standards and a third one on key comparisons. Of interest was the announcement that all air-kerma standards will decrease by around 0.8 % and that an additional second correction (of up to 0.5 % at the lowest x-ray energies) is being considered to correct for the fact that the realization of air kerma for photon beams makes use of W , which is defined for electrons. Well advanced is the work at the BIPM on the graphite calorimeter absorbed-dose standard, which will be used for a series of bilateral comparisons in the high-energy x-ray beams, and the resolution of problems with the new standard for mammog-

raphy, with the first comparison planned for the end of 2009.

The proposal to purchase and install an electron accelerator at the BIPM was unanimously endorsed, as “a natural progression towards the goal of achieving worldwide traceability”, “keeping pace with changes in radiotherapy”. Dr. Penelope Allisy-Roberts, CCRI Executive Secretary, informed that a building plan now existed, and that the accelerator specification was in progress. Dr. Sharpe indicated that the accelerator would be clinically representative. This will facilitate working on current challenges such as small field dosimetry.

CCRI (II)

Section II is involved in radionuclide activity determination and dosimetry and is chaired by Dr. B.R.S. Simpson, from the National Metrology Institute of South Africa. It has five working groups: “High-efficiency photon detection systems”, “Extension of the international reference system for radionuclides (SIR) to beta-emitters using liquid scintillation”, “Realization of the Becquerel”, “Key comparisons”, “Transfer instrument” and “Uncertainties”. Changes to the Key Comparison Reference Values (KCRVs), mainly for radionuclides not currently in the database (KCDB), were presented and it was discussed whether to use for KCRV calculations weighted rather than unweighted means in order to deal better with the uncertainty created by outliers. Of particular interest was the report of the preliminary study using the travelling instrument (TI) with a $^{99\text{Tc}}$ m solution from the LNE-LNHB (France), which

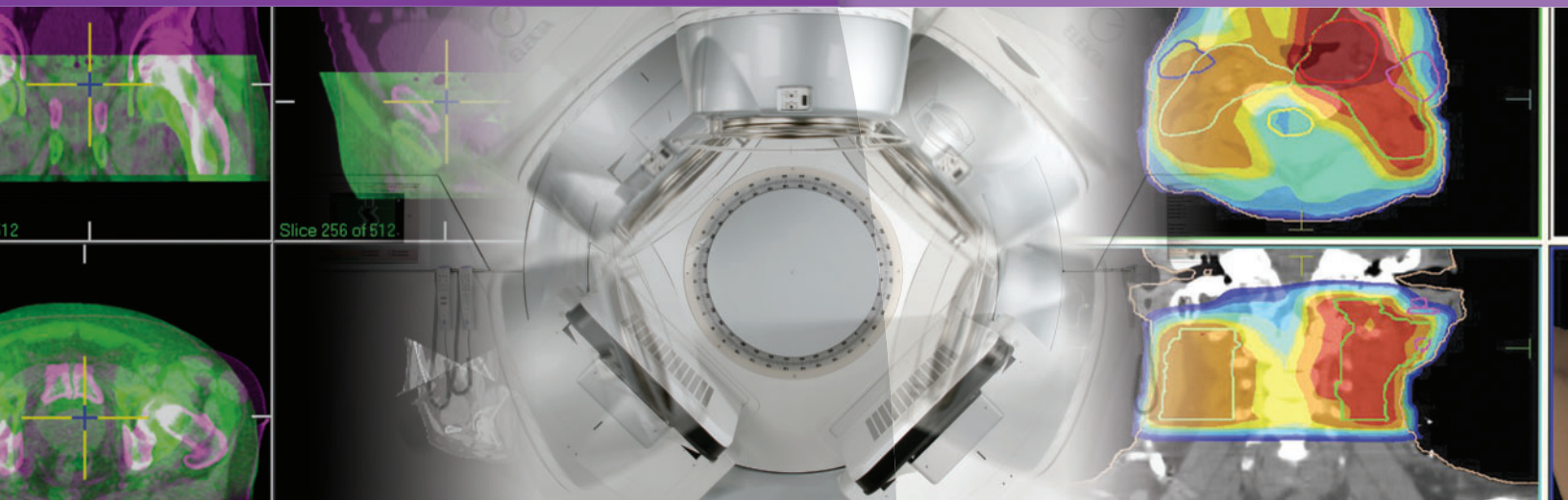
BIPM REPORT (Continued on page 15)

