



**ICTP-IAEA School on LoRa Enabled Radiation and Environmental  
Monitoring Sensors, Trieste – Italy  
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**Real-time measurements of I-131 in wastewater of  
the hospital**

**Noha Imam**

*Researcher (Lecturer)*

*National Institute of Oceanography and Fisheries*

*(Ph.D.) in Nuclear Physics*

*Ain Shams University*

*na.imam@niof.sci.eg*

# ❖ Outlines

- Introduction
- I-131 measurement
- Challenges
- The target
- Expectation of the target

# Iodine-131 a fission product



**Nuclear power plants**

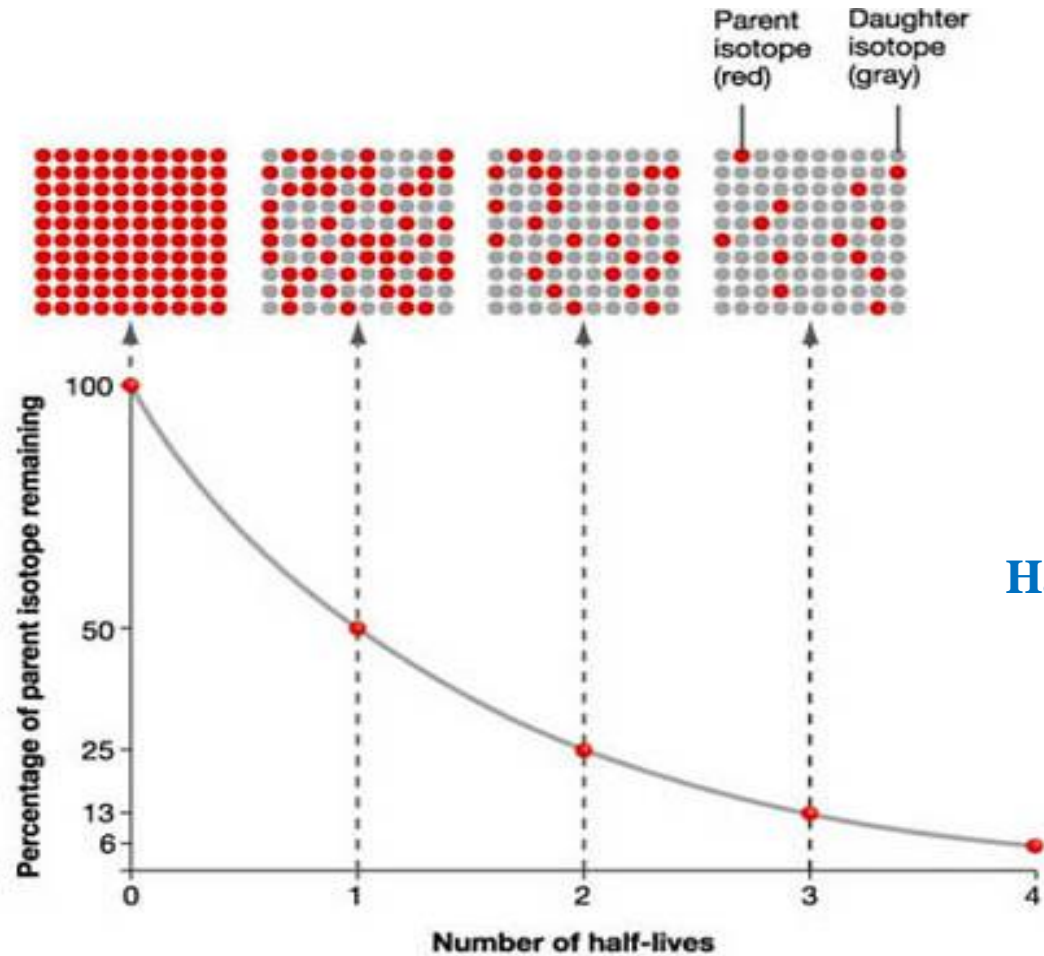


**Nuclear weapons tests**



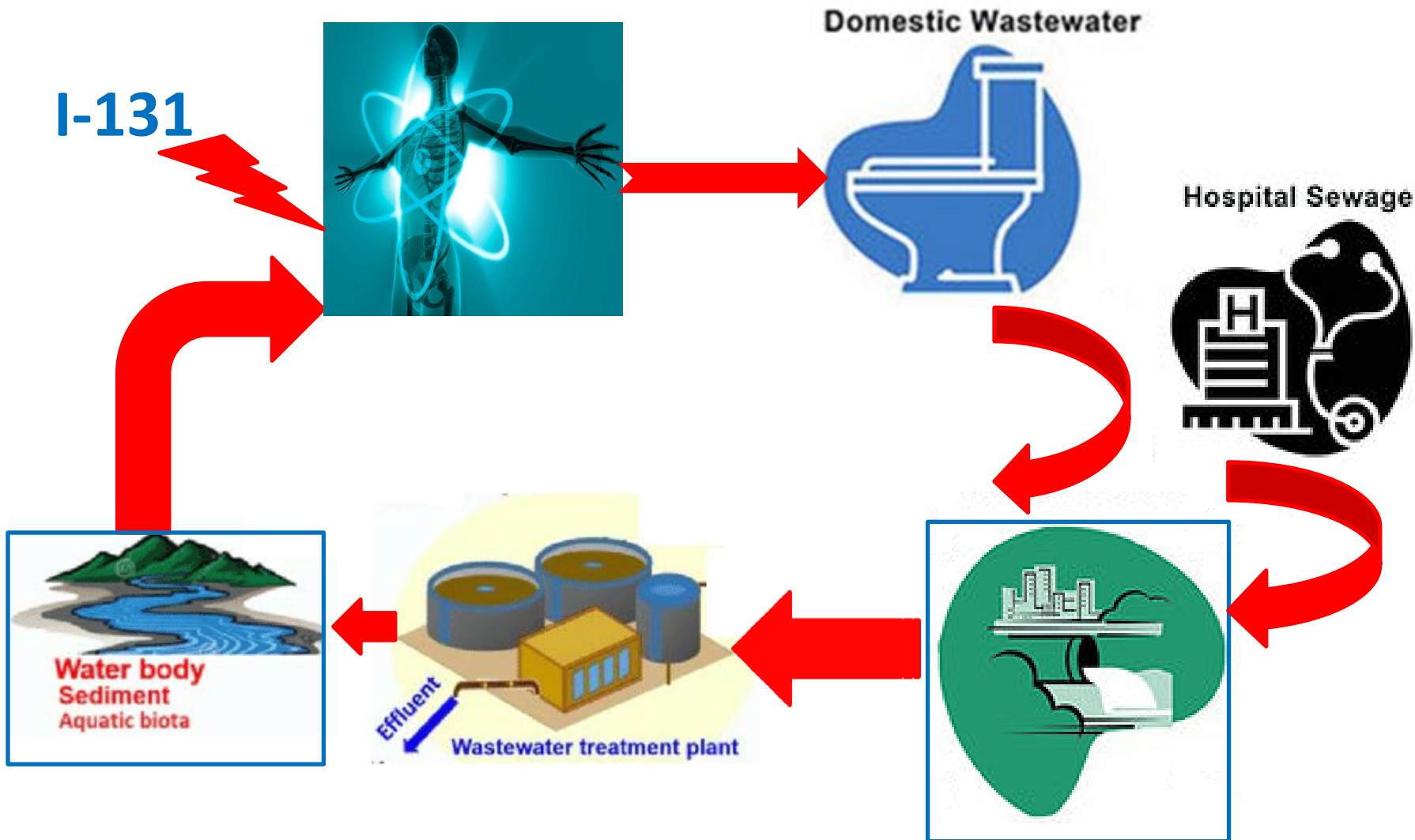
**Nuclear medicine**

# Iodine-131



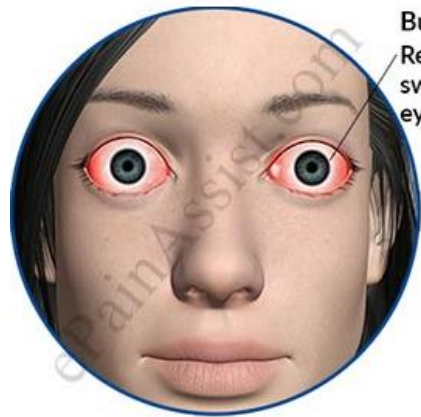
Half-life 8.04 days

# Pathway of I-131

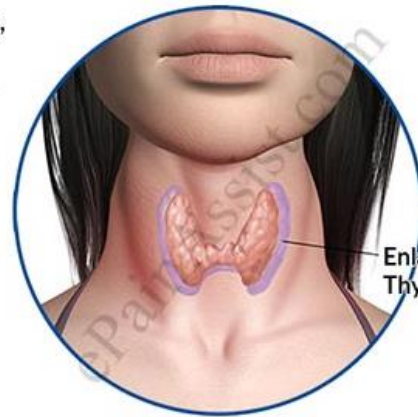




