BEFORE THE NATIONAL GREEN TRIBUNAL
PRINCIPAL BENCH, NEW DELHI

ORIGINAL APPLICATION NO. 1375 OF 2024

IN THE MATTER OF:

News Item titled "Four endangered crocodile found dead in Rajasthan River experts wonder if pollution to blame" appearing in the Indian Express dated 06.12.2024

REPLY ON BEHALF OF RESPONDENT NO. 1, I.E., MUNICIPAL CORPORATION KOTA

PAPER BOOK

[FOR INDEX KINDLY SEE INSIDE]

ADVOCATE FOR RESPONDENT NO.1: MUNICIPAL CORPORATION KOTA

SHIV MANGAL SHARMA AND SAURABH RAJPAL

FILED ON: 04.12.2025

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I N D E X

	food and Nutritional Sciences, Volume 11, December 2022	
6	**ANNEXURE R1/5** A true copy of clip of Patrika news dated 09.04.2025	**44**
7	**ANNEXURE R1/6** True copies of handover/ taken over report dated 08.04.2025 and 02.05.2025	**45-48**
8	**ANNEXURE R1/7** True copies of letter dated 09.07.2025 and 09.10.2025 by Municipal Corporation of Kota	**49-53**
9	**ANNEXURE R1/8** A true copies of CTO issued by Rajasthan State Pollution Control Board	**54-63**
10	**ANNEXURE R1/9** A true copy of a sample of one MoU signed by farmer	**64**
11	**ANNEXURE R1/10** A true copy of letters from RUIDP to industries	**65-70**
12	Vakalatnama	**71**

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PLACE: NEW DELHI
DATE: 04.12.2025

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REPLY ON BEHALF OF RESPONDENT NO. 1, I.E., MUNICIPAL CORPORATION KOTA

MOST RESPECTFULLY SHOWETH:

1. The present Reply is being filed on behalf of Respondent No. 1, i.e., Municipal Corporation ("**answering Respondent**"), in compliance of Order dated 25.02.2025 passed by this Hon'ble Tribunal in the present Original Application No. 1375/2024 ("**subject OA**"). It is submitted that this Reply is also being placed on record in terms of subsequent liberties granted by this Hon'ble Tribunal to the Respondents to file their respective responses.

2. It is to note that the present OA has been instituted by this Hon'ble Tribunal by taking *suo moto* cognizance of a news item titled *"Four endangered crocodile found dead in Rajasthan River experts wonder if pollution to blame"* published in '*India Express'* newspaper dated 06.12.2024. The news report highlighted that in 2022, around 50 crocodiles had died due to industrial waste pollution in the Chandraloi

River, Kota, State of Rajasthan. It was further reported that six days prior to the publication of the said news, four crocodiles measuring approximately 6–7 feet in length were found dead, with the cause of death attributed to industrial pollution contaminating the river water. The crocodiles are endangered species listed under Schedule I(c) of the Wildlife (Protection) Act, 1972, and their deaths are stated to have occurred due to water pollution.

3. In view of the above, this Hon'ble Tribunal, vide order dated 19.12.2024, was pleased to constitute a Joint Committee to ascertain the causes of the crocodile deaths. The Joint Committee comprises representatives of the Rajasthan State Pollution Control Board (RSPCB), the Central Pollution Control Board (CPCB), the Chief Wildlife Warden, State of Rajasthan, and a nominee of the Wildlife Institute of India, Dehradun, Uttarakhand.

4. Pursuant to the directions contained in the order dated 19.12.2024, the Joint Committee conducted a site inspection on 24th and 25th January 2025 and thereafter submitted a Joint Committee Report dated 24.02.2025, which includes the analysis of water samples collected during the inspection. The said report stands placed on record vide order dated 25.02.2025.

5. The Joint Committee Report summarises the findings based on the site inspection as follows:

> *"7. Summary:-*
>
> *The joint committee visited the areas on 24 & 25 January 2025 and collected the water samples from 09 representative locations where the incidents of crocodile death were reported during 30.11.2024 to 4.12.2024 in River Chandraloi. The*

samples collected from drain, industrial outlets, River Chandraloi and Chamble and later analysed for physico-chemical, heavy metal, pesticide and biological indicator as per location specific parameters. The joint committee's findings are quite comprehensive. It appears that organic pollution from raw sewage mixing into the Chandraloi River is a significant issue, as indicated by the physico-chemical parameters and the presence of Total & Faecal Coliform. The dominance of Chironomidae in benthic macro-invertebrates further confirms sewage contamination in the water body.

Interestingly, the bio-assay results show a high fish survival rate (90% to 100%) in the collected samples. This could suggest that, despite the contamination, aquatic life forms are still managing to survive. However, the long-term impacts of such pollution on the ecosystem could be detrimental.

It was observed that heavy metal levels are within normal ranges. However, the increasing use of pesticide41s by local farmers is concerning. Traces of pesticides like a-BHC,13-BHC, 8-BHC, Aldrin, Endo Sulfan, and 4,4-DDE have been detected in the river water. Although these concentrations are within the prescribed drinking water standards (IS 10500:2012).

The committee also interacted with officers of veterinary department, Kota who conducted the postmortem but report is not very clear about the cause of death as carcass was found in putrefied condition, the probable reason of death is multiple organ failure. However, samples of viscera have been sent to State Forensic lab Kota and report is awaited.

There's a sewage system issue in Kota, resulting in raw sewage entering the Chandraloi River. Despite having a 2.75 MLD surplus sewage treatment capacity, gaps in household connections lead to pollution. Effective measures are needed to

ensure all households are properly connected and sewage is treated before entering the river.

As reported in newspaper 50 crocodile died recently but as per the record of Forest & Wildlife Department of Kota since January 2022 to December 2024 total 10 deaths of Crocodiles were reported which includes the recent 4 deaths, hence fact is not in consonance with the field condition."

6. That the Answering Respondent by way of the present short reply, is placing on record the facts pertaining to the issue in the present OA.

OBSERVATIONS AND ANALYSIS BY EXPERT FROM UNIVERSITY OF KOTA:

7. It is submitted that the answering Respondent sent a letter to the University of Kota for conducting a detailed study in Kota to know the actual reasons for death of crocodiles and requested that a detailed study may be conducted on the specified area which were selected by the Joint Committee. A true copy of letter dated 31.10.2025 issued by Municipal Corporation Kota, North to Registrar, University of Kota is annexed hereto and marked as **ANNEXURE R1/1.**

8. That the experts from the University of Kota, Dr Pallavi Sharma (Microbiology), Dr. Sapna Bhargav (Zoology) and Ranjana Gupta (Zoology) Department of Wildlife Science from University of Kota pointed out analysis which can be taken from the review article titled "*Gut Microbiome- Immune System Interaction in Reptiles".*

A true copy of review article titled "*Gut Microbiome- Immune System Interaction in Reptiles"* is annexed hereto and marked as **ANNEXURE R1/2.**

9. It is submitted that the study indicates that the presence of fecal coliform suggests contamination; however, reptiles naturally have high bacterial loads, and crocodiles possess strong bacterial resistance. Coliform infections develop gradually and are rarely fatal unless combined with high toxicity or chronic pollutant exposure. Therefore, fecal coliform is not a direct or immediate cause of crocodile mortality.

OBSERVATION BY THE MUNICIPAL CORPORATION KOTA ON JOINT COMMITTEE REPORT:

10. It is pertinent to note that the Joint Committee observed approximately 50 crocodiles alive at the Habitat Centre during its field visit. If fecal coliform were the cause of death, other aquatic species such as fish, turtles, frogs, tadpoles, and crabs would also have been adversely affected.

11. The Bio-Assay Test conducted by the Joint Committee indicates 90%–100% fish survival after 96 hours in 100% effluent, thereby ruling out acute toxicity. If fish can survive, it is improbable that crocodiles died due to water toxicity alone.

12. In the report notes that two crocodile deaths occurred near Chandraloi River anicut, where expired medicines (Paracetamol and analgesics) were found in a nearby nallah. The Municipal Corporation, Kota has no role or liability regarding the disposal of expired medicines. The analysis of pharmaceutical contaminants falls under the purview of RSPCB.

13. As per the Joint Committee Report, the agriculture fields were observed on both sides of the river where mainly vegetables such as wheat, garlic and musteres are grown. According to the pesticides analysis, at river Chandraloi at Ramkhedli Puliya the concentration level of Aldarin were found on higher side that is 0.049 ug/l were as the acceptable limit as per drinking water limit as per 10500: 2012 is 0.03 ug/l. Also, it is to be noted that Aldrin is strictly banned in India significant toxicity, its classification as a persistent organic pollutant (POP), and its tendency to bioaccumulation in the environment and food chain, posing severe risks to human health and wildlife (Food Safety and Standards Authority of India). In this regards Municipal Corporation Kota have no liability and no concern with agriculture activity.

A true copy notification dated 29.11.2023 issued by Food Safety and Standards Authority of India is annexed hereto and marked as **ANNEXURE R1/3.**

14. It is noted that the crocodiles present near Chandraloi River has changed their colour into greyish white colour. This is probably due to the chemicals discharge from chemicals into the river and also due to the Kota stone cutting factories situated nearby the nallah as that also leads to the increasing of suspended solids into the water stream and thus decreases the percentage of dissolved oxygen into the water stream.

A true copy research paper titled as *"Physicochemical properties of wastewater in three typical sewage accumulated sites of Kota Districts of Rajasthan"* published in journal of IJANS International

Journal of food and Nutritional Sciences, Volume 11, December 2022 is annexed hereto and marked as **ANNEXURE R1/4.**

A true copy of clip of Patrika news dated 09.04.2025 is annexed hereto and marked as **ANNEXURE R1/5.**

15. Regarding the crocodile found dead in Kansua Nallah, it was a 50-year-old male. Considering the natural lifespan of crocodiles (50–70 years), this may have been a natural death. At Chandrasel Math, two carcasses were found in a decomposed state, preventing determination of cause of death. At Ramkhedli Bridge, one 15-year-old female crocodile was found dead, and the Joint Committee reported the presence of pesticides such as Aldrin, DDE and Endosulfan.

16. Therefore, the deaths of the four crocodiles cannot be attributed to the answering Respondent, and RSPCB's repeated assertion that fecal coliform is the cause of death is unfounded.

STATUS ON SEWAGE TREATMENT IN SOUTH KOTA:

17. It is respectfully submitted that the issue relating to the death of the crocodiles squarely falls within the jurisdiction of the Municipal Corporation Kota (South Zone). The Kota South area presently has two Sewage Treatment Plants (STPs): one 30 MLD STP located at Sajidhera and another 2 MLD STP situated near Oxyzone Park.

18. Subsequently, Kota South and Kota North have been reorganized and merged into a single administrative body, now functioning as the Municipal Corporation Kota.

19. At present, in several areas, the work of establishing sewer lines is being undertaken by the Kota Development Authority (KDA), with the planning and execution carried out by the Rajasthan Urban Infrastructure Development Project (RUIDP).

20. The Municipal Corporation of Kota is responsible only for the operation and maintenance of such sewerage infrastructure after it is formally handed over by RUIDP.

A true copy of handover/ taken over report dated 08.04.2025 and 02.05.2025 is annexed hereto and marked as **ANNEXURE R1/6.**

21. It is submitted that RUIDP has been appointed as the implementing agency submitted work to be done under the Budget Announcement for the year 2025-2026 for Municipal Corporation of Kota

A true copy of letter dated 09.07.2025 and 09.10.2025 by Municipal Corporation of Kota is annexed hereto and marked as **ANNEXURE R1/7.**

22. At present, seven nallahs fall under the jurisdiction of Municipal Corporation, Kota. Kota City has eight Sewage Treatment Plants (STPs), out of which five are operated by the Municipal Corporation and three by the Kota Development Authority.

S.NO	Name of STP	Capacity (MLD)	Status	Handled By:
1.	Oxyzone Park	02	Operatational	MCK
2.	Sajidehra	30	Operatational	KDA

3.	Balita	30	Operatational	KDA
4.	Balita	30	Operatational	KDA
5.	Balita	15	Operatational	MCK
6.	Kala Talab	15	Operatational	MCK
7.	Dhakadkeri	40	Operatational	MCK
8.	Dhakadkeri	20	Under upgradation since Jan 2024	MCK

A true copies of CTO issued by Rajasthan State Pollution Control Board is annexed hereto and marked as **ANNEXURE R1/8.**

STEPS TAKEN TO USE THE TREATED WATER OF STP IN HORTICULTURE OR CONSTRUCTION PURPOSES IN THE KOTA CITY:

23. That recently, MoUs have been executed between the Municipal Corporation, Kota and local farmers for utilizing treated sewage water for agricultural activities, and the process is currently underway. A true copy of a sample of one MoU signed by farmer is annexed hereto and marked as **ANNEXURE R1/9.**

24. That further the treated water could also be used for industrial purposes and in that case RUIDP had written letters to some major industries for the use of water for considering the usage of treated water.

A true copy of letters from RUIDP to industries is annexed hereto and marked as **ANNEXURE R1/10.**

25. That the Respondent No. 1 craves liberty of this Hon'ble Tribunal to file any further additional status report that may be required to be placed on record and reserves its right with regard to same.

26. That the documents annexed to the present reply are true copies of their respective originals.

FILED BY:

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PLACE: NEW DELHI
DATE: 04.12.2025

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AFFIDAVIT

I, Tanuj Kumar Sharma, S/o Shri Shiv Dutt Sharma, aged about 41 years, posted as Executive Engineer, Municipal Corporation, Kota (Nodal Officer),Department of L.S.G Rajasthan, do hereby and solemnly affirm and state herein under:

1. That I am the Office In-Charge (Respondent No.1)in the accompanying Replyand am well conversant with the facts and circumstances of the case and thus competent to swear this affidavit.

2. That I have read the accompanying Reply have been drafted under my instructions, which I have read and understood. I further state that the averments made therein are true and correct to my knowledge

3. That the Annexures filed along with the Replyare true copies of their respective originals.

DEPONENT

VERIFICATION

Verified at Kota on this the 3rd day of December, 2025. I, the abovenamed deponent, do hereby verify that the contents of the above affidavit are true and correct. No part of it is false and nothing material has been concealed therefrom.

DEPONENT

ATTESTED
MAHENDRA SINGH YADAV
(CENTRAL) KOTA (RAJ.)
03/12/2025

ANNEXURE R-1/1

MUNICIPAL CORPORATION KOTA NORTH

Ref :- Nnkn/Comm/2025/ 15176-80 **Date :-** 31/10/25

To
Registrar,
University of Kota

Subject: To conduct study in Kota City, regarding the NGT matter " Four endangered crocodile found dead in Rajasthan River experts wonder if pollution to blame"

Respected Sir,

As per the cited subject, NGT had filled a case against Municipal Corporation Kota, regarding the cited subject. In the above matter, Hon'ble NGT, Principal Bench, New Delhi constituted a joint Committee comprising of RSPCB, CPCB, chief wildlife warden, State of Rajasthan and Nominee of Wildlife Institute of India, Dehradun, State of Uttarakhand to find out the factual correctness of the information and the reasons of death of crocodiles (Report attached).
now we want to conduct study through Microbiology expertise, to know the actual reason behind the death of the Crocodile. Kindly conduct study on the specified areas which were selected by the joint committee as possible as soon.

Commissioner
Nagar Nigam Kota North

Ref :- Nnkn/Comm/2025/ 15176-80 **Date :-** 31/10/25
Copy To:

1. Add. Commissioner, Nagar Nigam Kota North.
2. Superintendent Engineer, Nagar Nigam Kota North.
3. Assistant Engineer, Nagar Nigam Kota North.
4. Guard File.

Commissioner
Nagar Nigam Kota North

Received: 10 November 2021 | Revised: 12 December 2021 | Accepted: 31 December 2021

DOI: 10.1111/jam.15438

Journal of Applied Microbiology sfam

REVIEW ARTICLE

Gut microbiome–immune system interaction in reptiles

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Funding information
Work in the authors' laboratories is supported by grants from the Air Force Office of Scientific Research (AFOSR), grant number: FA 8655-20-1-7004.

Abstract

Reptiles are ectothermic amniotes in a world dominated by endotherms. Reptiles originated more than 300 million years ago and they often dwell in polluted environments which may expose them to pathogenic micro-organisms, radiation and/or heavy metals. Reptiles also possess greater longevity and may live much longer than similar-sized land mammals, for example, turtles, tortoises, crocodiles and tuatara are long-lived reptiles living up to 100 years or more. Many recent studies have emphasized the pivotal role of the gut microbiome on its host; thus, we postulated that reptilian gut microbiome and/or its metabolites and the interplay with their robust immune system may contribute to their longevity and overall hardiness. Herein, we discuss the composition of the reptilian gut microbiome, immune system–gut microbiome cross-talk, antimicrobial peptides, reptilian resistance to infectious diseases and cancer, ageing, as well the current knowledge of the genome and epigenome of these remarkable species. Preliminary studies have demonstrated that microbial gut flora of reptiles such as crocodiles, tortoises, water monitor lizard and python exhibit remarkable anticancer and antibacterial properties, as well as comprise novel gut bacterial metabolites and antimicrobial peptides. The underlying mechanisms between the gut microbiome and the immune system may hold clues to developing new therapies overall for health, and possible extrapolation to exploit the ancient defence systems of reptiles for *Homo sapiens* benefit.

KEYWORDS

antimicrobial peptides, epigenetics, gut microbiome, immune system, longevity, novel metabolites, reptiles

INTRODUCTION

Reptiles are ectothermic amniotes and are certainly remarkable species, such as crocodiles being designated as 'living fossils' (Meyer, 1984; Stockdale & Benton, 2021). The origin of reptiles is thought to have been in the last 310–320 million years, with certain species (such as crocodilians) enduring mass extinction events, for instance the catastrophic Cretaceous-Tertiary extinction event (Jeyamogan et al., 2020; Laurin & Reisz, 1995; Tokaryk, 1991). Conversely, *Homo sapiens* are merely a single species in the midst of millions of other species, as well as being a relatively contemporary addition to planet Earth. With the gaining momentum of the concept of 'One Health', which connects human and animal health with the ecosystem (Bonilla-Aldana et al., 2020), it makes sense to look to reptiles who have displayed abilities evolve, adapt, thrive and survive successfully over millions of years, dwelling in environments which may comprise radiation and/or heavy metals (Gholamhosseini et al., 2021). Reptiles also possess greater longevity than similar-sized land mammals, for example crocodiles are long-lived reptiles sometimes living up to 100 years, advocating that we ought to learn from these species. Given that most of the immune system is thought to reside in the gut, accordingly, we speculated that the gut microbiome of reptiles most likely contributes

to their robust immune system, their ability to thwart infectious diseases, cancer, and in some cases display limited or negligible senescence (Akbar, Siddiqui, Sagathevan, Iqbal, et al., 2019; Akbar, Siddiqui, Sagathevan, et al., 2020; Jeyamogan et al., 2019, 2020; Siddiqui et al., 2021; Wiertsema et al., 2021). Currently, the gut microbiome is accepted to play a crucial role on the health of the host, and a surfeit of studies have depicted that the gut microbiome may provide protection against neurodevelopment disorders, as well as cancer, among other diseases (Lee et al., 2021; Mohajeri et al., 2018; Siddiqui et al., 2021). Moreover, the relationship between the microbiome and the mammalian immune system has been described (Zheng et al., 2020). However, there is a dearth of studies on the gut microbiome composition of reptiles and their interaction with their immune system and other important attributes, despite these species depicting a robust immune system and the ability to survive in environments that are detrimental to humans (Jeyamogan et al., 2017; Siddiqui et al., 2017). Reptiles are normally long-lived, generally with a prolonged period of growth as well as maturing earlier in life. Reptiles are ectothermic and so are unable to regulate their inner body temperature. They undergo ardent seasonal shifts in behaviour associated with environmental temperatures and these attributes may impact their immune function (Zimmerman et al., 2010). Furthermore, molecular mechanisms and microbiome cross-talk with the immune system, as well as the underlying benefits to reptile physiology are not yet comprehended. Herein, we discuss the composition of the reptilian gut microbiome, immune system–gut microbiome cross-talk, antimicrobial peptides, longevity and cellular senescence, reptilian resistance to infectious diseases and cancer, as well the current knowledge of the genome and epigenome of these remarkable species (Figure 1). Given the profound role of the gut microbiome, it is anticipated that studies on the reptilian gut microbiome will elucidate a myriad of important information for the benefit of *Homo sapiens*.