ANNOUNCEMENT — MPW IS GOING DIGITAL IN 2010

Dear Readers: The executive committee of the IOMP made a decision during the world congress meeting held in Munich last September, that from January of 2010, the MPW will be published only in digital format. You will have access to the new “eMPW” link through IOMP web page and will receive an email from your respected organization announcing the availability of the new edition online. In addition, as a renewed commitment to further expand resources in education of medical physicists, the new digital MPW will no longer reflect committee reports and organizational news and activities, as those information will be kept up-to-date on our web page at: www.iomp.org. Instead, we will make every effort to bring you relevant educational materials including review articles and other pertinent information aimed to make the new “eMPW” a resource for global education of medical physicists. ●

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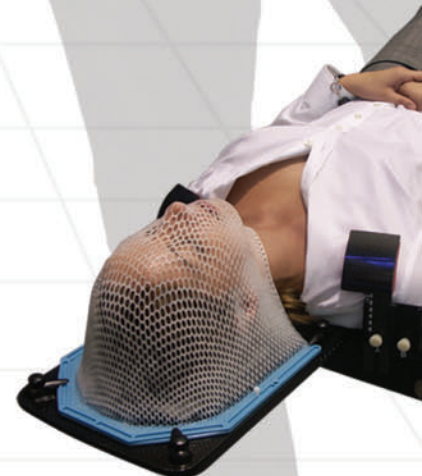
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Editor's Choice

CONTINUED FROM PAGE 6

HEAD AND NECK CANCER SURVIVORS WHO USE ALCOHOL AND CIGARETTES HAVE INCREASED DEATH RISK

— Cigarette smoking and alcohol consumption before head and neck cancer diagnosis strongly predicts the patient's future risk of death, according to a recent study published in December 2009 issue of the *Cancer Epidemiology, Biomarkers & Prevention*. Now, results of a new study show a similar effect among those who continued these habits after cancer diagnosis.

“Most cancer survivors are counseled to quit smoking; despite this, many still smoke. In our study, 21 percent continued to smoke even after their cancer diagnosis, increasing their risk of death,” said researcher S. T. Mayne, Ph.D. “Similarly, we found that continued drinking increases the risk of death.” Based on these findings, Mayne advises survivors of head and neck cancer -- which includes cancers of the oral cavity, pharynx and larynx -- to quit smoking cigarettes and drinking alcoholic beverages in order to increase their odds of longer survival. Mayne, a professor of epidemiology at the Yale Schools of Public Health and Medicine, and the associate director of the Yale Comprehensive Cancer Center is the lead author of this recent study published in *Cancer Epidemiology, Biomarkers & Prevention*, a journal of the American Association for Cancer Research. This issue has a special focus on tobacco.

Mayne and colleagues evaluated the habits of 264 recent survivors of early stage head and neck cancer before and after cancer diagnosis. They obtained detailed smoking and drinking histories through

in-person and telephone interviews. Patient recruitment was conducted at 49 hospitals in Connecticut and Florida. The purpose of this study was to evaluate if these habits affected the risk of dying in subsequent years. After more than four years of follow-up, 62 patients died.

Patients who continued to smoke were approximately two times as likely to die during the follow-up, as compared to those who did not smoke after diagnosis. Patients who continued to drink after diagnosis were approximately three times as likely to die during the follow-up, according to Mayne. “We expected to see an adverse effect of continued smoking; I was really not sure what we would find for continued drinking,” she said. “The data from our study indicated that continued drinking should be discouraged in head and neck cancer survivors. Patients need assistance with both tobacco and alcohol cessation.”

