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## NATURAL RADIOACTIVITY of SOME FERTILIZERS USED in YEMENI FARMS

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Board (GSMRB) / YEMEN Republic**



# Outline

- Purpose
- Why this study
- Key words, Terms and definition
- Introduction
- Sampling
- Experiment
- The Results
- Future work
- What we need to complete Future work





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- **Purpose**
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# 1. Purpose

Determination of natural radioactivity of some fertilizers that are used in Yemen in 2007-2008



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## 2. Why this study

Up normal increasing prevalence of cancer diseases are noted specially between Yemeni farmers and their families



# Outline

- Purpose
- Why this study
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### 3. Key Words ,Terms and definition

- Radioactivity,
- Phosphogypsum,
- $^{232}\text{Th}$  &  $^{40}\text{K}$  ,
- NaI Spectroscopy, &
- fertilizers



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## 4. Introduction <sup>1</sup>

- The raw material used in production of some fertilizers is phosphate ore containing various amounts of natural radioactive elements.
- During phosphate ore processing, owing to chemical properties of Radium, practically all  $^{226}\text{Ra}$  gets incorporated into phosphogypsum and remains in disequilibrium when compared to radioactivity levels contained in the raw material.



## 4. Introduction <sub>2</sub>

- Most of the phosphogypsum is considered waste and is stockpiled or discharged into the aquatic environment .
- Potential issues of concern resulting from phosphogypsum disposal are its environmental impacts; possible increases in radionuclides in soils or in groundwater and consequential ingestion by humans through exposure routes such as drinking water and food chain .





