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Synopsis of few published literatures on Endosulfan from states other than Kerala in India

1	Andhra Pradesh	
1.1	<p>Title: Concentrations of pesticide residues in tissues of fish from Kolleru Lake in India</p> <p>Authors and their affiliations: Amaraneni, S R, Pillala, R</p> <p>Department of Inorganic and Analytical Chemistry, School of Chemistry, Andhra University, Visakhapatnam 530 003, A. P., India.</p> <p>Published in: Environ Toxicol.</p>	<p>Major Points: Kolleru Lake is the largest natural freshwater lake of Andhra Pradesh in India. The use of pesticides for agricultural purposes is widespread in the Kolleru Lake region. The biological indicators like fish help in the studies of aquatic pollution by pesticides. Fish samples were analysed according to a modified method which is proposed for the gas chromatographic determination for the pesticides viz., alpha-BHC, gamma-BHC, malathion, chloirpyrifos, isodrin, endosulfan, dieldrin, and p,p-DDT. Water samples were analysed for selected chemical parameters. The extraction efficiency for the selected pesticides</p>

	2001;16(6):550-6.	is between 82.8% and 91.2%. These analyses were used to evaluate the baseline data and the pesticide pollution in the lake's ecosystem.
1.2	<p>Title: Endosulfan poisoning--a clinical profile</p> <p>Authors and their affiliations: Venkateswarlu, K Suryarao, K Srinivas, V Sivaprakash, N Jagannadharao, N R Mythilai, A</p> <p>Department of Neurology, Andhra Medical College, King George Hospital, Visakhapatnam.</p> <p>Published in: J Assoc Physicians India. 2000 Mar;48(3):323-5.</p>	<p>Major Points: The objective of the study is to identify the clinical profile of endosulfan poisoning and also to recognise any biochemical parameters which indicate clinical or subclinical dysfunction of organs so that the offending agent can be easily identified in a given case of poisoning and appropriate treatment instituted promptly.</p> <p>METHODS: Forty four individuals who consumed food which was accidentally contaminated by endosulfan in a rural area were the subjects of the present study.</p> <p>RESULTS: A postmortem examination carried out on the individual who died due to status epilepticus confirmed that the death was due to asphyxia.</p> <p>CONCLUSIONS: Endosulfan poisoning can be suspected by the primary CNS manifestations with or without clinical or laboratory evidence of other organ dysfunction</p>

		like liver, kidney and muscle.
1.3	<p>Title: Organochlorine pesticide contamination of ground water in the city of Hyderabad</p> <p>Authors and their affiliations: Shukla, Gangesh Kumar, Anoop Bhanti, Mayank Joseph, P E Taneja, Ajay</p> <p>School of Chemical Sciences, Department of Chemistry, St. John's College, Agra-282002, UP, India.</p> <p>Published in: Environ Int. 2006 Feb;32(2):244-7. Epub 2005 Sep 23.</p>	<p>Major Findings: Organochlorine pesticides are ubiquitous and persistent organic pollutants used widely throughout the world. The main aim of present study is to determine contamination levels of organochlorine pesticides in the ground water of Hyderabad City. All the samples analyzed were found to be contaminated with four pesticides i.e. DDT, beta-Endosulfan, alpha-Endosulfan and Lindane. DDT was found to range between 0.15 and 0.19 microg L(-1), beta-Endosulfan ranges between 0.21 and 0.87 microg L(-1), alpha-Endosulfan ranges between 1.34 and 2.14 microg L(-1) and Lindane ranges between 0.68 and 1.38 microg L(-1) respectively. These concentrations of pesticides in the water samples were found to be above their respective Acceptable Daily Intake (ADI) values for Humans.</p>
2	Bihar	
2.1	<p>Title: Concentration of organochlorines in Ganges River dolphins from Patna, Bihar</p>	<p>Major Points: Concentrations of DDT, HCH, aldrin and endosulfan were determined in river dolphins from the River Ganges, Patna. Presences of organochlorines to higher degree in tissues suggest</p>