REPTILES AND THEIR GUT MICROBIOME

Reptiles belong to the class Reptilia that consists of crocodilians, turtles, snakes, lizards, amphisbaenians and tuatara. Approximately 11,570 different species of reptiles, and 2192 subspecies were described in 2021 and this list is continually growing (Mans et al., 2021; reptile-database.org; Uetz, 2016). Reptiles belong to the Animalia kingdom, Chordata phylum, Reptilia class and Sauropsida clade. The Reptilia class comprises four orders: turtles and tortoises (Testudines), tuataras (Rhynochocephalia), snakes and lizards (Squamata) and crocodilans (Crocodilia) (Mans et al., 2021; Modesto et al., 2004).

It has been suggested that the gut microbiome is closely related to the host evolution and this has probably affected host species evolution for millions of years, possibly impacting the communities evolutionary trajectories

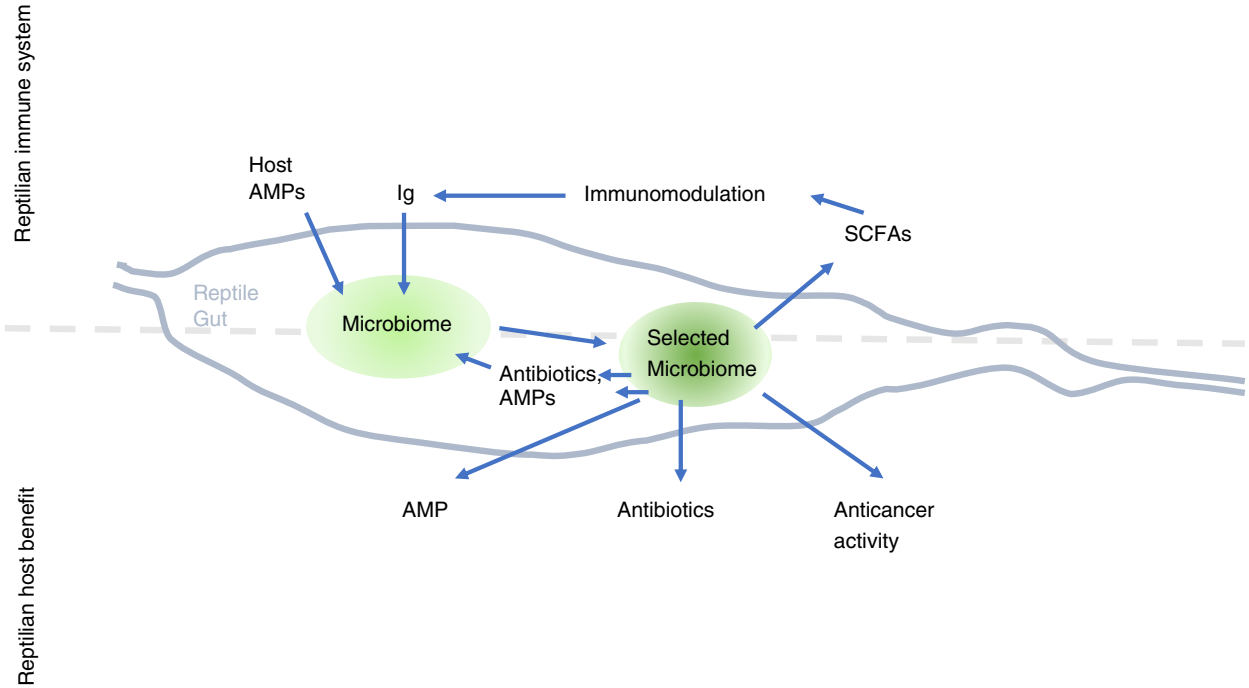

FIGURE 1 The role of reptilian gut microbiome in host defence and immunity. AMP, Antimicrobial peptides; Ig, immunoglobulins; SCFA, short-chain fatty acid

(Fraune & Bosch, 2010; Scheelings et al., 2020; Zilber-Rosenberg & Rosenberg, 2008). Reptile-associated microbiomes likely contain a myriad of information waiting to be explored.

In humans, the gut microbiome comprises circa 100 trillion micro-organisms (mainly bacteria, but also fungi, protists and viruses) and encodes more than 3 million genes that likely yield thousands of metabolites, with countless functions that influence the overall health of the host (Almeida et al., 2021; Bull & Plummer, 2014; Valdes et al., 2018). Various reports indicate that the microbiome can impart protection against disorders such as systemic metabolic disease (type 2 diabetes and obesity), inflammatory bowel disease, eczema, allergic diseases, whereas dysbiosis in the gut can, in turn, lead to development of disease as well as affect the immune system and even ageing (Bosco & Noti, 2021; Chakaroun et al., 2020; Ghoshal et al., 2012; Kang et al., 2017; Kelly et al., 2017). Prior studies indicate that the vertebrates gut microbiome is dominated by *Bacteroidetes* and *Firmicutes*, which are known to impact the physiology of their host in regard to metabolism and the immune system (Magne et al., 2020; Thomas et al., 2011). Other species namely *Proteobacteria*, *Fusobacteria*, *Actino-bacteria* and *Verrucomicrobia* are relatively less (Eckburg et al., 2005).

There are limited number of reports on the gut microbiome composition of reptiles, but with emerging next generation sequencing technologies it has been revealed that the core gut microbiome of reptiles gut microbiome consists of *Proteobacteria*, *Firmicutes* and *Bacteroidetes* and that reptile gut bacterial communities are more comparable to birds than mammals (Colston, 2017).

Forthcoming studies are warranted to determine the core gut microbiome of the reptilian species. For instance, from the 26 species of extant crocodilians (Moreira et al., 2021), analyses of microbiome have merely been accomplished in the alligator and salt water crocodile (Keenan et al., 2013; Willson et al., 2019). Given that these species are so resilient, as well as long-lived and display limited cellular senescence (Jones et al., 2014), studies to comprehend how their gut microbiome is connected with these attributes are necessary. One study reported the gut microbiome composition of the Australian saltwater crocodile (*Crocodylus porosus*) (Willson et al., 2019). This study depicted that the gut microbiome comprised *Firmicutes*, mainly *Clostridia*, and *Fusobacteria*, indicating that the crocodile gut microbiome is indeed distinct from mammals, fish and other reptiles which are typically dominated by *Firmicutes* and *Bacteroidetes* (Willson et al., 2019). Another recent study in the same crocodile species revealed that the gut bacteria was comprised of species including *Proteobacteria*, *Firmicutes*, *Actinobacteria*, *Bacteroidetes* and *Deinococcus-Thermus* (Khan et al., 2021). Prior to this study, it was reported the gut microbiome of alligators comprises of a core microbiome of *Fusobacteria*, *Bacteroidetes*, *Firmicutes* and *Proteobacteria*. Furthermore, the presence of *Fusobacteria* in the gut microbiome of alligators made them unique (Keenan et al., 2013). Nonetheless, these are the only studies that have been conducted to elucidate the gut microbiome in crocodilians.

A recent study examined the wild crotaline snake gut microbiome, known as the cottonmouth (*Agkistrodon piscivorus*) snake (Colston et al., 2015). This study revealed that *Proteobacteria* were abundant in the small intestine and cloaca (the single opening for both excretory and reproductive organs in reptiles) and members of the phylum *Bacteroidetes* were the dominant bacteria of the large intestine. However, another prior study indicated that the python gut microbiome was dominated by members of *Bacteroidetes* and *Firmicutes* (Costello et al., 2010). Of note, most extant reptiles are carnivores, while approximately 2% of known species are herbivores (Stevens & Hume, 2004).

In another report, it was found that the Gopher tortoise faecal microbiome was dominated by *Bacteroidetes* and *Firmicutes* in equal ratios, whereas normally reptiles that are herbivores usually have faecal bacteria dominated by *Firmicutes* (Hong et al., 2011; Yuan et al., 2015). Of note, tortoises and turtles are usually herbivore species among the reptiles (Vitt & Caldwell, 2013). Interestingly, increased diversity of bacterial species was found in adult tortoises in comparison to juveniles, which has also been observed in human gut microbiome studies (Koenig et al., 2011; Yuan et al., 2015). A weak correlation was observed between microbiome composition and kinship, with close relatives depicting similar microbiome composition, that may have arisen during direct transmission in egg development and/or sibling association in the nest (Yuan et al., 2015).

Recently, the gut microbiota in farmed snake species was elucidated in China (Zhang et al., 2019). The study revealed that *Bacteroidetes*, *Proteobacteria*, *Firmicutes*, *Fusobacteria* and *Actinobacteria* were most abundant, differing from mammals and birds and other reptiles (Keenan et al., 2013; Ley et al., 2008; McLaughlin et al., 2015; Waite & Taylor, 2014). In another major taxa of reptiles, a study was conducted in lizards, and this portrayed that their gut microbiome was dominated by *Firmicutes*, *Bacteroidetes* and *Proteobacteria* (Hong et al., 2011; Ren et al., 2016).

IMMUNE SYSTEM OF REPTILES

Although reptiles have an important status in evolutionary history, the reptilian immune system has gathered insufficient attention (Zimmerman et al., 2010). It is thought

that 70%–80% of immune cells are present in the gut, and they portray an intricate relationship with the gut microbiome (Wiertsema et al., 2021). Reptiles have an innate and adaptive immune system. The innate system, which incorporates components like non-specific leukocytes, a complement system and antimicrobial peptides, responds quickly as a non-specific first line of defence against a wide range of pathogens. Whereas the adaptive system is more specific but responds slower, producing a quicker and stronger response upon second exposure to an antigen (Rimer et al., 2014). In many cases, reptilian responses are stronger than those from mammals (Zimmerman, 2020). The ability of reptiles to depict attributes of an immune system was first demonstrated in lizards in the 1970s, when the adaptive significance of fever was portrayed, and higher body temperature improved their survival (Kluger et al., 1975). Recent work in reptiles has shown that their immune systems comprise similar general components in comparison to mammals, such as the level of organization of lymphoid tissue (Neely & Flajnik, 2016) and slight variations in the expression of cytokines (Zimmerman et al., 2014). This may lead to different immune strategies which may not fall categorically into the innate/adaptive categorization. Furthermore, cell-mediated responses such as T-cell proliferation and allograft rejection are affected significantly by the season; thus, this needs to be taken into account when studying the reptilian immune system. Much less is known about the adaptive branch, and studies of the cell-mediated and humoral responses are few and far between (Zimmerman, 2020; Zimmerman et al., 2010). For instance, the immune system of crocodilians is not well known; however, evidence indicates an active alternative serum complement pathway (belonging to the innate immune system) in freshwater and saltwater crocodiles (Merchant & Britton, 2006). This has also been suggested in alligators, but the proteins that activate the cascade may be via different micro-organisms, or the proteins may comprise varied specificities for various microbe membrane composition types (Merchant & Britton, 2006).

The microbiome plays an important role in the proper performance, training and activation of the immune system (Belkaid & Hand, 2014). Autoimmune and inflammatory diseases in humans are now known to be connected with dysregulation of the immune system (Li et al., 2018). Furthermore, over the recent years, it has become evident that the immune system is interconnected with the gut microbiome; which is a key contributory factor of immune responses (Wiertsema et al., 2021). Consequently, the role of several micro-organisms and their metabolites in human health is becoming apparent (Belkaid & Hand, 2014). However, the role of the gut microbiome in reptiles and interaction with their immune system is poorly understood, and is warranted, given that the reptilian immune system is so robust and that at least 70% of the immune system is thought to reside in the gut. The study of the reptile immune system also has practical implications as reptiles are threatened by emerging diseases as well as anthropogenic activities, and thus understanding the reptilian immune system will be of value in reptile conservation (Fitzgerald et al., 2018). Likewise, there may be relevance human health. For example, the strong innate immune system of reptiles may lead to new approaches to combat antibiotic-resistant bacteria and other pathogens (Akbar, Khan, et al., 2019; Akbar, Siddiqui, Iqbal, et al., 2020; Akbar, Siddiqui, Sagathevan, Iqbal, et al., 2019; Siroski et al., 2015). For instance, it has been suggested that the ability of alligators and crocodiles to thrive in environments that are laden with pathogens and heavy metals is probably due to a highly evolved immune system that most likely developed in evolution with their gut microbiome (Jeyamogan et al., 2019; Keenan & Elsey, 2015). Moreover, crocodilians, in particular the alligator may come across a high load of faecal coliforms in their aquatic environment (Johnston et al., 2010). Nonetheless, despite constantly being exposed to many potential pathogens, crocodilians do not seem to be susceptible to infection by these organisms, either systemically or through their skin, via lesions or wounds suggesting that these species possess potent antimicrobial abilities in their immune systems or gut microbiome (Kommanee et al., 2012; Merchant et al., 2006; Pata et al., 2007; Siddiqui et al., 2017, 2021).

REPTILIAN ANTIMICROBIAL PEPTIDES

It has been speculated that antimicrobial peptides may be a contributory factor in their evolutionary success (Van Hoek, 2014). Antimicrobial peptides are small molecular peptides with biological activity, and have molecular weights between 2000 and 7000 Da, and comprise between 20 and 60 amino acid residues (Forde & Devocelle, 2015). Antimicrobial peptides are part of an ancient defence system, and have co-evolved with the gut microbiome (Zong et al., 2020). Several classes of antimicrobial peptides are currently known, comprising defensins, cecropins, magainins, melittin, dermaseptins and cathelicidins (Wade et al., 2012). Various organisms, such as micro-organisms, plants, insects, mammals and reptiles, are known to produce antimicrobial peptides (Pasupuleti et al., 2012). These antimicrobial peptides portray antimicrobial activities, via eradication of pathogens such as bacteria, fungi, viruses or parasites or through immune response modulation, or via gut microbiome metabolites. Furthermore, these peptides recruit immune cells and activate them

leading to enhanced pathogen elimination or control of inflammation, angiogenesis, wound healing and even display antitumor activity (Hilchie et al., 2013; Teixeira et al., 2020). Enterocytes and Paneth cells (important secretory cells localized within intestinal crypts) in the gastrointestinal tract are thought to be the primary sources of antimicrobial peptides (Zong et al., 2020). Studies have portrayed that impaired antimicrobial peptide responses may lead to increased gastrointestinal infection with pathogens such as *Acinetobacter baumannii*, *Yersinia pseudotuberculosis* and *Pseudomonas aeruginosa* in the host (Muniz et al., 2012; Mwangi et al., 2019). Those suffering from inflammatory bowel disease exhibit reduced gastrointestinal antimicrobial peptides, which may potentially result in dysbiosis (Yao et al., 2017).

Reptilian antimicrobial peptides have shown antimicrobial and antifungal activities, including members of the defensins, cathelicidins and lysozyme class (Van Hoek, 2014). Recently, β-defensin variants were identified, in *Alligator mississippiensis* which displayed antimicrobial and antibiofilm activities (Santana et al., 2021) and earlier β-defensin genes and peptides were found in the red-eared slider turtle (Kaplinsky et al., 2013). Another study in lizards depicted genes encoding various β-defensin type peptides in the *Anole carolinensis* genome, and lizards are well recognized to be highly resistant to infection (Dalla Valle et al., 2012). Furthermore, 20 β-defensins genes were elucidated via bioinformatic and experimental techniques in the genome of *Alligator sinensis*, the Chinese Alligator (Tang et al., 2018). In a different study, haemoglobin hydrolysate from *Crocodylus siamensis* depicted a novel antibacterial peptide, which was able to cause iron dysregulation, induce permeabilization in membranes and cause bacterial death (Lueangsakulthai et al., 2017).

Antimicrobial peptides from snakes have been well described and snake venoms have been considered as a rich source of bioactive compounds for drug discovery (Pérez-Peinado et al., 2020). For example, in a recent study, peptidomes from the snake venoms of *Bothrops atrox* and *Bothrops jararacussu* snake venoms were purified, characterized and their activities were determined against gram-positive and gram-negative bacteria. And also against the parasites *Leishmania amazonensis* and *Plasmodium falciparum* and these identified antimicrobial peptides may be utilized as potential novel drugs (da Silva Caldeira et al., 2021). The importance of antimicrobial peptides in human health and comprehension of their regulatory mechanisms is ongoing. Antimicrobial peptides have been shown to influence pleiotropic functions in the eradication of microbes in the gastrointestinal tract and also impact homeostasis and the immune system (Muniz et al., 2012). Antimicrobial peptides are thought to encourage immune responses to invading microbes via the activation and of leukocytes via interaction with chemokine and formyl peptide receptors. Prospective studies should be conducted in reptiles to elucidate the role of reptilian antimicrobial peptides in intestinal homeostasis as well as determining the role of the microbiome during reptile health and disease.

IMMUNE SYSTEM–GUT MICROBIOME CROSS-TALK

The gut microbiome is known to produce metabolites that converse with the immune system and modulate immune responses, which plays a central part in cellular signalling, inflammation and interaction with the immune cells (Belkaid & Hand, 2014; Kau et al., 2011). Various immune cells, such as phagocytes, macrophages and dendritic cells are closely linked with the gut microbiome and its metabolites and have key roles in gut homeostasis maintenance as well as recognition of pathogenic bacteria (Jiao et al., 2020). Gut-associated lymphoid tissues are part of the mucosal associated lymphoid tissues (Brandtzaeg et al., 2008). Previous work indicated that the structural make-up of the gut-associated lymphoid tissue depends on the gut microbiome. For instance, in germ-free animals, the development of gut-associated lymphoid tissue was perturbed and characterized by abnormal crypt patches formation and innate lymphoid cells (Hamada et al., 2002; Rhee et al., 2004). In fact, it is thought that gut-associated lymphoid tissues are a vital connection between the immune system and the gut microbiome. Previously, it was shown that pro-inflammatory cytokines produced by gut-associated lymphoid tissue in vivo models (Dark Agouti rats and Albino Oxford rats). Greater proportions of $CD4^+$ T cells and regulatory T cells in non-immunized Dark Agouti rats were observed in comparison to Albino Oxofrd rats. The study concluded that differing species of gut microbiome may impact susceptibility to autoimmune diseases (Stanisavljević et al., 2016), while others show that metabolic by products produced by the gut bacteria such as short-chain fatty acids (SCFAs) may regulate the immune response of the gut-associated lymphoid tissue through epigenetic mechanisms (Jiao et al., 2020).

