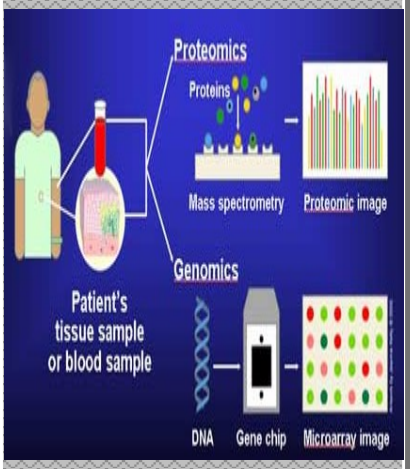

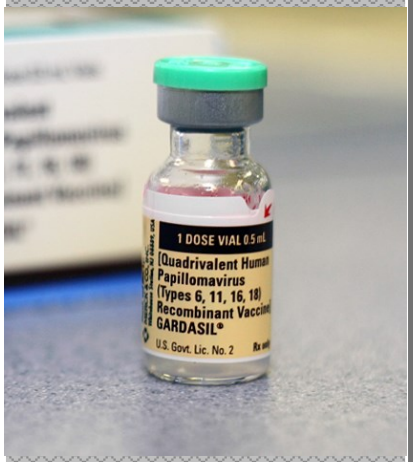

EMGEN Newsletter

Vol. 7, Issue 1

IN THIS ISSUE:

Eastern Mediterranean Health Genomics and Biotechnology Network (EMGEN) was created in 2004 with collaboration of representatives of selected centers of excellence in (health related) molecular biology, biotechnology & genomics in the Eastern Mediterranean region by recommendations and efforts of WHO/EMRO.

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THE STATUS OF HELTH BIOTECHNOLOGY INDUSTRY IN CHINA

1. Overview of Biotechnology Industry in China

History and Development Factors

Biotechnology industry in China started in 1984. Despite the rather late starting time (compared to western countries), China has gone from being one of the slowest to one of the fastest groing nations in the field of biotechnology. By 1997, the number of Chinese biotech companies was about 200. In 2000, the number of Chinese biotech companies expanded to 600. In 2005, China's biotechnology industry grew to 900 modern biotech companies. China's biotech industry registered sales totaling US$2.4 billion in 2000, compared with US$ 31 million in 1986.

The contributing factors of the rapid developments are China's rapid economic growth, people's higher income, and increasing awareness of and demand for biopharmaceutical products. Another important factor is the government support.

Since the seventh 5-year plan (1986-1990), the Chinese government has been implementing a series of programs to prioritize the development of biotechnology. The programs encouraged the R&D of new biotechnologies. Besides, the government invested money in setting up high-tech incubators, made favorable taxation policies for biotech companies, encouraged venture capital investment, etc. China’s Minister of Health has pledged to spend $11.8 billion to advance biotechnology industry from 2015 to 2020, as China looks forward to its 13th Five-Year Plan.

Health Care

With the reform of health care system in 2009 and people's rising awareness of disease treatment, more non-conservative treatment methods are used in clinical treatment, promoting the development of blood products. Currently, blood products frequently used in clinical treatment include over 20 types, belonging to such 3 sub-catalogues as human serum albumin, immunoglobulin and coagulation factors.

Nowadays generic drugs and antibody drugs are replacing the chemical drugs which have many side effects to cure the cancer patients. Among the current priorities, China’s State Food and Drug Administration (SFDA) has been focusing on biosimilar drugs, calling on scientists and entrepreneurs to actively participate in the process.

Vaccine

In vaccine production, China is dominant. State-owned CNBG (China National Biotech Group) has an 80 percent domestic market share in vaccines and is already the world's biggest vaccine producer. The demand of charged vaccine has increased dramatically with the rising consumption power and health awareness of people.

