

ISSN-0971-720X (Print) • ISSN-0973-1283 (Electronic)

Volume 19 / Number 1 / January-June 2019

# Medico-Legal Update

An International Journal



[www.medicolegalupdate.org](http://www.medicolegalupdate.org)

# Medico-Legal Update

Editor-in Chief

**Prof. (Dr) R K Sharma**

Former Head, Department of Forensic Medicine & Toxicology  
All-India Institute of Medical Sciences, New Delhi-110029  
E-mail: medicolegalupdate@gmail.com

## ASSOCIATE EDITOR

1. **S.K. Dhatarwal** (*Professor*)  
Forensic Medicine, PGIMS, Rohtak, Haryana
2. **Dr. Adarsh Kumar** (*Additional Professor*)  
Forensic Medicine, AIIMS, New Delhi
3. **Dr. Vijaynath V** (*Associate Professor*)  
Forensic Medicine, Vinayaka Mission Medical college, Tamil Nadu
4. **Ms. Roma Khan**, Forensic Sciences, INSAAF Mumbai
5. **Dr. Imran Sabri** (*Assistant Professor*)  
Department of Bio-Medical Sciences, College of Medicine, King Faisal University, Saudi Arabia

## INTERNATIONAL EDITORIAL ADVISORY BOARD

1. **B. N. Yadav** (*Professor*)  
Forensic Medicine, BP Koirala Institute of Medical Sciences, Nepal
2. **Dr. Vasudeva Murthy Challakere Ramaswam** (*Senior Lecturer*)  
Department of Pathology, International Medical University, Bukit Jalil, Kuala Lumpur, Malaysia
3. **Babak Mostafazadeh** (*Associate Professor*)  
Department of Forensic Medicine & Toxicology, Shahid Beheshti University of Medical Sciences, Tehran-Iran
4. **Dr. Sarathchandra Kodikara** (*Lecturer*)  
Forensic Medicine Department of Forensic Medicine, Faculty of Medicine, University of Peradeniya, Sri Lanka

## NATIONAL EDITORIAL ADVISORY BOARD

1. **Prof. N.K. Agarwal** (*Professor*) Forensic Medicine, UCMS, Delhi
2. **P.K. Chattopadhyay**, (*Professor*)  
Forensic Sciences, Amity University, Noida
3. **Dalbir Singh** (*Professor*) Forensic Medicine, PGIMER, Chandigarh
4. **Dr. Harish Pathak**, Mumbai
5. **J. Gargi** (*Professor*) GGS Medical College, Faridkot
6. **P.C. Dikshit** (*Professor*)  
Forensic Medicine, Jamia Hamdard Medical College, New Delhi
7. **Anil Mittal** (*Professor*)  
Forensic Medicine, Vardhman Mahavir Medical college, New Delhi
8. **Balbir Kaur** (*Professor*)  
Forensic Medicine, MM institute of Medical Sciences, Ambala
9. **Mukesh Yadav** (*Professor*) Forensic Medicine, School of Medical Sciences and research, Greater Noida
10. **T.K.K. Naidu** (*Professor*) Forensic Medicine, Prathima Institute of Medical Sciences Andhra Pradesh
11. **S. Das** (*Professor*) Forensic Medicine, Himalayan Institute of Medical Sciences Dehradun
12. **Col Ravi Rautji**, Forensic Medicine, Armed Forces Medical College, Pune
13. **Dr. Manish Nigam** (*Professor and Head*)  
Department of Forensic Medicine & Toxicology Sri Aurobindo Institute of Medical Sciences, INDORE (M.P.)
14. **Dr. Shailesh Kudva** (*Principal*)  
Rajasthan Dental College and Hospital Jaipur-302026
15. **Usmanganishah Makandar** (*Associate Professor*)  
Anatomy, AIIMS, Bhatinda
16. **Dr. Pratik Patel** (*Professor and Head*) Forensic Medicine, Smt NHL Municipal Medical College Ahmedabad
17. **Basappa S. Hugar** (*Associate Professor*)  
Forensic Medicine, Ramaiah Medical College, Bangalore

## NATIONAL EDITORIAL ADVISORY BOARD

18. **Dr. Vandana Mudda** (*Awati*) (*Associate Prof*)  
Dept of FMT, M.R. Medical College, Gulbarga, Karnataka, India
19. **Dr. Harish Kumar. N.** (*Associate Professor*)  
Dept. of Forensic Medicine, Sri Siddhartha Medical College, Tumkur
20. **Dr. Gowri Shankar** (*Associate Professor*)  
Forensic Medicine, SNMC, Bagalkot
21. **Dr. Manjunath Badni** (*Reader*) Dept of Oral pathology Maharana Pratap college of Dentistry and Research Centre, Gwalior
22. **Dr. L. Ananda Kumar** (*Associate Professor*) Forensic Medicine, Rajiv Gandhi Institute of Medical Sciences, (RIMS), Kadapa
23. **Dr. Ramesh Nanaji Wasnik** (*Associate Professor and Head*)  
Forensic Medicine Late B.R.K.M. Govt. Medical college, Jagdalpur
24. **Dr. Sachin Sinha** (*Reader*), Dept. of Oral Pathology & Microbiology  
Daswani Dental College & Research Centre, Rajasthan
25. **Dr. Sasi Kanth**, Asst. Professor, A.C.S.R Government Medical College, Nellore, Andhra Pradesh.