Short-chain fatty acids are important microbial metabolites and comprise approximately two and six carbon atoms in their chain, such as butyrate, acetate and propionate (Den Besten et al., 2013). In mammals, SCFAs are known to play a critical role in food intake regulation and protect against pathogen infiltration, as well as intestinal barrier integrity maintenance (Martin et al., 2018; Yoo et al., 2020). Moreover, SCFAs regulate host immune cells and provide a carbon source for colonocytes (Cummings et al., 1987). SCFAs also display anti-inflammatory

properties on host immune cells, and regulating expression of pro-inflammatory cytokines, for instance: Interleukin-12 (IL-12), IL-6 and tumour necrosis factor-α, through activation of macrophages (Vinolo et al., 2011).

It has been reported that SCFAs can inhibit gut inflammation through various mechanisms and are known to stimulate histone acetyltransferase activity and stabilizing hypoxia-inducible factors (Vinolo et al., 2011). It was shown that butyrate possesses anti-inflammatory effects; in vitro and ex vivo production of cytokines and nitric oxide (NO) by Lipopolysaccharides-stimulated neutrophils was inhibited. It was revealed that propionate also reduced the production of these cytokines and NO in vitro by neutrophils but was less potent than butyrate (Vinolo et al., 2011). Earlier reports revealed that butyrate and propionate can inhibit production of proinflammatory cytokines and NO in murine macrophages, and this was connected with NF-κB activation inhibition (Park et al., 2007).

Recently, it was shown that germ-free mice, which have low levels of SCFAs due to the absence of microbiome, also have an increased food intake (Tremaroli & Bäckhed, 2012). Several reports in fish depicted the production of SCFAs in the gastrointestinal tract, with the highest levels occurring in the distal intestine (Tran et al., 2020). Moreover, in comparison to what it is observed in mammals, carnivorous fish have relatively higher concentrations of SCFAs than omnivorous or herbivorous species (Tran et al., 2020). A study was reported in sea bass (*Sparus aurata*) which revealed that butyrate improved adverse effects from consuming a plant-based diet, including the upregulation of inflammatory markers and high presence of granulocytes and lymphocytes in the submucosa (Estensoro et al., 2016).

The presence of SCFAs in reptiles has not yet been reported in the literature; nonetheless, the gut bacterial metabolites from the water monitor lizard (*Varanus salvator*) revealed hydroxylated fatty acids and oxygenated fatty acids in a recent study (Akbar, Siddiqui, Sagathevan, Iqbal, et al., 2019). Among the reptiles, the water monitor lizard is an important species; and it has been used for medicinal reasons. These reptiles feed human-discarded food waste and carcasses of wild animals such as pig (Uyeda, 2015; Uyeda et al., 2013). The study elucidated the identity of several gut bacterial metabolites from the water monitor lizard and several secondary metabolites with antibacterial properties including alkaloids, flavonoids, terpenes, hydroxylated fatty acids, oxygenated fatty acids and pyrazine derivatives were found (Akbar, Siddiqui, Sagathevan, Iqbal, et al., 2019). Interestingly, numerous potentially novel molecules with no previously reported biological activity were also ascertained. Furthermore, several of these metabolites showed promising antibacterial activities. In another study carried out in the crocodile (*Crocodylus porosus*), numerous potential anticancer peptides were elucidated, as well as several small peptides from the serum of the crocodile (Jeyamogan et al., 2020). In a subsequent study, several novel molecules that showed anticancer efficacies were discovered from the crocodile gut bacterial metabolites, which comprised: flavonoids, lactic acid, F-Honaucin A, L,L-Cyclo(leucylprolyl) and 3-hydroxy-decanoic acid; however, the activities of most of these gut bacterial metabolites need to be elucidated (Khan et al., 2021). Further characterization of these innovative molecules is needed and these should be tested both in vitro and in vivo models as well as germ-free animals to understand their precise mechanism of action, interaction with the immune system and potential use as probiotics.

GENOME AND EPIGENOME OF REPTILES

Most genomic sequencing has remained focused on *Homo sapiens* as evident by forthcoming plans to sequence 2 million human genomes for use in personalized medicine (Ledford, 2016). Many animal species that are in vivo models in research, or important in agriculture, have also been sequenced. On the other hand, reptile genomes have naturally received much less consideration. In 2011, the first reptile to be sequenced was the North American green anole lizard (*Anolis carolinensis*) and the genome was shown to encode for several β-defensin antimicrobial peptide and lysozyme genes. (Alföldi et al., 2011). Successively, all four orders of reptiles have been sequenced (Zimmerman, 2020) which includes members of the Squamata, such as the King Cobra (*Ophiophagus hannah*) (Vonk et al., 2013). The first draft genomes of snakes comprised of the *Boa constrictor*, and the Burmese python (*Python bivittatus*) were sequenced and the genome sizes were found to be approximately half the size of the human genome, closer to the smaller genomes of such as the chicken and the anole lizard (Kerkkamp et al., 2016). More recently, the genome of the Tiger Rattlesnake was elucidated (Margres et al., 2021). This study revealed the most contiguous snake-genome assembly and it was shown that chromatin accessibility, gene loss and levels of methylation contributed to produce the simple and most toxic rattlesnake venom as well as key mechanisms were also identified (Margres et al., 2021). Future work in the Tiger Rattlesnake and other snake species can focus on extrapolating this information from the genome to mime bioactive molecules. Previously, working on snake venoms led to the discovery of the important drugs such as Captopril, which is used for the treatment of hypertension, Integrilin, used for heart patients and Byetta, used to

treat symptoms of diabetes (Bryan, 2009; Kerkkamp et al., 2016; Raufman, 1996).

The tuatara (*Sphenodon punctatus*) endemic in New Zealand, whose genome has recently been sequenced, revealed that the genomic architecture was unique and a combination of features characteristic of mammals and reptiles (Gemmell et al., 2020). Interestingly, multiple repetitive sequences as well as the higher levels of methylation were observed (Gemmell et al., 2020). Furthermore, genetic candidates that may be connected with the longevity and apparent resistance to infectious diseases in the tuatara should be elucidated, given this reptile is long-lived, with a life span of up to 100 years or more (Castanet, 1994; Gemmell et al., 2020).

The testudine order comprises turtles and tortoises. The western painted turtle (*Chrysemys picta bellii*) genome was recently sequenced as well as the green sea turtle (*Chelonia mydas*) and the Chinese softshell turtle (*Pelodiscus sinensis*) genomes (Ernst & Lovich, 2009; Shaffer et al., 2013; Wang et al., 2013). The genomes of these turtles encode snake-like antimicrobial peptides and defensin type peptides that are similar to avian antimicrobial peptides.

Various genome sequences of crocodilians have been reported and more sequencing studies are currently underway (Castoe & Pollock, 2013; St John et al., 2012) which comprise the Chinese alligator (*Alligator sinensis*), the American alligator (*Alligator mississippiensis*), the saltwater crocodile (*Crocodylus porosus*) and the Indian gharial (*Gavialis gangeticus*) (St John et al., 2012; Wan et al., 2013). This has greatly expanded the range of immunological studies that are possible by both aiding in reagent development and providing the basis for comparative studies across the orders.

The record of changes in the DNA of the organism is known as the epigenome and it encompasses several environmental changes over the life span (Pal & Tyler, 2016). Various epigenetic occurrences are concomitant with ageing but it varies between species and they are not well elucidated yet (de Paoli-Iseppi et al., 2017). Likewise, the environment and the genome are thought to impact the longevity, aetiology of disorders, immune system and overall health with epigenetic mechanisms as key arbitrators of complex interactions (Liu et al., 2008). Several reports connected with global DNA methylation, conducted in humans, link methylation to cancer incidence and other diseases as well exposure to environmental toxins and other diseases (Choi et al., 2009). Limited studies on the reptile epigenome have been employed. Alteration in reptile epigenomes will be helpful to assess epigenetic biomarkers and determine any environmental exposures and influence on reptile health. Interestingly, crocodilian genome analyses depicted that they have evolved very slowly over the past several million years, and it will be useful to grasp how slow-evolving species such as the crocodile are able to thrive over millions of years despite the ongoing environmental changes (Green et al., 2014). A recent study in alligators residing in three different lakes in Florida, with different levels of contaminants, was conducted. Results from the study portrayed no significant DNA methylation difference in the three different groups, revealing the resilience of these species against environmental contaminants and the fact that contaminants did not result in changes in the DNA (Guillette et al., 2016).

Recent knowledge regarding DNA methylation in animals is on the rise; however, data on DNA methylation in reptiles is very scarce. The basic patterns of DNA methylation appear to be similar to those seen in other vertebrates, for instance the depiction of non-methylated islands in gene promoters (Long et al., 2013). Nonetheless, more research is required to understand reptilian epigenetic mechanisms. Epigenetic therapy, often in combination with other therapies, may become a potent tool to treat various diseases that comprise, heart disease, diabetes, and that are impacted by these changes. Given the resilience of reptiles and their longevity, studies on the genome and epigenome of these species are warranted.

REPTILE RESISTANCE TO INFECTIOUS AGENTS, CANCER AND LONGEVITY

Several reptile species appear to be resistant to infectious diseases and/or cancer, as well as showing reduced rates of cellular senescence with reports of extreme longevity and/or negligible senescence in some reptiles. Cellular senescence is the disintegration of physiological and biochemical function with increasing age, which eventually results in age-related issues and functional deterioration. At the cellular level, senescence encompasses multi-faceted signalling pathways, functional and genetic changes (Hoekstra et al., 2020; Van Deursen, 2014). Some reptiles, such as crocodiles or turtles with decreased mortality may also be potentially connected with reduced rates of senescence and there are reports of extreme longevity and/or negligible senescence in reptiles (de Magalhães & Costa, 2009). For instance, reptiles such as crocodiles possess 'protective phenotypes' or adaptations that may impact their mortality (Hoekstra et al., 2020). Protective phenotypes in reptiles are venom or toxicity in lizards or snakes, skin armour in crocodilians, and external ribcages or shells in turtles (Hoekstra et al., 2020). A recent report portrayed negligible or slow senescence relative to their mortality in three reptiles, specifically the lizard (*Zootoca vivipara*), the freshwater crocodile (*Crocodylus*

johnstoni) and desert tortoise (*Gopherus agassizi*) (Jones et al., 2014). Interestingly, both the crocodile and desert tortoise showed no decline in reproduction even with their advancing age. Importantly, it has been reported that gut microbiome composition is interconnected with different ageing conditions in humans, such as cancer, cardiovascular disease, dementia, and further age-associated mechanisms which may lead to accumulation of aged immune cells, oxidative stress-mediated macromolecular damage and metabolic dysregulation (Renson et al., 2020). Moreover, some reports show that age-related diseases may be due to gut dysbiosis (Narasimhan et al., 2021). Furthermore, it is now understood that aging is usually connected with decreased diversity of the gut microbiome, in particular the *Firmicutes* to *Bacteroides* ratio, as well as elevation in some opportunistic species and some *Proteobacteria* (Biagi et al., 2010). As indicated above, it seems that reptiles display negligible senescence and continue to reproduce in their advanced age, which may be due to their unique gut microbiome and interaction with their immune system. The role of reptile gut microbiome in ageing is not yet comprehended and needs to be elucidated. It will be interesting to extrapolate reptilian gut microbiome and/or their metabolites with an eye to utilize these for possible clinical therapeutic use. Alternatively, implantation of selected gut microbiome species from reptiles into in vivo models of ageing or disease will be useful; nonetheless, further research will be required (Siddiqui et al., 2021).

There are several reports which discuss the ability of reptiles to fight infectious diseases and/or cancer (Akbar, Siddiqui, Sagathevan, & Khan, 2019; Jeyamogan et al., 2017; Shaw, 2009; Siddiqui et al., 2017; Soopramanien et al., 2021; Zhao et al., 2008; Zhong et al., 2020; Jeyamogan et al., 2021). In a recent study, the effects of crude *Pseudocerastes* and *Eristicophis* snake venoms in haematological disorders and cancer treatment were investigated (Ghezellou et al., 2021). The study found that the *Pseudocerastes* venoms significantly reduced the viability of human melanoma cells by more than 80%, and had almost no effects on healthy neonatal foreskin fibroblasts (Ghezellou et al., 2021).

Other studies in crocodilians found that there is a high incidence of *Salmonella* in farmed *Crocodylus porosus* and *Crocodylus johnsoni* (Manolis et al., 1991). In another study, a plethora of *Salmonella* serotypes were observed in healthy Nile crocodiles (*Crocodylus niloticus*) (Madsen et al., 1998). Various work revealed that serum from crocodilians possesses antimicrobial properties. For example, a recent study portrayed anti-amoebic activities from crocodile sera from the mugger crocodile (*Crocodylus palustris*) and crocodile sera diminished viability of *Acanthamoeba*, a free-living amoebae and opportunistic pathogen. In addition, lysates from various tissues of the crocodile depicted potent anti-amoebic activity (Siddiqui et al., 2017). In another study, it was shown that crude extracts from the tissues of the Nile crocodile (*Crocodylus niloticus*) portray antimicrobial properties (Shaharabany et al., 1999). In a recent work carried out in the fresh water crocodile (*Crocodylus siamensis*), an antibacterial compound from blood was partially purified and functionally characterized and given the name 'crocosin'. Crocosin exhibited activities against *Salmonella typhi* and *Staphylococcus aureus* and it has been speculated that this compound may be used as a defence mechanism from bacterial infections in freshwater (Preecharram et al., 2010).

This work was substantiated by other reports in the close relative: the American alligator (*Alligator mississippiensis*) that showed strong antibacterial, antiviral and amoebicidal efficacies (Merchant et al., 2003, 2004, 2005). Moreover, in another recent study, four novel antibacterial peptides were shown from Siamese crocodile white blood cell extracts termed as leucrocins. These exhibited potent antibacterial efficacies against *Vibrio cholerae*, *Staphylococcus epidermidis* and *Salmonella typhi* (Pata et al., 2011). Prospective work is needed to understand the detailed nature of these antimicrobial effects, as well as the association with the gut microbiome and its metabolites.

Both cancer and aging are connected biologically (Fane & Weeraratna, 2020). It is now thought that some cellular processes such as response to DNA damage and cellular senescence are involved in tumour suppression and ageing. Furthermore, increasing age in humans is considered a risk factor for cancer development (Torre et al., 2015). Nonetheless, the connections between aging and cancer are multifaceted, as aging also comprises loss of organ function as well as tissue degeneration, whereby cancer involves sustained cellular proliferation and gain of new functions (Zinger et al., 2017).

The anticancer efficacy of crocodile sera and their various organ lysates was elucidated in vitro (Jeyamogan et al., 2020). Crocodile serum exhibited potent growth inhibitory efficacies as well as cytotoxic effects against in vitro cancer cell lines. Moreover, this study revealed the differential gene analysis of cancer cells incubated with crocodile sera. Analyses highlighted that 51 genes in breast cancer cells, 14 genes in treated cervical cancer cells and 2 genes in prostate cancer cell lines were differentially expressed in comparison to controls with these genes involved in cellular communication, DNA growth and repair, respiration and others (Jeyamogan et al., 2020). In this study, numerous potential anticancer peptides were elucidated (Jeyamogan et al., 2020) and subsequently in a follow-up study, several novel molecules that showed anticancer efficacies were discovered from the crocodile's gut bacterial

metabolites, suggesting that crocodile's resistance to cancer may be connected with their gut bacterial metabolites; however, further work needs to be accomplished (Khan et al., 2021). Nonetheless, the precise genetic mechanisms for these anticancer effects remain to be determined, and further research to determine the connection with the gut microbiome and its metabolites should be undertaken in other reptiles as well such as the tuatara which is also a long-lived animal.

CONCLUSION

Reptiles possess a highly robust immune system and a unique gut microbiome which most likely contributes to their ability to produce antimicrobial peptides as well as their apparent resistant to infection and cancer and their longevity. At the moment, there are very few reports on the reptile gut microbiome and even fewer on the gut microbial metabolites produced and the interplay with the immune system. Implantation of selected gut microbiome species from reptiles into disease or ageing mammalian models and germ-free in vivo models may offer an approach in the identification of novel therapeutic interventions to benefit human health. In a recent study, it was shown that microbiome from young mice were able to reverse signs of ageing in older mice (Boehme et al., 2021). In this study, the older mice were given faecal material from younger mice and it was found that species *Enterococcus* became much more abundant in the older mice, similar to younger mice. Interestingly, changes in the hippocampus region of the brain were also perceived to become physically and chemically similar to younger mice. The mice who received microbiome transplants were also able to solve mazes faster. Furthermore, none of these effects were observed in control older mice who received microbiome transplants from fellow older mice. In another recent and interesting study, the development of a genetically engineered mouse was described whereby antibodies similar to those generated by llamas were generated (Xu et al., 2021). These nanobodies were able to overcome the recently elucidated SARS-CoV-2 viral mutations, whereas human antibodies could not. Therefore, nanobodies could be promising innovative solutions to prevent COVID-19 mortality when vaccines are compromised. Similar studies could be conducted to investigate the distinctive gut microbiome metabolites of reptiles for the benefit of *Homo sapiens* with in vivo work and clinical trials in forthcoming stages. This is not as far-fetched as it seems, as evidenced by the discovery of the hypertension drug Captopril from snake venom, as a successful example. Reptiles are known to be evolutionary successful and diverse groups, and their gut microbiome is likely a precious and innovative resource for novel bioactive molecules of therapeutic potential. The underlying mechanisms between the gut microbiome and the immune system may hold clues to develop new therapies for overall health, and possible extrapolation to exploit the reptiles ancient defence systems for the benefit of *Homo sapiens*.

CONFLICT OF INTEREST

No conflict of interest declared.

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How to cite this article: Siddiqui, R., Maciver, S.K. & Khan, N.A. (2022) Gut microbiome–immune system interaction in reptiles. *Journal of Applied Microbiology*, 132, 2558–2571. https://doi.org/10.1111/jam.15438

Food Safety and Standards Authority of India
(A statutory Authority established under the Food Safety and Standards Act, 2006)
(Quality Assurance Division)
FDA Bhawan, Kotla Road, New Delhi – 110002

Dated 29th Nov, 2023

Subject: Direction to all notified laboratories to test banned pesticides in Tea.

1. In exercise of the powers conferred under Food Safety and Standards Act, 2006, FSSAI has notified the FSS (Contaminants, Toxins and Residues) regulations, 2011, to facilitate testing of food products to ascertain the safety of food products in India.

2. FSSAI on 19th March, 2018, published the Food Safety and Standards (Contaminants, toxins and Residues) first Amendment Regulations, 2018, thereby banning the use of 20 pesticides (attached at Annexure-1) as per the Insecticides Act, 1968 (46 of 1968).

3. FSSAI after thorough deliberations with relevant stakeholders hereby, directs all the laboratories notified under section 43 (1) and 43 (2) of Food Safety and Standards Act, 2006, to test the 20 banned pesticides (attached at Annexure-1) in addition to all the pesticides specified for Tea as per FSS (Contaminants, Toxins and Residues) regulations, 2011.

4.This issues with the approval of the competent authority.

Digitally Signed by Satyen Kumar Panda
Date: 30-11-2023 16:53:32
Reason: Approved

(Dr. Satyen Kumar Panda)

Advisor QA

To,

All FSSAI Notified Laboratories under section 43(1) and 43(2) of FSS Act, 2006.

