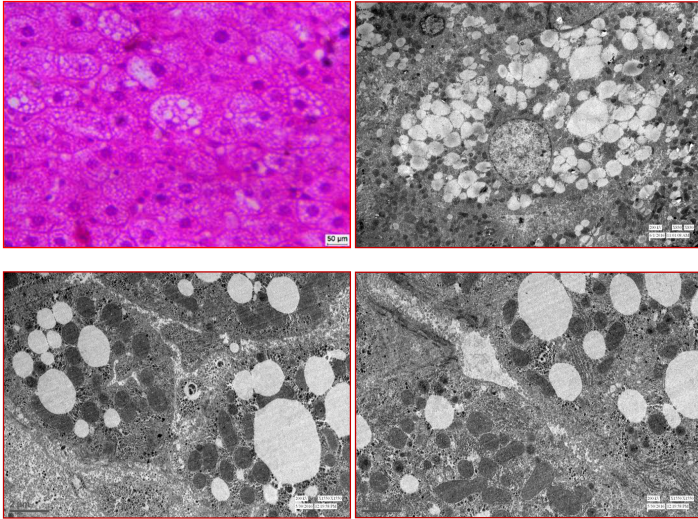


A Handbook on Hepatotoxicity



CHIEF EDITOR
Dr. Monika Bhadauria

EDITORS
Satendra Kumar Nirala • Sadhana Shrivastava
Arvind Kumar Shakya • Neetu Sharma

A Handbook on Hepatotoxicity

Editors: Monika Bhadauria • Satendra Kumar Nirala
Sadhana Shrivastava • Arvind Kumar Shakya • Neetu
Sharma

Published by:

Poddar Publication

Tara Nagar, Chittupur, BHU

Varanasi - 221005

Ph: 0542-2366370, Mob. 09415390515

Email: poddarfoundation@gmail.com

© Editors

Second Edition : **2024**

Price: Rs. 900/-

ISBN: 978-93-84817-00-8

Composing by:

Kumar Graphic

Delhi-110032

Printer:

Kumar Graphic

Shahadra, Delhi-110032

Contents

Chapters

	Page no
1. An Introduction to Toxicology <i>Satendra Kumar Nirala and Monika Bhadauria</i>	25
2. Biochemical and Physiological Pattern of Hepatotoxicity <i>Monika Bhadauria and Satendra Kumar Nirala</i>	36
3. Histological Pattern of Hepatotoxicity <i>Monika Bhadauria and Satendra Kumar Nirala</i>	51
4. Xenobiotic metabolism and Hepatotoxicity <i>Divya Bisht, Arvind Kumar Shakya and Monika Bhadauria</i>	70
5. Antioxidant Defence Mechanism against Hepatotoxicity <i>Divya Bisht, Satendra Kumar Nirala and Arvind Kumar Shakya</i>	86
6. Acetaminophen induced Hepatotoxicity <i>Monika Sharma, Chandra Kant Sharma, Neetu Sharma, Arvind Kumar Shakya, Sadhana Shrivastava and Monika Bhadauria</i>	99
7. Acrylamide induced Hepatotoxicity <i>Piyush Shukla and Satendra Kumar Nirala</i>	111
8. Aflatoxin induced Hepatotoxicity <i>Shamli S Gupte, Sadhana Shrivastava and Monika Bhadauria</i>	125
9. Aspartame induced Hepatotoxicity <i>Lipika Dash and Gita Mishra</i>	148

10. Carbon tetrachloride induced Hepatotoxicity <i>Neetu Sharma, Banita Dhatwalia, Monika Sharma, Monika Bhadauria and Sadhana Shrivastava</i>	158
11. Cyclophosphamide induced Hepatotoxicity <i>Ankita Mukherjee, Asim Amitabh Sahu, Satendra Kumar Nirala and Monika Bhadauria</i>	171
12. Diethylnitrosamine induced Hepatotoxicity and Hepatocarcinogenesis <i>Shubham Singh and Monika Bhadauria</i>	180
13. D-galactosamine induced Hepatotoxicity <i>Samrat Rakshit</i>	190
14. Ethambutol induced Hepatotoxicity <i>Amita Jaswal, Sadhana Shrivastava and Monika Bhadauria</i>	200
15. Ethanol induced Hepatotoxicity <i>Hemeshwer Kumar Chandra</i>	208
16. Heavy Metal induced Hepatotoxicity: Cadmium <i>Shahid Yousuf Ganie, Darakhshan Javaid, Syed Sanobar Qadri, Satendra Kumar Nirala and Mohd Salim Reshi</i>	226
17. Heavy Metal induced Hepatotoxicity: Lead <i>Samta Sharma, Shubham Singh, Satendra Kumar Nirala and Sadhana Shrivastava</i>	244
18. Heavy Metal induced Hepatotoxicity: Mercury <i>Pratima Dutta, Pavitra Behra, Piyush Shukla, Narottam Das Agrawal, Mohd Salim Reshi and Satendra Kumar Nirala</i>	261
19. High Fat Diet induced Hepatotoxicity	