	<p>Authors and their affiliations: Kumari, Anupma Sinha, R K Gopal, Krishna Lata, Swarn</p> <p>Environmental Biology Laboratory, Department of Zoology, Patna University, Patna 800 005, India</p> <p>Published in: J Environ Biol. 2002 Jul;23(3):279-81.</p>	<p>that the river dolphins be at greater risk due to pesticidal contamination of the river system.</p>
3	Delhi	
3.1	<p>Title: Genotoxicity of the Yamuna River water at Okhla (Delhi), India</p> <p>Authors and their affiliations: Aleem, Asma Malik, Abdul</p> <p>Department of Agricultural Microbiology, Faculty of Agricultural Sciences, Aligarh Muslim University, Aligarh 202 002, India.</p>	<p>Water samples from the Yamuna River at Okhla (Delhi), India, were analysed. Gas chromatographic analysis of liquid-liquid extracted water samples revealed the presence of the pesticides DDT, BHC, dieldrin, endosulfan, aldrin, 2,4-D, dimethoate, methyl parathion, and malathion at concentrations of 14, 25, 2.1, 114, 0.9, 0.6, 0.9, 1.7, and 1.9 ng/L, respectively. The genotoxicity of the extracted water samples was evaluated with the Ames Salmonella/mammalian microsome test, DNA repair-defective mutants, and bacteriophage lambda systems.</p>

	<p>Published in: Ecotoxicol Environ Saf. 2005 Jul;61(3):404-12.</p>	<p>All mutants invariably exhibited significant declines in their colony-forming units as compared with their isogenic wild-type counterparts. Survival decreased by 86.3 and 75.5% in the polA- strain after 6 h of treatment with XAD-concentrated and liquid-liquid-extracted water samples, respectively. A significant decrease was also observed in the survival of bacteriophage lambda when treated with the test samples.</p>
3.2	<p>Title: Organochlorine pesticide residue levels and oxidative stress in preterm delivery cases</p> <p>Authors and their affiliations: Rahul Pathak¹, Sanvidhan G Suke¹, Tanzeel Ahmed¹, Rafat S Ahmed¹, AK Tripathi¹, Kiran Guleria², CS Sharma³, SD Makhijani³ and BD Banerjee¹</p> <p>¹ Environmental Biochemistry and Immunology laboratory, Department of Biochemistry, University</p>	<p>Major Findings: The aim of the present study was to analyse the OCP residues in maternal and cord blood of women and assess the levels of different non-enzymatic oxidative stress markers as well as to establish correlation with OCP levels, if any.</p> <p>Levels of OCPs like Hexachlorocyclohexane (HCH), endosulfan, and DDT were analysed by gas chromatography. Non-enzymatic oxidative stress was measured.</p> <p>In conclusion, our results suggest that higher levels of some of the OCP (like Endosulfan) may be associated with Preterm Delivery and increased oxidative stress.</p>

	<p>College of Medical Sciences & G.T.B. Hospital (University of Delhi), Delhi, India</p> <p>2 Department of Obstetrics and Gynecology, University College of Medical Sciences & G.T.B. Hospital (University of Delhi), Delhi, India</p> <p>3 Instrumentation and Bio-Labs, Central Pollution Control Board, Ministry of Environment and Forest, Delhi, India</p> <p>Published in: Hum Exp Toxicol. 2010 Mar 8.</p>	
3.3	<p>Title: Endosulfan and other organochlorine pesticide residues in maternal and cord blood in North Indian population</p> <p>Authors and their affiliations: Pathak, Rahul Suke, Sanvidhan G Ahmed, Rafat S Tripathi, A K</p>	<p>Major Findings: There was a paucity of data regarding the present blood levels of organochlorine residues in North Indian population with reference to reproductive health. The present study was designed to analyze the levels of organochlorine pesticide residues in maternal and cord blood samples of normal healthy women with full term pregnancy to gain insight into the current status of pesticide burden in newborns.</p>