Copy to:

1. Sr. PS to CEO, FSSAI
2. CITO- to upload on FSSAI website

Annexure-1

Sl.No.	Name of Banned Insecticide
1	Aldicarb (sum of Aldicarb its sulphoxide and sulphone)
2	Aldrin, Dieldrin
3	Chlordane (Total of α- and β-chlordane)
4	Heptachlor (heptachlor metabolite, heptachlor epoxide)
5	Lindane (Gamma (γ) HCH), Alpha HCH, Beta HCH & delta-HCH)
6	Endosulfan (Total of alpha endosulfan & beta endosulfan and endosulfan sulphate)
7	Carbofuran
8	Methomyl
9	Phosphamidon
10	Captafol
11	Ferbam
12	Formothion
13	Simazine
14	Diazinon
15	D.D.T (Total of p,p'-DDT, o,p'-DDT, p,p'-DDE, o,p'-DDE, p,p' -DDD and o,p'-DDE)
16	Fenitrothion
17	Fenthion (sum of fenthion, its oxygen analogue and their sulphoxides and Sulphones)

18	Methyl Parathion (Methyl Parathion and its oxygen analogue i.e. methyl paraoxon)
19	Ethyl Parathion (Ethyl Parathion and its oxygen analogue i.e. ethyl paraoxon)
20	Monocrotophos

Note : The Extraneous MRL of the above mentioned banned insecticides shall be 0.01 mg/kg except for DDT for which it shall be 0.05 mg/kg. ”

ISSN PRINT 2319 1775 Online 2320 7876

Research paper UGC CARE Listed (Group -I) Journal Volume 11,S Iss 3, Dec 2022

PHYSICOCHEMICAL PROPERTIES OF WASTEWATER IN THREE TYPICAL SEWAGE ACCUMULATED SITES OF KOTA DISTRICT OF RAJASTHAN

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DOI: 10.48047/IJFANS/S3/145

ABSTRACT

The physicochemical qualities of the effluent samples of three Wastewater sites (Sazidehra site, Raipura site and Nayapura site) and one control site (Akelgarh site) in Kota district of Rajasthan, India were evaluated from three slots of time in the year i.e., September, December and March using standard methods. The physicochemical parameters assessed included color, odor, pH, temperature, total dissolved solid (TDS), turbidity (NTU), Biological Oxygen Demand (BOD), Chemical oxygen demand (COD), dissolved oxygen (DO) and Heavy metals. The results of the evaluation were as follows: temperature (28 ºC-36ºC), COD (17-92mg/L), and turbidity (1.96-286 NTU), BOD (2-7mg/l), DO (1-7mg/l) and TDS (175-1890mg/l). The temperature, TDS, turbidity, COD, DO were not found to be in the recommended limits. Some of the parameters exceeded from their normal ranges and some found to be below the range that ensure the contaminants present in the water and considering the samples unhealthy for drinking and highly polluted. The Raipura site was found highly contaminated. The heavy metals were concentrated in the research area, which suggests that the river is severely polluted. Zinc (Zn) was found highly (267ppm) accumulated in the sewage water of Raipura site. We conclude that these sewage dumping areas of water sources are polluted to their respective receiving watersheds and threats to public and environmental health.

Keywords*: physicochemical, wastewater effluent, sewage treatment, pollution, BOD, COD*

Introduction

Industries and Municipal corporations often discharge their treated effluents back to the environment, most especially in the surface water environments. Untreated or inadequately treated municipal sewage and waste discharges may contain public health compromising pathogens and hazardous elements (e.g., heavy metals) and the chemical substances that could lead to hostile environmental effects such as alterations of aquatic organism behaviors and structure, this kind of pollution resulted in reduction of diversity of life on earth, diminishing

ISSN PRINT 2319 1775 Online 2320 7876

Research paper UGC CARE Listed (Group -I) Journal Volume 11,S Iss 3, Dec 2022

the quality of recreational waters and shellfish harvesting zones, and polluting of water meant for consumption [1-2]. The heavy metals are produced from natural and anthropogenic sources and can build-up in sediments, having significant environmental implications for local communities, as well as for river water quality [3]. The water sources get contaminated by the flow of various industrial effluents into it, the ground waters are contaminated from landfill leachates, deep well liquid disposal, industrial wastes, etc. [4].

Apart from the adverse effect of these activities on the environment, the different levels of chemical and microbiological constituents in discharged wastewater effluent brought additional pressure to bear on the already stressed freshwater resources in many developing countries including India [5-6]. It has also been reported from several studies that the use of freshwater polluted by industrial and municipal effluents resulted negative impact on the irrigation of agricultural produce due to changes in the physicochemical properties of the watershed [7]. The toxic chemicals present in the contaminated water destroy the aquatic organisms, which in turn results in the disruption of the food chain and aquatic ecosystem [8]. Good quality surface water relies on various factors that includes the physicochemical parameters and the magnitude of the pollution load. The physicochemical characteristics of the water can reveal particular conditions for the ecology of aquatic organisms and suggest suitable conservation and management strategies [9-10]. Thus, industrialization has led to increased emission of pollutants into ecosystems. Therefore, this study has been carried out to assess a comparative study on physico-chemical parameters between polluted and non-polluted sites of river Chambal.

Materials and Methods

I. Study Area Description

The current research was directed in the largest state of India that is Rajasthan and particularly of the Kota district. Due to arid and semiarid climate and insufficient surface water resources, Rajasthan depends heavily on groundwater for drinking and for irrigation [11]. Availability of groundwater is deeper with high mineral concentrated chemicals which make the water unfit to drink. Sadly, the groundwater quality in most of the districts of Rajasthan is not bestowed to recommended standards. Kota is the biggest industrial city of Rajasthan state. It is well known for its major industrial network in and around the city. The Chambal River is the one and only perennial water from drinking and agricultural point of Region in Rajasthan. In addition, Chambal River is the fundamental resource of water necessary for various thermal, fertilizers, chemical and glass industries in Kota. Some of the well-known industries in Kota like Shri Ram Rayons, Shri Ram Fertilizers and Chemicals, Shri Ram Cement Works, Chambal Fertilizers and Chemicals Ltd., Kota Thermal Power Station, there are many other small and medium enterprises functioning in and around Kota which require a lot of water for their operation and maintenance [12]. Effluents from these industries contain N, P, K, heavy metals, organic and inorganic pollutants, and toxic colors. In Kota city, there are two water treatment plants in city,

ISSN PRINT 2319 1775 Online 2320 7876
Research paper UGC CARE Listed (Group -I) Journal Volume 11,S Iss 3, Dec 2022

named as Akelgarh (270 MLD) and Mini Akelgarh (Sakatpura, 130 MLD) distributing about 390 MLD water to the public. Due to water treatments, contaminants are less at this site. Therefore, this site has been used as a control in this study. On the other hand, domestic waste, and wastewater from Nayapura Naala directly dump into the Chambal River near Chambal Bridge on NH12. Sazidhera Naala is situated in the middle of the city hence, all domestic waste, wastewater, and small industries waste from this Naala decants into the Chambal River before Kota barrage.

II. Water Sample Collection

Different water specimens of polluted and non-polluted sites (below mentioned) of river Chambal were collected in pre-sterilized bottle and Zip-lock plastic bag respectively according to standard procedures from American Public Health Association [13]. Standard methods were applied to check all physicochemical parameters.

III. Physicochemical Analysis

Selected physicochemical parameters such as color, odor, pH, temperature, turbidity, TDS, BOD, COD in the water samples were analyzed according to APHA,1995 and Trivedi and Goel, 1986. The DO parameter was analyzed according to Romanian Standard (SR ISO 5814,1990) [14-15].

IV. Heavy metals determination by AAS- Heavy metals are important for all living organisms in varying amounts, such as iron, copper, zinc, and cobalt, for proper growth. However, the excessive amount of these heavy metals can also produce toxic effects. Thus, the determination of the amounts of heavy metals is especially important where there is a risk of having anthropogenic influence on aquatic environment. Before analysis of heavy metals, water samples were filtered through Whatman filter paper no. 541 (Whatman, Germany) into 100 ml of prewashed plastic bottles and the analytical grade HCl was used to adjust water pH to 3.5. After that, the samples were kept in a room temperature until analysis. Cadmium (wavelength 228.8 nm), Chromium (wavelength 357.9 nm), Zinc (wavelength 217 nm), and Lead (wavelength 283.3 nm) specific hollow cathode lamps were used to analyze the samples. The instrument has a minimum detection limit of 0.01 mg/l for Cd, 0.10 mg/l for Cr, 0.03 mg/l for Zn, and 0.2 mg/l for Pb in the flame method. Samples were aspirated through nebulizer and the absorbance was measured with a blank as a reference. Calibration curve was obtained using standard samples (containing 0.5, 1.0, 1.5 and 2 mg/l for Cd, 0.5, 1.0, 2.0, and 3.0 mg/l for Cr, 0.2, 0.4, 0.8,1.0 and 2.0 mg/l for Zn, 1.0, 2.0, 4.0,

ISSN PRINT 2319 1775 Online 2320 7876

Research paper UGC CARE Listed (Group -I) Journal Volume 11,S Iss 3, Dec 2022

8.0 and 10.0 mg/l for Pb). The correlation coefficient was found for Cd 0.998, for Cr 0.999, for Zu 0.999, and for Pb 0.999. The sample was diluted many folds to keep the results in the analytical range. The heavy metals (Pb, Cd, Cr, and Zn) concentrations in all samples were determined by atomic absorption spectrophotometer (AAS) (Model AA-6800, Shimadzu Corporation, Japan) using an air-acetylene flame with digital read-out system [16, 17, 18].

V. Statistical Treatment of Data

The data obtained were analyzed using descriptive statistical analysis at a 95% confidence interval. SPSS was used for the one-way analysis of variance (IBM SPSS version 20), mean, and range. t-Test was used to test variations among all possible pairs of treatments. Correlation was performed using the Pearson procedure of SPSS.

Results and Discussion

The results of the physicochemical qualities of the wastewater samples are presented in various Tables obtained from the data of various sites of testing.

I. Analysis of Physicochemical parameters

In the present investigation, water samples were collected from four sites (one was the control site) of the Kota district to determine various physiochemical parameters that were described as follows:

At Akelgarh site, the observations were made on various parameters that was shown in Table-1. In the control site (Akelgarh), the parameters were obtained within or around the standard range depicting the pH range from 7.0-8.5 with no odour, Temperature from 28°C to 36°C, BOD 2-2.7 mg/l whereas the content in COD was observed from 5-8.12mg/l. The level of DO was found 5mg/l to 7mg/l. The quantity of TDS varied between 175 mg/l to 193 mg/l. The visualization in terms of turbidity varied from 1-4 in terms of NTU (Nephelometric Turbidity Unit). All parameters were showed variations according to the months. At Sazidehra site, the pH range obtained was in between 7.7 to 8.7, temperature between 29°C to 34°C. The odour was pungent, the standard level of BOD was 1.5 mg/l, whereas in our study it was reported between 2.64 mg/l to 3.88 mg/l, due to effluent discharge on the site.

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COD obtained was 39 mg/l to 50 mg/l (10 times increased from the standard range). The level of DO was found in range 3.03 mg/l to 4.62 mg/l. The quantity of TDS was found to be very far from the standard value in all three months and varied between 329 mg/l to 390 mg/l. Similarly, the visualization in terms of turbidly varied from 15-25 in terms of NTU which was very high from standard value and unacceptable (Table-2). At Raipura, pH range was observed in between 7.7-8.4, temperature 29°C to 33°C. The odour was very pungent, BOD was recorded in range 4.93 mg/l to 6.54 mg/l whereas, COD was observed from 77 mg/l to 99 mg/l which was very high as compared to standard values, resulting from the elevated organic discharge in water body. The level of DO was 1.28 mg/l to 2.70 mg/l and quantity of TDS varied between 530 mg/l to 1890 mg/l. The visualization in terms of turbidity varied from 122-286 in terms of NTU (Table-3). At Nayapura, site the variations were observed in all parameters in comparison to other sites. The pH ranges obtained were from 6.3 to 8.9. The temperature was found very high ranges from 21 to 38°C. The odour of Nayapura water sample was mild pungent odour. The level of BOD as comparison to standard was found high i.e., 4.10 mg/l to 5.75 mg/l whereas, the content in COD was observed between 27 mg/l to 55 mg/l. The level of DO was observed between 2.04 mg/l to 3.64 mg/l. The quantity of TDS varied between 355 mg/l to 390 mg/l. The visualization in terms of turbidly varied from 9.67-23 in terms of NTU (Table-4).

Table-1: Periodic physiochemical parameters of water estimated at Akelgarh site

AKELGARH											
S. No.	**Water Parameters**	**Std. (IS-10500)**	**September**			**December**			**March**		
			A1	**A2**	**A3**	**A1**	**A2**	**A3**	**A1**	**A2**	**A3**
1.	Colour	Colourless	Colourless								
2.	Odour	Odorless	Odourless								
3.	Temp (°C)	34	32±2.32	33±2.19	34±2.25	28±2.08	29±2.11	30±1.96	34±2.18	36±2.96	35±0.17
4.	pH	6.5-8.5	7.6±2.33	8.2±1.18	7.8±0.92	8.1±2.68	8.3±3.41	7.4±0.59	7.9±1.99	7.0±1.34	7.5±1.02
5.	BOD (mg/l)	1.5	2.1±0.11	2.5±0.35	2.6±0.05	2.2±0.94	2.4±0.08	2.3±0.004	2.0±0.10	2.7±0.56	2.6±0.41
6.	COD (mg/l)	4.0-6.0	5.3±0.89	5.0±1.92	6.2±1.09	6.9±2.11	6.4±1.32	8.6±1.15	9.10±0.86	9.53±2.94	10.12±1.02
7.	DO (mg/l)	4.0-6.0	5.9±0.08	6.0±1.19	6.2±2.06	6.7±1.58	6.5±1.91	6.2±2.33	6.9±3.1	7.0±2.81	6.8±0.88

ISSN PRINT 2319 1775 Online 2320 7876

Research paper UGC CARE Listed (Group -I) Journal Volume 11,S Iss 3, Dec 2022

8.	TDS (mg/l)	500-2000	176±1.43	183±1.56	179±1.26	181±2.28	186±2.13	188±2.25	175±1.02	191±1.11	193±1.13
9.	Turbidity (NTU)	1.0-5.0	2 ±0.29	1±0.5	1.9±0.09	2.1±0.04	4.1±0.11	3.3±0.21	4±0.81	3±0.55	1.8±0.49

A1, A2, A3-Three sites at Akelgarh

Table-2 Periodic physicochemical parameters of water estimated at Sazidehra site

SAZIDEHRA											
S. No.	**Water Parameter**	**Std. (IS-10500)**	**September**			**December**			**March**		
			S1	**S2**	**S3**	**S1**	**S2**	**S3**	**S1**	**S2**	**S3**
1.	Colour	Colourless	Colorless								
2.	Odour	Odorless	Pungent odour								
3.	Temp (^oC)	34	30±1.31	29±1.29	32±1.34	31±0.88	30±0.92	33.11±0.99	30±1.29	31±1.27	34±1.22
4.	pH	6.5-8.5	7.7±2.38	7.8±1.91	8.0±3.35	8.6±0.92	8.2±2.66	8.5±1.08	8.7±1.43	8.2±2.09	8.4±3.71
5.	BOD (mg/l)	1.5	3.88 ±0.071	3.81±0.035	3.69±0.085	2.91±0.98	2.78±0.004	2.64±0.18	2.85±0.51	2.81±0.009	2.89±0.81
6.	COD (mg/l)	4.0-6.0	50±2.27	47±2.19	48±2.22	43±1.17	40±1.23	45±1.22	39±2.36	41±2.31	44±2.35
7.	DO (mg/l)	4.0-6.0	4.62±0.08	4.40±0.67	4.57±1.07	3.03±0.36	3.61±0.71	3.29±1.83	3.14±1.25	3.22±0.99	3.07±0.13
8.	TDS (mg/l)	500-2000	390±4.23	383±3.87	373±2.82	341±3.05	355±1.46	339±3.49	329±0.91	335±1.81	343±4.23
9.	Turbidity (NTU)	1.0-5.0	21±0.66	25±1.23	23±0.89	15±0.54	18±0.77	20±0.39	21±1.2	23±0.79	22±1.69

S1, S2, S3- Three sites at Sazidehra

Table-3 Periodic physicochemical parameters of water estimated at Raipura site

RAIPURA											
S. No.	**Water Parameter**	**Std. (IS-10500)**	**September**			**December**			**March**		
			R1	**R2**	**R3**	**R1**	**R2**	**R3**	**R1**	**R2**	**R3**
1.	Colour	Un objectionable	Light white/ Milky	Milky	Milky	Light white / Milky	Milky	Light white/ Milky	Milky	Light white/ Milky	Light white/ Milky
2.	Odour		Very Pungent odour								
3.	Temp (^oC)	34	32±1.88	33±1.91	32±0.90	30±1.78	29± 1.15	29±1.46	33±2.95	31±2.02	31±3.83
4.	pH	6.5-8.5	8.4±0.56	8.0±1.12	8.1±0.74	7.9±2.18	7.7±1.59	7.9±0.88	7.8±3.19	8.0±3.88	7.9±0.91
4.	BOD (mg/l)	1.5	6.32±1.8	6.21±0.05	6.54±1.26	5.7±2.81	5.31±2.07	5.79±3.19	5.19±0.009	5.04±1.47	4.93±0.68

ISSN PRINT 2319 1775 Online 2320 7876

Research paper UGC CARE Listed (Group -I) Journal Volume 11,S Iss 3, Dec 2022

5.	COD (mg/l)	4.0-6.0	88 ±1.56	90±1.61	86±1.48	87±1.52	91.50±1.35	85±1.43	77±0.35	79±2.44	81±3.46
6.	DO (mg/l)	4.0-6.0	2.85±0.05	2.70±0.09	2.21±0.41	1.08±0.03	1.51±0.50	1.59±0.39	1.28±0.01	1.31±0.53	1.45±0.004
7.	TDS (mg/l)	500-2000	887 ±4.33	1141±2.08	1890±4.01	750±2.21	1784±1.83	1604±4.77	530±3.41	618±1.9	1401±3.67
8.	Turbidity (NTU)	1.0-5.0	179 ±2.18	325±1.10	156±0.27	122±2.13	205±1.53	201±3.05	286±1.03	180±0.85	145±0.19

R1, R2, R3- Three sites at Raipura

Table-4 Periodic physicochemical parameters of water estimated at Nayapura site.