Yale researchers are conducting studies to determine the most effective ways to help head and neck cancer survivors stop smoking. One preliminary study will compare medications to help survivors quit, and will specifically focus on the effectiveness of varenicline (Chantix) compared with the nicotine patch. Some evidence has shown that varenicline may also help reduce alcohol consumption in patients. Given these findings, the researchers will monitor alcohol use and address potential methods to help patients quit.

EDITOR'S CHOICE (Continued on page 18)

BIPM REPORT

CONTINUED FROM PAGE 12

had showed great potential. Excellent results were obtained at the NPL (UK) and NIST (USA), in spite of some technical difficulties created by droplets remaining above the solution on the inner wall of the ampoule, which required modifications to the protocol. Although currently limited to ^{99m}Tc , the TI use might be expanded to other radionuclides, for example ^{18}F , so important in PET studies.

Program planning for the BIPM was discussed, including updates to the international reference system (SIR) and the extension to electron capture and pure beta emitters. High priorities for the new developments within the 2013–2016 program include extension of the travelling instrument to ^{18}F and other short-lived radionuclides; establishment of a new independent measurement method at the BIPM; construction of a becquerel chamber in collaboration with the IRMM (European Commission); and the expansion of the SIR to alpha emitters and low levels of activity.

CCRI (III)


Section III, chaired by Dr. D. Thomas, from the National Physical Laboratory in the United Kingdom, deals with neutron metrology, and it has a “Key Comparison Working Group”. Over the past twenty years most of the work has been related to radiation protection, yet no device has yet been developed that

measures the desired quantity to the required accuracy. The comparisons discussed during the meeting involved monoenergetic neutron fluences, neutron source emission rates, thermal neutron standards, and monoenergetic (24 keV) neutron fields. New areas of work include stray neutron fields around therapy linacs, PET machines, light ion therapy accelerators and synchrotron light sources.

Conclusions / Recommendations

The IOMP is one of the international organizations included as observer members in the three committees and as such, is given the opportunity to comment on the various committees' activities and is invited to attend their biennial meetings. Hans Svensson attended the CCRI (I) meeting in 2007 as Secretary of the IOMP Science Committee (SC) and Cari Borrás attended the CCRI (II) and the CCRI in June 2009 as Chair of the IOMP Science Committee at the time.

Medical physicists need to know about the scientific output of the BIPM through these Committees. From a scientific point of view, there is nothing more important in our work than measurement accuracy. The link to the BIPM publications, with its wealth of scientific and technical documentation, including the journal *Metrologia*, is: <http://www.bipm.org/en/publications/>. ●



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* Van Esch et al: "On-line quality assurance of rotational radiotherapy treatment delivery by means of a 2D ion chamber array and the Octavius phantom" *Med. Phys.* 34 (10), October 2007

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KNOWING WHAT RESPONSIBILITY MEANS

REPORT OF THE PROFESSIONAL RELATIONS COMMITTEE (PRC)

Mohammed K. Zaidi, Program Manager, IOMP Professional Relations Committee.

The meeting of the PRC was held on Monday, September 7, 2009 at 9:00-11:00 am, during the World Congress WC-2009 Munich, Germany. It was a wonderful scientific meeting.

Those who were present were:

KY Cheung, Chairman 2006-09, Hong Kong, China, Shanglian Bao, China, Maria-Ester Brandan, Mexico, Arun Chougule, India, Fridtjof Nuslin, Germany, Agnetta Peralta, Philippines, Madan Rehani, IAEA, and Raymond Wu, Chairman 2009-12, USA. Mohammed Zaidi, Secretary for PRC, was excused for his attendance at this meeting. Dr. Habib Zaidi was the vice-chair.

The meeting endorsed the minutes of PRC Meeting held in WC-2006

The meeting endorsed the Chairman's report on the activities of PRC in 2006-09.

Equipment Donation Programme- The Chairman reported on behalf of the Programme Manager (PM). The Chairman further indicated that IOMP had requested PRC to review the Programme with reference to the recommendation as specified in IOMP policy document "Review and Way Forward".