	<p>Guleria, Kiran Sharma, C S Makhijani, S D Mishra, Meenu Banerjee, B D</p> <p>Department of Biochemistry, University College of Medical Sciences, Dilshad Garden, Delhi, 110 095, India.</p> <p>Bull Environ Contam Toxicol. 2008 Aug;81(2):216-9. Epub 2008 May 17.</p>	<p>Hexachlorocyclohexane (HCH) contributed maximum towards the total organochlorine residues present in maternal and cord blood followed by endosulfan, pp' DDE and pp' DDT being the least. This is also the first report indicating endosulfan levels in this population. Our data indicates a transfer rate of 60-70% of these pesticides from mothers to newborns and this high rate of transfer of pesticides is of great concern as it may adversely affect the growth and development of newborn.</p>
4	Haryana	
4.1	<p>Title: Endosulfan poisoning in Northern India: a report of 18 cases</p> <p>Authors and their affiliations: Chugh, S N, Dhawan, R Agrawal, N Mahajan, S K</p> <p>Department of Medicine II, Post Graduate Institute of Medical Sciences, Rohtak, Haryana, India.</p> <p>Published in:</p>	<p>Major Findings: Eighteen cases of endosulfan poisoning by accidental overexposure during spray, admitted between October 1995 to September 1997, were observed and analyzed. These accounted for approximately one third of the total number of poisoning cases admitted in our unit during this period. Nausea, vomiting abdominal discomfort, tonic and clonic convulsions, confusion, disorientation, and muscular twitchings were cardinal manifestations. None of the patients succumbed to their illness. Analysis</p>

	<p>Int J Clin Pharmacol Ther. 1998 Sep;36(9):474-7</p>	<p>of various incriminating factors revealed that accidental overexposure was due to failure to adhere to the instructions for spray either due to ignorance or due to illiteracy. All the patients avoided preventive measures and developed toxicity both due to inhalation and absorption through skin. Endosulfan (a chlordiene derivative) poisoning is gaining up momentum in this part of world and has become an important matter for public health in India.</p>
4.2	<p>Title: Status of insecticide contamination of soil and water in Haryana, India</p> <p>Authors and their affiliations: Kumari, Beena, Madan, V K Kathpal, T S</p> <p>Department of Entomology, CCS Haryana Agricultural University, Hisar 125 004, India. beena@hau.ernet.in</p> <p>Published in: Environ Monit Assess. 2008 Jan;136(1-3):239-44. Epub 2007 Apr 4.</p>	<p>Major Findings: Twelve samples each of soil and ground water were collected from paddy-wheat, paddy-cotton, sugarcane fields and tube wells from same or nearby fields around Hisar, Haryana, India during 2002-2003 to monitor pesticide residues. Residues were estimated by GC-ECD and GC-NPD systems equipped with capillary columns for organochlorine, synthetic pyrethroid and organophosphate insecticides. Dominant contaminants were DDT, cypermethrin and chlorpyrifos from the respective groups. In water samples, HCH, DDT, endosulfan and cypermethrin residues were observed frequently. Only chlorpyrifos among organophosphates was detected in 10</p>

		<p>samples. On consideration of tube well water for drinking purpose, about 80% samples were found to contain residues above the regulatory limits.</p>
5	Madhya Pradesh	
5.1	<p>Title: Repeated episodes of endosulfan poisoning</p> <p>Authors and their affiliations: Dewan, A. Bhatnagar, V. K. Mathur, M. L. Chakma, T. Kashyap, R. Sadhu, H. G. Sinha, S. N. Saiyed, H. N.</p> <p>National Institute of Occupational Health, (Indian Council of Medical Research), Ahmedabad, India. dewanaruna@yahoo.com</p> <p>Published in: J Toxicol Clin Toxicol. 2004;42(4):363-9.</p>	<p>Major Findings: A number of families in a rural area of Jabalpur District (Madhya Pradesh), India, were affected by repeated episodes of convulsive illness over a period of three weeks. The aim of this investigation was to determine the cause of the illness. The investigation included a house-to-house survey, interviews of affected families, discussions with treating physicians, and examination of hospital records.</p> <p>RESULTS: Thirty-six persons of all age groups had illness of varying severity over a period of three weeks. The blood and food samples analyzed by our team showed presence of endosulfan, which was confirmed by GCMS. One of the food items (Laddu) prepared from wheat flour was found to contain 676 ppm of alpha-endosulfan.</p> <p>CONCLUSIONS: Contamination of wheat grains or flour with endosulfan and its consumption over a period of time was the most</p>