NAYAPURA											
S. No.	**Water Parameter**	**Std. (IS-10500)**	**September**			**December**			**March**		
			N1	**N2**	**N3**	**N1**	**N2**	**N3**	**N1**	**N2**	**N3**
1.	Colour	Un Objectionable	Colorless								
2.	Odour		Mild Pungent odour								
3.	Temp (^{o}C)	34	23±0.88	21±1.62	25±0.19	24±2.89	26±0.70	22±0.58	38±1.19	37±1.61	35±3.00
4.	pH	6.5-8.5	7.1±1.93	7.8±2.29	6.3±1.18	8.6±3.08	6.6±0.92	8.2±0.63	7.0±1.44	8.9±1.02	6.8±2.59
5.	BOD (mg/l)	1.5	5.71±0.012	5.67±0.99	5.75±1.27	4.90±1.83	4.85±0.19	4.69±0.59	4.32±2.12	4.36±0.05	4.10±0.093
6.	COD (mg/l)	4.0-6.0	36±1.10	31±1.23	27±1.19	35±1.07	38±0.29	38±1.72	55±2.06	53±2.31	55±2.85
7.	DO (mg/l)	4.0-6.0	3.64±0.08	3.52±0.13	3.41±1.06	2.90±1.36	2.61±1.71	2.72±0.87	2.19±0.54	2.24±0.09	2.04±0.12
8.	TDS (mg/l)	500-2000	345±3.88	378±3.14	367±4.46	360±3.75	355±3.46	359±2.49	387±2.91	380±1.81	390±4.23
9.	Turbidity (NTU)	1.0-5.0	11±3.09	9.67±2.49	12±0.13	15±0.54	18±0.77	20±0.39	21±1.20	23±1.79	22±1.09

N1, N2, N3- Three sites at Nayapura

The temperature profile generally varies significantly ($P<0.05$). The temperature complied with set limits for discharged effluent for most of the sampling period due to the prevailing atmospheric conditions. High temperature may produce softening of bituminous joints and increase odour as a result of anaerobic reaction and can be deteropans to the pipe material itself [19], the temperature of the effluents may pose a threat to the aqua-based organisms. The pH values as observed in this study fell within the guideline limit for discharged effluents into a receiving waterbody, although there were variations at all the treatment plants in January and February, which may be due to increases in temperature during the summer season. The pH of the water is known to affect the availability of micronutrients as well as trace and heavy metals.

ISSN PRINT 2319 1775 Online 2320 7876

Research paper UGC CARE Listed (Group -I) Journal Volume 11,S Iss 3, Dec 2022

The pH level of water defines its utility for a different purpose. It has been established that pH is a vital characteristic in assessing the acid-base level of water. Low or high pH has a toxic effect on aquatic life and alters the solubility of other chemical pollutants as well other important elements in surface water. This may lead to adverse effects on those that depend on it for various uses and also the ecosystem [20]. This suggests that there could be other unidentified contaminants gaining access to the watershed.

A high concentration of TDS could be lethal to aquatic organisms, leading to osmotic shock thereby, affecting the osmoregulatory strength of the organism [21]. The concentrations of TDS in irrigation water hinder plant growth, crop yield, and quality of product [22]. The TDS values obtained in this study are similar to those reported previously by [23]. DO is used to determine the level of pollution by organic matter and the demolition of organic substance, as well as the self-purification strength of water bodies. DO is a guide of physical and biological process in water. The acceptable standard for drink purposes is 6 mg/L and for aquatic organisms is 4-5 mg/L. DO in concentration in unpolluted water normally ranges from 8-10 mg/L [24]. Low DO in water disturbs the existence of fish by increasing their susceptibility to disease, migration, and reproductive behavior, hindering swimming capacity, fluctuating feed, and leading to death of aquatic life [25]. Inorganic compounds such as ammonia nitrites, hydrogen sulphates,

and Ferro ions also tend to decrease the oxygen in water. Biochemical oxygen demand is described as the amount of oxygen required to break down organic substances in water while COD is the amount of strong oxidant required to break down both organic and inorganic matters [26]. BOD in the aquatic system is caused by high levels of organic matters such as leaves and dead plants, animals, industrial effluents, wastewater treatment plants, food processing plants, woody debris, animal manure, and urban storm water runoff. High levels of BOD can be traced to heavy discharge of industrial effluents, domestic sewage, crops, and animal waste [27]. High levels of COD in water may point to poor water standards caused by municipal or farmed effluent discharges [28], which may in turn result in higher oxygen depletion that affects aquatic organisms [29]. The observation from this study agrees with Salem *et al.,* [30] for COD and BOD at the receiving watershed. Studies have shown that too much turbidity in water can lead to interference with some treatment steps at some stages, such as coagulation and separation solids of the water treatment techniques, which may increase treatment cost, and when extremely turbid water is chlorinated, there is a possibility for a rise in trihalomethane (THM) precursor formation [24]. Pipraiya *et al.* (2017) [31] reported the similar physicochemical parameters of Chambal River water at three locations that were chosen for sampling in his studies: Kota (Rajasthan), Dhoulpur (Rajasthan), and the boundary between Bhind and Etawa throughout the winter and summer seasons (2014-15). They concluded that at a chosen sampling station in Kota, several factors, including DO, call for close attention. The quality of the wastewater that industries at station Kota discharge needs to be strictly monitored. Gupta *et al.* (2011) [32] investigated the physicochemical assessment of the Chambal River's water quality in the Kota city area of Rajasthan state (India). They discovered that the average water quality parameter over the course of three years (2007–2009) was pH 7.5-8.25, turbidity 3.9–8.2 NTU, total alkalinity 112-148 mg/l, total dissolved solids (TDS) 180–219 mg/l, and total hardness 132-146 mg/l, DO (4.3–6.1 mg/l), COD (7.40–38.80 mg/l), and BOD (1.20–12.20 mg/l). They concluded that the river near Kota is moderately polluted as evidenced by the increasing levels of ammonia, BOD, COD, and low DO. Reddy and Baghel (2010) [33] investigated the effects of effluent from the chemical and textile industries on the physicochemical properties of the Chambal River. For each of the

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three seasons, water samples were taken quarterly. In accordance with the locations of the noteworthy industrial discharges into the river, five sampling stations were picked by them along the course of the river. The pH, BOD, and COD values slightly increased as a result of the effluent released into stations 2, 3, and 4. The findings of the t-test showed that there were significant differences in turbidity, TDS, TSS, electrical conductivity, DO, chloride, sulphate, and hardness between the several sites analyzed. With the exception of TDS, which varied dramatically among sampling times, season had no impact on many of these metrics. Ansari and Sharma, 2019 [34] periodically investigated the physicochemical parameters and heavy metals (Cd, Cr, Zn, Pb) of wastewater collected from three contaminated sites (Raipura, Sazidehra and Akelgarh) of river Chambal. The conventional techniques were used to analyze these physiochemical characteristics in our current study. Temperature ranged from 28 ℃ to 36, and the pH of the soil and wastewater was found to be alkaline. It was discovered that the Raipura site was more contaminated, whereas the sites in Sazidehra had the highest OC content. The permitted limit established by the World Health Organization and the United States Environmental Protection Agency was exceeded by the studied physicochemical characteristics.

II. Analysis for the presence of heavy metals

Due to unplanned industrial growth, and accumulation of sewage waste without sufficient treatment, and other factors, some portions of the river Chambal are severely poisoned. One of the main contributors to water pollution is the environmental contamination caused by industrial waste. A variety of chemicals (Heavy metals), pathogens, and physical and sensory alterations like high temperature and discoloration were the specific contaminants that cause water pollution [11].

The phrase "heavy metals" refers to a set of metals and metalloids whose atomic density is found to be greater than 4 g/cm and 3 or 5 times or more, than that of water [35]. Fish and other aquatic organisms could be at risk from heavy metal contamination of aquatic ecosystems. Metals are known to affect a number of physiological and biochemical processes important for fish metabolism. From the perspective of water contamination, the most significant heavy metals needed to be studied; Zn, As, Cu, Pb, Cd, Hg, Ni, and Cr. Some of these metals, like Cu, Fe, Mn, Ni, and Zn, needed as nutrients in minute amounts by plants and microbes, but at higher concentrations, they become hazardous [36-37]. In the present study, the presence of heavy metals (Pb, Cd, Zn, and Cr) was screened in water samples collected from all four collection sites using AAS with seasonal effects.

At Akelgarh site (Control), The amount of Pb was found maximum in March months (0.548ppm), and Cd was found to be maximum in September (0.688ppm), Zn in December (208ppm) while Cr in March (1.256 ppm). At Sazidehra site, the amount of Pb was resulted maximum in September (3.227ppm), similarly Cd was found to be maximum in September (0.194ppm). Zn was found to be maximum in December (225ppm) while Cr in September (1.631 ppm). At Raipura site, the amount of Pb was observed maximum in September (4.321ppm), similarly Cd was found to be maximum in September (0.778ppm). Zn was found to be maximum in December (267.97ppm) while Cr was maximum in September (6.484 ppm). 3/4 heavy metals resulted to be maximum in the month of September. At Nayapura site, the amount of Pb was maximum in September (0.496 ppm), and the amount of Cd (0.073 ppm), similarly the amount of Zn was found highest in December (202.02ppm) and Cr in March (1.01ppm).

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Table-5 Mean concentration of heavy metals in different water sample (all data in ppm)

Water sample	Pb*	Cd*	Zn*	Cr*
Standard	0.05	0.005	5.0	0.05
Akelgarh-1(Sep)	0.511±0.06	0.688±0.08	200.211±2.26	1.118±0.12
Akelgarh-II(Dec.)	0.297±0.04	0.039±0.007	208.347±2.24	0.334±0.05
Akelgarh-III(March)	0.548±0.08	0.299±0.04	198.577±1.89	1.256±0.2
Sazidehra I(Sep)	3.227±0.21	0.194±0.02	202.113±1.91	1.631±0.31
Sazidehra II(Dec.)	0.278±0.02	0.027±0.004	225.512±2.45	0.338±0.05
Sazidehra III(March)	1.528±0.112	0.089±0.01	212.405±2.31	0.798±0.09
Raipura I(Sep)	4.321±0.25	0.778±0.09	197.023±1.78	6.484±0.88
Raipura II(Dec.)	2.128±0.119	0.036±0.007	267.976±2.58	1.814±0.34
Raipura III(Mar)	3.825±0.23	0.468±0.06	207.088±2.22	4.358±0.42
Nayapura I(Sep)	0.496±0.02	0.052±0.01	194.623±1.34	0.641±0.08
Nayapura II(Dec)	0.441±0.04	0.073±0.03	202.02±1.45	1.002±0.01
Nayapura III(Mar)	0.395±0.02	0.033±0.002	187.924±2.98	1.01±0.060

WHO maximum permissible (mg/l) limit 2008 [38]

Ansari and Sharma, 2019 [34] periodically investigated the physicochemical parameters and heavy metals (Cd, Cr, Zn, Pb) of wastewater collected from three contaminated sites (Raipura, Sazidehra and Akelgarh) of river Chambal. The maximum concentration of heavy metals was at Raipura sites (Pb, Cd, Cr, Zn). In the summers of 2019-21[39], samples were taken from various polluted industry sites along the Jojari River. Dubey (2021) [39] studied the levels of heavy metals in the Ganga's water and sediments. Iron (Fe), Chromium (Cr), Lead (Pb), Nickel (Ni), and Zinc (Zn) were measured in water and sediment samples, taken from various places (Zn). These heavy metals were concentrated in the research area, which suggests that the river is severely polluted. This point indicates natural and anthropogenic sources, were among the many potential sources of these heavy metal contaminants. When compared to national and international organizations like the WHO and USEPA, the quantities found were higher and above the maximum permissible and recommended limit.

The status of heavy metal contamination and health concerns related to the usage of water from the river Gomti by millions of people were evaluated by Khan *et al.* in 2021 [40]. The degree of contamination (Cd) value was determined to be high, indicating "high" danger levels as a result of heavy metal contamination in the river Gomti. Singh and Sao (2015) [41] assessed the Hasdeo

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river's water quality in sarvamangla nagar, Korba (Chhattisgarh). They assessed the water quality parameters (temperature, pH, DO, BOD, COD, and level of heavy metal contaminants) to determine the pollution level. Heavy metal pollution was seen by them in the following order: Fe>Pb>Cd>Zn. Although, in our study Zn was found in higher concentration (Table-5).

Conclusions

The current study assessed the water quality of wastewater disposal sites and the characterization of various physicochemical parameters. The results showed compliance of effluent quality for some parameters while a few among others did not comply with set limits for most of the sampling period. The Raipura site was found highly contaminated. The heavy metals were concentrated in the research area, which suggests that the river is severely polluted. Zinc (Zn) was found highly accumulated in the sewage water of Raipura site. This study revealed a general deterioration in the physicochemical qualities of the discharged wastewater effluents as well as the receiving watershed and suggests the inefficiency of the treatment works at producing effluents of acceptable quality together with its attendant environmental health challenges. The findings underscore the need for continuous pollution monitoring and intervention strategies to curb indiscriminate pollution of environments by the continuous release of inadequately treated effluents in Kota city of Rajasthan, India, and many other developing countries in order to forestall public health concerns associated with environmental pollution.

Acknowledgements
The authors are thankful to Department of Botany, MBPG College, University of Kota, Kota for the overall support.

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प्रदूषण से मगरमच्छों का रंग बदला, जान का खतरा

चन्द्रलोई नदी व रायपुरा नाले में 100 से अधिक मगरमच्छ

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कोटा. नदी में प्रदूषण से कोटा में मगरमच्छ सफेद हो रहे हैं। कोटा स्टोन की स्लरी और केमिकल युक्त पानी में विचरण करने से इनका रंग ही बदल गया है। चन्द्रलोई नदी और इसमें मिलने वाले रायपुरा नाले में 100 से अधिक मगरमच्छ विचरण करते हैं। विशेषज्ञों के अनुसार, लगातार स्लरी युक्त पानी में रहने से मगरमच्छों का रंग सफेद हो गया गया। चम्बल नदी की सहायक नदी चन्द्रलोई अलनिया बांध से शुरू होती है। करीब 17 किलोमीटर बहने के बाद नौंटाना और मानसगांव के पास चम्बल नदी में मिल जाती है। चन्द्रलोई नदी में रायपुरा नाला मिलता है। इस नाले में दो दर्जन मगरमच्छ विचरण करते हैं। नाले में कोटा स्टोन फैक्ट्रियों की स्लरी (कोटा स्टोन की चिराई से निकलने वाला सफेद मलबा) और कारखानों का केमिकल प्रवाहित किया जाता है। इससे नदी के जल में खतरनाक रसायन घुल रहे हैं। जिनके लगातार संपर्क में रहने से मगरमच्छों का रंग ही बदल गया है।

पत्रिका
स्पॉट लाइट

मगरमच्छों की मौत अभी भी रहस्य

पिछले साल चन्द्रलोई नदी में विचरण करने वाले आधा दर्जन मगरमच्छों की रहस्यमयी मौत हो गई थी। मौतों के कारणों से अभी तक पर्दा नहीं उठ पाया है। इन मगरमच्छों की मौत का मामला एनजीटी में भी पहुंचा था। एक कमेटी का गठन कर जांच के निर्देश दिए गए थे। इससे पहले भी वर्ष 2022 में मगरमच्छों की असमय मौत हो चुकी है।

फाइलों से बाहर नहीं आया क्रोकोडाइल पार्क

चन्द्रलोई नदी और रायपुरा नाले में मगरमच्छों की अधिकता के चलते सरकार की ओर से क्रोकोडाइल पार्क का प्रोजेक्ट तैयार किया था। ताकि मगरमच्छ इस पार्क में सुरक्षित विचरण कर सके। लेकिन अब तक यह परियोजना फाइलों से बाहर नहीं आई है।

विस्तृत खबर पढ़ने के लिए QR कोड स्कैन करें

प्रदूषित पानी से हो रहे सफेद

फैक्ट्रियों से निकलने वाले दूषित पानी की वजह से क्षेत्र के मगरमच्छों का रंग सफेद हो गया है। जब ये क्षेत्र विशेष से दूसरी जगह पर जाते हैं तो फिर से रंग बदल जाता है। संबंधित विभागों को नदी में प्रदूषण के मामले को गंभीरता से लेना चाहिए। कैमिकल का इन पर प्रतिकूल प्रभाव पड़ता है।

आदिल सैफ, वाइल्डलाइफ कंजर्वेशनिस्ट

रसायन के संपर्क से दूरगामी दुष्प्रभाव

स्लरी व कैमिकल के प्रभाव से मगरमच्छों की स्किन सफेद हो रही है। इनके स्वास्थ्य पर पड़ रहे प्रभाव की स्टडी होनी चाहिए। मगरमच्छ लगातार प्रदूषण के बीच रहेंगे तो निश्चित रूप से इनकी त्वचा पर दुष्प्रभाव तो पड़ेगा। लगातार कैमिकल जमा होने से शरीर के भीतर भी दूरगामी प्रभाव पड़ सकते हैं।

डॉ. अखिलेश पांडेय, उपनिदेशक, जिला पशु चिकित्सालय

राजस्थान सरकार
कार्यालय अधीक्षण अभियन्ता,
राजस्थान शहरी आधारभूत विकास परियोजना (आरयूआईडीपी)
तृतीय चरण (फेज–III) प्रोग्राम लोन, पीआईयू, कोटा
ऑक्सीजोन के पीछे, आई.एल. मंदिर के पास,
एस.टी.पी. परिसर, राजीव गांधी नगर, कोटा
फोन नम्बर: 0744-2407661 Email- kota.ruidp@rajasthan.gov.in

क्रमांक: आरयूआईडीपी / कोटा / 2024–25 /6291 दिनांक:– 8/4/25

हैण्ड ओवर / टेकन ओवर रिपोर्ट

कार्य का नाम– Design and Construction of Sewer system including Sewer Network, Sewage Treatment Plant, Sewage pumping stations and house sewer connections along with all allied works and Operation services of the entire system for 10 years for left out areas on left bank of Chambal river at Kota City **(Package Rusdp/Program/Kot/03)**

संवेदक का नाम:– **Dineshchandra R. Agrawal Infracon Private Ltd.**
401, The Grand Mall, S.M. Road, Ambawadi, Ahemdabad-380015
Email: kota.ugd2019@gmail.com drainfra89@gmail.com

संदर्भ:–कार्यालय अधीक्षण अभियंता, आरयूआईडीपी तृतीय चरण, कोटा का संदर्भित पत्र क्रमांक 1283 दिनांक 08.01.2024

कोटा शहर में आरयूआईडीपी सीवरेज परियोजना तृतीय चरण कोटा के अन्तर्गत पैकेज संख्या Kot/03 में किए गये सीवर कार्यो की क्लीनिंग हेतु 1 रोबोटिक सीवर क्लीनिंग मशीन एवं दो सक्शन कम जेटिंग मशीनें उक्त संदर्भित पत्र के क्रम में आज दिनांक 8/4/25 को नगर निगम, कोटा उत्तर को हैण्ड ऑवर / टेकन ऑवर किया गया।

Handed Over by

अधीक्षण अभियंता,
आरयूआईडीपी तृतीय चरण, कोटा

Taken Over by

अधीक्षण अभियंता,
नगर निगम, कोटा उत्तर

राजस्थान सरकार
कार्यालय अधीक्षण अभियन्ता,
राजस्थान शहरी आधारभूत विकास परियोजना (आरयूआईडीपी)
तृतीय चरण (फेज–III) प्रोग्राम लोन, पीआईयू, कोटा
ऑक्सीजोन के पीछे, आई.एल. मंदिर के पास,
एस.टी.पी. परिसर, राजीव गांधी नगर, कोटा
फोन नम्बरः 0744-2407661 Email- kota.ruidp@rajasthan.gov.in

क्रमांकः आरयूआईडीपी/कोटा/2024–25/2912 दिनांकः– 8/4/25

हैण्ड ओवर/टेकन ओवर रिपोर्ट

कार्य का नाम– Design and Construction of Sewer system including Sewer Network, Sewage Treatment Plant, Sewage pumping stations and house sewer connections along with all allied works and Operation services of the entire system for 10 years for left out areas on left bank of Chambal river at Kota City **(Package Rusdp/Program/Kot/03)**

संवेदक का नामः– **Dineshchandra R. Agrawal Infracon Private Ltd.**
401, The Grand Mall, S.M. Road, Ambawadi, Ahemdabad-380015
Email: kota.ugd2019@gmail.com drainfra89@gmail.com

संदर्भः–कार्यालय अधीक्षण अभियंता, आरयूआईडीपी तृतीय चरण, कोटा का संदर्भित पत्र क्रमांक. 976 दिनांक 04.09.2023, 985 दिनांक 07.09.2023 एवं 1160 दिनांक 02.11.2023

कोटा शहर में आरयूआईडीपी सीवरेज परियोजना तृतीय चरण के अन्तर्गत कुन्हाड़ी क्षेत्र में 15 एम.एल.डी. सीवरेज ट्रीटमेंट प्लॉन्ट मय टर्मिनल सीवेज पम्पिंग स्टेशन, **2 MLD** सीवेज पम्पिंग स्टेशन विकास नगर, **1.20 MLD** सीवेज पम्पिंग स्टेशन कमला उद्यान एवं **2 MLD** सीवरेज ट्रीटमेंट प्लॉन्ट ऑक्सीजोन पार्क आई.एल. कॉलोनी तथा संबंधित सीवर लाईन नेटवर्क (200MM व्यास से 1000MM व्यास) मय घरेलू सीवर कनेक्शन कार्य को पूर्ण एवं कमीशन कर उक्त संदर्भित पत्र के क्रम में आज दिनांक 8/4/25. को नगर निगम, कोटा उत्तर को हैण्ड ऑवर/टेकन ऑवर किया गया।

संलग्नः–संदर्भित पत्र के साथ संलग्न चेक लिस्ट की प्रति एवं As built Drawing और O&M Manual.