**Medico Legal Update** is a scientific journal which brings latest knowledge regarding changing medico legal scenario to its readers. The journal caters to specialties of Forensic Medicine, Forensic Science, DNA fingerprinting, Toxicology, Environmental hazards, Sexual Medicine etc. The journal has been assigned international standard serial number (ISSN) 0971-720X. The journal is registered with Registrar of Newspaper for India vide registration numbers 63757/96 under Press and Registration of Books act, 1867. The journal is also covered by EMBASE (Excerpta Medica Database) from 1997 and by INDEX COPERNICUS, POLAND. Medico legal update is a half yearly peer reviewed journal. The journal has also been assigned E-ISSN 0973-1283 (Electronic version). The first issue of the journal was published in 1996.

**Website: [www.medicolegalupdate.org](http://www.medicolegalupdate.org)**

© All Rights reserved The views and opinions expressed are of the authors and not of the Medico Legal Update. The Medico Legal Update does not guarantee directly or indirectly the quality or efficacy of any products or service featured in the advertisement in the journal, which are purely commercial.

## Editor

**Dr. R.K. Sharma**  
Institute of Medico-legal Publications  
Logix Office Tower, Unit No. 1704, Logix City Centre Mall  
Sector- 32, Noida - 201 301 (Uttar Pradesh)

## Printed, published and owned by

**Dr. R.K. Sharma**  
Institute of Medico-legal Publications  
Logix Office Tower, Unit No. 1704, Logix City Centre Mall  
Sector- 32, Noida - 201 301 (Uttar Pradesh)

## Published at

**Institute of Medico-legal Publications**  
Logix Office Tower, Unit No. 1704, Logix City Centre Mall  
Sector- 32, Noida - 201 301 (Uttar Pradesh)



# Medico-Legal Update

[www.medicolegalupdate.org](http://www.medicolegalupdate.org)

## CONTENTS

Volume 19, Number 1

January-June 2019

1. An Evaluation of Colour Change in Abrasion and its Correlation to Time: A Cross-Sectional Study from a Tertiary Care Centre ..... 1  
*Anil Mangeshkar, P S Varghese*
2. Correlation of the Age of Eruption of Teeth with the Body Mass Index among School Children ..... 7  
*Karikalan T, Anil R Pandey*
3. Profile of Internal Injuries to Thorax, Abdomen and Pelvis Sustained by the Victim During Fatal Road Traffic Accident in Central India ..... 11  
*Manu D Sharma, Deepak L Bhagwat, B. H. Tirpude, P. N. Murkey, I L Khandekar, Sharjeel Khan, Ambedkar Ranjan*
4. Profile of Cases of Fatal Road Traffic Accident with Respect to Diurnal Variation of Time, Age, Sex and Death of Victim in Central Rural India-Autopsy Based Study ..... 15  
*Deepak L Bhagwat, Manu D Sharma, B. H. Tirpude, P. N. Murkey, I L Khandekar, Sharjeel Khan, Ambedkar Ranjan*
5. A Two-Year Prospective Study from Punjab Region of India ..... 20  
*Mittal D R, Jasbir S, Rai G, Kumar K, Sharma R K*
6. A Prospective Study of Unnatural Deaths in Married Women within Seven Years of Marriage in Hapur District of Western Uttar Pradesh ..... 26  
*Rizwi A, Jasbir S, Sharma R K, Abhishek S*
7. Pattern and Distribution of Injuries in Victims of Fatal Road Traffic Accident Cases of Bikers in Haryana a Retrospective Study ..... 31  
*Jitender Kumar Jakhar, Tarun Dagar, Naveen Yadav, Piyush Jain*
8. Applicability of Three Component System of Age Estimation in Haryana Population ..... 36  
*Kumaran M, Dalbir Singh, Bansal YS, Mandal SP, Murali G*
9. Bite Marks: An Indispensable Tool for Forensic Odontological Evidence ..... 42  
*M. K. Sunil, Upender Malik, Sourav Malhotra, Arishah Gulzar, Radhika Sharma*
10. A Study on Pattern of Adolescent Deaths- A Retrospective Study ..... 47  
*SantoshKumar P, Gajanan H Nayak, Mahalaxmi B Karlawad*
11. A Study of Thermal Deaths in Rohtak, Haryana ..... 52  
*Malik A K, Sharma D, Dhatarwal S K, Panchal K, Singla K*
12. Does Knowledge and Attitude is Needed Regarding Euthanasia in Clinical Course? A Narrative Review Based on an Available Literature ..... 56  
*Mohd. Arif Husain, Ishak Mohammad, Nageshwar V, K M K Sridhar*