	<i>Hemeshwer Kumar Chandra, Gita Mishra, Nisha Sahu, Arvind Kumar Shakya, Piyush Shukla, Satendra Kumar Nirala and Monika Bhadauria</i>	273
20.	Isoniazid induced Hepatotoxicity <i>Nisha Sahu, Gita Mishra, Javid Ahmad Malik, Hemeshwer Kumar Chandra, Amita Jaswal and Monika Bhadauria</i>	295
21.	Lipopolysaccharide induced Hepatotoxicity <i>Samrat Rakshit and Satendra Kumar Nirala</i>	304
22.	Light Metal induced Hepatotoxicity: Aluminum <i>Pavitra Behra, Gita Mishra, Narottam Das Agrawal, Pratime Dutta, Satendra Kumar Nirala and Monika Bhadauria</i>	318
23.	Light Metal induced Hepatotoxicity: Beryllium <i>Narottam Das Agrawal, Anjani Verma, Komal Singh Suman, Pavitra Behra, Pratime Dutta and Satendra Kumar Nirala</i>	329
24.	α -Naphthylisothiocyanate induced Hepatotoxicity <i>Asim Amitabh Sahu, Ankita Mukherjee, Shubham Singh and Monika Bhadauria</i>	348
25.	Polycyclic aromatic hydrocarbon induced Hepatotoxicity <i>Nisha Sahu</i>	365
26.	Pyrazinamide induced Hepatotoxicity <i>Gita Mishra, Nisha Sahu, Javid Ahmad Malik, Hemeshwer Kumar Chandra, Satendra Kumar Nirala and Monika Bhadauria</i>	373
27.	Rifampicin induced Hepatotoxicity <i>Gita Mishra</i>	381

28. Silica induced Hepatotoxicity
*Shruti Saxena, Satendra Kumar Nirala and Sadhana
Srivastava* 388
29. Thioacetamide induced Hepatotoxicity
*Shubham Singh, Asim Amitabh Sahu, Ankita Mukherjee, Pavitra
Behra, Satendra Kumar Nirala and Monika Bhadauria* 402
30. Vanadium induced Hepatotoxicity
Sadhana Shrivastava and Satendra Kumar Nirala 414

Chapter 22

Light metal induced Hepatotoxicity:

Aluminium

**Pavitra Behra¹, Gita Mishra², Narottam Das Agrawal³,
Pratima Dutta⁴, Satendra Kumar Nirala⁴ and
Monika Bhadauria^{1*}**

¹Toxicology and Pharmacology Laboratory, Department of Zoology, Guru Ghasidas Vishwavidyalaya Bilaspur 495009 (C.G.) India

²Department of Zoology, Guru Ghasidas Vishwavidyalaya Bilaspur 495009 (C.G.) India

³Department of Biochemistry, Government Medical College, Jaulan 285001 (U.P.) India

⁴Laboratory of Natural Products, Department of Rural Technology and Social Development, Guru Ghasidas Vishwavidyalaya, Bilaspur 495009 (C.G.) India

*Corresponding author

Metals in the earth crust are distributed in the environment naturally by geologic and biologic cycles (Mohammadirad and Abdollahi, 2011). They can be classified into heavy and light metals. The metal which has a relatively high density and toxic at low quantity is referred as 'heavy metal' e.g. Arsenic (As), Lead (Pb), Cadmium (Cd), Chromium (Cr), Titanium (Ti) etc. But the 'lighter metals' e.g. beryllium and aluminium can also be toxic in certain circumstances (Govind and Madhuri, 2014). Some metals are essential for plant and animal growth and development e.g., Iron (Fe), Zinc (Zn), Copper (Cu), Manganese (Mn), Calcium (Ca), Sodium (Na), Potassium (K) and Magnesium (Mg). However, if present in excessive concentrations they become toxic. Metals undergo an array of biogeochemical processes at