Donations for major medical equipment being shipped to developing country on need basis. IOMP provides some financial help – very limited to ship them. The donors of the used equipment can get tax-rebate in some cases in the USA.

Library Programme- Dr. Raymond Wu gave a report on behalf of the PM. Dr. Chenug indicated that IOMP EXCOM has requested

PRC to review the programme with reference to the recommendation as specified in IOMP policy document "Review and Way Forward".

The programme currently serves 42 developing nations through the maintenance of 75 active libraries. All active libraries receive a free copy of the SRP quarterly journals and some gets Medical Physics. PM had difficulty in communicating with these libraries: Argentina (Bariloche), Brazil (Sao Paolo), Ecuador (Quito), India (Betul, Bangalore, Srinagar), Pakistan (Lahore), Poland (Poznan), Turkey (Ankara, Istanbul), and Viet Nam (Hanoi). Please contact the PM.

Certification of Medical Physicist - Dr. Raymond Wu, Chairman of Task Group on Certification gave a report on the current status of the programme. He further reported that two meetings had been scheduled to discuss the issue during WC-2009. All PRC members present were invited to attend these meetings.

WC-2009 Travel Assistance Programme – IOMP provided funds to support travel of eight (8) medical physicists to attend WC-2009. 31 applications from 21 developing countries were received. The medical physicists selected to receive the travel awards were: William Rae (South Africa), Valerii Orel (Ukraine), Areesha Zaman (Pakistan), Hasin Anupama Azhari (Bangladesh), Jianrong Dai (China), Kanchan Adhikari (Nepal), Diana Adliene (Lithuania), and Arun Chougule (India). They need to send a short report about their experience to the Secretary, PRC.

the PRC suggestion to the Working Group on Policy Statement (Post-meeting note: The WG on Policy Statement No.1 had accepted the suggested change).

ILO classification of Medical Physicists - Professor Nuesslin reported that IOMP had for many years been working to have the medical physics recognized by the ILO as a profession and listed in the International Standard Classification of Occupations (ISCO). There had been many consultations by ILO and IOMP over the past few years on the issue. The latest development was that ILO had agreed to classify medical physics as a profession in ISCO. However, the classification would be made under Unit 2111 "Physicists and Astronomers" instead of under "Health Professionals". Nevertheless, IOMP had at least succeeded in getting medical physicists classified as professionals. IOMP would prepare guidance for its members once the ISCO document was released. A subject officer from ILO, Dr. David Hunter would be making a presentation at the Congress on classification of medical physicists and biomedical engineers as professionals. There was also a round table discussion session on the subject. Members were encouraged to attend these sessions.

New PRC Chairman - Dr. KY Cheung introduced the new Chairman Dr. Raymond Wu. Dr. Wu is also the Chairman for the AAPM International Affairs Committee. He is deeply involved with education and training programs for medical physicists. His email address is RayKWu@gmail.com.

Dr. Cheung thanked all members of PRC for their hard work and contributions in the past three years, particularly Dr. Mohammed Zaidi (zaidimk@gmail.com) of the Equipment Donation Programme and Dr. Allen Wilkinson (iompl@aapm.org) of the Library Programme.

PRC is thankful to Dr. Peter Smith and IOMP Secretariat for timely advice and help. PRC welcomes the newly elected officers – Dr. KY Cheung as Vice-president, Dr. Madan M. Rehani as Secretary-General and Dr. Slavik Tabakov as Treasurer. ●

IOMP Policy Statements - The Chairman briefed the meeting on the draft IOMP Policy Statement No. 1- Role and Responsibilities of Medical Physicists. Apart from a suggestion in removing the word "dosimetry" from the 7th bullet point in Section 3 of the main text, the meeting accepted the draft document. The Chairman would report

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ISBN: 978-1-4200-5979-3, \$129.95 / £78.99

Introduction to Physics in Modern Medicine
Second Edition
Suzanne Amador Kane
Catalog no. C9438, April 2009, 448 pp., Soft Cover
ISBN: 978-1-56488-943-4, \$59.95 / £38.99

Signal Processing in Magnetic Resonance Spectroscopy with Biomedical Applications
Dzavad Belkic and Karen Belkic
Catalog no. K10321, November 2009, c. 432 pp.
ISBN: 978-1-4398-0644-9, \$119.95 / £76.99

COMING SOON!