13. A Study Pattern of Poisoning among the Autopsies Conducted at Adichunchanagiri Institute of Medical Sciences .....	61
<i>N T Satish, M G Shivaramu, Jethin Ramadasan</i>	
14. Determination of Sex from Mastoid Dimensions among North Indians .....	65
<i>Rajeev Kumar Chaudhary, Anupama Mahajan, Monika Piplani, Baljeet Singh Khurana</i>	
15. Implications of Maxillofacial Injuries on Quality of Life in Trauma Victims .....	70
<i>Karan Giriyan, Rajesh Kamath, Brayal D'Souza, Sagarika Kamath, Sneha R Bhat</i>	
16. Maxillofacial Injuries and Its Implications on Economic Burden in Trauma Victims .....	76
<i>Karan Giriyan, Rajesh Kamath, Brayal D'Souza, Sagarika Kamath, Sneha R. Bhat</i>	
17. Study of the Impact of Quality of Patient Care on Discharge against Medical Advice Patients in a Tertiary Care hospital .....	82
<i>Aswathi Raj L, Rajesh Kamath, Somu G., Biju Soman, Brayal D'Souza, Sagarika Kamath, Sneha R. Bhat</i>	
18. Body Mass Index and Suicide .....	89
<i>Jayanthi Yadav, Sujeet Kumar Samadder, Rajneesh Kumar Pandey</i>	
19. A Study on the Association Between Extradural Hemorrhage and Skull Fractures in Head Injury .....	95
<i>Parinita, Renju Raveendran, K. Valsala</i>	
20. A Rare Case of Suicide by Multiple Gunshot Wounds to the Head .....	99
<i>Filippo Milano, Michele Treglia, Anna Mancuso, Stefania Urso, Gian Luca Marella</i>	
21. A Study to Estimate the Reliability of "Moritz Rule of Thumb-Method A and Method B" Method of Estimation of Time Since Death in Tropical Climate of Central India .....	104
<i>Jayanthi Yadav, Rajneesh Kumar Pandey, Sujeet Kumar Samadder</i>	
22. Effect of Role Play Video-An Innovate Tool on Court Room Procedures to Educate Medical Graduates	108
<i>B. Suresh Kumar Shetty, Sharada Rai, Rohit C Shet, M S Kotian, Navjot S Dhillon, Ishika Mahajan, Ciraj A M</i>	
23. Profile of Mortalities due to Alcohol and Drug Consumption in Road and Rail Traffic Accidents in Mangaluru, a Coastal City of Karnataka, India .....	113
<i>Subham Sarthak, B. Suresh Kumar Shetty, Jagadish Rao PP, Pavanchand Shetty H, Haniel D'Souza, Adithi S Shetty, M S Kotian</i>	
24. Psychological Well-Being as a Mediator Between Psychological Contract Breach and Organisation Citizenship Behaviour .....	118
<i>Veena Christy, Jayapreethi Manoharan, M. Yokesh</i>	
25. Pattern of Poisoning Cases at a Tertiary Health Care Centre—A Cross Sectional Study .....	124
<i>Vinay Bannur, Prasanna S. Jirli, Ravindra S. Honnungan, Vishal V. Koulapur, Somashekhar S. Pujar</i>	
26. An Analysis of Pattern of Fatal Head Injuries in Road Traffic Accidents .....	130
<i>Shobhana S S, RaviRaj K G, Yadav Abhishek, Lohith Kumar R</i>	
27. Antibody Detection (IgG, IgM) of both HSV-1 and VZV in Serum and Saliva of Bell's Palsy Patients Recovered by Low Level Laser Therapy .....	134
<i>Ali Mihsen Hussein Alyassiri, Taghreed Fadil Zaidan</i>	

28. Demographic Profile of Pattern of Railway Injuries in Warangal Municipal Limits, A. P. ....	138
<i>D. Vijaya Raghavendra, K. Ravimuni, K. Usha Rani</i>	
29. Retrospective Study of Autopsied Firearm Fatalities Over Period of Five Years .....	143
<i>Kiran Patil, Gyanendra Kumar, Ashesh Wankhede, Pawan Tekade, Shashikant Kaulaskar</i>	
30. The Development of a Web Portal for an Assisted Reproduction Center in South India and an Analysis of its Efficacy .....	147
<i>Rahul Munikrishna, Kavitha T. C., Venkataramanaiah, Somu G., Rajesh Kamath, Brayal D'Souza, Sagarika Kamath</i>	
31. Knowledge and Practice on Dietary Management among Patients with Gallbladder Diseases .....	152
<i>Sahil George Lal</i>	
32. The Prevalence of Work-Related Musculoskeletal Disorders among the Nurses in Dubai: Occupational Health Study .....	156
<i>Yassen Alfoteih, Zelal Kharaba, Vanessa Lobo, Salimbabu Abdulla</i>	
33. A Postmortem Study of Blunt Cardiac Injuries .....	161
<i>Konduru Laxman</i>	
34. A Study of Determination of Stature in Hyderabad Population from External Ear Morphometry .....	164
<i>Konduru Laxman</i>	
35. Comparable Study between Panic Disorder Patients (With or Without) Mitral Prolapse in Nassiria City/Iraq .....	169
<i>Kadum Mohan Manil, Hussain Hlail Wda'a Al-Sayyad</i>	
36. A Study to Assess the Knowledge and Compliance of Critical Care Nurses Regarding Ventilator Care Bundle in Prevention of Ventilator Associated Pneumonia .....	176
<i>Dipali U Dumbre</i>	
37. Determinants of Levels of Cardiac Troponin I in Post-Mortem Blood Sample in Sudden Cardiac Death—An Autopsy Based Study .....	179
<i>Sharija S, Sarathkumar A, Sasikala K</i>	
38. Effect of Group Education (Simulation Model) on Information Disclosure and HIV/AIDS Transmission Prevention for HIV/AIDS Risk Groups .....	184
<i>Ngesti W Utami</i>	
39. Health Insurance for Indonesian Migrant Workers .....	188
<i>Wafda Vivid Izziyana, Harun, Absori, Kelik Wardiono, Heru Santoso Wahito Nugroho, Arief Budiono</i>	
40. An Artificial Neural Networks (ANN) Based Lung Nodule Identification and Verification Module .....	193
<i>S. Sandhiya, Y. Kalpana</i>	
41. Training and Communication Skills of Little Dentist Cadre .....	199
<i>Ristya Widi Endah Yani, Isa Ma'rufi, Yunita Puspita Sari Pakpahan</i>	
42. Service Quality Model with Cultural Perspective in Effect on Patient Satisfaction in Hospitals with Different Accreditation Status .....	204
<i>Tjatur Sembodo, Cholichul Hadi, Windhu Purnomo</i>	