Genomics

It is the favorable amount of data and qualified staffs that contributes to the development of genomics in China. DNA sequencing is more about computer power and data mining than breakthroughs in laboratories. Given its population of 1.37bn people, the potential database in China is larger than anywhere else. It is also cheaper to gather and analyze information. Moreover, BGI -the Beijing Genomics Institute, founded in 1992 is one of the world's premier genome sequencing centers. It has about 2,000 members of staff with PhDs, perhaps the largest concentration of any company in China.

Authorities in the Filed

The main leading industry body is the China National Center for Biotechnology Development. The CNCBD is an organization established on November 3, 1983 under the Ministry of Science and Technology with the approval of the State Council.

a. Organizations:

Chinese Academy of Agricultural Sciences (CAAS)

Chinese Academy of Medical Sciences (CAMS)

Chinese Academy of Forestry (CAF)

Chinese Academy of Sciences (CAS)

National Natural Science Foundation of China (NSFC)

China Association for Science and Technology (CAST)

b. Ministries

Ministry of Science and Technology (MOST)

Ministry of Health (MOH)

Ministry of Agriculture (MOA)

Ministry of Education (MOE)

c. Agencies

State Food and Drug Administration (SDA)

State Environment Protection Administration (SEPA)

State Intellectual Property Office (SIPO)

National Natural Science Foundation of China (NSFC)

China Science and Technology Exchange Center (CSTEC)

2. The Status of Pharmaceutical Industry in China

Overview of Pharmaceutical Industry in China

The pharmaceutical industry is one of the leading industries in China, including synthetic chemicals and drugs, prepared Chinese medicines, medical devices, apparatus and instruments, hygiene materials, packing materials, and pharmaceutical machinery.

The ranking of Chinese pharmaceutical market globally has been going up from 2003 to 2013, from 10th to 5th to 3th.

Market for Products

The pharmaceutical market in China is dominated by its non-branded generic products. As shown in Figure 1, the market sales volume of generic prescription drugs takes up more than 70% of the total volume from 2005 to 2014. Domestic companies are mainly government owned and are often faced with the problem overproduction and losses. The Chinese government has begun consolidating and upgrading the industry in an effort to compete with foreign corporations.

Why Over the Counter drugs account for more than 38% (see Figure 2)

1) The popularity of type of medicine for prevention in Chinese people

2) Cultural tendency to self-medicate for small health complaints

Note: Most of OTC sales are led by: cough, cold, other respiratory remedies, vitamins, minerals, nutritional supplements and pain relievers.

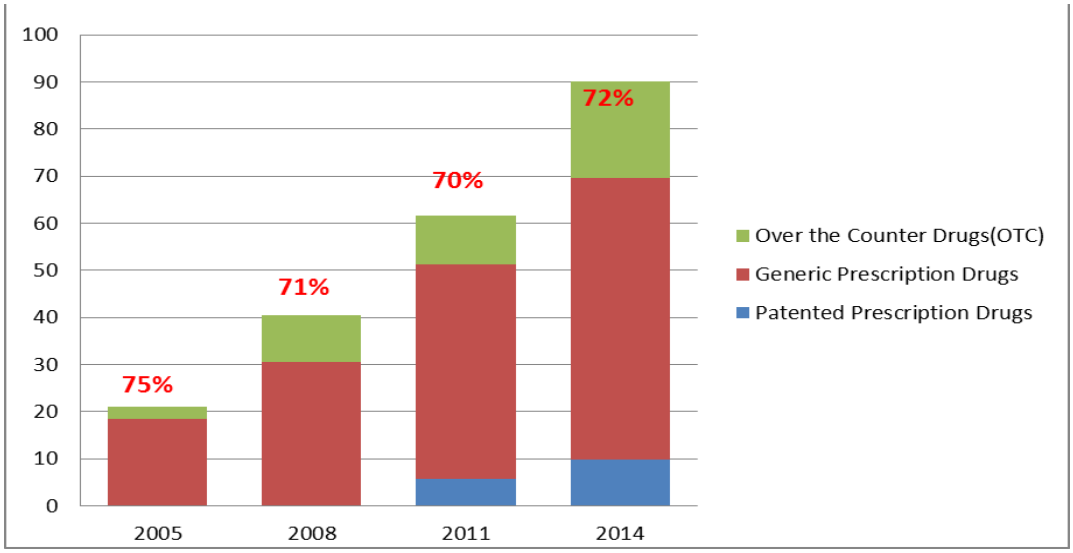

Figure 1. The pharmaceutical market in China and market sales volume (USD Billion).

