

# **Sequencing**

## **Part II: Markets & Companies**

by

**Prof. K. K. Jain  
MD, FRACS, FFPM  
Jain PharmaBiotech  
Basel, Switzerland**

**November 2021**

**A Jain PharmaBiotech Report**

## AUTHOR'S BIOGRAPHY

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, practiced, 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, biomarkers: proteomics, molecular diagnostics, nanobiotechnology, and personalized medicine. Contributions to MedLink, an accredited continuing education program for neurologists, include 172 articles out of a total of 1250 articles by 450 authors. These articles are updated on a yearly basis. Prof. Jain's earlier books were the first in the areas covered: "Handbook of Laser Neurosurgery" (Charles C. Thomas, Springfield, Ill, 1983) and "Textbook of Hyperbaric Medicine" (1st ed in 1990 and 6th ed by Springer, 2017). His "Textbook of Gene Therapy" was translated into Chinese in 2000. Recent books include "Handbook of Nanomedicine" (Springer 2008, Chinese edition by Peking University Press 2011, 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 ed, Chemical Industry Press 2016, 2nd ed 2017), "Drug-induced Neurological Disorders", 4th ed (Springer 2021), "Handbook of Neuroprotection" (Springer 2011, 2nd ed 2019), "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 also edited 3 editions of "Drug Delivery System" (Springer 2008, 20012 and 2020) and "Applied Neurogenomics" (Springer 2015). Lectures on personalized medicine given at Kazakh National Medical University, Kazakhstan were translated into Russian and published as a book "Essentials of Personalized Medicine" (LITERRA Publishing House, Moscow, 2019). Currently, he is writing "The Handbook of Alzheimer Disease" to be published by Springer in 2022.

## ABOUT THIS REPORT

This report will cover sequencing technologies, equipment, reagents, markets and companies involved in this area. It is an extension of the report on Molecular Diagnostics, which has been in continuous publication since 1995. New advances and applications of sequencing have justified the issuance of a separate report on the topic.

**November 2021**  
**Copyright © 2021 by**

**Jain PharmaBiotech**  
**Bläsiring 7**  
**CH-4057 Basel**  
**Switzerland**

**Tel & Fax:** +4161-6924461  
**Email:** [info@pharmabiotech.ch](mailto:info@pharmabiotech.ch)  
**Web site:** <http://pharmabiotech.ch/>

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, or otherwise without the prior written permission of the Publisher. This report may not be lent, resold or otherwise traded in any manner without the consent of the Publisher. While all reasonable steps have been taken to ensure the accuracy of the information presented, the Publisher cannot accept responsibility for inadvertent errors or omissions.

# TABLE OF CONTENTS

<b>13. Markets for Sequencing .....</b>	<b>7</b>
<b>Introduction .....</b>	<b>7</b>
<b>Methods used for estimation of sequencer markets.....</b>	<b>7</b>
<b>Currently marketed sequencers .....</b>	<b>7</b>
<b>Academic and research markets for sequencing .....</b>	<b>8</b>
<b>Factors affecting future development of sequencing markets.....</b>	<b>8</b>
Future needs and support of research.....	8
Bioinformatics in relation to sequencing .....	9
Cost of integrating WGS into clinical care .....	9
Reducing the cost of human genome sequencing .....	9
<i>US Government-supported research on sequencing.....</i>	<i>10</i>
<i>Contribution of American Recovery and Reinvestment Act.....</i>	<i>10</i>
Cost of NGS .....	11
<i>Genome X Prize Foundation.....</i>	<i>11</i>
<i>Innovations to reduce cost of whole genome sequencing .....</i>	<i>11</i>
<i>Commercial aspects of low-cost genome sequencing .....</i>	<i>12</i>
<i>NGS for personalized medicine .....</i>	<i>12</i>
<b>Global sequencing markets.....</b>	<b>12</b>
Global markets for sequencers.....	13
Markets for sequencing services according to geographical regions .....	13
Global sequencing markets according to applications.....	14
Global sequencing markets according to therapeutic areas .....	14
<i>NGS markets for cancer.....</i>	<i>14</i>
<i>NGS markets for genetic disorders .....</i>	<i>14</i>
<i>NGS markets for microbiome.....</i>	<i>15</i>
<b>Market trends for NGS .....</b>	<b>15</b>
Needs of the clinical market for NGS .....	15
Sequencers for the clinical market .....	16
<b>Challenges to developing market for sequencers.....</b>	<b>16</b>
<b>Recommendations .....</b>	<b>17</b>
<b>14. Companies Involved in Sequencing .....</b>	<b>19</b>
<b>Introduction .....</b>	<b>19</b>
<b>Top ten players in sequencing .....</b>	<b>23</b>
<b>Profiles of companies involved in sequencing.....</b>	<b>24</b>
<b>Collaborations.....</b>	<b>204</b>
<b>15. References.....</b>	<b>211</b>

## Tables

Table 13-1: Marketed next generation sequencers .....	7
Table 13-2: De novo sequencing vs resequencing markets.....	8
Table 13-3: Global markets for sequencers from 2020 to 2030.....	13
Table 13-4: Global markets for sequencing services according to geographical regions.....	13
Table 13-5: Global markets for sequencing services according to applications .....	14
Table 13-6: Sequencing markets according to therapeutic areas from 2020 to 2030 .....	14
Table 14-1: Companies developing sequencing technologies and instruments .....	19
Table 14-2: Companies that provide sequencing services.....	20
Table 14-3: Companies that provide bioinformatics support for sequencing.....	22
Table 14-4: Top ten companies in sequencing .....	23
Table 14-5: Selected collaborations for DNA sequencing.....	204

## Figures

Figure 13-1: Cost of sequencing per genome from 2001 to 2020 .....	10
--	----