43. SPEOS (Stimulation of Endorphin, Oxytocin and Suggestive): Intervention to Improvement of Breastfeeding Production .....	210
<i>Indah Lestari, Ima Rahmawati, Emik Windarti, Hariyono</i>	
44. Natural Insecticide Spray for <i>Aedes sp.</i> , Made from Ethanol Extract of Purple Eggplant Fruit ( <i>Solanum melongena L.</i> ) .....	216
<i>Yunan Jiwintarum, Erlin Yustin Tatontos, Anisa Noviana, Maruni Wiwin Diarti, Setiawan</i>	
45. Effect of Vitamin A and Zink Intake of Breastfeeding Mothers on Infection in Infants .....	221
<i>Lydia Fanny, Retno Sri Lestari, Hijrah Asikin</i>	
46. Knowledge, Attitudes towards Health Insurance, Eradication of Mosquito Breeding Places and the Incidence of Dengue Hemorrhagic Fever in Badung Regency .....	225
<i>I Nyoman Gede Suyasa, Ni Made Sirat, Ni Luh Putu Yunianti Suntari, I Nyoman Wirata</i>	
47. The Anachronism of the Indonesian Social Security Policy in Health .....	229
<i>Arief Budiono, Absori, Harun, Heru Santoso Wahito Nugroho, Khudzaifah Dimiyati, Ayesha Hendriana Ngestiningrum, Wafda Vivid Izziyana</i>	
48. Effect of Alkaline Water Consumption on Decreasing Blood Sugar Levels of Diabetes Mellitus Patients	234
<i>Dwi Agustanti, Purbianto</i>	
49. Family Support for Diabetes Self-care Behavior in T2DM Patients who Use Herbs as a Complementary Treatment .....	238
<i>Anita Joeliantina, Mangestuti Agil, M. Bagus Qomaruddin, Kusnanto, Oedojo Soedirham</i>	
50. The Influence of Knowledge, Attitude and Action on Family Health Tasks in Controlling Hypertension through the <i>Germas</i> Approach .....	244
<i>Lembunai Tat Alberta, Dwi Utari Widyastuti</i>	
51. Student Centered Learning as a Method to Increase Clinical Competencies of Nursing Students at Health Polytechnic of Jakarta I, Indonesia .....	249
<i>Mumpuni, Uun Nurulhuda, Tutiany, Dewi Purnamawati</i>	
52. The Factors Making the Law Protection for the Patients of Esthetic Beauty Clinic in Indonesia not fulfilling Citizen's Constitutional Right .....	252
<i>Siska Diana Sari, I Gusti Ayu Ketut Rachmi Handayani, Pujiyono</i>	
53. The Application of Cyclone Ventilator Modification for Indoor Air Sanitation .....	257
<i>Khambali, Setiawan, Kuat Prabowo</i>	
54. Efficiency Effort of Inpatient Service for BPJS-Health Participants with Lean Method at Surabaya Islamic Hospital .....	262
<i>Muryani, Thiwit Nurul Huda, Yeni Farida, Tito Yustiawan, Setya Haksama, Samsul Arifin</i>	
55. Stirring Chamber Design Development to Increase the Potention of Chicken Egg Shells to Decrease Cadmium (Cd) Level in Blood Cockle ( <i>Anadara Granosa</i> ) .....	269
<i>Narwati, Hadi Suryono</i>	
56. Querying the Dataset from the Developed Ontology for Swineflu Disease .....	275
<i>Radhika Pathi, Suresh Verma Penumatsha, Lakshmi Kalyani Neerukonda, P. Rama Krishna</i>	



# Stirring Chamber Design Development to Increase the Potention of Chicken Egg Shells to Decrease Cadmium (Cd) Level in Blood Cockle (*Anadara Granosa*)

Narwati<sup>1</sup>, Hadi Suryono<sup>1</sup>

<sup>1</sup>Department of Environmental Health, Health Polytechnic of Surabaya, Indonesia