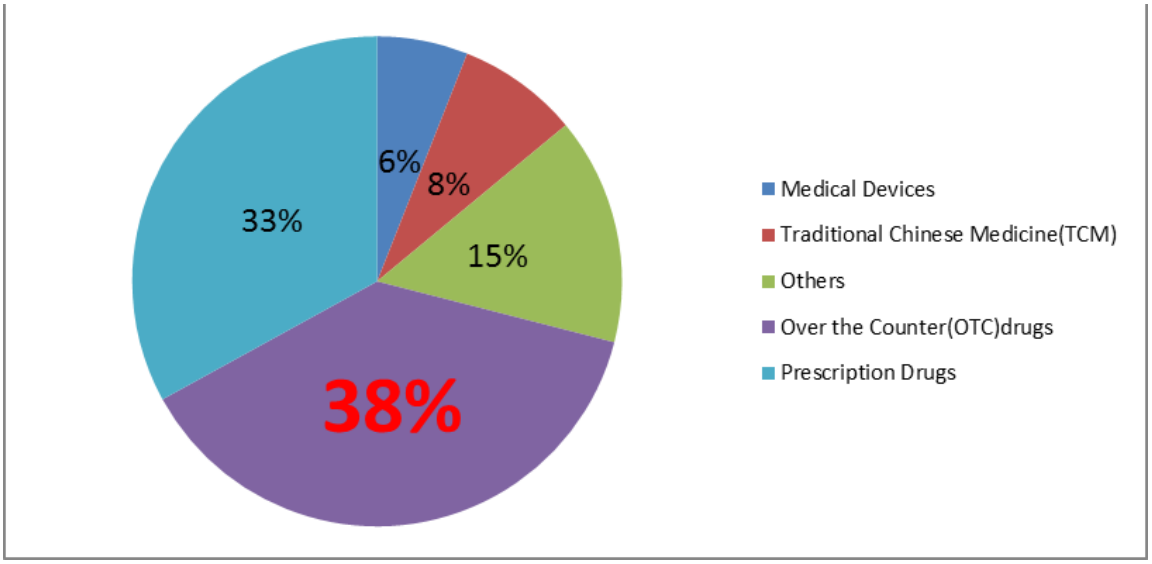

Figure 2. The pharmaceutical market segment in China.

Distribution of Biotechnology and Pharmaceutical Industry

During the "Thirteenth Five Year" period (2016-2010), China's biotechnology and pharmaceutical industry was more clustered in the east coastal region and the Beijing, and a few cities in the Northwest region. All the regions have their own roles to play.

Beijing and Shanghai: R&D Hub

As the center of highly qualified scientific research institution and the abundant talent resources in the field, Beijing is the hub for the nation's research and development, information and technological services.

Shanghai possesses a multiplicity of multinational biotech and pharmaceutical companies and international financial institutions, thus, becoming the perfect land for investment and marketing.

Jiangsu and Shandong Provinces: Manufacturing Base

Up to now, biotech and pharmaceutical companies China are mainly small and media-sized. But Jiangsu and Shandong are the main manufacturing base in the next 5 years due to their solid industrial infrastructure and the gathering of giant monopolies in the industry. For instance, there are 17 Jiangsu-based companies in the list of China's Fortune 100 pharmaceutical companies. And it is going to form a "China Medical City"-Taizhou centered development pattern, with surrounding cities like Nanjing, Suzhou developing at different paces.

Shandong province will put its emphasize on 5 key areas, namely genetic engineering pharmaceuticals, fermentation engineering pharmaceuticals, biochemical pharmaceuticals, new diagnostic reagent and marine pharmaceuticals. The province's development in the field is heavily relying on domestically famous big pharmaceutical companies such as Lunan Pharmaceutical and Xinhua Pharmaceutical.