## 4. Introduction 3

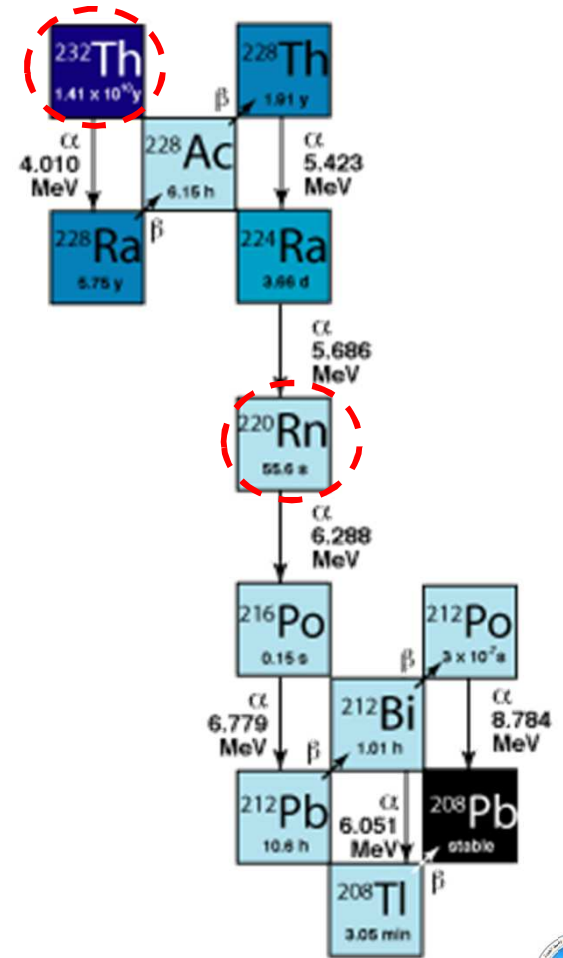
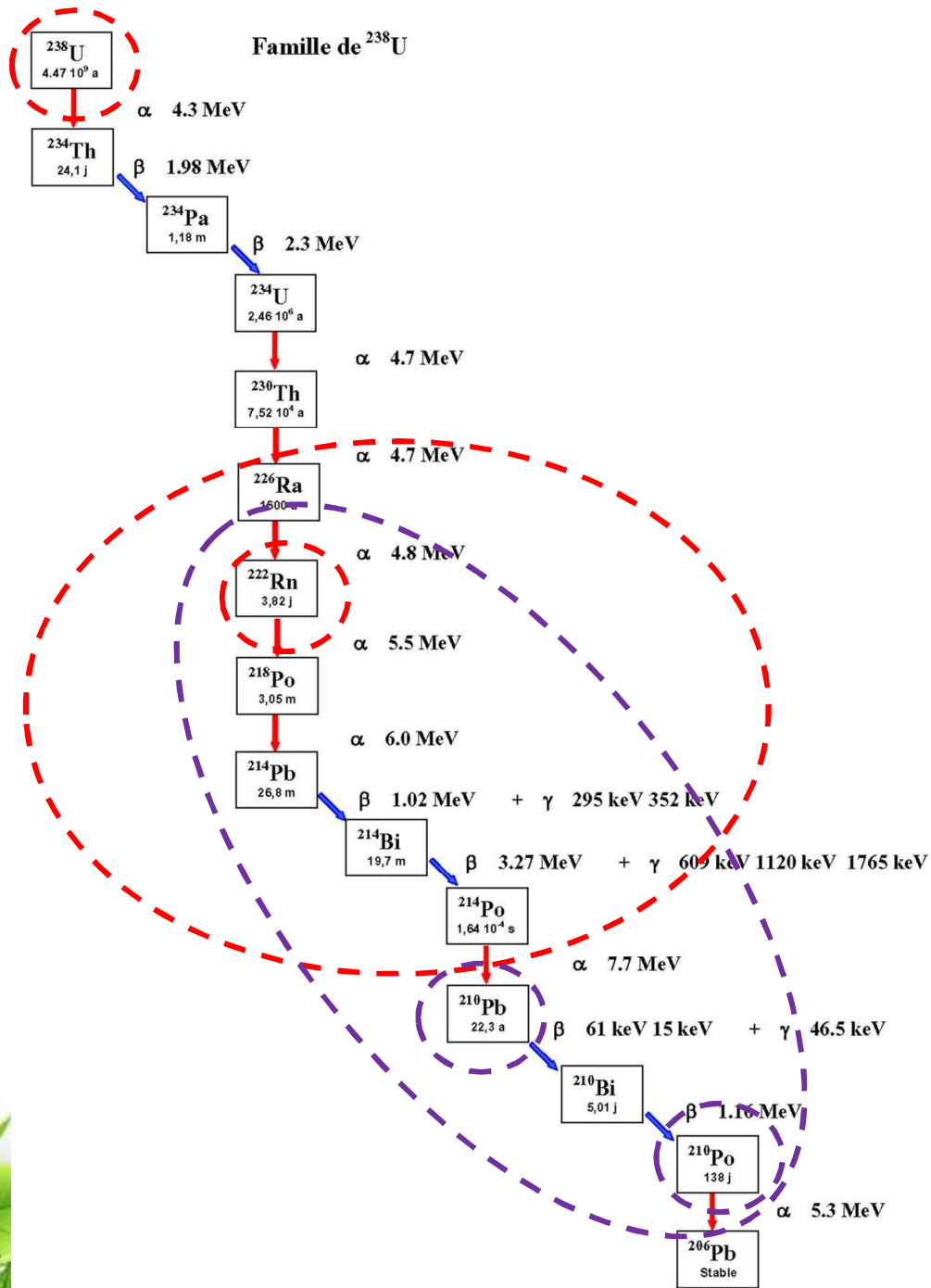
Once deposited in bone tissue,  $^{226}\text{Ra}$  it has a high potential for causing biological damage through continuous irradiation of human skeleton over many years and may induce bone sarcoma .