## ABSTRACT

A study about chicken egg shells as an adsorbent to decrease Hg level in blood cockle (*Anadara granosa*) has been done by Suryono in 2017, its results showed that chicken egg shells could decrease Hg level in blood cockle. The lowest level of Hg (0.545 ppm or 93.64%) was using 45 minutes of stirring process with 75 grams of chicken egg shells, there was a significant difference of Hg level in blood cockle before and after the process. The Hg level decrease from 0.582 ppm to 0.037 ppm. Those processes include the use of chicken egg shells as adsorbent cannot reduce all the level of Hg. This study used One Group pretest-posttest Design. Samples were blood cockle (*Anadara granosa*). Stirring chamber was a food sanitation tool, it had ability to decrease heavy metal level such as Cd in blood cockle using the stirring and adsorbent temperature principles. Samples were taken using purposive sampling. There were 9 treatments and 3 replications. The stirring process was done in 15 minutes using 50 rpm, 150 rpm, and 250 rpm of speed. The adsorbent temperature were 35°C, 50°C and 65°C, it used 50 grams of chicken egg shells (adsorbent) in 1 liter of water. The results showed that blood cockle (*Anadara granosa*) which was taken from Kenjeran coastal area, Surabaya contain 0.93 ppm of Cd level in average. The level of Cd in the control group was 0.82 ppm. While the average level of Cd in the blood cockle in the treatment groups were 0.15 ppm. The amount of Cd level decreasing in treatment groups were 82.1% (0.67 ppm). The stirring speed and adsorbent temperature were contributed to give significant difference of Cd level in blood cockle. From the results we could conclude that the intervention stirring and adsorbent temperature can decreased Cd level. We suggest that societies can use stirring and heating using chicken egg shells as an adsorbent to control food contamination of Cd.

**Keywords:** *Stirring chamber, Stirring speed, Adsorbent temperature, Chicken egg shells*

## INTRODUCTION

Food quality that is not fulfil health requirements was a main problem of food safety. It needs awareness to understand that this was some parties responsibility. They were governments, food industries, food producer, and also consumer<sup>(1)</sup>. The regulation in Indonesia (UU No.18, 2012) mention that farmers, fishermen, fish farmers, and food business actors are obliged to apply food safety norms, standards, procedures and criteria.

Food safety intend to prevent the possibility of biological, chemical and other contaminants that can interfere, harm and endanger human health. Seafood was potential to contaminate by heavy metal<sup>(2)</sup>.

Suryono et al. reported that blood cockle that was taken from Kenjeran coastal area in Surabaya contain 0.620 ppm of Mercury (Hg). Mercury contamination also was found in Asian green mussel (*Mytilus viridus*)<sup>(3)</sup>. Trisnawati mention that the level of Cadmium (Cd) in Asian green mussel was 50.23-70.39 pmm inside its gill, 31.08-44.53 pmm in its liver, and 6.73-7.37 ppm on the sea water<sup>(4)</sup>. Fransiska et al. also proved that there were 0.76073 mg/kg of lead (Pb) in blood cockle that was taken from Kenjeran coastal area, Surabaya<sup>(5)</sup>.

---

### Corresponding Author:

Hadi Suryono  
Department of Environmental Health,  
Health Polytechnic of Surabaya, Indonesia  
Pucang Jajar Tengah Street-56, Surabaya, Indonesia  
Email: suryono Hadi.2008@gmail.com

Simple and inexpensive efforts to decrease the level of heavy metal that can be done were using chicken egg

shells. Suryono found that the use of 75 grams chicken egg shells powder and 45 minutes of stirring process can decrease 93,64% of Hg level<sup>(3)</sup>. Aimi et al. mention that this due to chicken egg shells contains CaCO<sub>3</sub>. It can absorb metals<sup>(6)</sup>.

Besides Hg, blood cockle also contain Cd. The level of Cd in blood cockle which was taken from Kenjeran, Surabaya was 0.93 ppm<sup>(3)</sup>. This level is still safe based on SNI No.7387, 2009. But consume food that is contaminated by Cd have potential to damage the organs or death due to the accumulation of Cd inside the body. The aim of this research is to analyse the difference of Cd level in blood cockle (*Anadara granosa*) after it is given a treatment by using the stirring speed and adsorbent temperature principles.

## MATERIALS AND METHOD

This was experimental research using one group pretest-posttest design. Independent variables were the speed of stirring and adsorption temperature. We used 50 rpm, 150 rpm, and 250 rpm of speed. The adsorption temperature was 35°C, 50°C, and 65°C. The dependent variable was Cd level. Samples were blood cockle from Kenjeran coastal area, Surabaya.

The stages to make the chicken egg shells adsorbent were: 1) Washed the chicken egg shells then take the membrane and all the dirt, 2) Soaked with hot water in 15 minutes then let it dry, 3) The egg shells then be mashed using blender, 4) Sifted the chicken egg shells powder with 120 mesh sieve, 5) Put the powder in the oven for 15 minutes 100 °C, 6) Activated the powder using 0.1 M of HCl in 48 hours, 7) After 48 hours drain well and wash until the pH 7 or neutral, 8) Put the powder in oven again to make it dry for 30 minutes 100 °C.

If the chicken egg shells powder as adsorbent was ready, put 50 grams of the powder to a liter of water and 250 grams blood cockle inside the stirring chamber. Adjust the adsorbent temperature and stirring speed, then analyze the Cd level in blood cockle using Atomic Absorption Spectrophotometry.

## FINDINGS AND DISCUSSION

The results of Cd level test in blood cockle (*Anadara granosa*) with 50 grams of chicken egg shells as adsorbent before and after the treatment using stirring speed and adsorption temperature can be seen below. We use three replication.

**Table 1: The average Level of Cd in Blood Cockle (*Anadara granosa*) with 50 grams of chicken egg shells as adsorbent before the treatment**

Samples Code	Stirring	Adsorption	Results
	Speed (rpm)	Temperature (°C)	Cd (ppm)
KAT1		35	0.93
KAT2	50	50	0.87
KAT3		65	0.75
KBT1		35	0.79
KBT2	150	50	0.80
KBT3		65	0.80
KCT1		35	0.82
KCT2	250	50	0.82
KCT3		65	0.79
Total			7.37
Average			0.82

Based on SNI (Indonesian Standard) No. 7387, 2009, the level of Cd in blood cockle after it soaked with adsorbent chicken egg shells powder was below the maximum allowable threshold value (1 ppm). But we need to consider the effect of blood cockle consumption continuously in short time.