Shenzhen and Wuhan: Rapid Developing Base

Due to the establishment of China National Genebank, local government support and the new internet-based technology, Shenzhen is developing rapidly into the R&D center of gene engineering and bioinformatics.

The central government plans to build Wuhan as a national biotechnology industry base. It plans to bring into Wuhan the World Fortune 500 and National Fortune 5, outsourcing pharmaceuticals from Europe and the US and international programs. So far, the number of signed contract reaches 76 with 10.2 bn RMB capital investment. Currently, 38 programs are underway. It is estimated that by 2020, there will be around 700 biotechnology companies in Wuhan.

Shanxi, Fujian and Gansu Provinces: Emerging hotspots

Shanxi is the most ideal place for fermentation of biotech products due to its abundant resources and cool weather.

Fujian province is going to focus on developing genetic engineering pharmaceuticals in Xiamen Haicang biotech & pharmaceutical zone.

Gansu province is going to develop its own way with ethnic characteristics, that is, traditional Chinese medicine and modern Tibetan medicine. The leading institutions and companies include Lanzhou Institute of Biological Products Co., Ltd.

3. The Status of Biotechnology and Pharmaceutical Industry in Asia

In general, Asia is the hub of global biotechnology and pharmaceutical industry following North America and Europe. Recently, Asian countries have been drawing benefits from increases in venture capital and public research funding, as well as in initial public offerings (IPOs). According to Tech in Asia, the total value of biotechnology venture capital funding during the first quarter of 2016 increased to $174 million from $150 million in the fourth quarter of 2015 and $9.4 million in the first quarter of 2015. Besides, in the 2016 edition of Thomson Reuters' annual "State of Innovation" report, four of the top ten global generators of patents for bio-

technology inventions in 2015 come from Asia. Moreover, three of the four are Chinese institutions.

Top 8 Asia Biopharma Clusters	
2016	2015
China	China
Japan	Japan
India	India
South Korea	South Korea
Taiwan	Taiwan
Australia	Australia
Singapore	Malaysia
Malaysia	Singapore

Table 1. Top 8 Asia Biopharma Clusters

According to five criteria, namely Public R&D Spending, Patents, Initial Public Offerings, Number of Companies and Jobs, GEN issued 2015 and 2016 editions of its annual Asia biotechnology and pharmaceutical cluster ranking (see Table 1).

Singapore

Singapore's biotechnology industry might lack in numbers, but its strength lies in activity. More than 30 corporate giants have developed R&D sites and/or Asian regional headquarters in the city-state. In April, 2016, Nestlé stated its intention of expanding its activity in the country by establishing a Nestlé Research Centre Asia at Biopolis. In 2016 (until May, 2016), Singapore ranks sixth in IPOs with $126 million, sixth in patents (same as in 2015, according to WIPO), as well as seventh in R&D ($8.686 billion in 2013, according to OECD), compared to eighth in 2015, and eighth in companies (95 in 2012). As the data updated in 2012, Singapore ranks in seventh in jobs.

Malaysia

Since 2005, Malaysia has put great emphasis on biotechnology with the launching of National Biotechnology Policy. In 2015, the country stepped into the third phase of National Biotechnology Policy, focusing on strengthening the global business of Malaysian biotechs by 2020. Till April, 2016, Malaysia remains seventh in jobs (25,397), moving ambitiously toward the goal of growing its biotech workforce to 170,000 jobs by 2020. In 2015, Malaysia ranked seventh in the number of companies. However, the country places lower in R&D spending (ninth with$1.192 billion) and patents-eighth. As for IPOs, since 2015, the country has seen a single biotech IPO, Bioalpha Holdings, which raised $5 million in 2015.