Calendar of Events

Carter Schroy, Ph.D., MPW Associate Editor

The following events can be found on the IOMP Calendar at <http://iomp.org/nextmeetings.htm> and on the Medical Physics Calendar at <http://medphys.org/calendar> which has links to other calendars. Please email your international events to the Calendar Editor, Carter Schroy, at eventsed@aol.com (or fax to +01 612.465.2600) for inclusion in MPW. Deadlines are April 1 and October 1 for issues that are mailed several weeks later. Most meetings are also posted on the Global Medical Physics Mailing List. Subscribe at <http://lists.wayne.edu/cgi-bin/wa?A0=MEDPHYS>

6-10 February 2010

Winter Institute of Medical Physics; Summit County, CO USA
<http://www.regonline.com/builder/site/Default.aspx?eventid=675242> ||
mkessler@umich.edu

9 February 2010

IPEM: Creative Counting in Nuclear Medicine; London, U.K.
<http://www.ipem.ac.uk/ipem%5Fpublic/article.asp?id=397&did=49&aid=3916&st=&oid=-1>

11-12 February 2010

ABS: Breast Brachytherapy and Brachytherapy Physics School; Amelia Island, FL USA
<http://www.americanbrachytherapy.org>
|| rguggolz@drohanmgmt.com

13-18 February 2010

SPIE Medical Imaging Conference; San Diego, CA USA
<http://spie.org/medical-imaging.xml>

4-8 March 2010

European Congress of Radiology; Vienna, Austria
<http://www.myESR.org>

8-12 March 2010

European Conference on Individual Monitoring of Ionizing Radiation; Athens, Greece
<http://www.gaec.gr/im2010> || im2010@gaec.gr

29 April - 1 May 2010

ABS: American Brachytherapy Society Annual Meeting; Atlanta, GA USA
<http://www.americanbrachytherapy.org>
|| rguggolz@drohanmgmt.com

20-22 May 2010

Austrian, Italian, Slovenian and Croatian Medical Physics Meeting; Ljubljana, Slovenia
<http://www.aiscmp2010.com>

3-6 June 2010

Society for Imaging Informatics in Medicine (SIIM) Annual Meeting; Minneapolis, MN USA
<http://www.siimweb.org> || siim2010@siimweb.org

12-16 June 2010

American Society for Photobiology; Providence RI USA
http://www.pol-us.net/ASP_Home/asp_meet.html || lhardwick@allenpress.com

16-18 June 2010

Int'l Workshop on Digital Mammography; Girona, Spain
<http://liwdm2010.org>

23-26 June 2010

CARS 2010 - Computer Assisted Radiology and Surgery; Geneva, Switzerland
<http://www.cars-int.org> || office@cars-int.org

18-22 July 2010

AAPM Annual Meeting; Philadelphia, PA USA
karen@aapm.org || <http://www.aapm.org/meetings/>

22-25 July 2010

AAPM Summer School; Philadelphia, PA USA
Teaching Medical Physics: Innovations in Learning
<http://aapm.org/meetings/>

Editor's Choice

CONTINUED FROM PAGE 15

The following has been compiled by: **Mohammed K. Zaidi**, Member, IOMP Professional Relations Committee.