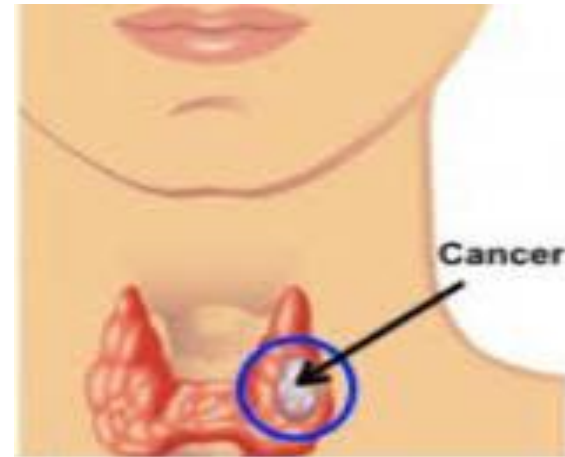
# Iodine-131 %



Bulging,  
Red  
swollen  
eyes



Enlarged  
Thyroid



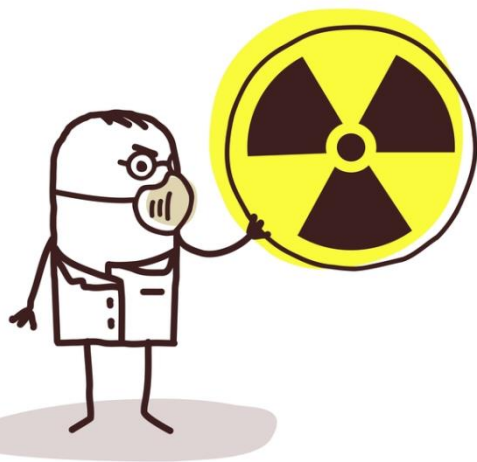
Cancer

**Hyperthyroidism treatments is  
1.5 per 1000 people**

**Thyroid cancer treatments is  
0.38 per 1000 people**

**Rose,P.S., Lawrence Swanson,R., Kirk Cochran,J.,2012. Medically-derived <sup>131</sup>I in municipal sewage effluent. Water research ,46, 5663-5671.**