Taiwan

Taiwan will launch its BioEconomy Plan in 2016, aiming at growing the bioindustry to NT$3 trillion (US$92.1 billion) by 2020. The Plan will take the place of the National Research Program for Biopharmaceuticals, created "to develop new therapeutics for disease prevention, diagnosis, and treatment" through increased commercialization and a network of incubators. As a result, in 2016, Taiwan ranks highest in companies (third) with 850. Since 2015, Taiwan is also third in IPOs owing to the $316 million raised by a company, API/ injection drug manufacturer Pharmally International Holding. Besides, Taiwan ranks from sixth in R&D spending in 2015 to fifth in 2016. It is also fifth in jobs (37,340 in 2014, consisting of 18,340 biotech and 19,000 pharmaceutical jobs). Moreover, Taiwan has remained seventh in patents for two years-2015 and 2016.

South Korea

In April, 2016, the President of South Korea Park Geun-hye got recommendations from the Presidential Advisory Council on Science & Technology that the government needs to support more than 100 biotech startups and to create an R&D center, financial incentives, and programs to help businesses expand overseas. The reason for the business focus is due to South Korea's lower rankings in number of companies (fourth with approximately 600 in 2014), IPOs (fifth with $201.88 million raised by 12 companies), and jobs (sixth with 35,596 in 2014). South Korea develops better in R&D spending (third with $72.267 billion in 2014, according to OECD) and especially patents which ranked fourth with 18, 620 in 2015.

India

At the end of 2015, India unveiled a five-year National Biotechnology Development Strategy, aiming at developing the biotechnology and pharmaceutical industry into a $100 billion one by 2025. The strategy focuses on healthcare, food/nutrition, clean energy, and education. The strategy also aims to create a Technology Development and Translation network to include 5 new clusters, 40 incubators, 150 tech transfer offices, and 20 "bio-connect" centers to promote academia-industry partnerships. India is also going to nurture new businesses through the "Startup India" program launched in January, 2016.

In 2016, India is second in IPOs ($451 million raised by six companies), ranking two places higher than 2015. India places also second in companies (3,000 pharma companies, according to the Pharmaceutical Export Promotion Council and India Brand Equity Foundation); third in patents; and fourth in R&D ($48,063 billion in 2011, according to UNESCO).

Japan

Since 2015, Japan's biotechs raised the third highest amount of capital through IPOs ($263.2 million).For the last two years, Japan has been Asia's number one country in biotechnology and pharmaceutical patents, and second in R&D ($166.861 billion in 2014, $160.247 billion in 2013, according to OECD). However, Japan ranks lower in companies (third with more than 1100 in 2011, including 538 biotechs). Besides, Japan ranks second to China in jobs (figures in recent years have increased wildly from 210,000, to about 878,000).

China

China is Asia's biotech leader, surpassing other nations in R&D spending ($336.495 billion in 2013, according to OECD), number of companies (7,500 in 2013), and jobs (250,000 in 2013, according to Kelly Services). China is rapidly making progress in patents (third with 30,627 in 2016 and fourth in 2015). In 2015, China possessed IPO leadership with $1.936 billion raised by 14 companies while in 2016, China follows Japan in IPO leadership with $2.747.5 billion raised by 18 companies.

China will see more development in the industry during the new 13th Five-Year Plan for 2016 to 2020.

Note

- Tech in Asia: A media, events and jobs platform for Asia's tech communities.
- Thomson Reuter: A major multinational mass media and information firm .

- GEN: Genetic Engineering & Biotechnology News (GEN) has been the leading biotech publication since its launch in 1981. GEN publishes 21 editions annually and has an additional exclusive editorial content online.
- Biopolis: Singapore's biomedical research hub, focused on healthy aging.
- WIPO: World Intellectual Property Organization is one of the 17 specialized agencies of the United Nations. It was created in 1967 to" encourage creative activity, to promote the protection of intellectual property through the world."
- OECD: The Organization for Economic Co-operation and Development (OECD) is an intergovernmental economic organization founded in 1961 to stimulate economic progress and world trade.
- OECD: The Organization for Economic Co-operation and Development (OECD) is an intergovernmental economic organization founded in 1961 to stimulate economic progress and world trade.
- Pharmaceutical Export Promotion Council of India is the authorized agency of the government of India for the purpose of promoting pharmaceutical exports from India.
- India Brand Equity Foundation:
- UNESCO: The United Nations Educational, Scientific and Cultural Organization is a specialized agency of the United Nations aiming at promoting international collaborations in five major programs: education, natural sciences, social/human sciences, culture and communication/information.
- OECD: The Organization for Economic Co-operation and Development (OECD) is an intergovernmental economic organization founded in 1961 to stimulate economic progress and world trade.
- Kelley Services: An American temporary staffing agency offering temporary staffing services, outsourcing, Vendor on-site and full-time placement.