		likely cause of repeated episodes of convulsions.
5.2	<p>Title: Organochlorine and organophosphorus pesticide residues in breast milk from Bhopal, Madhya Pradesh, India</p> <p>Authors and their affiliations: Sanghi, Rashmi, Pillai, M K K Jayalekshmi, T R Nair</p> <p>Facility of Ecological and Analytical Testing, 302 Southern Laboratories, Indian Institute of Technology, Kanpur-208016, India. rsanghi@iitk.ac.in</p> <p>Published in: Hum Exp Toxicol. 2003 Feb;22(2):73-6.</p>	<p>Major Findings: HCH isomers, endosulfan, malathion, chlorpyrifos, and methyl-parathion were monitored in human milk samples from Bhopal, Madhya Pradesh. The endosulfan concentrations were highest and exceeded the sigma-HCH, chlorpyrifos, and malathion concentrations by 3.5-, 1.5-, and 8.4-fold, respectively. Through breast milk, infants consumed 8.6 times more endosulfan and 4.1 times more malathion than the average daily intake levels recommended by the World Health Organization. A correlation analysis (r values) between mothers' age and the content of the chemicals accumulated in breast milk indicated a substantial degree of correlation for malathion (r = 0.5). The other chemicals showed low to negligible correlation with donor age.</p>
6	Uttar Pradesh	
6.1	<p>Title: Perturbations in immune responses induced by concurrent subchronic exposure to arsenic and endosulfan</p>	<p>The metalloid arsenic and the chlorinated insecticide endosulfan are common environmental contaminants. Humans, animals, and birds are exposed to these chemicals through water and food. Although</p>

	<p>Authors and their affiliations: Aggarwal, Manoj Naraharisetti, Suresh Babu Dandapat, S Degen, G H Malik, J K</p> <p>National Referral Laboratory (Chemical Residues), Division of Pharmacology and Toxicology, Indian Veterinary Research Institute, Izatnagar UP, India. drmanoj_2k@yahoo.com</p> <p>Published in: Toxicology. 2008 Sep 29;251(1-3):51-60. Epub 2008 Jul 23.</p>	<p>health effects due to either arsenic or endosulfan exposure are documented, the toxicological impact of co-exposure to these environmental pollutants is unpredictable and unknown. The present study was undertaken to assess whether concurrent exposure to arsenic and endosulfan induces significant alterations in immunological functions. Peripheral blood and splenic mononuclear cells was significantly suppressed following concurrent exposure to arsenic and endosulfan. Therefore, immunotoxicological effects induced by concurrent exposure to arsenic and chlorinated pesticides should be considered when assessing the risk to human and animal health.</p>
6.2	<p>Title: Hypertension and myocarditis in rabbits exposed to hexachlorocyclohexane and endosulfan</p> <p>Authors and their affiliations: Anand, M Gulati, A Gopal, K</p>	<p>Male albino rabbits were exposed to the organochlorinated pesticides hexachlorocyclohexane (HCH) and endosulfan (2.5 and 5.0 mg/kg, ip) twice a week for 12 mo. The mean body weight of the rabbits at 12 mo was lower than that of the controls. There was rise in blood pressure and heart rate. Electrocardiograms (ECG) in both the exposed groups showed increases in PR, QT and RR intervals.</p>

	<p>Gupta, G S Khanna, R N Ray, P K Chandra, S V</p> <p>Industrial Toxicology Research Centre, Mahatma Gandhi Marg, Lucknow, India.</p> <p>Published in: Vet Hum Toxicol. 1990 Dec;32(6):521-3.</p>	<p>Extensive myocardial damage was recorded with marked degeneration of muscle fibers vacuolization and leucocytic infiltration. Adrenals had thickened capsules and hyperplasia of cortical cells. Both pesticides produced significant increases (p less than 0.001) of 11-hydroxycortisone at all time intervals. Hypertension and myocarditis occurred in rabbits exposed to HCH and endosulfan.</p>
6.3	<p>Title: Monitoring of organochlorine pesticide residues in summer and winter vegetables from Agra, India - a case study</p> <p>Authors and their affiliations: Bhanti, Mayank, Taneja, Ajay</p> <p>Department of Chemistry, St. John's College School of Chemical Sciences, Agra, India. mayankbhantil6@rediffmail.com</p> <p>Published in: Environ Monit Assess.</p>	<p>Analysis of summer and winter vegetable samples during 2002-2003 for pesticidal contamination was carried out on Gas Chromatograph-Electron Capture Detector with capillary columns. The contamination levels of winter vegetables (average concentration of 4.57, 6.80 and 5.47 ppb respectively for Lindane, Endosulphan and DDT) were found to be slightly higher than the summer vegetables (average concentration of 4.47, 3.14 and 2.82 ppb respectively for Lindane, Endosulphan and DDT). The concentration of these organochlorine pesticides in summer and winter vegetables were well below the established tolerances but continuous consumption of such vegetables even with moderate contamination level can accumulate</p>