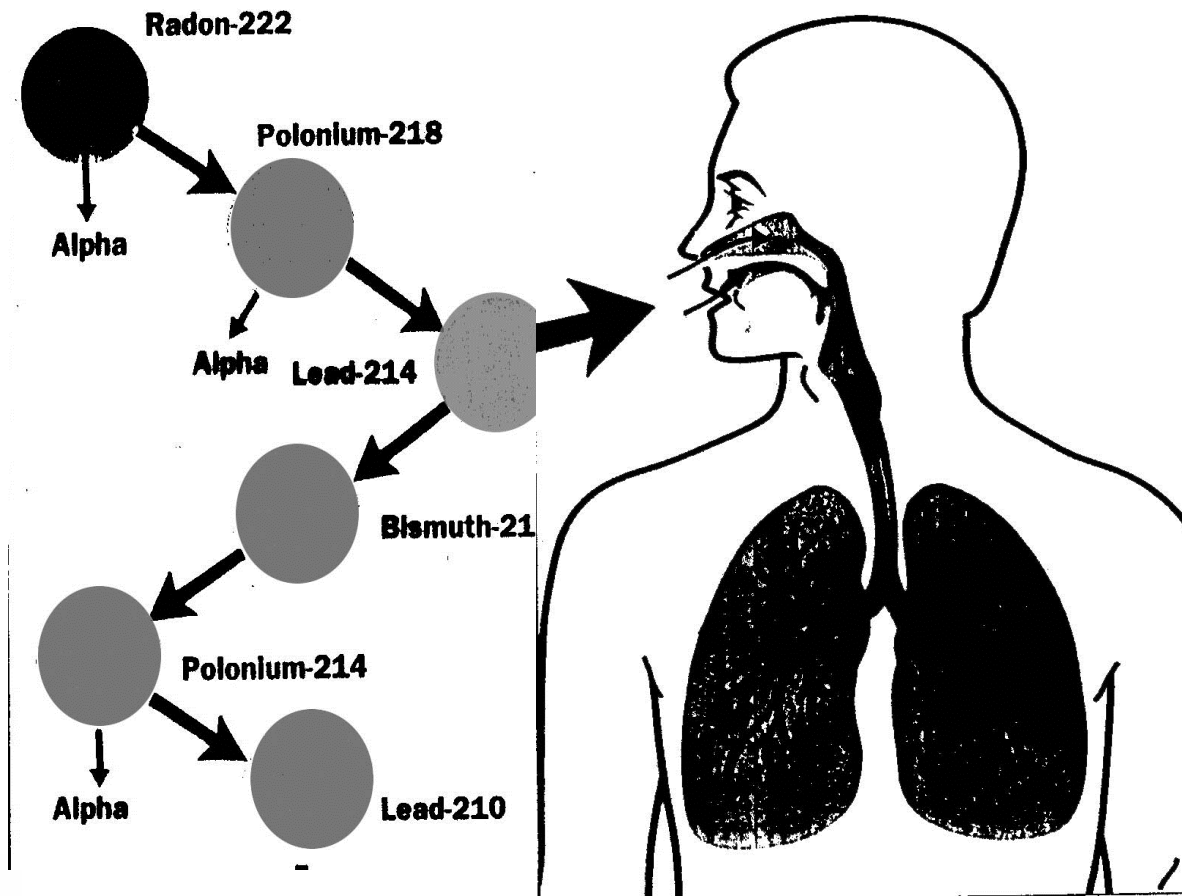
## 4. Introduction 4

The natural radionuclides of concern are mainly Potassium, Uranium, Thorium, and the radionuclides that are created as their radioactive decay chains. Emanation of Radon gas (e.g.,  $^{222}\text{Rn}$  and  $^{220}\text{Rn}$  of lifetimes 3.8 d and 55.6 s, respectively) into air occurs as a product of uranium  $^{238}\text{U}$  and thorium  $^{232}\text{Th}$  decay chains, respectively.