Handed Over by

अधीक्षण अभियंता,
आरयूआईडीपी तृतीय चरण, कोटा

Taken Over by

अधीक्षण अभियंता,
नगर निगम, कोटा उत्तर

Government of Rajasthan
Office of The Superintending Engineer
Rajasthan Urban Infrastructure Development Project
Phase-III, Program Loan (PIU), Kota
Behind Oxyzone, Near I.L. Temple
STP, Rajeev Gandhi Nagar, Kota
TEL: 0744-2407661
Email- kota.ruidp@rajasthan.gov.in

S.No./RUIDP/Kota/2024-25/ 3197 Dated: 2/5/25

हैण्ड ओवर / टेकन ओवर रिपोर्ट

कार्य का नाम–Design and Construction of Work of Providing Sewer Network with house sewer connections, Trenchless Sewer, Design and construction of Sewage Treatment Plant, Sewage pumping station, Power Generation Unit at STP & allied works and Operation & maintenance services of the entire system for 10 years in Kota City (Part Area) **(Package Rusdp/Program/Kot/02)**

संवेदक का नाम:– **Dineshchandra R. Agrawal Infracon Private Ltd.**
401, The Grand Mall, S.M. Road, Ambawadi, Ahemdabad-380015
Email: kota.ugd2019@gmail.com drainfra89@gmail.com

संदर्भ:–कार्यालय अधीक्षण अभियंता, आरयूआईडीपी तृतीय चरण, कोटा का संदर्भित पत्र क्रमांक 1527 दिनांक 27.12.2023

कोटा शहर में आरयूआईडीपी सीवरेज परियोजना तृतीय चरण के अन्तर्गत पैकेज संख्या Kot/02 में किए गये सीवर कार्यो की क्लीनिंग हेतु 1 रोबोटिक सीवर क्लीनिंग मशीन एवं 4 सक्शन कम जेटिंग मशीनें उक्त संदर्भित पत्र के क्रम में आज दिनांक 2/5/25 को नगर निगम, कोटा उत्तर को हैण्ड ऑवर / टेकन ऑवर किया गया।

Handed Over by	**Taken Over by**
अधीक्षण अभियंता,	2/5/25
आरयूआईडीपी तृतीय चरण, कोटा	अधीक्षण अभियंता
	नगर निगम, कोटा उत्तर

Government of Rajasthan
Office of The Superintending Engineer
Rajasthan Urban Infrastructure Development Project
Phase-III, Program Loan (PIU), Kota
Behind Oxyzone, Near I.L. Temple
STP, Rajeev Gandhi Nagar, Kota
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TEL: 0744-2407661

S.No./RUIDP/Kota/2024-25/ 3196 Dated: 2-5-25

हैण्ड ओवर/टेकन ओवर रिपोर्ट

कार्य का नाम–Design and Construction of Work of Providing Sewer Network with house sewer connections, Trenchless Sewer, Design and construction of Sewage Treatment Plant, Sewage pumping station, Power Generation Unit at STP & allied works and Operation & maintenance services of the entire system for 10 years in Kota City (Part Area) **(Package Rusdp/Program/Kot/02)**

संवेदक का नामः– **Dineshchandra R. Agrawal Infracon Private Ltd.**
401, The Grand Mall, S.M. Road, Ambawadi, Ahemdabad-380015
Email: kota.ugd2019@gmail.com drainfra89@gmail.com

संदर्भः–कार्यालय अधीक्षण अभियंता, आरयूआईडीपी तृतीय चरण, कोटा का संदर्भित पत्र क्रमांक 1527 दिनांक 27.12.2023

कोटा शहर में आरयूआईडीपी सीवरेज परियोजना तृतीय चरण कोटा के अन्तर्गत बोरखेड़ा क्षेत्र में 40 एम.एल.डी. सीवरेज ट्रीटमेंट प्लॉन्ट धाकड़खेड़ी मय टर्मिनल सीवेज पम्पिंग स्टेशन, **4.77 MLD** सीवेज पम्पिंग स्टेशन थेगड़ा, **1.59 MLD** सीवेज पम्पिंग स्टेशन बोरखेड़ा तथा संबंधित सीवर लाईन नेटवर्क बोरखेड़ा एवं इस परियोजना में शामिल अमृत–1.0 संबंधित क्षेत्र (200 **MM** व्यास से 1800 **MM** व्यास) मय एम.बी.एस. अस्पताल परिसर की सीवर लाईनें एवं संबंधित घरेलू सीवर कनेक्शन कार्यो को पूर्ण एवं कमीशन कर उक्त संदर्भित पत्र के क्रम में आज दिनांक 2/5/25 को नगर निगम, कोटा उत्तर को हैण्ड ऑवर/टेकन ऑवर किया गया।

संलग्नः–संदर्भित पत्र के साथ संलग्न चेक लिस्ट की प्रति एवं As built Drawing और O&M Manual.

Handed Over by

अधीक्षण अभियंता,
आरयूआईडीपी तृतीय चरण, कोटा

Taken Over by

2/5/25

अधीक्षण अभियंता,
नगर निगम, कोटा उत्तर

कार्यालय नगर निगम, (उत्तर) कोटा (राज0)

Email : nnnorth.kota@rajasthan.gov.in Website : www.kotamc.org, Tel. Ph. 0744-2502293

क्रमांक :– ननि(उ)को/आयुक्त/2025/1220-25 दिनांक :– 9/7/25

परियोजना निदेशक महोदय,
RUIDP, Jaipur

विषय :– बजट घोषणा वर्ष 2025–26 शहरी निकायों में करवाए जाने वाले कार्यों के लिए की गई घोषणा के तहत नगर निगम, कोटा–उत्तर के द्वारा करवाए जाने वाले प्रस्तावित कार्य के संबंध में प्रस्ताव भिजवाने बाबत्।

प्रसंग :– निदेशालय स्थानीय निकाय विभाग जयपुर के पत्रांक एफ.6/लेखा/डीएलबी/बजट/घोषणा/2025–26/198 दिनांक 03.04.2025 के क्रम में।

महोदय,

उपरोक्त विषयान्तर्गत प्रासंगिक पत्रांक के द्वारा बजट घोषणा वर्ष 2025–26 के तहत करवाए जाने वाले निम्नानुसार कार्यों के लिए की गई घोषणा में RUIDP को कार्यकारी एजेंसी नियुक्त किया गया है। इस संबंध में नगर निगम, कोटा–उत्तर के द्वारा निम्नानुसार कार्य प्रस्तावित किये गये हैं :–

क्र	बजट घोषणा	कार्य का विवरण	नगर निगम, कोटा–उत्तर द्वारा प्रस्तावित कार्यों का विवरण
1.	29.09.00	296 शहरों Waste Water Management इससे Treated Water का उद्योगों, कृषि आदि में पुनः उपयोग संबंधी कार्य करवाया जायेगा	नगर निगम, कोटा–उत्तर क्षेत्र में 04 STP's Working में है जिनकी कुल क्षमता 72 MLD Sewage को दैनिक ट्रीट किया जा रहा है, शोधित जल का रियूज उद्योग/कृषि कार्य हेतु निम्न प्रकार से किया जा सकता है :– • धाकडखेडी (40 MLD) शोधित जल को जरिये पम्प व पाईप लाईन के जरिये निकट स्थित डीसीएम फैक्ट्री एवं इण्डस्ट्रियल उपयोग में लिया जा सकता है एवं कृषि उपयोग में भी लिया सकता है • काला तालाब (15 MLD) शोधित जल को जरिये पम्प व पाईप लाईन के जरिये निकट स्थित कृषि कार्यों में उपयोग लिया सकता है • बालिता (15 MLD) शोधित जल को जरिये पम्प व पाईप लाईन के जरिये निकट स्थित कृषि कार्यों में उपयोग लिया सकता है व वर्तमान में C & D Wate Plant में 0.3 MLD शोधित जल का उपयोग निर्माण पश्चात किया जावेगा • ऑक्सीजोन (02 MLD) शोधित जल को जरिये पम्प व पाईप लाईन के जरिये निकट स्थित ऑक्सीजोन पार्क में उपयोग किया जा रहा है
2.	29.14.00	जयपुर, अजमेर, विराटनगर बयाना, कामां, बान्दीकुई, बसवा, सूरजगढ़, नाथद्वारा लक्ष्मणगढ़–अलवर, कोटा, खींवसर, सांचोर, पुष्कर, हनुमानगढ़ व संभागीय मुख्यालयों सहित 75 शहरों में Sewerage Gap को चरणबद्ध रूप से कवर करने का कार्य करवाया जायेगा	नगर निगम, कोटा–उत्तर क्षेत्र में अमृत 2.0 के तहत सीवर का कार्य चल रहा है। जो इस वर्ष के अंत तक पूर्ण होना संभावित है। इसके बाद भी नगर निगम, कोटा–उत्तर की वर्तमान सीमा में विभिन्न क्षेत्रों में नगरीय सीमा विस्तार के साथ आने वाले आबादी एरिया को देखते हुए लगभग 150–200 किमी की सीवर लाईन की और आवश्यकता रहेगी। उक्त Sewage को प्रबन्धन एवं ट्रीट करने के लिए Gap को पूर्ण करने हेतु DPR बनाई जानी प्रस्तावित की जाती है

अतः उक्तानुसार कार्यों को बजट घोषणा वर्ष 2025–26 में किये गये प्रावधान के तहत प्रस्ताव में शामिल किया जाना प्रस्तावित किया जाता है।

आयुक्त
नगर निगम, कोटा–उत्तर

कार्यालय नगर निगम, कोटा दक्षिण (राज0)

क्रमांक :– ननिको–(द0)/अधि0अभि0/2025/ 9572-75 दिनांक :– 09/10/25

कार्यकारी निदेशक महोदय,
RUIDP, Jaipur

विषय :– बजट घोषणा वर्ष 2025–26 शहरी निकायों में करवाए जाने वाले कार्यों के लिए की गई घोषणा के तहत नगर निगम कोटा दक्षिण के द्वारा करवाए जाने वाले प्रस्तावित कार्य के संबंध में प्रस्ताव भिजवाने बाबत।

प्रसंग :– निदेशालय स्थानीय निकाय विभाग जयपुर के पत्रांक एफ.6/लेखा/डीएलबी/बजट घोषणा/2025–26/198 दिनांक 03.04.2025 के क्रम में।

उपरोक्त विषयान्तर्गत प्रासंगिक पत्रांक के द्वारा बजट घोषणा वर्ष 2025–26 के तहत करवाए जाने वाले निम्नानुसार कार्यों के लिए की गई घोषणा में RUIDP को कार्यकारी एजेंसी नियुक्त किया गया है। इस संबंध में नगर निगम कोटा दक्षिण के द्वारा निम्नानुसार कार्य प्रस्तावित किये गये :–

क्र.स.	बजट घोषणा	कार्य का विवरण	नगर निगम कोटा दक्षिण द्वारा प्रस्तावित कार्यो का विवरण
1	29.14.00	नगर निगम कोटा दक्षिण क्षेत्र में, जयपुर, अजमेर, विराटनगर, बयाना, कामां, बान्दीकुई, बसवा, सूरजगढ, नाथद्वारा, लक्ष्मणगढ़ अलवर, कोटा, खींवसर, सांधोर, पुष्कर, हनुमानगढ़, संभागीय मुख्यालयों सहित 75 शहरों मे सीवरेज गैप को चरणबद्ध रूप से कवर करने का कार्य करवाया जायेगा।	नगर निगम कोटा दक्षिण की वर्तमान सीमा में विभिन्न क्षेत्रों में नगरीय सीमा विस्तार के साथ आने वाले आबादी एरिया को देखते हुए संलग्न सूची अनुसार कुल 512.36 कि0मी0 सीवरेज लाईन की अतिरिक्त आवश्यकता रहेगी।

अतः उक्तानुसार कार्यों को बजट घोषणा वर्ष 2025–26 में किये गये प्रावधान के तहत प्रस्ताव में शामिल किया जाना प्रस्तावित किया जाता है।

आयुक्त
नगर निगम, कोटा दक्षिण

क्रमांक :– ननिको–(द0)/अधि0अभि0/2025/ 9572-75 दिनांक :– 09/10/25
प्रतिलिपि :–

1. श्रीमान जिला कलक्टर महोदय, कोटा (राज0)
2. श्रीमान प्रोजेक्ट डायरेक्टर, ~~RUDSICO~~ RUIDP, Jaipur
3. गार्ड फाईल।

आयुक्त
नगर निगम, कोटा दक्षिण

List of Trapped Drains	
SR NO.	Location
1	BAIRRAGE COLONY NALLA
2	KOTA BAIRRAGE-2
3	KUNHARI NALLA
4	GANESH MANDIR
5	BED COLLEGE
6	LALTEK-1
7	LALTEK-2
8	MAHADEV MANDIR-1
9	MAHADEV MANDIR-2
10	MASJID
11	CHOTH MATA MANDIR-1
12	CHOTH MATA MANDIR-2
13	COMPLEX NEAR MATAJI MANDIR
14	NEAR WINE SHOP
15	NEAR SCHOOL
16	COMPLEX NEAR SHAMSHAN
17	NEAR WATER TANK
18	BEHIND SHAMSHAN
19	FISH MARKET
20	SAKATPURA NALLA
21	VMC OFFICE
22	BARGED TREE
23	LED GARDEN
24	FISH MARKET
25	CHOTH MATA MANDIR-3
26	BALITA NALLA
27	JHARNE KE BALAJI
28	VYAMSHALA
29	BHATT JI GHAT
30	MASJID-2
31	MASJID-3
32	DARGAH
33	CHASME KI BAWADI
34	HARIJAN BASTI
35	CHOTI SAMAD
36	COMPLEX
37	FATEHGARI-1
38	FATEHGARI-2
39	BHUTESWAR
40	SAHITYA CHOWK-1
41	SAHITYA CHOWK-2

42	LAL JI GHAT NALLA
43	BAWADI
44	DWARIKADISH
45	BALBULIYA GHAT
46	KABRISTAN
47	RAMPURA SHAMSHAN
48	CHOTI SAMAD 2
49	KHAI ROAD
50	KARBALLA NALLA
51	MUKTI MARG NAYAPURA NALLA
52	RAJBHAWAN ROAD
53	GAWDI/CIVIL LINES
54	NANDA JI KI BADI
55	GHUMCHAKKAR NALLA
56	CHANDMARI KE BALAJI NALLA

06/8/24
पवन कुमार शर्मा
अधिशाषी अभियन्ता
नगर विकास प्राधिकरण, कोटा

डी0पी0आर0 में शामिल नाले ट्रेपिंग की वर्तमान प्रगति रिपोर्ट

30 एम0एल0डी0 एस0टी0पी0 दशहरा मैदान में ट्रेप किये जाने वाले नालो की सूची			6 एम0एल0डी0 एस0टी0पी0 बालीता में ट्रेप किये जाने वाले नालो की सूची			20 एम0एल0डी0 एस0टी0पी0 धाकडखेडी में ट्रेप किये जाने वाले नालो की सूची			30 एम0एल0डी0 एस0टी0पी0 बालिता में ट्रेप किये जाने वाले नालो की सूची		
1	गोदावरी धाम	भूमि विवाद	1	बालिता नाला	कार्य पूर्ण	1	मुक्ति मार्ग नयापुरा नाला	कार्य पूर्ण	1	करबला नाला	कार्य पूर्ण
2	किशोरपुरा नाला	कार्य आंशिक पूर्ण				2	राजभवन रोड	कार्य पूर्ण	2	खाईरोड नाला	कार्य पूर्ण
3	साजी देहडा नाला	कार्य आंशिक पूर्ण				3	गावडी/सिविल लाईन्स	कार्य पूर्ण	3	फतेह गडी नाला	कार्य पूर्ण
4	भट्टेजी का धाट	कार्य पूर्ण				4	नन्दाजी की बाडी	कार्य पूर्ण	4	लालजी धाट नाला	कार्य पूर्ण
						5	धुमचक्कर नाला	कार्य पूर्ण	5	छोटी समाध नाला	कार्य पूर्ण
						6	चांदमारी के बालाजी नाला	कार्य पूर्ण	6	चश्मे की बावडी	कार्य पूर्ण
									7	बमबुलियाधाट	कार्य पूर्ण
									8	हरीजन बस्ती	कार्य पूर्ण
									9	बेराज कॉलोनी नाला	कार्य पूर्ण
									10	कुन्हाडी नाला	कार्य पूर्ण
									11	सकतपुरा नाला	कार्य पूर्ण

06/8/15

अधिशाषी अभियन्ता–सीवरेज
कोटा विकास प्राधिकरण, कोटा

Kala Talab 15 MLD.

Head Office Liquid Waste

Rajasthan State Pollution Control Board

4, Institutional Area, Jhalana Doongari, Jaipur-302 004
Phone: 0141-2716852

Registered

File No : F(Tech)/Kota(Ladpura)/6465(1)/2023-2024/1073-1075 Date: May 19 2023 1:25PM

Order No : 2023-2024/Liquid Waste/1320

Unit Id : 102652

M/s MUNICIPAL CORPORATION KOTA

DHAKARKHEDI, DISTT.KOTA , KOTA

Sub: **Consent to Operate** under Section 25/26 of the Water (Prevention & Control of Pollution) Act, 1974 and under Section 21(4) of Air (Prevention & Control of Pollution) Act, 1981.

Ref: Your application for Consent to Operate dated 15/11/2022 and subsequent correspondence.