	2005 Nov;110(1-3):341-6	in the receptor's body and may lead to chronic effects that could be fatal.
6.4	<p>Title: Organochlorine pesticide residues in bovine milk</p> <p>Authors and their affiliations: Nag, Subir K Raikwar, Mukesh K</p> <p>Plant Animal Relationship Division, Indian Grassland and Fodder Research Institute, Jhansi, UP 284 003, India. subirknag@yahoo.com</p> <p>Published in: Bull Environ Contam Toxicol. 2008 Jan;80(1):5-9. Epub 2007 Oct 17</p>	<p>Monitoring of bovine milk of different places in Bundelkhand region of India was carried out to evaluate the status of organochlorine pesticide (OCP) residues. Out of a total of 325 samples 206 (63.38%) were contaminated with residues of different OCPs. The average concentration of total HCH was 0.162 mg/kg. Among the different HCH isomers the frequency of occurrence of alpha-isomer was maximum followed by delta-, gamma- and beta. Endosulfan (alpha, beta, sulfate) was detected in 89 samples with mean concentration of 0.0492 mg/kg while total DDT comprising of DDT, DDE and DDD was present in 114 samples having mean concentration of 0.1724 mg/kg. Dicofol was positive in 17 samples.</p>
6.5	<p>Title: Pesticide residues and reproductive dysfunction in different vertebrates from north India</p> <p>Authors and their affiliations: Singh, Pratap B</p>	<p>Organochlorines (like endosulfan) and organophosphate (chlorpyrifos) insecticide residues were investigated by gas liquid chromatography in the blood of fish, chick, goat and man. Results indicated that in R. rita the SigmaDDT, SigmaHCH, endosulfan, aldrin, chlorpyrifos in blood levels</p>

	<p>Singh, Vandana Nayak, P K</p> <p>Department of Zoology, Tilak Dhari College, Jaunpur 222 002, India. pratap_b_singh@rediffmail.com</p> <p>Published in: Food Chem Toxicol. 2008 Jul;46(7):2533-9. Epub 2008 Apr 15.</p>	<p>were in preferential order (SigmaDDT>SigmaHCH>endosulfan>aldrin>chlorpyrifos) of their bioaccumulation. The blood levels of SigmaHCH and SigmaDDT also showed high levels in chick, goat and man, and preferential order of bioaccumulation was goat>chick>man>fish. The SigmaDDT also showed preferential order (man>chick>goat>fish) of bioaccumulation. Among the different tissues of fish (blood, liver, brain and ovary) the SigmaDDT was very high as compared to SigmaHCH as well as the rest of tissues which was very selective bioconcentration in different tissues of fish during prespawning phase. The gonadosomatic index, T and E2 declined in the catfish captured from polluted river when compared with the catfish captured from reference site affecting reproductive physiology. Our results indicated that increase of insecticides in blood level in vertebrates causes reproductive dysfunction and suggested that for human beings food like fish, chick and goat containing beyond permissible limit of insecticides must be avoided.</p>
6.6	Title:	

	<p>Organochlorine pesticide residue levels and oxidative stress in preterm delivery cases</p> <p>Authors and their affiliations:</p> <p>Pathak, Rahul Suke, Sanvidhan G Ahmed, Tanzeel Ahmed, Rafat S Tripathi, A K Guleria, Kiran Sharma, C S Makhijani, S D Banerjee, B D</p> <p>Environmental Biochemistry and Immunology Laboratory, Department of Biochemistry, University College of Medical Sciences & G.T.B. Hospital (University of Delhi), Delhi, India.</p> <p>Published in: Hum Exp Toxicol. 2010 May;29(5):351-8.</p>	<p>The aim of the present study was to analyze the OCP residues in maternal and cord blood of women and assess the levels of different non-enzymatic oxidative stress markers as well as to establish correlation with OCP levels, if any. Thirty women in each group of full-term delivery (FTD; ≥ 37 weeks of gestation) and preterm delivery (PTD; < 37 weeks of gestation) were enrolled in this study. Levels of OCPs like Endosulfan, and DDT were analyzed by gas chromatography. We found significant correlations between cord blood levels of beta-HCH and MDA ($r = .59$), beta-HCH and GSH ($r = -.69$), gamma-HCH and MDA ($r = .62$) and alpha-endosulfan and MDA ($r = .54$) in PTD cases. In conclusion, our results suggest that higher levels of some of the OCP residues may be associated with Preterm Delivery and increased oxidative stress.</p>
6.7	<p>Title: Ameliorating effect of N-acetylcysteine and</p>	<p>Major Findings: Subchronic exposure to endosulfan commonly affects the central nervous</p>

