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Editorial

Fifty Years of Witnessing Biomedical Science Developments

On the occasion of the 50th anniversary of the Iranian Journal of Medical Sciences (IJMS), a review on the major progresses in biomedical sciences in the past fifty years could remind the journey that have revolutionized the disease diagnosis and treatment during which IJMS have been served as a companion to the scientific community.

Much of the accomplishments in biomedicine in the last 50 years, is in fact based on the success of Watson and Crick in solving the double helix structure of deoxyribonucleic acid (DNA) more than half a century ago. About twenty years later, in 1972, Paul Berg created the first recombinant DNA molecule via combining genes from two different organisms, taking advantage of the restriction enzyme discovery in 1970. Later, in 1978, Werner Arber, Daniel Nathans, and Hamilton O. Smith jointly received the Nobel Prize in Physiology or Medicine for discovering restriction enzymes and their application to problems of molecular genetics. In 1972, Godfrey Hounsfield, a British engineer, and Allan Cormack, a South Africa-born physicist working in the US, independently invented Computed Tomography (CT) scan diagnostic machine and technique, which brought them the Nobel prize for Physiology or Medicine in 1979. Small pox eradication in1977, could be named as one of the most outstanding achievements in medical history, which was accomplished through vaccination. In 1977, Frederick Sanger and Walter Gilbert, who separately worked on developing rapid methods for DNA sequencing, won half of the 1980 Nobel prize in Chemistry. The first clinical whole-body magnetic-resonance imaging (MRI) scan was also performed in 1980. Two years later, the teams of Robert Weinberg, Michael Wigler, and Mariano Barbacid reported the first human oncogenes and proved that tumors are the result of mutations in the genome.

Polymerase chain reaction (PCR), the well-known and indispensable technique in many diagnostic and research molecular labs, which enables amplification of billions of copies of desired genomic DNA segments in a short period of time, was invented by Kary Mullis in 1985, who was awarded the Nobel Prize in Chemistry in 1993.

The human genome project, which was begun in 1988 and finished in 2003, manifests the collaboration of scientists from 20 institutions in six countries, including France, Germany, Japan, China, the UK, and the USA.

In 1990, a science fiction came into reality when William French Anderson was allowed by the US National Institute of Health to perform the first clinical trial of gene therapy on a patient with a severe immune system deficiency genetic disease.[1] Dolly, the first famous and cloned female sheep, was created by Ian Wilmut and colleagues in 1996. Notably, the photo of Dolly was posted on the cover of the TIME magazine on 10 March, 1997. In 1998, Craig Mello and Andrew Fire, succeeded to discover RNA interference (RNAi), a mechanism for the intentional gene silencing.[2] Mello and Fire won the Nobel Prize in Physiology or Medicine in 2006.

The rollercoaster of biological science advancements has accelerated in the recent ten years. In 2010, Craig Venter and colleagues created the first synthetic bacterial cell, named *Mycoplasma mycoides* JCVI-syn1.0, which was constituted from chemically synthesized 1.08–mega–base pairs.[3] In 2012, clustered regularly interspaced short palindromic repeats (CRISPR)-Cas 9 technology was developed by Jennifer A. Doudna and Emmanuelle Charpentier, who won the Nobel Prize in Chemistry recently. This technology could be employed as a precise scissor for large-scale editing of the genome, expanding the possibilities in genetic engineering.

Harnessing the power of the immune system to fight cancer goes back to Coly's studies in 1989; however, James Allison is known as the father of novel cancer immunotherapy. He showed that an antibody against CTLA-4 erased tumors in mice.[4] He won the Nobel Prize in Physiology or Medicine in 2018 for the discovery of anti-CTLA-4 and anti-PD-1.

Despite all these achievements, the race never stops. The emergence of SARS-COV-2 in 2019 and the unavoidable challenge with COVID-19, is a clear example of such urgencies for the scientific society. This crowned virus with a linear RNA[5] has had a logarithmic growth, disrupted the global order, and conquered the globe in a very short time shaping a new world. With no cure after more than one year, the number of victims increases day by day.[6] Would the breakthroughs in biomedical sciences help scientists to win the struggle with this tiny virus? How this battle will end is still hidden in the future.

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