The accumulation of heavy metal in seafood can be happen due to food chain cycle. Palar explained that in the body of aquatic biota, the amount of heavy metal will accumulated and continue to increase (biomagnification) in the food chain, where biota at the higher level in the food chain will experience more accumulation<sup>(7)</sup>.

**Table 2: The average level of Cd in Blood Cockle (*Anadara granosa*) with 50 grams of chicken egg shells as adsorbent after the treatment**

Samples Code	Stirring	Adsorption	Results
	Speed (rpm)	Temperature (°C)	Cd (ppm)
AT1		35	0.48
AT2	50	50	0.31
AT3		65	0.15
BT1		35	0.12
BT2	150	50	0.09
BT3		65	0.08
CT1		35	0.07
CT2	250	50	0.04
CT3		65	0.03
Total			1.37
Average			0.15

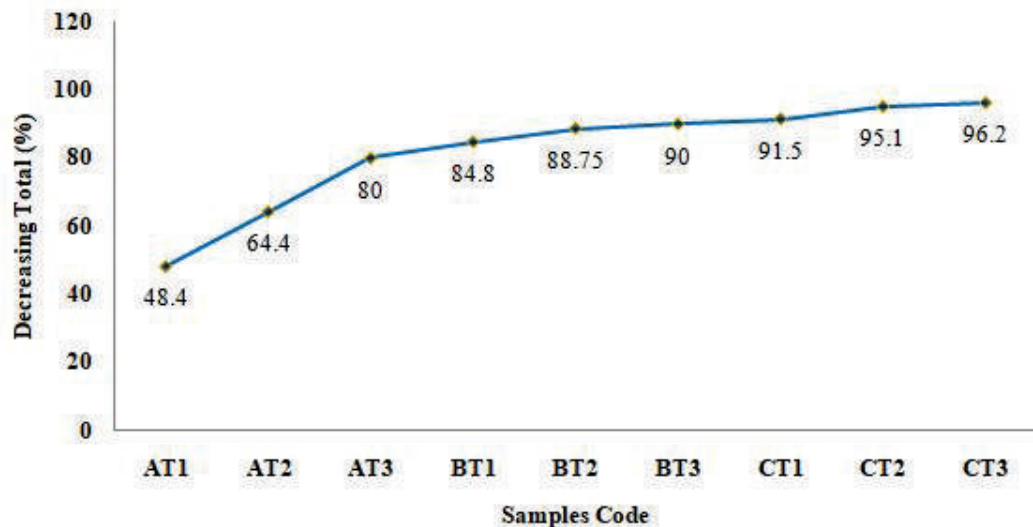


The average difference of Cd level in blood cockle before and after the treatment using stirring speed and adsorption temperature was 0.82 ppm in before treatment group and 0.15 ppm in after treatment group. While the amount of Cd level decreasing can be seen in table 3.

**Table 3: The amount of Cd level decreasing in Blood Cockle (*Anadara granosa*) with 50 grams of chicken egg shells as adsorbent before and after the treatment**

Samples Code	Stirring Speed	Adsorption Temperature	Cd Results (ppm)		Decreasing Total	Decreasing Total
	(ppm)	(°C)	Before	After	(ppm)	(%)
AT1		35	0.93	0.48	0.45	48.4
AT2	50	50	0.87	0.31	0.56	64.4
AT3		65	0.75	0.15	0.60	80.0
BT1		35	0.79	0.12	0.67	84.8
BT2	150	50	0.80	0.09	0.71	88.75
BT3		65	0.80	0.08	0.72	90.0
CT1		35	0.82	0.07	0.75	91.5
CT2	250	50	0.82	0.04	0.78	95.1
CT3		65	0.79	0.03	0.76	96.2
Total			7.37	1.37	6.00	739.2
Average			0.81	0.15	0.67	82.1

The difference of average Cd level before and after treatment was 0.67 ppm (82.1%). It indicated that there was Cd level decreasing that is caused by stirring speed and adsorption temperature. This is the graphic which shows the percentage of Cd level in blood cockle (*Anadara granosa*) after the treatment using 3 variations of stirring speed and adsorption temperature with 50 grams of chicken egg shells as adsorbent.



**Figure 1: The Graphic of Cd Level Percentage in blood cockle (*Anadara granosa*) after the treatment using 3 variations of stirring speed and adsorption temperature with 50 grams of chicken egg shells as adsorbent.**

From the Figure 1, we can understand that the highest decreasing total was CT3 sample using 250 rpm of stirring speed and 65°C. The total decreasing in sample CT3 was 96.2%.

Ancova test was used to assess the difference of each stirring speed and adsorption temperature variation. This test also was used to know the amount of difference of Cd level before and after the treatment. The decreasing

of Cd level has a positive correlation with the increasing of stirring speed and adsorption temperature. This means that the higher the speed of the stirring and adsorption temperature, will lead to the increasing of Cd level in blood cockle (*Anadara granosa*).