	<p>curcumin on pesticide-induced oxidative DNA damage in human peripheral blood mononuclear cells</p> <p>Authors and their affiliations</p> <p>Ahmed, Tanzeel, Pathak, Rahul Mustafa, Md Kar, Rajarshi Tripathi, Ashok K, Ahmed, Rafat S, Banerjee</p> <p>Environmental Biochemistry and Molecular Biology Laboratory, Department of Biochemistry, University College of Medical Sciences and G.T.B. Hospital (University of Delhi), Dilshad Garden, Delhi, 110 095, India.</p> <p>Published in: Environ Monit Assess. 2011 Aug;179(1-4):293-9. Epub 2010 Nov 4.</p>	<p>system, immune, gastrointestinal, renal, and reproductive system.</p> <p>This study was conducted to examine the role of oxidative stress in genotoxicity following pesticide exposure using human peripheral blood mononuclear cells (PBMC) in vitro. Further possible attenuation of genotoxicity was studied using N-acetylcysteine (NAC) and curcumin as known modulators of oxidative stress. Lipid peroxidation was assessed by cellular malondialdehyde (MDA) level and DNA damage was quantified by measuring 8-hydroxy-2'-deoxyguanosine (8-OH-dG) using ELISA.</p> <p>The results indicate that pesticide-induced oxidative stress is probably responsible for the DNA damage, and NAC or curcumin attenuate this effect by counteracting the oxidative stress.</p>
7	West Bengal	
7.1	Title: Assessment of the impact	Major Findings: The main aim of this study was to

	<p>of pesticide residues on microbiological and biochemical parameters of tea garden soils in India</p> <p>Authors and their affiliations Bishnu, A Saha, T Mazumdar, D Chakrabarti, K Chakraborty, A</p> <p>Institute of Environmental Studies and Wetland Management, Salt Lake City, Calcutta, India. avhikb@yahoo.co.in</p> <p>Published in: J Environ Sci Health B. 2008 Nov;43(8):723-31.</p>	<p>assess the impact of pesticidal residues on soil microbial and biochemical parameters of the tea garden soils. The microbial biomass carbon (MBC), basal (BSR) and substrate induced respirations (SIR), beta-glucosidase activity and fluorescein diacetate hydrolyzing activity (FDHA) of six tea garden soils, along with two adjacent forest soils (control) in West Bengal, India were measured. The alpha endosulfan, beta endosulfan and endosulfan sulfate pesticide residues in the tea garden soils ranged from 7.40 to 81.40 ppb, 8.50 to 256.1 ppb and 55 to 95.9 ppb respectively. Canonical correlation analysis shows that 93% of the total variation was associated with the negative impact of chlorpyriphos, beta and alpha endosulfan and endosulfan sulfate on MBC, BSR and FDHA. At the same time ethion had negative impact on SIR and beta-glucosidase. Data demonstrated that the pesticide residues had a strong impact on the microbial and biochemical components of soil quality.</p>
8	Rajasthan	
8.1	<p>Title: Gas chromatographic analysis of</p>	<p>Major Findings: Anasagar is a perennial, shallow fresh water body which is degraded</p>

