

# Forensic Identification of Human Remains Using DNA Analysis: The Case of Four Missing Girls in Takoradi, Ghana

**Kofi Adjapong Afrifah,<sup>1,2</sup> (PhD, MS)**  
**(kofi.afrifah@gwu.edu)**

*<sup>1</sup> Forensic Science Laboratory  
Criminal Investigation Department  
Ghana Police Service*

*<sup>2</sup> Assistant Professor of Criminalistics  
Bowie State University  
Bowie, MD*



# Forensics...

- The application of science to those criminal and civil laws that are enforced by police agencies in a criminal justice system



# ***Basic Principle of Relationship Testing...***

- Every individual inherits 50% of the Genetic Make-up of Both Parents
- At each locus on a chromosome, two alleles, one from both parents are inherited
- In forensics, these alleles (STR markers) are used for human Identification
- In the Global Filer™ Kit, 24 markers present



# A Case of National Attention...



#Bring Back Our Taadi Girls - News Desk on JoyNews (27-8-19).mp4

Friday, August 18, 2023



# A Case of National Attention...



DNA TESTS OF MISSING TAKORADI GIRLS Forensic team nearing the conclusion of the analysis.mp4

# The case...

- Request made by CID for Forensic Examination
- ✓ To conduct **DNA Test** to ascertain the identity of the suspected Human Remains
- ✓ In relation to the alleged father or mother of the four families



# Samples for Examination...

- I. Evidence samples taken from four (4) suspected human skulls
- II. Reference Buccal Swab Samples taken from the four families



# Samples for Examination...

- **Abekah Family**

1. Buccal swab of Cecilia Owusu (Alleged Mother of missing Ruth Abekah)

2. Buccal swab of Matilda Abekah (Alleged Sister of missing Ruth Abekah)





# Samples for Examination...

- **Koranchie Family**

1. Buccal swab of Alexander Kojo Koranchie  
(Alleged Father of missing Priscilla Koranchie)
2. Buccal swab of Philip Osei Koranchie (Alleged  
Brother of missing Priscilla Koranchie)



# Samples for Examination...

- ***Quayson Family***

1. Buccal swab of Comfort Arhin (Alleged Mother of missing Ruth Love Quayson)
2. Buccal swab of Nana Adwoa Quayson (Alleged Sister of missing Ruth Love Quayson)

# Samples for Examination...

- **Bentum Family**

1. Buccal swab of Francis Bentum Ackon (Alleged Father of missing Priscilla Blessing Bentum)
2. Buccal swab of Gladys Bentum (Alleged Mother of missing Priscilla Blessing Bentum)
3. Buccal swab of Francis Bentum (Alleged Brother of missing Priscilla Blessing Bentum)



# Laboratory Procedures

- Buccal swabs from the alleged parent(s) from each family were subjected to Forensic DNA analysis following Standard Forensic DNA Analytical procedures
  - ✓ Extraction
  - ✓ Quantification
  - ✓ Amplification
  - ✓ Electrophoresis

Friday, August 18, 2023



# Laboratory Procedures

- Bone samples from the four (4) suspected human skulls were also subjected to Forensic DNA Analysis following same procedures
- Paternity and Maternity relationship tests were conducted on the skulls and the families