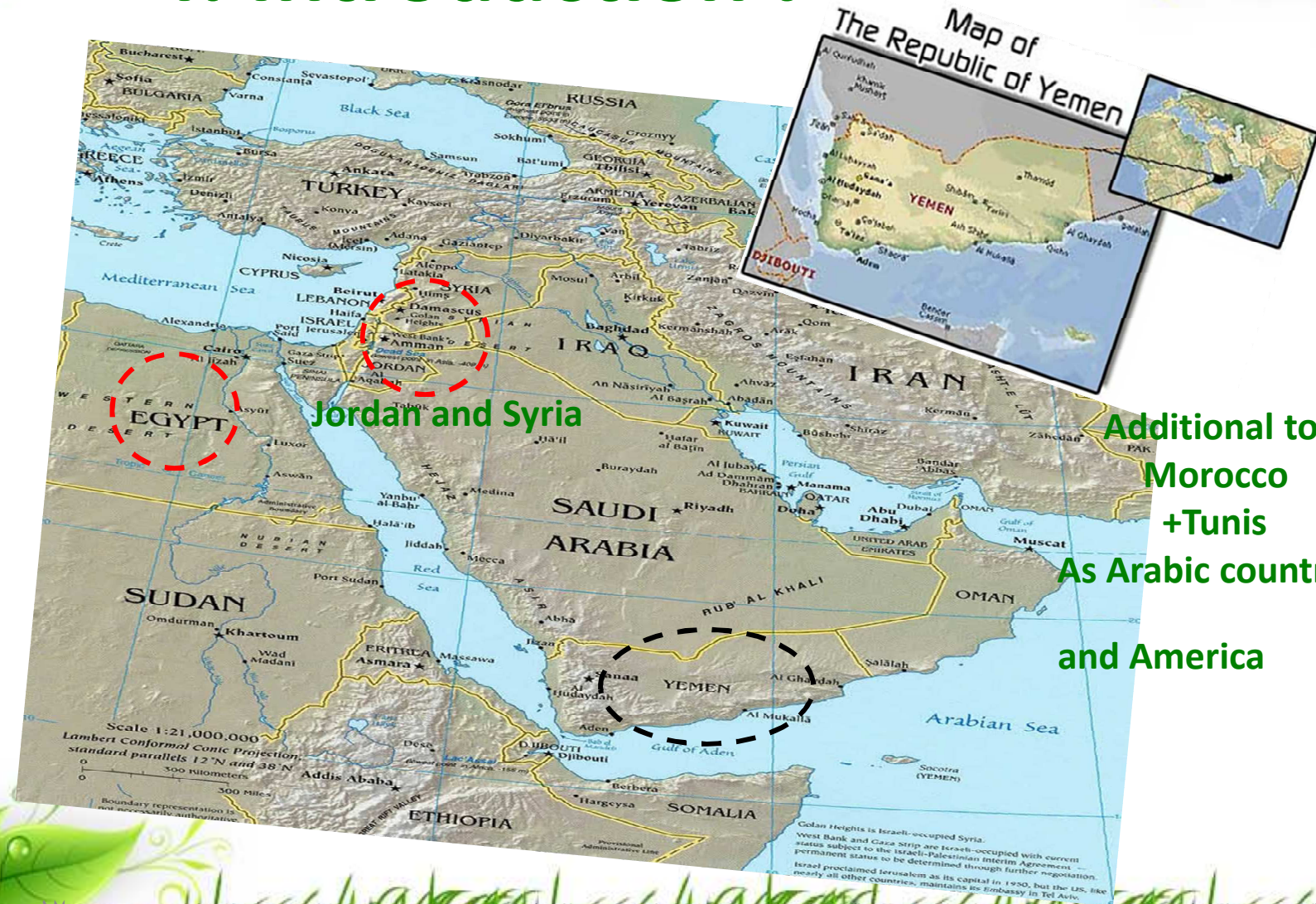


# 4. Introduction 5





# 4. Introduction 6



Jordan and Syria

Additional to  
Morocco  
+Tunis  
As Arabic countries  
and America



## 4. Introduction 7

Yemen	2011	2012
The total amount of * general fertilizer	(11,500)	(9,631)
Total imported * fertilizer	(32,370)	(66,613)

\*By Ton





## 4. Introduction 8

<b>Space Yemen</b>	55.5
<b>Agriculture lands</b>	1.670 in 2007

Units by : Million hectares



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## 5. Sampling

Six common samples were collected in Yemen from two governmental places:

**First** Sana'a University – Faculty of Agricultural,  
**second** Ministry of Agriculture - Public  
Establishment for Agricultural Services .



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- What we need to complete Future work



## 6. Experiment

After preparing the samples,

- **Gamma Ray-spectroscopy (NaI)** was used by Ministry of Oil & Minerals- Geological Survey & Mineral Resources Board (GSMRB) to measure the radioactivity for that samples .
- Each sample's spectrum was collected 10800 sec.



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- Sampling
- Experiment
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# 7. The Results

Sample No.	Chemistry Character	Activity Bq	
		40K	232Th
1	(NH <sub>4</sub> )SO <sub>4</sub>	6.614±2.017	≤ 0
2	CO(NH <sub>2</sub> ) <sub>2</sub>	11.253±1.690	≤ 0
3	CaH <sub>4</sub> (PO <sub>2</sub> ) <sub>4</sub>	≤ 0	≤ 0
4	K <sub>2</sub> SO <sub>4</sub>	314.812±1.780	≤ 0
5	NPK+20-20-20-TE	86.899±0.705	≤ 0
6	Actosol	≤ 0	≤ 0

Sample No.(4) has net activity (341.812 Bq) , & sample No.(5) also contain activity (86.899 Bq)



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## 8. Future work

It is necessary to know the dose limits of public exposures and to measure the natural environmental radiation level provided by ground, air, water, foods, building interiors, etc., for the estimation of the exposures to natural radiation sources using modern techniques.