	<p>organochlorine pesticides in Lake Anasagar of Ajmer, Rajasthan (India)</p> <p>Authors and their affiliations Charan, P D Sharma, Renu Sharma, K C India</p> <p>Department of Environmental Studies, MDS University, Ajmer, Rajasthan-305 009. prabhuenviro@gmail.com</p> <p>Published in: J Environ Sci Eng. 2010 Jan;52(1):37-40.</p>	<p>because of agricultural and other anthropogenic activities. The study revealed that water of Anasagar is highly contaminated with these synthetic pesticides. Among these agrochemicals, the level of Endosulfan, DDT and Y-HCH were found to be significantly high in the lake. Therefore, the research efforts are needed to conserve the wetland as well as to minimise the impacts of agrochemicals on the lake ecosystem.</p>
8.2	<p>Title: A study of physico-chemical characteristics of lakes around Jaipur, India</p> <p>Authors and their affiliations Srivastava, Neera Harit, Garima Srivastava, Rama India</p> <p>Fish Biology Laboratory, Centre for Advanced Studies, Department of</p>	<p>Annual survey of Jalmahal, Amer, Nevta and Ramgarh lakes, has been conducted for one calendar year, to determine physicochemical characteristics of water and the levels of zinc (heavy metal) and endosulfan (an organochlorine pesticide). These lakes are situated on the outskirts of Jaipur city. Changes in pollutants correlated well with the physico-chemical characteristics of water bodies. Results reveal that the levels of endosulfan and zinc are highest in Jalmahal lake (1.324 and 0.197 mg l(-1) respectively) and lowest in Ramgarh lake (0.020 and 0.120 mg l(-</p>

	<p>Zoology, University of Rajasthan, Jaipur 302 004, India.</p> <p>Published in: J Environ Biol. 2009 Sep;30(5 Suppl):889-94.</p>	<p>1) respectively). Anthropogenic sources and cultivation in the dried up area of these lakes seem to contribute largely to pollution.</p>
9	Tamil Nadu	
9.1	<p>Title: Organochlorine pesticide residues in ground water of Thiruvallur district, India</p> <p>Authors and their affiliations Jayashree, R, Vasudevan, N</p> <p>Centre for Environmental Studies, Anna University, Chennai, 600025, Tamil Nadu, India. p_tamil@yahoo.com</p> <p>Published in: Environ Monit Assess. 2007 May;128(1-3):209-15. Epub 2006 Oct 3.</p>	<p>The present study was chosen to know the level of organochlorines contamination in ground water of Thiruvallur district, Tamil Nadu, India. The samples were highly contaminated with DDT, HCH, endosulfan and their derivatives. Among the HCH derivatives, Gamma HCH residues was found maximum of 9.8 microg/l in Arumbakkam open wells. Concentrations of pp-DDT and op-DDT were 14.3 microg/l and 0.8 microg/l. The maximum residue (15.9 microg/l) of endosulfan sulfate was recorded in Kandigai village bore well. The study showed that the ground water samples were highly contaminated with organochlorine residues.</p>

9.2	<p>Title: Organochlorine pesticides in commercial marine fishes of Coimbatore, India and their suitability for human consumption</p> <p>Authors and their affiliations Muralidharan, Subramaniyan Dhananjayan, Venugopal Jayanthi, Palaniyappan</p> <p>Ecotoxicology Division, Salim Ali Centre for Ornithology and Natural History, Coimbatore 641 108, TN, India. ecot_mur@yahoo.com</p> <p>Published in: Environ Res. 2009 Jan;109(1):15-21. Epub 2008 Oct 11.</p>	<p>Organochlorine pesticide residues were determined in 10 species of fishes caught at Cochin and Rameshwaram coast, and sold in Coimbatore, Tamil Nadu, India. A total of 389 fishes were analyzed for organochlorine residues and their suitability for human consumption was evaluated. Results show varying levels of residues of hexachlorocyclohexane (HCH), DDT, heptachlor epoxide, endosulfan and dieldrin. About 22% of the fishes exceeded the maximum residue limits (MRL) of total HCH prescribed by FAO/WHO for fish products. The present study recommends continuous monitoring of environmental contaminants in marine fishes to assess the possible impact on human health.</p>
10	Maharashtra	
10.1	<p>Title: Acute toxicity of endosulfan 35EC to two freshwater bivalve</p>	<p>Static bioassay tests were conducted using commercial grade endosulfan 35EC to study its toxicity during different seasons to two species of</p>