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IBM WATSON COLLABORATES WITH HOSPITALS IN CHINA TO FIGHT CANCER

IBM Watson, with the collaboration of its Beijing-based partner, Hangzhou CognitiveCare will work with 21 hospitals in China to adopt its "Watson for Oncology" artificial intelligence system to improve the diagnosis and treatment of cancer in China. Cancer is number one cause for death and the number of cancer cases is still increasing. With joint efforts, cancer care will hopefully be personalized and professionalized.

IBM Watson Group: IBM Watson is a technology platform that uses natural language processing and machine learning to reveal insights from large amounts of unstructured data.

Hangzhou Cognitive Network Tech Co., Ltd., established in January 2016, is the operation service provider designated for IBM Watson for Oncology in China. The goal is to bring cognitive computing to fight against cancer in China including support for sales, service and customer. Hangzhou CognitiveCare is localizing the language for more Chinese doctors can participate. It is also working with local hospitals and medical research institutes to bring artificial intelligence innovation to the medical field.

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BIG DATA IN HEALTHCARE IN CHINA

China's big data healthcare initiative was announced in June, 2016, aiming at creating industrial scale medical services by 2020. The big data platform is set to collect individual's health conditions, medical service, disease control and prevention, food safety and healthcare, covering an individual's whole life cycle.

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EMGEN AND THE UNITED INSTITUTE OF INFORMATICS PROBLEMS OF NATIONAL ACADEMY OF SCIENCES (BELARUS) SIGNED A MEMORANDUM OF UNDERSTANDING (MOU) TO BROADEN COOPERATION IN THE SCIENCE.

In the" International Exhibition of Inotex" in Iran Dr. Soroush Sardari director of EMGEN and institute's deputy Prof Alexander Tuzikov agreed to sign a MoU around scientific cooperation.

According to the documents, this MoU would strengthen the bonds of friendship and understanding between two parties and it desires to develop the scientific capabilities in the fields of information technologies.

http://uiip.bas-net.by/eng/

http://www.emhgbn.net

ANNALS OF MICROBIOLOGY

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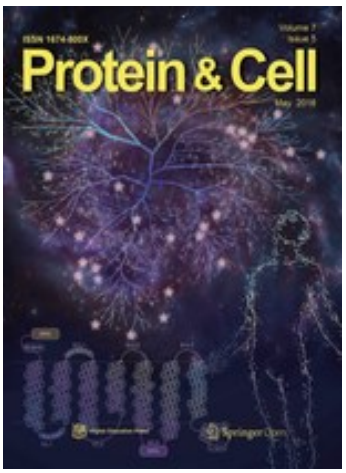

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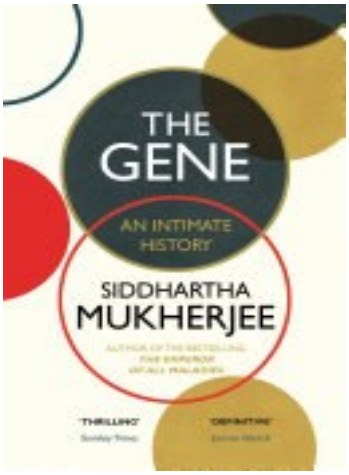