Sir,

Consent to Operate under the provisions of Section 25/26 of the Water (Prevention & Control of Pollution) Act, 1974 (hereinafter to be referred as the Water Act) and under Section 21 of the Air (Prevention & Control of Pollution) Act, 1981, (hereinafter to be referred as the Air Act) as amended to date and rules & the orders issued thereunder **is hereby granted** for your **Sewage Treatment Plant 15 MLD Kala Talab plant** situated at **Sewage Treatment Plant, 15 MLD, Kala Talab KOTA Tehsil:Ladpura District:Kota** , Rajasthan, subject to the following conditions:-

1 That this Consent to Operate is valid for a period from **15/11/2022** to **31/10/2027** .

2 That this Consent is granted for manufacturing / producing following products / by products or carrying out the following activities or operation/processes or providing following services with capacities given below:

Signature Not Verified
Digitally signed by [illegible]
Mathur
Date: 2023.05.19 13:25:26 IST
Reason: Approved
Location:

Particular	Type	Quantity with Unit
Sewage Treatment Plant	Service	15.00 MLD

3 That this Consent to Operate is for existing plant, process & capacity and separate Consent to Establish/Operate is required to be taken for any addition / modification / alteration in process or change in capacity or change in fuel.

4 That the quantity of effluent generation along with mode of disposal for the treated effluent shall be as under:

Head Office Liquid Waste
Rajasthan State Pollution Control Board
4, Institutional Area, Jhalana Doongari, Jaipur-302 004
Phone: 0141-2716852

Registered

File No : F(Tech)/Kota(Ladpura)/6465(1)/2023-2024/1073-1075
Order No : 2023-2024/Liquid Waste/1320 Date: May 19 2023 1:25PM

Unit Id : 102652

Type of effluent	Max. effluent generation (KLD)	Recycled Qty of Effluent (KLD)	Disposed Qty of effluent (KLD)and mode of disposal
Domestic Sewage	15.000	NIL	15.000 On Land For Plantation/Horticulture after adequate treatment

5 That the sources of air emissions along with pollution control measures and the emission standards for the prescribed parameters shall be as under:

Sources of Air Emissions	Pollution Control Measures	Prescribed	
		Parameter	Standard
DG Set(900KVA)	ACOUSTIC ENCLOSURE , ADEQUATE AIR POLLUTION CONTROL MEASURES , ADEQUATE STACK HEIGHT	--	--

6 In addition to above total suspended solids in the treated effluent before disposal shall not exceed 20 mg/l.

7 That fee for this consent to operate has been deposited on the basis of estimated project cost of Rs. 39.60Crs and in case of any increase in the project cost, the project proponent shall be liable to deposit balance amount.

8 That this consent to operate is issued for DG Set of capacity 900KVA in place of DG Set of capacity 500KVA for which consent to establish was issued vide this office letter dated 24.07.2020

9 That neither any ground water shall be abstracted nor shall any ground water abstraction structure be constructed without obtaining prior permission from the Central Ground Water Authority (CGWA).

10 That above stated effluent standards are subject to the Hon'ble NGT order dated 30/4/2019 in matter of O.A. no 1069/2018 Nitin Shankar Deshpande Vs Union of India and Ors.

Regional Office Kota
Rajasthan State Pollution Control Board
SPL-2A, Road no. 6, Indrapasth Ind. Area, Kota
Phone: 0744-2490873

Registered

ile No : F(MUID)/Kota(Ladpura)/10(1)/2012-2013/377-370 Date: Aug 28 2023 5:43PM
rder No : 2023-2024/Kota/8427

Init Id : 40023

/s Sewage Treatment

ecretary, Urban Improvement Trust ,
istrict:Kota

Consent to Operate under Section 25/26 of the Water (Prevention & Control of Pollution) Act, 1974 and under Section 21(4) of Air (Prevention & Control of Pollution) Act, 1981.
Your application for Consent to Operate dated 27/09/2022 and subsequent correspondence.

Consent to Operate under the provisions of Section 25/26 of the Water (Prevention & Control of Pollution) Act, 1974 (hereinafter to be referred as the Water Act) and under Section 21 of the Air (Prevention & Control of Pollution) Act, 1981, (hereinafter to be referred as the Air Act) as amended to date and rules & the orders issued thereunder is hereby granted for your **6 MLD Sewage Treatment plant** situated at **Khasra No 669, Village Balita kota Tehsil:Ladpura District:Kota** , Rajasthan, subject to the following conditions:-

1 That this Consent to Operate is valid for a period from **15/09/2023** to **31/08/2027** .

2 That this Consent is granted for manufacturing / producing following products / by products or carrying out the following activities or operation/processes or providing following services with capacities given below:

Particular	Type	Quantity with Unit
Sewage Treatment Plant	Service	6.00 MLD

3 That this Consent to Operate is for existing plant, process & capacity and separate Consent to Establish/Operate is required to be taken for any addition / modification / alteration in process or change in capacity or change in fuel.

4 That the quantity of effluent generation along with mode of disposal for the treated effluent shall be as under:

Signature valid
Digitally signed by Amit Soni
Date: 2023.08.28 17:43:54 IST
Reason: Self Attested
Location:

30 MLD Kota 15239 57

Head Office Liquid Waste
Rajasthan State Pollution Control Board
4, Institutional Area, Jhalana Doongari, Jaipur-302 004
Phone: 0141-2716852

Registered

File No : F(Tech)/Kota(Ladpura)/6499(1)/2023-2024/1606-1608
Order No : 2024-2025/Liquid Waste/1336 Date: Sep 9 2024 10:51AM

Unit Id : 40149

M/s Secretary, Urban Improvement Trust
Kota , Tehsil:Ladpura
District:Kota

Sub: Consent to Operate under Section 25/26 of the Water (Prevention & Control of Pollution) Act, 1974 and under Section 21(4) of Air (Prevention & Control of Pollution) Act, 1981.

Ref: Your application for Consent to Operate dated 25/03/2023 and subsequent correspondence

Sir,

Consent to Operate under the provisions of Section 25/26 of the Water (Prevention & Control of Pollution) Act, 1974 (hereinafter to be referred as the Water Act) and under Section 21 of the Air (Prevention & Control of Pollution) Act, 1981, (hereinafter to be referred as the Air Act) as amended to date and rules & the orders issued thereunder is hereby granted for your **Sewerage Treatment Plant 30 MLD plant** situated at **Khasra No 22, Kishorpura Kishorpura Tehsil:Ladpura District:Kota** , Rajasthan, subject to the following conditions:-

1 That this Consent to Operate is valid for a period from **01/06/2023** to **31/05/2028**

2 That this Consent is granted for manufacturing / producing following products / by products or carrying out the following activities or operation/processes or providing following services with capacities given below:

Particular	Type	Quantity with Unit
SEWAGE TREATMENT PLANT	Service	30.00 MLD

3 That this Consent to Operate is for existing plant, process & capacity and separate Consent to Establish/Operate is required to be taken for any addition / modification / alteration in process or change in capacity or change in fuel.

4 That the quantity of effluent generation along with mode of disposal for the treated effluent shall be as under:

Signature valid
Digitally signed by Vidyata Singh
Date: 2024.09.09 10:55:33 IST
Reason: Self Attested
Location:

Head Office Liquid Waste
Rajasthan State Pollution Control Board
4, Institutional Area, Jhalana Doongari, Jaipur-302 004
Phone: 0141-2716852 Fax: 0141-276852

Revised Consent

File No : F(Tech)/Kota(Ladpura)/6336(1)/2021-2022/2239-2241 824-826
Order No : 2021-2022/Liquid Waste/1254 Date: 03/09/2021

Unit Id : 97113

M/s Sewage Treatment Plant

Dhakarkheri , Dhakarkheri Tehsil:Ladpura
District:Kota

Sub: Consent to Operate under section 25/26 of the Water (Prevention & Control of Pollution) Act, 1974.

Ref: Your application for Consent to Operate dated 25/01/2019 and subsequent correspondence.

Sir,

Consent to Operate under the provisions of section 25/26 of the Water (Prevention & Control of Pollution) Act, 1974 (hereinafter to be referred as the Water Act) as amended to date and rules & the orders issued thereunder is **hereby granted** for your Sewage Treatment plant(STP) plant situated at, Dhakarkheri Dhakarkheri Tehsil:Ladpura District:Kota , Rajasthan, subject to the following conditions:-

1 That this Consent to Operate is valid for a period from **25/01/2019** to **31/12/2023** .

2 That this Consent is granted for manufacturing / producing following products / by products or carrying out the following activities or operation/processes or providing following services with capacities given below.

Particular	Type	Quantity with Unit
Sewage Treatment Plant	Service	20.00 MLD

3 That this consent to operate is for existing plant, process & capacity and separate consent to establish/operate is required to be taken for any addition / modification / alteration in process or change in capacity or change in fuel.

4 That the quantity of effluent generation along with mode of disposal for the treated effluent shall be as under:

Signature valid
Digitally signed by Niraj Mathur
Date: 2021.09.03 16:37:33 IST
Reason: Self Attested
Location:

Balita 15 MLD.

Regional Office Kota
Rajasthan State Pollution Control Board
SPL-2A, Road no. 6, Indrapasth Ind. Area, Kota
Phone: 0744-2490873

Registered

File No : F(Tech)/Kota(Ladpura)/6320(1)/2020-2021/229-230
Order No : 2024-2025/Kota/8653 Date: Jun 12 2024 6:14PM

Unit Id : 102652

M/s MUNICIPAL CORPORATION KOTA

DHAKARKHEDI, DISTT.KOTA , KOTA

Sub: **Consent to Operate** under Section 25/26 of the Water (Prevention & Control of Pollution) Act, 1974 and under Section 21(4) of Air (Prevention & Control of Pollution) Act, 1981.

Ref: Your application for Consent to Operate dated 05/02/2024 and subsequent correspondence.

Sir,

Consent to Operate under the provisions of Section 25/26 of the Water (Prevention & Control of Pollution) Act, 1974 (hereinafter to be referred as the Water Act) and under Section 21 of the Air (Prevention & Control of Pollution) Act, 1981, (hereinafter to be referred as the Air Act) as amended to date and rules & the orders issued thereunder **is hereby granted** for your **Sewage Treatment Plant 15 MLD at Balita plant** situated at **Sewage Treatment Plant15MLD Khasra no 668, 669, Balita, Kota Balita KOTA Tehsil:Ladpura District:Kota** , Rajasthan, subject to the following conditions:

Signature Not Verified
Digitally signed by Vimal Soni
Date: 2024.06.12 18:57:29 IST

1 That this Consent to Operate is valid for a period from **05/03/2024** to **31/01/2029** .

2 That this Consent is granted for manufacturing / producing following products / by products or carrying out the following activities or operation/processes or providing following services with capacities given below:

Particular	Type	Quantity with Unit
SEWAGE TREATMENT PLANT	Service	15.00 MLD

3 That this Consent to Operate is for existing plant, process & capacity and separate Consent to Establish/Operate is required to be taken for any addition / modification / alteration in process or change in capacity or change in fuel.

4 That the quantity of effluent generation along with mode of disposal for the treated effluent shall be as under:

Regional Office Kota
Rajasthan State Pollution Control Board
SPL-2A, Road no. 6, Indrapasth Ind. Area, Kota
Phone: 0744-2490873

Registered

File No : F(Tech)/Kota(Ladpura)/6320(1)/2020-2021/229-230 Date: Jun 12 2024 6:14PM
Order No : 2024-2025/Kota/8653

Unit Id : 102652

Type of effluent	Max. effluent generation (KLD)	Recycled Qty of Effluent (KLD)	Disposed Qty of effluent (KLD)and mode of disposal
Domestic Sewage	15000.000	NIL	15,000.000 On Land For Plantation/Horticulture after adequate treatment

5 That the sources of air emissions along with pollution control measures and the emission standards for the prescribed parameters shall be as under:

Sources of Air Emissions	Pollution Control Measures	Prescribed	
		Parameter	Standard
D.G. Set(910KVA)	ACOUSTIC ENCLOSURE , ADEQUATE STACK HEIGHT	--	--

6 That the Domestic Sewage shall be treated before disposal so as to conform to the standards prescribed under the Environvent (Protection) Act-1986for disposal Into **Inland Surface Water.** The main parameters for regular monitoring shall be as under:

Parameters	Standards
pH Value	Between 6.5 to 9.0
Biochemical Oxygen Demand (3 days at 27C)	Not to exceed 10 mg/l
Chemical Oxygen Demand	Not to exceed 50 mg/l
NH4 (N)	5 mg/l
N total	10 mg/l
Total Suspended Solids	Not to exceed 20 mg/l
Fecal Coliform (MPN per 100 ml)	Not to exceed 100

30 MLD Balita.

Head Office Liquid Waste
Rajasthan State Pollution Control Board
4, Institutional Area, Jhalana Doongari, Jaipur-302 004
Phone: 0141-2716852

Registered

File No : F(Tech)/Kota(Ladpura)/6380(1)/2021-2022/3364-3366
Order No : 2022-2023/Liquid Waste/1303 Date: Oct 20 2022 5:34PM
Unit Id : 115185

M/s 30 MLD STP UIT BALITA KOTA

30 MLD STP, Near Balita, UIT, Kota, Rajasthan , Kota
Tehsil:Ladpura
District:Kota

Sub: **Consent to Operate** under Section 25/26 of the Water (Prevention & Control of Pollution) Act, 1974 and under Section 21(4) of Air (Prevention & Control of Pollution) Act, 1981.

Ref: Your application for Consent to Operate dated 23/06/2022 and subsequent correspondence.

Sir,

Consent to Operate under the provisions of Section 25/26 of the Water (Prevention & Control of Pollution) Act, 1974 (hereinafter to be referred as the Water Act) and under Section 21 of the Air (Prevention & Control of Pollution) Act, 1981, (hereinafter to be referred as the Air Act) as amended to date and rules & the orders issued thereunder **is hereby granted** for your **30 MLD STP plant** situated at **30 MLD STP, Near Balita, UIT, Kota, Rajasthan Kota Tehsil:Ladpura District:Kota** , Rajasthan, subject to the following conditions:-

1 That this Consent to Operate is valid for a period from **20/10/2022** to **30/09/2027** .

2 That this Consent is granted for manufacturing / producing following products / by products or carrying out the following activities or operation/processes or providing following services with capacities given below:

Particular	Type	Quantity with Unit
Sewage Treatment Plant (STP)	Service	30.00 MLD

3 That this Consent to Operate is for existing plant, process & capacity and separate Consent to Establish/Operate is required to be taken for any addition / modification / alteration in process or change in capacity or change in fuel.

4 That the quantity of effluent generation along with mode of disposal for the treated effluent shall be as under:

40 MLD Dhakerkhedi

HQ Office (PLG)

Rajasthan State Pollution Control Board
4, Institutional Area, Jhalana Doongari, Jaipur-302 004
Phone: 0141-5159600,5159695 Fax: 0141-5159697

Registered

File No : F(Tech)/Kota(Ladpura)/6320(1)/2020-2021/2891-2893
Order No : 2020-2021/PLG/1161 Dispatch Date: 29/09/2020

Unit Id : 102652

M/s MUNICIPAL CORPORATION KOTA

DHAKARKHEDI, DISTT.KOTA , KOTA

Sub: **Consent to Establish** under section 25/26 of the Water (Prevention & Control of Pollution) Act, 1974 and under section 21(4) of Air (Prevention & Control of Pollution) Act, 1981.

Ref: Your application(s) for Consent to Establish dated 06/12/2019 and subsequent correspondence.

Sir,

Consent to Establish under the provisions of section 25/26 of the Water (Prevention & Control of Pollution) Act, 1974 (hereinafter to be referred as the Water Act) and under section 21 of the Air (Prevention & Control of Pollution) Act, 1981, (hereinafter to be referred as the Air Act) as amended to date and rules & the orders issued thereunder **,is hereby granted** for your **MUNICIPAL CORPORATION KOTA plant** situated / proposed at **DHAKARKHEDI, DISTTKOTA KOTA Tehsil:Ladpura District:Kota** , Rajasthan under the provisions of the said Act(s). This consent is granted on the basis of examination of the information furnished by you in consent application(s) and the documents submitted therewith, subject to the following conditions:-

1 That this Consent to Establish is valid for a period from **06/12/2019** to **30/11/2024 or date of Commencement of production / commissioning of the project or activities whichever is earlier .**

2 That this Consent is granted for manufacturing / producing following products / by products or carrying out the following activities or operation/processes or providing following services with capacities given below.

Particular	Type	Quantity / Capacity
Sewage Treatment Plant	Service	40.00 MLD

3 That in case of any increase in capacity or addition / modification / alteration or change in product mix or process or raw material or fuel the project proponent is required to obtain fresh consent to establish.

4 That the control equipment as proposed by the applicant shall be installed before trial operation is started for which prior consent to operate under the provision of the **Water Act and Air Act** shall be obtained. This consent to establish shall not be treated as consent to operate.

2 MLD OXYZONE.

Regional Office Kota
Rajasthan State Pollution Control Board
SPL-2A, Road no. 6, Indrapasth Ind. Area, Kota
Phone: 0744-2490873

Registered

File No : F(Tech)/Kota(Ladpura)/6324(1)/2021-2022/119-120
Order No : 2024-2025/Kota/8612 Date: May 1 2024 7:19PM

Unit Id : 110853

M/s Urban Improvement Trust, Kota

Urban Improvement Trust, Near CAD Circle, Rawatbhata road, Kota , Kota

Sub: **Consent to Operate** under Section 25/26 of the Water (Prevention & Control of Pollution) Act, 1974 and under Section 21(4) of Air (Prevention & Control of Pollution) Act, 1981.

Ref: Your application for Consent to Operate dated 05/02/2024 and subsequent correspondence.

Sir,

Consent to Operate under the provisions of Section 25/26 of the Water (Prevention & Control of Pollution) Act, 1974 (hereinafter to be referred as the Water Act) and under Section 21 of the Air (Prevention & Control of Pollution) Act, 1981, (hereinafter to be referred as the Air Act) as amended to date and rules & the orders issued thereunder **is hereby granted** for your **Sewage Treatment Plant 2MLD IL Township plant** situated at **Sewage Treatment Plant 2 MLD, IL township, Oxyzone, Kota Kota Tehsil:Ladpura District:Kota** , Rajasthan, subject to the following conditions:-

1 That this Consent to Operate is valid for a period from **05/02/2024** to **31/01/2029** .

2 That this Consent is granted for manufacturing / producing following products / by products or carrying out the following activities or operation/processes or providing following services with capacities given below:

Particular	Type	Quantity with Unit
SEWAGE TREATMENT PLANT	Service	2.00 MLD

3 That this Consent to Operate is for existing plant, process & capacity and separate Consent to Establish/Operate is required to be taken for any addition / modification / alteration in process or change in capacity or change in fuel.

4 That the quantity of effluent generation along with mode of disposal for the treated effluent shall be as under:

Signature Not Verified
Digitally signed by Amit Soni
Date: 2024.05.01 19:20:00 IST
Reason: SelfAttested
Location:

ANNEXURE R-1/9

–:: शपथ पत्र ::–

मैं कि रामकल्याण गैहरा आयु– ५१ वर्ष आत्मज श्री कस्तूर चन्द

निवासी ग्राम– चंदसेल तह० लाडपुरा जिला– कोटा

.....