	<p>molluscs from Godavari river at Maharashtra State, India</p> <p>Authors and their affiliations Mane, U H Muley, D V</p> <p>Published in: Toxicol Lett. 1984 Nov;23(2):147-55.</p>	<p>Lamellidens from the Godavari river at Paithan (Maharashtra State). Acute toxicity studies for 96 h showed that both species of Lamellidens were more sensitive to endosulfan 35EC in summer, at times of high temperature, pH and total carbonate content of the water used, than in monsoon and winter. The results are discussed in the light of possible effects of endosulfan on these species of bivalve molluscs.</p>
10.2	<p>Title: Monitoring of pesticide residues in market vegetables at Ranchi, Jharkhand (India)</p> <p>Authors and their affiliations Shahi, D K, Nisha, Kumari Sharma, A</p> <p>Department of Soil Science & Agricultural Chemistry, Birsa Agricultural University, Ranchi, Jharkhand.</p> <p>Published in: J Environ Sci Eng. 2005 Oct;47(4):322-5.</p>	<p>Thirty nine market samples of seasonal vegetables, namely cauliflower (14), brinjal (12) and okra (13), were monitored for residues of endosulfan applied during their growth period from four different locations (Kanke, Gandhi Nagar, Doranda and Ratu road) near by Ranchi. Out of thirty nine samples, 10 each from Kanke, Gandhi Nagar, Doranda and 9 from Ratu road, all samples were found to be contaminated with endosulfan (0.002-2.47 ppm). Among these three samples from Kanke and one each from Gandhi Nagar, Doranda and Ratu road showed endosulfan residues above the MRL values (2.0 ppm).</p>
11	Punjab	

11.1	<p>Title: Endosulfan poisoning: a study of 22 cases</p> <p>Authors and their affiliations Singh, N ,Singh, C P Kumar, H Brar, G K</p> <p>Department of Medicine, G G S Medical College and Hospital, Faridkot, Punjab.</p> <p>Published in: J Assoc Physicians India. 1992 Feb;40(2):87-8.</p>	<p>Twenty two cases of endosulfan poisoning with their symptomatology are reported. The management and lack of awareness regarding specific treatment are highlighted.</p>
11.2	<p>Title: Adverse reproductive and child health outcomes among people living near highly toxic waste water drains in Punjab, India</p> <p>Authors and their affiliations Thakur, Jarnail Singh Prinja, Shankar Singh, Dalbir Rajwanshi, Arvind Prasad, Rajendra Parwana, Harjinder Kaur Kumar, Rajesh</p>	<p>Punjab has been reported as having a high degree of water pollution due to heavy metals from untreated industrial effluent discharge and high pesticide consumption in agriculture. The present study ascertained the association of heavy metal and pesticide exposure on reproductive and child health outcomes in Punjab, India.</p> <p>A cross-sectional community-based survey was conducted in which 1904 women in reproductive age group and 1762 children below 12 years of age from 35 villages in three districts</p>

	<p>School of Public Health, Postgraduate Institute of Medical Education and Research, Sector 12, Chandigarh 162001, India. jsthakur64@gmail.com</p> <p>Published in: J Epidemiol Community Health. 2010 Feb;64(2):148- 54. Epub 2009 Oct 19.</p>	<p>of Punjab were interviewed on a semistructured schedule for systemic and general health morbidities.</p> <p>RESULTS: Spontaneous abortion (20.6 per 1000 live births) and premature births (6.7 per 1000 live births) were significantly higher in area affected by heavy metal and pesticide pollution (p<0.05). Stillbirths were about five times higher as compared with a meta-analysis for South Asian countries. Endosulfan was found in 19.6% of ground water samples.</p> <p>CONCLUSION: Heavy metal and pesticide exposure may be potential risk factors for adverse reproductive and child health outcomes.</p>
12	Gujarat	
12.1	<p>Title: Assessment of thyroid function in pesticide formulators</p> <p>Authors and their affiliations Zaidi, S S Bhatnagar, V K Gandhi, S J Shah, M P Kulkarni, P K Saiyed, H N</p>	<p>Thirty male pesticide formulators exposed to the dust and liquid formulation of endosulfan, quinalphos, chlorpyrifos, monocrotophos, lindane, parathion, phorate, and fenvalerate and 20 comparable control subjects from the same area of study were examined for the evaluation of thyroid function tests. The level of TSH was elevated (about 28%) in pesticide formulators</p>

<p>National Institute of Occupational Health (Indian Council of Medical Research), Meghani Nagar, Ahmedabad. Published in: Hum Exp Toxicol. 2000 Sep;19(9):497-501.</p>	<p>as compared to a control group. This study indicated thyroid function impairment in few pesticide formulators.</p>
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All the articles were reviewed and only relevant points were included in the synopsis.

This synopsis is not exhaustive and only forms a part of scientific studies from India on Endosulfan.

Sd/

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