Author: Siddhartha Mukherjee

Publisher: Random House, 2016

ISBN: 144818116X, 9781448181162

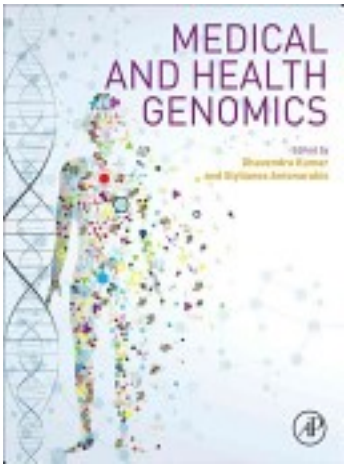
CYBERGENETICS: HEALTH GENETICS AND NEW MEDIA

Authors: Anna Harris, Anna Harris, (Me, Susan Kelly, Sally Wyatt

Publisher: Routledge, 2016

ISBN: 1317368185, 9781317368182

MEDICAL AND HEALTH GENOMICS

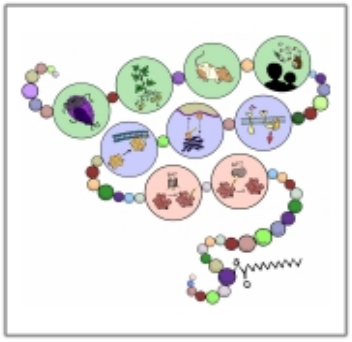


Editor: Stylianos Antonarakis

Publisher: Elsevier Science & Technology Books, 2016

ISBN: 0124201962, 9780124201965

Announcements



Protein S-palmitoylation: from Mechanism to Application
21—23 September 2016
St Hilda's College, Oxford, UK

https://www.biochemistry.org/Events/tabid/379/Page/1/MeetingNo/SA185/view/Conference/Default.aspx

Inflammatory diseases - mechanisms and clinical perspectives
3—4 November 2016
Maynooth University, Ireland

A Biochemical Society Focused Meeting

Abstract deadline: 5 September 2016

Early bird registration deadline: 5 September 2016

https://www.biochemistry.org/Events/tabid/379/MeetingNo/SA189/view/Conference/Default.aspx

9th UK Gap Junction Conference
Warwick 2016
12th December

9th UK GAP Junction Meeting
12 December 2016
University of Warwick, UK

A Biochemical Society Focused Meeting

Abstract deadline: 7 October 2016

https://www.biochemistry.org/Events/tabid/379/MeetingNo/SA190/view/Conference/Default.aspx

MOLECULAR DIAGNOSTICS

Molecular diagnostics is a collection of techniques applied to diagnose and monitor disease, find risks, and decide the best therapies for patients individually. With the method of molecular biology in medical testing, an individual's genetic mode and how the cells express genes into proteins can be analyzed. These medical tests can be used in many medical conditions, such as infectious disease, oncology, human leukocyte antigen -typing, coagulation and pharmacogenomics.

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THE EPIDEMIC OF EBOLA VIRUS DISEASE

From 2013 to 2015, the Ebola virus disease spread widely in West African Countries. With the first outbreak in Guinea in December 2013, the epidemic spread to Liberia and Sierra Leone and elsewhere. It has caused significant morality. According to the World Health Organization, there were a total of 28,657 suspected cases and 11,325 deaths. In 2016, though the epidemic is under control, flare-ups of the disease are likely to stagger on for some time. Though in April 2016, the flare-up in Sierra Leone has been declared over, and new flare-ups reported in Liberia are also over, the WHO warns that small outbreaks may still occur.

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HPV Vaccines in China

Human papilloma virus (HPV) vaccines are vaccines that can prevent infection by certain types of human papillomavirus. They may prevent 70% of cervical cancer, 80% of anal cancer, 60% of vaginal cancer, 40% of vulvar cancer and so on. In addition, they prevent some genital warts with the vaccines against 4 and 9 HPV types. HPV vaccines were used for the first time in 2006. On July 18, 2016, with the permission of CFDA (China Food and Drug Administration) Cervarix finally stepped into market in China, which is said to bring blessings for women who suffer cervical cancer. Therefore, the market scale is said to be promising.

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