Personalized Medicine

Part I: Technologies & Applications

by

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Professor K. K. Jain is a neurologist/neurosurgeon with specialist qualifications including Fellowships of the Royal Colleges of Surgeons in Australia and Canada. He has trained, practised and held academic positions in several countries including Switzerland, India, Iran, Germany, Canada and USA. After retirement from neurosurgery, Prof. Jain remains a consultant in neurology. He is also working in the biotechnology/biopharmaceuticals industry and is a Fellow of the Faculty of Pharmaceutical Medicine of the Royal College of Physicians of UK. Currently, he is the CEO of Jain PharmaBiotech.

Prof. Jain's 492 publications include 35 books (6 as editor + 29 as author) and 50 special reports, which have covered important areas in biotechnology, gene therapy and biopharmaceuticals. Books relevant to biotechnology and pharmaceuticals include "Role of Nanobiotechnology in Molecular Diagnostics" (2006), "Handbook of Nanomedicine" (Humana/Springer 2008; Chinese edition, Peking University Press 2011, 2nd ed Springer 2012, 3rd ed 2017), "Textbook of Personalized Medicine (Springer 2009; Japanese ed 2012; 2nd ed Springer 2015, 3rd ed 2021), "Handbook of Biomarkers" (Springer 2010; Chinese edition by Chemical Industry Press 2016, 2nd edition Springer 2017), "Handbook of Neuroprotection" (Springer 2011, 2nd ed 2019), "Drug-induced Neurological Disorders", 4th ed, Springer 2021),"Applications of Biotechnology in Cardiovascular Therapeutics" (Springer 2011), "Applications of Biotechnology in Neurology" (Springer 2013), and "Applications of Biotechnology in Oncology" (Springer 2014). He has edited "Drug Delivery Systems", 2nd ed (Springer 2014, 3rd edn 2019) and "Applied Neurogenomics" (Springer 2015). Currently, he is writing "The Handbook of Alzheimer Disease" to be published by Springer in 2022.

Prof. Jain has been interested in using biotechnology to develop personalized medicine since 1997. He has also lectured and conducted several workshops on personalized medicine worldwide during the past 2 decades. Most recently, he was Visiting Professor of Personalized Medicine at Almaty Medical University in Kazakhstan in 2018. During a period of 2 weeks, he delivered 30 lectures to cover important areas of personalized medicine for physicians and students. A transcript of lectures in Russian was published as a book "Essentials of Personalized Medicine" (LITERRA Publishing House, Moscow, 2019).

ABOUT THIS REPORT

Prof. Jain wrote the first report on Personalized Medicine in 1998, which was published by. Decision Resources Inc. This was the first recorded use of the term "personalized medicine" in medical literature. The second edition was published in 2001 by Informa Publications, London. Since 2003, the report is published and continuously updated and rewritten at Jain PharmaBiotech.

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Abbreviations

ACE	angiotensin-converting enzyme
ADME	Adsorption, Distribution, Metabolism, Excretion
ADR	adverse drug reaction
BRCA1	breast cancer susceptibility gene 1
CE	capillary electrophoresis
CF	cystic fibrosis
CML	chronic myeloid leukemia
CRADA	Cooperative Research & Development Agreement
CYP	cytochrome P
DARPA	Defense Advanced Research Projects Agency
DHPLC	denaturing high performance liquid chromatography
DNA	deoxyribonucleic acid
DR	dopamine receptor
dsDNA	double-stranded DNA
eNOS	endothelial nitric oxide synthase
EPOE	apolipoprotein E
HER	electronic health records
FDA	Food and Drug Administration (USA)
FISH	fluorescent in situ hybridization
GFP	green fluorescent protein
HCV	hepatitis C virus
HER-2	human epidermal growth factor receptor-2
HIV	human immunodeficiency virus
IL	interleukin
JAK	Janus kinase
MAb	monoclonal antibody
MALDI-TOF	Matrix Assisted Laser Desorption Ionization Time of Flight
MDR	multidrug resistance protein
MHC	major histocompatibility complex
MRI	magnetic resonance imaging
mRNA	messenger RNA
MS	mass spectrometry