A NEW VACCINE FOR CERVICAL CANCER:

The U.S. Food and Drug Administration (FDA) has approved a new vaccine, "CERVARIX", for use at their October 16, 2009 meeting. This medication was tested on a diverse population from 30 countries involving 30,000 girls/women before getting clinical acceptance and can be administered as standard immunization for girls 11-12 years old. Cervarix protects against two strains of Human Papilloma Virus (HPV) that causes cervical cancer while Gardasil protects against those two strains plus two other strains that cause genital warts. Gardasil was put on the market in late 2006. Merck and GlaxoSmithKline had been awarded rights to develop this vaccine to protect young ladies with cancer of cervix. Cervical cancer strikes nearly half a million women worldwide each year and kills nearly 300,000 and about 3700 in the USA. Virtually all cases are caused by infection with Human Papilloma Virus (HPV), which

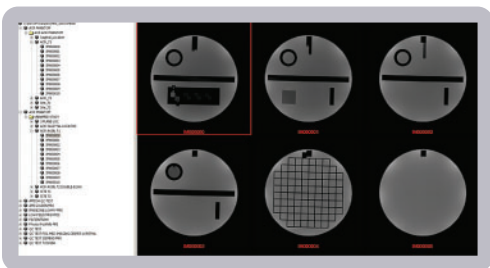
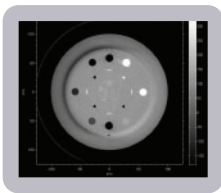
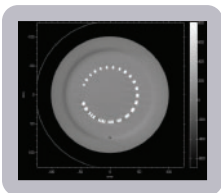
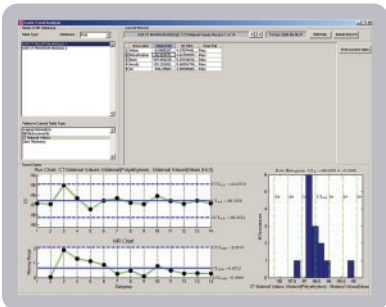
is spread through sex. This infection can interfere with normal cell growth creating abnormalities that eventually can be cervical cancer. It will be administered at a young age, 11-12 years, so that they are protected before they had any sex. The hepatitis B vaccine has dramatically reduced the number of infections that progress to liver cancer. It is also being researched to help cure genital warts in men and women and penile and anal cancers in men. Another research worked to show how the cells can destroy unwanted proteins; it will help scientists to develop new medicines for cancer and other diseases. It is reported that they will be able to manipulate the protein degradation system in two different ways – either to prevent it from destroying proteins that boost the immune system, or to get rid of proteins that help cause diseases [The Houston Chronicle, October 22, 2009, www.gsk.com/media/pressreleases/2009]. ●

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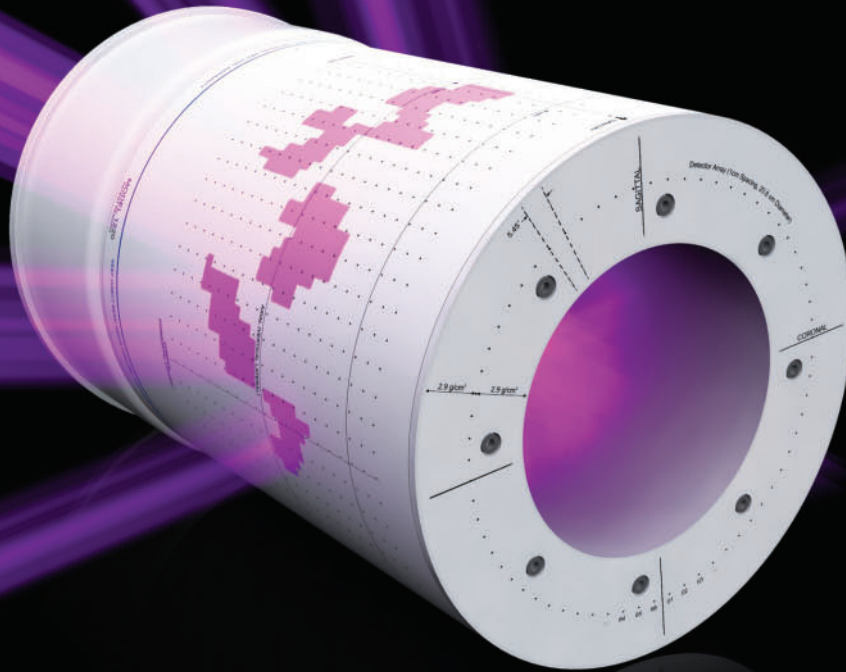
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