**Table 4: Tests of Between-Subjects Effects**

Dependent Variable: Cd Level After Treatments								
Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power <sup>b</sup>
Speed	0.163	2	0.081	568.125	0.000	0.985	1136.250	1.000
Adsorption Temperature	0.084	2	0.042	293.468	0.000	0.972	586.937	1.000
Speed * Adsorption Temperature	0.072	4	0.018	125.149	0.000	0.967	500.595	1.000

a. R Squared = .995 (Adjusted R Squared = .993)

b. Computed using alpha = 0.05

**Table 5: Pairwise Comparisons**

Dependent Variable: Cd Level After Treatments						
(I) Stirring Speed	(J) Stirring Speed	Mean Difference (I-J)	Std. Error	Sig. <sup>b</sup>	95% Confidence Interval for Difference <sup>b</sup>	
					Lower Bound	Upper Bound
50 RPM	150 RPM	0.222*	0.010	0.000	0.201	0.243
	250 RPM	0.272*	0.008	0.000	0.254	0.289
150 RPM	50 RPM	-0.222*	0.010	0.000	-0.243	-0.201
	250 RPM	0.049*	0.006	0.000	0.037	0.062
250 RPM	50 RPM	-0.272*	0.008	0.000	-0.289	-0.254
	150 RPM	-0.049*	0.006	0.000	-0.062	-0.037

Based on estimated marginal means

\*. The mean difference is significant at the 0.05 level.

b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

This test shows that chicken egg shells can be use as heavy metal adsorbent. Chicken egg shells can decrease Hg level in blood cockle. This indicates that activated chicken egg shells can absorb heavy metal. Napitapulu explain that physical activation can enlarge chicken egg shells pores. It happened due to chemical bonds breaking or surface oxidizing molecules so that the surface area increases and affects the adsorption potency<sup>(8)</sup>.

HCl as activator in chicken egg shells activation process can clean up the pores surface, remove impurities (non-carbon) compounds and rearrange the location of atoms exchanged. We can said that chemical

activation was a process to add certain reagents to clean and enlarge the surface of the chicken egg shell so that it can be used as an adsorbent.

Chemical activation method was the best way for adsorbent, in that research zeolite was used as adsorbent. It can adsorb water up to 13.77% after it is activated by chemical method<sup>(9)</sup>. Fitriyana & Safitri reported that chicken egg shells adsorbent potency test to ion, it results shows that non-activated chicken egg shells can adsorb 18.73% while physical activated chicken egg shells can adsorb 31%. This result indicated that activated chicken egg shells can adsorb ion better than non activated chicken egg shells<sup>(10)</sup>.

Aidha explained that activating adsorbent using HCl for 80 minutes can decrease up to 78.99% of calcium. Acid adding lead to cation exchange with  $H^+$  thus enlarges the cavity in the adsorbent zeolite and increases the adsorbent power due to the increased porosity of the adsorbent<sup>(11)</sup>.

Beside of that, stirring speed and adsorption temperature contribute to decrease Cd level in blood cockle. Statistic analysis shows that there was an influence of stirring speed and adsorption temperature to the Cd level decreasing. The increasing stirring speed and adsorption temperature lead a greater decrease of Cd level in blood cockle. Stirring causes turbulent liquids which is containing adsorbents. The faster the stirring will cause the greater movements so that it will make the film layer that surrounds the adsorbent particles thinner which makes the adsorption process run fast.

Webber explained that adsorption was limited by film diffusion and pore diffusion process, it depend on movements in the system. If the movements was slow, the film which is coating the particles will be thick so adsorption will be slow. If the stirring process was enough, the film diffusion process will run faster<sup>(12)</sup>.

Syauqiyah et al. explained that increased temperature causes the energy and reactivity of the ions to increase so that more ions are able to pass through the energy level to interact chemically with the active layer on the surface, so that more ions can be adsorbed on the surface. The heating treatment in this process can increase the adsorbent power to decrease Pb and Cd level in blood cockle<sup>(13)</sup>.

Heating or adsorbent activating would increase adsorbent power due to the adsorbent's pores will be larger. But if the temperature was too high it could damage the adsorbent<sup>(12)</sup>. Flores et al. stated that adsorption power in chicken egg shells will increase on 15-35°C due to endothermic process. The absorption of Cd (II) occurs mainly in the calcareous layer (which contains  $CaCO_3$ ) and slightly in the membrane layer. This shows that the absorption of Cd (II) is irreversible and the main absorption mechanism is ion precipitation and exchange.

## CONCLUSION

Stirring speed and adsorption temperature can increase the potenton of chicken egg shells to decrease Cd level in blood cockle by develop stirring chamber tool.