राज० का हूँ। Mo.No. ..... मैं अपने खेतो में सिवरेज ट्रिटमेंट प्लांट के पानी का उपयोग करता/करती हूँ। जिससे मेरे खेत में पानी की कमी नही होती है व फसल अच्छी होने के कारण फसल में वृद्धि हुई है।

रामकल्याण
हस्ताक्षर

राजस्थान सरकार

कार्यालय अधीक्षण अभियन्ता,
राजस्थान शहरी आधारभूत विकास परियोजना (आरयूआईडीपी)
तृतीय चरण (पैकेज III) प्रोग्राम लोन, पीआईयू, कोटा
ऑक्सीजोन के पीछे, आई.एल. मंदिर के पास,
एस.टी.पी. परिसर, राजीव गांधी नगर, कोटा
फोन नम्बर: 0744-2407661 Email- kota.ruidp@rajasthan.gov.in

क्रमांक: आरयूआईडीपी/कोटा/2023-24/1368-91 दिनांक: 26/02/24

महाप्रबंधक,
श्रीराम रयन्स
डी.सी.एम., कोटा

विषय: आरयूआईडीपी तृतीय चरण सीवरेज परियोजना के तहत धाकड़खेड़ी में निर्मित 40 एम.एल.डी. एस.टी.पी. (सीवरेज ट्रीटमेंट प्लान्ट) के परिशोधित पानी को उपयोग में लेने बाबत।

महोदय,

उपरोक्त विषयान्तर्गत लेख है आरयूआईडीपी तृतीय चरण सीवरेज परियोजना के अन्तर्गत धाकड़खेड़ी में निर्मित 40 एम.एल.डी. क्षमता का एस.बी.आर. तकनीक आधारित एस.टी.पी. (सीवरेज ट्रीटमेंट प्लान्ट) निर्मित किया गया है। जिसमें परिशोधित जल की गुणवत्ता औद्योगिक इकाईयों के उपयोग अनुकूल होने, पर्यावरण संरक्षण में सहायक होने के साथ-साथ नहरी पानी की बचत आदि को दृष्टिगत रखते हुये कृपया राजस्थान सीवरेज पॉलिसी के तहत दर पर परिशोधित जल का डी.सी.एम. की सभी इकाईयों में औद्योगिक उपयोग हेतु शीघ्रातिशीघ्र सप्लाई लाईन सहित प्रस्ताव प्रेषित करने का श्रम करावें।

(राकेश गर्ग)
अधीक्षण अभियंता
आर.यू.आई.डी.पी.,(पी.आई.यू.),
तृतीय चरण, कोटा।

क्रमांक: आरयूआईडीपी/कोटा/2023-24/1368-91 दिनांक:- 26/02/24

प्रतिलिपि:

1. श्रीमान् जिला कलेक्टर महोदय, कोटा।
2. आयुक्त, नगर निगम, कोटा उत्तर।
3. कनिष्ठ अभियंता, आरयूआईडीपी, पीआईयू, कोटा।
4. प्रोजेक्ट मैनेजर, डी.आर.ए. कृपया संबंधितों से समन्वय कर कार्यवाही सुनिश्चित् करें।

अधीक्षण अभियंता
आर.यू.आई.डी.पी.,(पी.आई.यू.),
तृतीय चरण, कोटा।

राजस्थान सरकार
कार्यालय अधीक्षण अभियन्ता,
राजस्थान शहरी आधारभूत विकास परियोजना (आरयूआईडीपी)
तृतीय चरण (फेज-III) प्रोग्राम लोन, पीआईयू, कोटा
ऑक्सीजोन के पीछे, आई.एल. मंदिर के पास,
एस.टी.पी. परिसर, राजीव गांधी नगर, कोटा
फोन नम्बरः 0744-2407661 Email- kota.ruidp@rajasthan.gov.in

क्रमांकः आरयूआईडीपी/कोटा/2024-25/05 दिनांक- 05/04/24

-स्मरण पत्र

महाप्रबंधक,
श्रीराम रेयन्स,
डी.सी.एम., कोटा।

विषय :- आरयूआईडीपी तृतीय चरण सीवरेज परियोजना के तहत धाकड़खेड़ी में निर्मित 40 एम.एल.डी. एस.टी.पी. (सीवरेज ट्रीटमेंट प्लान्ट) के परिशोधित पानी को उपयोग में लेने बाबत्।

संदर्भ :- इस कार्यालय का पूर्व का पत्रांक 1387 दिनांक 26.02.24।

महोदय,

उपरोक्त विषयान्तर्गत सदर्भित पत्र के क्रम में लेख है राजस्थान सीवरेज पॉलिसी के तहत देय दरों पर परिशोधित जल का डी.सी.एम. की सभी इकाईयों में औद्योगिक उपयोग हेतु पत्र लिखा गया था, किन्तु आपके स्तर पर कार्यवाही अपेक्षित है।

अतः पुनः अनुरोध है कि पूर्व पत्रानुसार शीघ्रातिशीघ्र प्रस्ताव प्रेषित करने का श्रम करावें।

संलग्न-पूर्व के पत्र की छाया प्रति

(राकेश गर्ग)
अधीक्षण अभियंता
आर.यू.आई.डी.पी. (पी.आई.यू.),
तृतीय चरण, कोटा।

क्रमांकः आरयूआईडीपी/कोटा/2024-25/06-09 दिनांकः- 05/04/24

प्रतिलिपि:

1. श्रीमान् जिला कलेक्टर महोदय, कोटा।
2. आयुक्त, नगर निगम, कोटा उत्तर।
3. कनिष्ठ अभियंता, आरयूआईडीपी, पीआईयू, कोटा।
4. प्रोजेक्ट मैनेजर, डी.आर.ए. कृपया संबंधितों से समन्वय कर कार्यवाही सुनिश्चित करें।

अधीक्षण अभियंता
आर.यू.आई.डी.पी. (पी.आई.यू.),
तृतीय चरण, कोटा।

Signature valid
Digitally signed by Rakesh Sharan Garg
Designation : Superintending Engineer
Date: 2024.04.05 14:37:42 IST
Reason: Approved

राजस्थान सरकार
कार्यालय अधीक्षण अभियन्ता,
राजस्थान शहरी आधारभूत विकास परियोजना (आरयूआईडीपी)
तृतीय चरण (फेज–III) प्रोग्राम लोन, पीआईयू, कोटा
ऑक्सीजोन के पीछे, आई.एल. मंदिर के पास,
एस.टी.पी. परिसर, राजीव गांधी नगर, कोटा
फोन नम्बर: 0744-2407661
Email- kota.ruidp@rajasthan.gov.in

15

क्रमांक: आरयूआईडीपी/कोटा/2024–25/526 दिनांक:– 28/11/24

महाप्रबंधक,
श्रीराम रेयन्स,
डी.सी.एम., कोटा

स्मरण पत्र –II

विषय:–आरयूआईडीपी तृतीय चरण सीवरेज परियोजना के तहत धाकड़खेड़ी में निर्मित 40 एम. एल.डी. क्षमता एस.टी.पी. (सीवरेज ट्रीटमेंट प्लान्ट) के परिशोधित पानी को उपयोग में लेने बाबत्।

संदर्भ:–इस कार्यालय का पूर्व का पत्रांक 5 दिनांक 05.04.2024 एवं पत्रांक 1387 दिनांक 26.02.24।

महोदय,

उपरोक्त विषयान्तर्गत संदर्भित पत्रों के क्रम में आदिनांक तक जवाब अप्राप्त है। अतः पुनः छायाप्रतियां संलग्न कर अनुरोध हैं कि शीघ्रातिशीघ्र कार्यवाही प्रत्युत्तर प्रेषित करें।

संलग्न:–उपरोक्तानुसार

अधीक्षण अभियंता
आर.यू.आई.डी.पी.,(पी.आई.यू.),
तृतीय चरण, कोटा।

क्रमांक: आरयूआईडीपी/कोटा/2024–25/527-30 दिनांक:– 28/11/24
प्रतिलिपि:–

1. श्रीमान् जिला कलेक्टर महोदय, कोटा।
2. श्रीमान् अति.परियोजना निदेशक महोदय, आरयूआईडीपी, जयपुर।
3. आयुक्त, नगर निगम, कोटा उत्तर।
4. कनिष्ठ अभियंता, आरयूआईडीपी, पीआईयू, कोटा।

अधीक्षण अभियंता
आर.यू.आई.डी.पी.,(पी.आई.यू.),
तृतीय चरण, कोटा।

Signature valid
Digitally signed by Rakesh Sharan Garg
Designation : Superintending Engineer
Date: 2024.11.28 14:05:30 IST
Reason: Approved

राजस्थान सरकार
कार्यालय अधीक्षण अभियन्ता,
राजस्थान शहरी आधारभूत विकास परियोजना (आरयूआईडीपी)
तृतीय चरण (फेज–III) प्रोग्राम लोन, पीआईयू, कोटा
ऑक्सीजोन के पीछे, आई.एल. मंदिर के पास,
एस.टी.पी. परिसर, राजीव गांधी नगर, कोटा
फोन नम्बरः 0744-2407661 Email- kota.ruidp@rajasthan.gov.in

क्रमांकः आरयूआईडीपी/कोटा/2023–24/1132 दिनांकः– 30/10/23

अधीक्षण अभियंता,
सिंचाई, वृत कोटा,
सी.ए.डी. कोटा।

विषय :– डी.सी.एम. एवं अन्य फैक्ट्रियों/प्लांटों द्वारा उपयोग हेतु लिये जाने वाले पानी का विवरण चाहने बाबत्।

उपरोक्त विषयान्तर्गत लेख है कि कोटा शहर या आस–पास क्षेत्र में स्थित डी.सी.एम., थर्मल तथा अन्य बड़ी औद्योगिक इकाईयों द्वारा माहवार केनाल/नदी या भूमिगत जल स्त्रोत से कितनी मात्रा में पानी लिया जा रहा है। कृपया इकाईवार विवरण उपलब्ध करावें, ताकि राज्य सरकार की पॉलिसी अनुसार सीवरेज ट्रीटमेंट प्लांटों (एस.टी.पी.) से उत्पन्न परिशोधित जल उपयोग हेतु तदानुसार प्लान बनाया जा सके।

(राकेश गर्ग)
अधीक्षण अभियंता
आर.यू.आई.डी.पी.,(पी.आई.यू.),
तृतीय चरण, कोटा।

क्रमांकः आरयूआईडीपी/कोटा/2023–24/1133-36 दिनांकः– 30/10/23
प्रतिलिपि सूचनार्थ –

1. श्रीमान् जिला कलेक्टर, कोटा।
2. श्रीमान् परियोजना निदेशक, आर.यू.आई.डी.पी., जयपुर।
3. श्रीमान आयुक्त नगर निगम, उत्तर/दक्षिण, कोटा।
4. श्रीमान् अति. परियोजना निदेशक/मुख्य अभियन्ता, आर.यू.आई.डी.पी., जयपुर।

अधीक्षण अभियंता
आर.यू.आई.डी.पी.,(पी.आई.यू.),
तृतीय चरण, कोटा।

राजस्थान सरकार
कार्यालय अधीक्षण अभियन्ता,
राजस्थान शहरी आधारभूत विकास परियोजना (आरयूआईडीपी)
तृतीय चरण (फेज--III) प्रोग्राम लोन, पीआईयू, कोटा
[illegible]
एस.टी.पी. परिसर, राजीव गांधी नगर, कोटा

फोन नम्बरः 0744-2407661 Email- kota.ruidp@rajasthan.gov.in

क्रमांकः आरयूआईडीपी / कोटा / 2023–24 / 1199 दिनांकः– 17/11/23

स्मरण पत्र

अधीक्षण अभियंता
सिंचाई, वृत कोटा,
सी.ए.डी. कोटा।

विषय :– डी.सी.एम. एवं अन्य फैक्ट्रियों / प्लांटों द्वारा उपयोग हेतु लिये जाने वाले पानी का विवरण चाहने बाबत।

संदर्भ :– इस कार्यालय का पत्र क्रमांक 1132 दिनांक 30.10.2023

उपरोक्त विषयान्तर्गत संदर्भित पत्र के क्रम में लेख है कि कोटा शहर या आस–पास क्षेत्र में स्थित डी.सी.एम., थर्मल तथा अन्य बड़ी औद्योगिक इकाईयों द्वारा माहवार केनाल / नदी या भूमिगत जल स्त्रोत से कितनी मात्रा में पानी लिया जा रहा है। इकाईवार विवरण उपलब्ध करवानें हेतु लिखा गया था किन्तु सूचना आज दिनांक तक अप्राप्त है।

अतः पुनः अनुरोध है कि उपरोक्तानुसार इकाईवार विवरण उपलब्ध करावें ताकि राज्य सरकार की पॉलिसी अनुसार सीवरेज ट्रीटमेंट प्लांटों (एस.टी.पी.) से उत्पन्न परिशोधित जल उपयोग हेतु तदानुसार प्लान बनाया जा सके।

(राकेश गर्ग)
अधीक्षण अभियंता
आर.यू.आई.डी.पी.,(पी.आई.यू.),
तृतीय चरण, कोटा।

क्रमांकः आरयूआईडीपी / कोटा / 2023–24 / 1200 – 1203 दिनांकः– 17/11/23

प्रतिलिपि सूचनार्थ

1. श्रीमान् जिला कलेक्टर, कोटा।
2. श्रीमान् परियोजना निदेशक, आर.यू.आई.डी.पी., जयपुर।
3. श्रीमान आयुक्त नगर निगम, उत्तर / दक्षिण, कोटा।
4. श्रीमान् अति. परियोजना निदेशक / मुख्य अभियन्ता, आर.यू.आई.डी.पी., जयपुर।

अधीक्षण अभियंता
आर.यू.आई.डी.पी.,(पी.आई.यू.),
तृतीय चरण, कोटा।

कार्यालय क्षेत्रीय विकास आयुक्त (सिंचाई प्रकोष्ठ) सीएडी चम्बल, कोटा

क्रमांक/एफ/अअसि/सीएडी/लेखा/2023/7506 दिनांक 23-11-2023

श्रीमान अधीक्षण अभियन्ता,
आर.यू.आई.डी.पी. (पी.आई.यू.)
तृतीय चरण, कोटा।

विषय :–डीसीएम एवं अन्य फेक्ट्रियों/ प्लांटों द्वारा उपयोग हेतु लिये जाने वाले पानी का विवरण चाहने बाबत्।
प्रसंग :–आपका पत्रांक/ 1199 दिनांक 17.11.2023

महोदय,

उपरोक्त विषयान्तर्गत प्रासंगिक पत्र के सन्दर्भ में निवेदन है कि इस कार्यालय के नियंत्रणाधीन चम्बल दांई मुख्य नहर कि.मी. 0 से 57.50 के मध्य स्थित कोटा शहर या आस–पास में स्थित औद्योगिक इकाईयों को माहवार दांई मुख्य नहर से उपलब्ध कराये जा रहे पानी की मात्रा निम्नानुसार है।

क्र.सं.	औद्योगिक इकाई का नाम	माह	औद्योगिक इकाई को दिये जा रहे पानी की मात्रा (CFT)	दर (275/ 1000 CFT)	राशि
1	2	3	4	5	6
1	M/s shri Ram Vinayal Ltd. kota	अक्टूबर 2023	6475795.053	0.275	1780844.00
2	M/s Multimetals Ltd. kota		328303.8869	0.275	90284.00
3	M/s shri Ram Reyons Ltd. kota		6382332.155	0.275	1755141.00
4	M/s shri Ram Fertilizers Ltd. kota		15775406.36	0.275	4338237.00
	Total		**28961337.45**	**0.275**	**7964505.29**

अतः इस कार्यालय द्वारा 4 औद्यागिक इकाईयों को लगभग 28961837.45 (CFT) पानी प्रत्येक माह उपलब्ध कराया जा रहा है।

(महावीर प्रसाद सामरिया)
अधीक्षण अभियन्ता,
सिंचाई वृत सीएडी चम्बल, कोटा

Daily water requirement
KTPS → 190 MLD
Adani Kanti → 55 MLD
As required on dated
27/3/25 Email

BEFORE THE NATIONAL GREEN TRIBUNAL
PRINCIPAL BENCH NEW DELHI

ORGINAL APPLICATION NO. 1375 OF 2024

IN THE MATTER OF:
News item titled "Four endangered crocodile found dead in Rajasthan river experts wonder if pollution to blame" appearing in the Indian Express dated 06.12.2024

VAKALATNAMA

KNOW ALL to whom, these presents shall come that I, Tanuj Kumar Sharma, S/o Sh. Shiv Dutt Sharma, aged about 41 years, posted as Executive Engineer, Municipal Corporation Kota (Nodal Officer) Department of L.S.G., Rajasthan, Respondent No.1, the above-named do hereby appoint (hereinafter called the Advocate/s) to be my/our Advocates(s) in the above-noted case, authorise him/them: -

SHIV MANGAL SHARMA
Advocates for the Respondent No.1
D-291, 2nd & 3rd Floor,
Defence Colony, New Delhi-110024
Mobile: +91 70427 00133
Email: auraleague@gmail.com & nid.jaswal@gmail.com

To act, appear and plead in the above-noted case in this Court or in any other Court in which the same may tried or heard and also in the appellate Court including High Court subject to fees separately for each court by me/ us. To sign file, verify and present pleadings, appeals cross-objections or petitions for executions, review as revision, withdrawal, compromise or other petitions or affidavits or other documents may be deemed necessary or proper for the prosecution of the said case in all its stages subjects to payment of fees for each stage. To file and take back documents, to admit and/or deny the documents of opposite party. To withdraw or compromise the said case or submit to arbitration any differences or disputes that may arise touching or in any manner relating to the said case. To take execution proceedings. To deposit, draw and receive money, cheques, cash and grant receipts hereof and to do all other acts and things which may be necessary to be done for the progress and in the court of the prosecution of the said case. To appoint and instruct any other Legal Practitioner authorising him to exercise the power and authority hereby conferred upon the Advocate whenever he may think fit to do so and to sign the power of attorney on my/our behalf. And I/we, undersigned do hereby agree to ratify and confirm all acts, done by the advocate or his substitute in the matter as my/our own acts, as if done by me/us to all intents and purposes. And I/we undertake that I/we or my/our duly authorised agent would appear in Court on all hearings and will inform the Advocate for appearance when the case is called. And I/we undersigned do hereby agree not to hold the advocate or his substitute responsible for the result of the said case. The adjournment costs whenever ordered by the Court shall be of the Advocate, which he shall receive and retain for himself.

And I/we the undersigned do hereby agree that in the event of the whole or part of the fee agreed by me/us to be paid to the advocate remaining unpaid he shall be entitled to withdraw from the prosecution of the said case until the same is paid up. The fee settled is only for the above case and above Court. I/we hereby agree that once the fees, is paid. I/we will not be entitled for the refund of the same in any case whatsoever and if the case prolongs for more than 3 years the original fee shall be paid again by me/us.

IN WITNESS WHEREOF I/we do hereunto set my/our hand to these presents, the contents of which have been understood by me/us on this _____ day of December 2025.

Accepted subject to the terms of the fees.

Tanuj Kumar Sharma,
S/o Sh. Shiv Dutt Sharma,
Executive Engineer, Municipal Corporation Kota (Nodal Officer)
Department of L.S.G., Rajasthan
Respondent No.1

Advocate

NOTARY MAHENDRA SINGH YADAV NOTARY Area KOTA (Raj.) Regd. No. 1[illegible]04 Exp. Dt. 6-3-[illegible] GOVT. OF INDIA

ATTESTED
MAHENDRA SINGH YADAV
NOTARY (CENTRAL) KOTA (RAJ.)