# Exposures to I-131

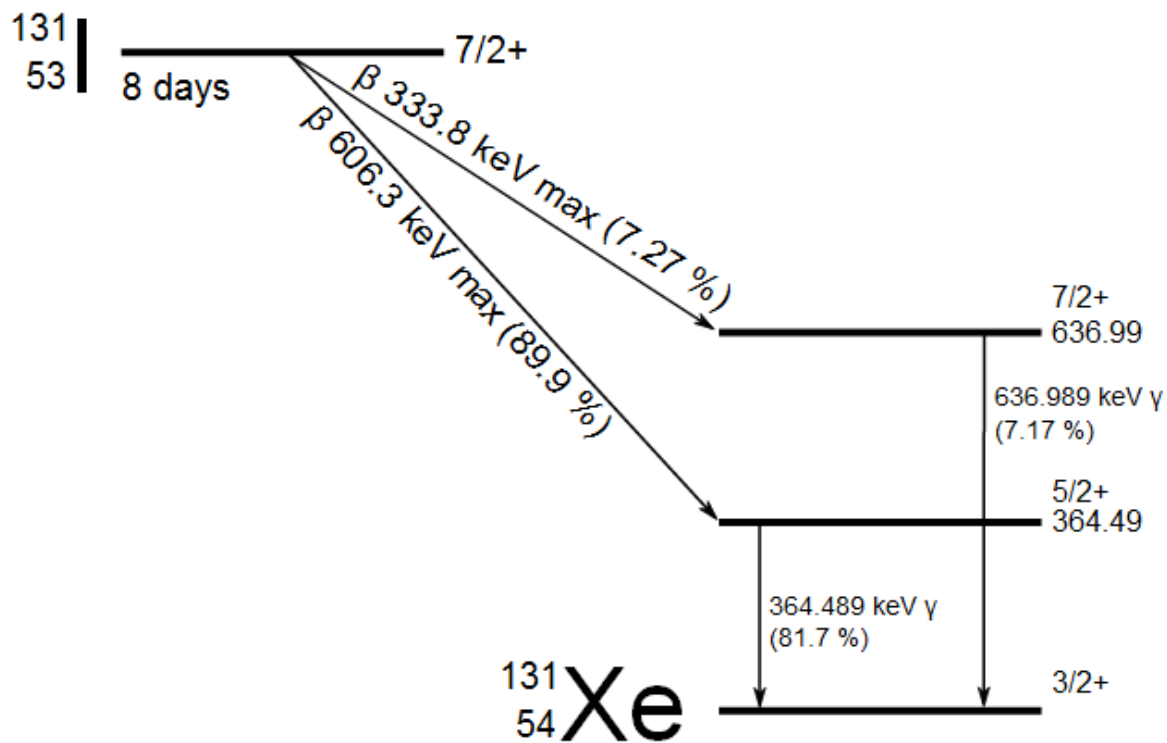


**Sewer workers**



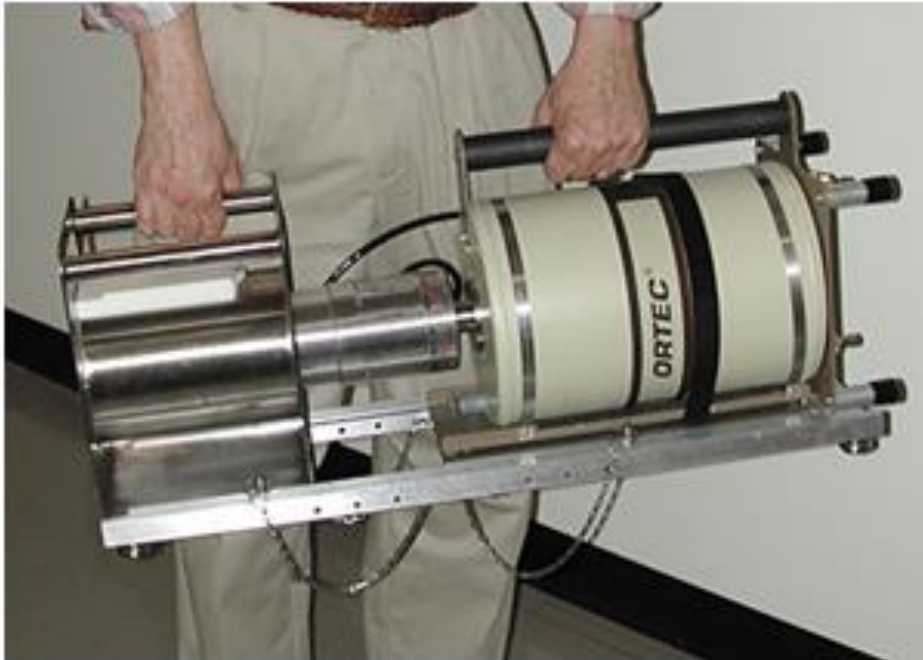
**Contaminate fish + Polluted water**

# I-131





# I-131 can measure



**ISO-CART-II LN2, HPGe detector**  
[www.ortec-online.com](http://www.ortec-online.com)



**NaI detector**  
[www.ortec-online.com](http://www.ortec-online.com)



# Challenges

## (Why I use LoRa)

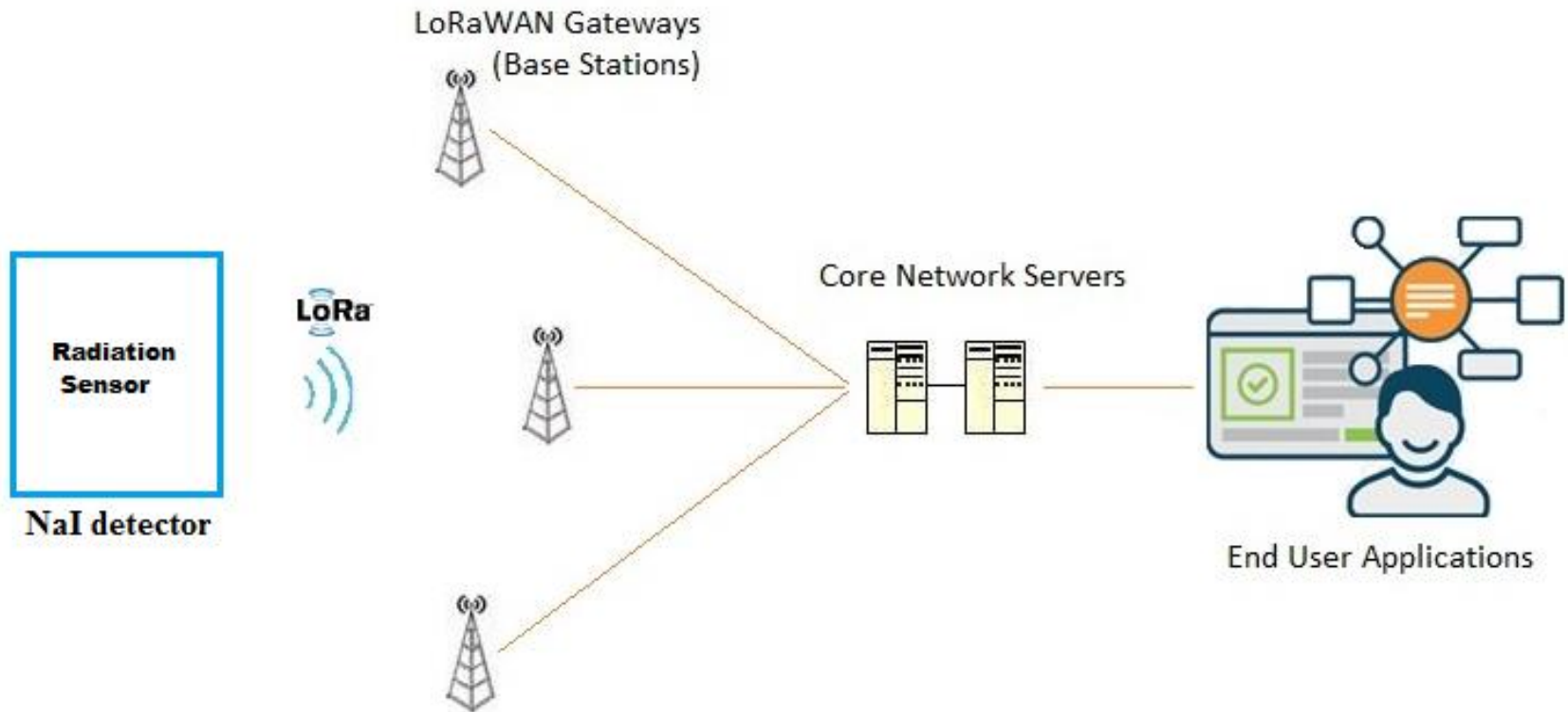
- Difficult to collect samples with tradition methods.
- Measure of dose rate in situ of wastewater the hospital.
- Real time measurement of dose rate.



# The Target

- To measure dose rate in sewer of the hospital and at end point of discharge (river ,lake)  
(An important concern in terms of cost, detection precision, real time data processing, flexibility)
- The goal is to deploy devices integrating detector to capture radiation doses in real time and to wirelessly dispatch them to a remote database where the radiation values are stored.
- Response to data measurements (**Action**)

# Detector LoRa design



[www.rfwireless-world.com](http://www.rfwireless-world.com)



# Expectation of the target

- The real-time monitoring of the I-131 concentration in wastewater and discharge point , the effective dose rate.
- we can make timetable for workers of sewer to check or repairs the down-stream of the hospital .

Thank you