**Source of Funding:** Author

**Ethical Clearance:** Yes

**Conflict of Interest:** No

## REFERENCES

1. Hariyadi P, Andarwulan N. How to Stop Problematic Food in Markets: Food Safety System Consolidation in Indonesia. Depok: Pirmedia Publisher; 2007.
2. Republic of Indonesia. Law of the Republic of Indonesia, Number 18 of 2012 concerning Food. Jakarta: Republic of Indonesia; 2012.
3. Suryono H, Narwati, Nugroho HSW. The Potention of Chicken Egg Shell (*Galus-galus domesticus*) as Mercury Adsorbent for Blood Cockle (*Anadara granosa*) by Stirring Chamber Engineering. Indian Journal of Public Health Research & Development. 2018;9(5).
4. Trisnawati A. Study of Cadmium Heavy Metal Content in Green Shellfish (*Mytilus viridus*) in the Waters of the Surabaya Kenjeran Beach. Thesis. Malang: Maulana Malik Ibrahim State Islamic University; 2008.
5. Fransiska M, Arief M, Cahyoko Y. Study of Lead Heavy Metal (Pb) in White Shrimp (*Penaeus merguensis*) and Blood Shells (*Anadara granosa*) in the Waters of Kenjeran Beach Surabaya and Waters of Sumenep Saronggi. Journal of Aquaculture and Fish Health. 2012;1(3).
6. Aimi N, Norhafizah, Wong CS. Removal of Cu (II) from Water by Adsorption on Chicken Eggshell. International Journal of Engineering and Technology. 2013;13(01):40-45.
7. Palar H. Heavy Metal Pollution and Toxicology. Jakarta; Rineka Cipta Publisher; 2004.
8. Napitupulu A. Activated Carbon Impregnation Using Sulfide to Binding Copper (II) and Cadmium (II) in the Water. Thesis. Medan: Postgraduate School, USU; 2009.
9. Affandi F, Hadisi H. The Effect of Nature Zeolit Activation Method to Decrease Warm Paved Mixture Temperature. Jakarta: PU; 2011.

10. Fitriyana, Safitri E. The Use of Chicken Egg Shells as Adsorbent to Increase Used Cooking Oil. *Konversi*. 2015;4(1):12-16.
11. Aidha N. Activation of Physically and Chemically Zeolites to Reduce Hardness Levels (Ca and Mg) in Groundwater. *JKK*. 2013;35(1):58-64.
12. Webber. Adsorption Analysis: Equilibria and Kinetics. Queensland: Imperial College Press; 1972.
13. Syauqiah I, Amalia M, Kartini HA. Analysis of Variations in Time and Speed of Stirrers in the Process of Heavy Metal Waste Adsorption with Active Charcoal. *Jur.Inf.Tek*. 2011;12(1):11-20.
14. Flores CJ, Leyva RR, Mendoza BJ, Guerrero CR, Aragon PA, Lebrada DG. Sorption Mechanism of Cd (II) from Water Solution Onto Chicken Eggshell. *Journal of Applied Surface Science*. 2013;276:682-690.



# MEDICO-LEGAL UPDATE

Logix Office Tower, Unit No. 1704, Logix City Centre Mall

Sector- 32, Noida - 201 301 (Uttar Pradesh)

Phone no.: +91 120 429 4015, Mob: 09971888542

E-mail: medicolegalupdate@gmail.com, Website: www.medicolegalupdate.org

## CALL FOR SUBSCRIPTIONS

### About the Journal

Print-ISSN:0971-720X, Electronic-ISSN:0974-1283, Frequency: Six monthly (2 issues per volume).

**Medico-Legal Update** is a journal which brings latest knowledge regarding changing medico legal scenario to its readers. The journal caters to specialties of Forensic Medicine, Forensic Science, D. N. A. fingerprints, Toxicology, Environmental hazards, Sexual Medicine etc. The journal has been assigned international standard serial number (ISSN) 0971-720X. The journal is registered with Registrar of Newspapers of India vide registration numbers 63757/96 under Press and Registration of Books act, 1867. The journal is also covered by EMBASE (Excerpta Medica Database) from 1997 and by INDEX COPERNICUS, POLAND.

**Medico-Legal Update** is quarterly peer reviewed journal. The journal has also been assigned E-ISSN 0974-1283 (Electronic version). The first issue of the journal was published in 1996.

Journal Title	Pricing of Journals
Medico-Legal Update	Print Only
Indian	₹ 9000

### NOTE FOR SUBSCRIBERS:

Advance payment required by cheque/demand draft/online/NEFT in the name of “**Institute of Medico-Legal Publications**” payable at New Delhi.

You can make the payment by any of the following methods either by DD or multicity cheque or NEFT.

#### 1. Bank details for NEFT

Name of Account: Institute of Medico-Legal Publications Pvt Ltd  
Bank: HDFC Bank  
Branch: Sector-50, Noida-201 301  
Account Number: 09307630000146  
Type of Account: Current Account  
MICR Code: 110240113  
RTGS/NEFT code: HDFC0000728

Please quote reference number. Email us the proof of deposit. (scan copy or photograph of the slip of bank transfer)

#### 2. You can send DD / multi city cheque in favour of “Institute of Medico-Legal Publications Pvt Ltd”. payable at New Delhi as manuscript handling charges.

Cancellation not allowed except for duplicate payment. Claim must be made within six months from issue date.

A free copy can be forwarded on request.

### SEND REMITTANCE TO:

#### **Institute of Medico-Legal Publications Pvt Ltd**

Logix Office Tower, Unit No. 1704, Logix City Centre Mall

Sector- 32, Noida - 201 301 (Uttar Pradesh)

Phone no.: +91 120 429 4015, Mob: 09971888542

E-mail: medicolegalupdate@gmail.com, Website: www.medicolegalupdate.org

---

Published, Printed and Owned: Dr. R. K. Sharma

Printed: Printpack Electrostate G-2, Eros Apartment, 56, Nehru Place, New Delhi-110019

Published at: Institute of Medico Legal Publications Pvt. Ltd., Logix Office Tower, Unit No. 1704,  
Logix City Centre Mall, Sector- 32, Noida-201 301 (Uttar Pradesh)

Editor: Dr. R.K. Sharma, Phone: +91 120 429 4015, Mobile: +91 9971888542