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## 9. What we need to complete Future work <sub>1</sub>

- a. Recollect the common fertilizers in Yemen and their information.
- b. Using HpGe Spectroscopy for  $^{232}\text{Th}$ ,  $^{40}\text{K}$ , and  $^{235}\text{U}$
- c. Using Solid State Nuclear Track Detector SSNTD (CR-39) for  $^{222}\text{Rn}$ , and  $^{221}\text{Rn}$ .



## 9. What we need to complete Future work <sub>2</sub>

d. Need statistical information about the patients who have cancer diseases that's answer different questions , for examples:

where they live , what they do, do they smoke ? how much in day? Do they used fertilizers? How do they store them? Where? Do they follow the safety procedures? Do they wear the protection clothes? etc





## 9. What we need to complete Future work <sup>3</sup>

e. Measure the radioactivity for the most consumed vegetables and fruit in Yemen and calculate the annual dose.

f. Need to get information about the patients from the data base of hospitals

j. Need sponsor labs for the different tests.



# Poster of the Paper

QR Code : d817c4

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 Board (GSMRB) | YEMEN Republic



- 1. Purpose**  
Determination of natural radioactivity of some fertilizers that are used in Yemen in 2008-2007.
- 2. Why this study**  
In Yemen we note up normal increasing prevalence of cancer diseases specially between Yemeni's farmers and their families.
- 3. Key words**  
Radioactivity,  $^{232}\text{Th}$ ,  $^{40}\text{K}$ , NaI Spectroscopy, & fertilizers.
- 4. Introduction**  
The raw material used in production of some fertilizers is phosphate ore containing various amounts of natural radioactive elements. During phosphate ore processing, owing to chemical properties of Radium, practically all  $^{226}\text{Ra}$  gets incorporated into phosphogypsum and remains in disequilibrium when compared to radioactivity levels contained in the raw material. Most of the phosphogypsum is considered waste and is stockpiled or discharged into the aquatic environment. Potential issues of concern resulting from phosphogypsum disposal are its environmental impacts; possible increases in radionuclides in soils or in groundwater and consequential ingestion by humans through exposure routes such as drinking water and food chain. Once deposited in bone tissues,  $^{226}\text{Ra}$  it has a high potential for causing biological damage through continuous irradiation of human skeleton over many years and may induce bone sarcoma. The natural radioactivities of concern are mainly Potassium, Uranium, Thorium, and the radionuclides that are created as their radioactive decay chains. Emission of Radon gas (e.g.,  $^{222}\text{Rn}$  and  $^{220}\text{Rn}$  of half-lives 3.8 d and 55.6 s, respectively) into air occurs as a product of uranium  $^{238}\text{U}$  and thorium  $^{232}\text{Th}$  decay chains, respectively.
- 5. Sampling**  
Six common samples were collected in Yemen from two governmental places: First Sand'a University – Faculty of Agricultural, second Ministry of Agriculture - Public Establishment for Agricultural Services.
- 6. Experiment**  
Gamma Ray-spectroscopy (NaI) was used by Ministry of Oil & Minerals- Geological Survey & Mineral Resources Board (GSMRB) to measure the radioactivity for that samples. Each sample's spectrum was collected 10800 sec.
- 7. The Results**

Sample No.	Chemistry Character	Activity Bq	
		$^{40}\text{K}$	$^{232}\text{Th}$
1	(NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub>	6.614±0.017	≤ 0
2	CO(NH <sub>2</sub> ) <sub>2</sub>	11.253±1.690	≤ 0
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- 8. Future work**  
It is necessary to know the dose limits of public exposures and to measure the natural environmental radiation level provided by ground, air, water, foods, building interiors, etc. for the estimation of the exposures to natural radiation sources using modern techniques.

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# Any Question ?

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# Thank you for Attention

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