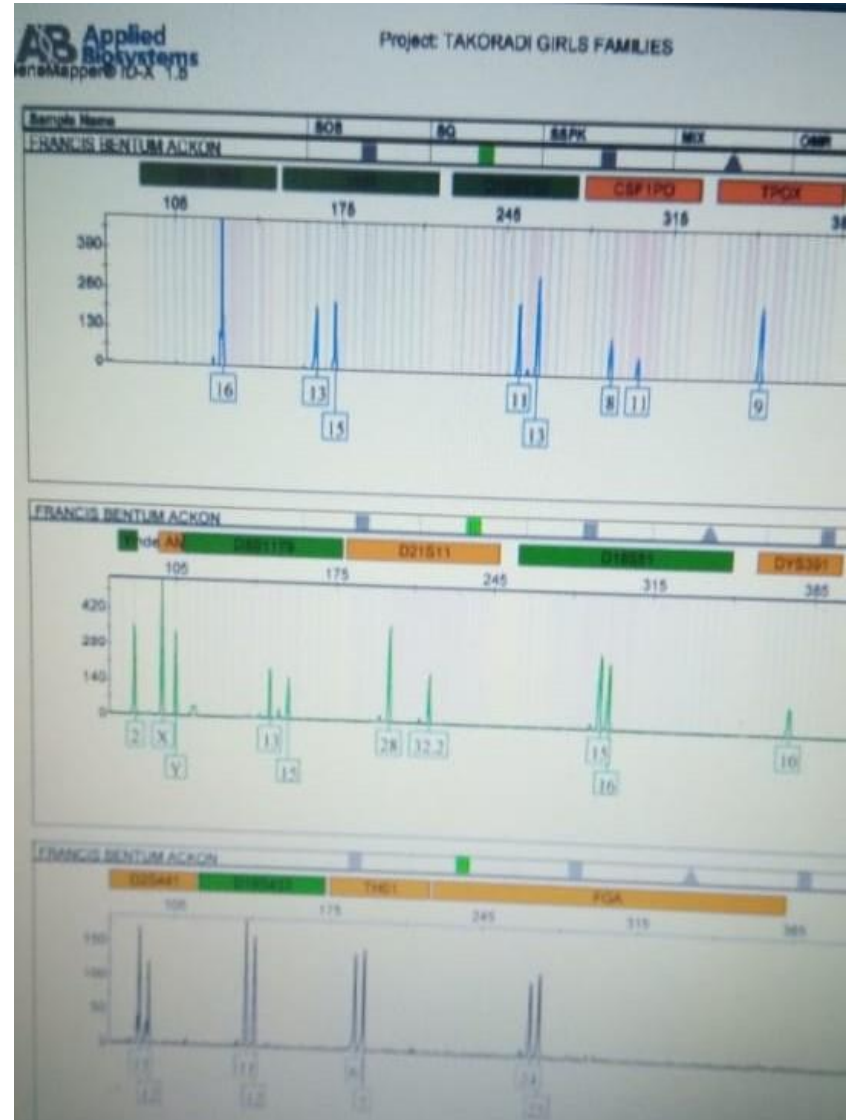


# Results:

Bone Sample (Skull)	DNA Concentration (ng/ $\mu$ l)	Degradation Index
Skull 1	0.047	1.568
Femur 1	0.010	4.166
Humerus 1	0.001	1.923
Skull 2	0.082	2.304
Femur 2	0.006	1.242
Humerus 2	0.459	3.311
Skull 3	0.007	1.998
Femur 3	1.126	1.683
Humerus 3	0.001	2.334
* Skull 4	0.574	3.005
* Femur 4	0.003	1.644
* Humerus 4	0.274	2.457



# Results...



# Results...

STR LOCI	ALLELE CALLS						Parents alleles in skull 2	Maternity Index	Paternity Index
	Francis B. Ackon	Gladys Bentum	Skull 1	Skull 2	Skull 3	Skull 4			
D3S1358	16	14,17	15,17	14,16	15,16	14,16	Present	2.7152	1.6113
vWA	13,15	15	15,17	15	15,16	16,18	Present	4.7013	2.3507
D16S539	11,13	11,12	9,13	11,12	8,10	9,11	Present	2.2117	0.8364
CSF1PO	8,11	10,12	11	8,10	12,13	10,12	Present	0.9594	3.3112
TPOX	9	7,11	8,9	7,9	8	8,10	Present	10.4167	2.3063
D8S1179	13,15	12,15	14	12,13	13	13,14	Present	2.0568	1.1805
D21S11	28,32.2	28,32.2	28,30	32.2	29,31	31,32.2	Present	6.7889	6.7875
D18S51	15,16	15,17	17,20	-	20	16,18	-	-	-
D2S441	11,12	11,14	11,13	11,12	11,12	11	Present	0.6299	2.2556
D19S433	11,12	12,16	14,16.2	11,16	13,15.2	12,12.2	Present	20.8768	3.3112
TH01	6,7	7	7,9	7	7,10	7,9	Present	2.4908	1.2455
FGA	24,25	22,26	25	25,26	24,26	21,26	Present	6.4641	2.4462
D22S1045	11,17	10,17	15,16	10,17	12,15	16,17	Present	7.9773	1.0207
D5S818	12,13	10,12	12,13	10,13	11,12	11,13	Present	4.1135	1.0526
D13S317	11,12	12,13	11	11,13	11,13	12	Present	1.7516	0.8901
D7S820	10	11,12	10,11	10,11	6,10	8,10	Present	1.1703	1.5042
SE33	18,25.2	16,17	14,20	17,18	16,19	19,27.2	Present	3.2927	1.9286
D10S1248	15	14	12,14	14,15	15	14,15	Present	1.8406	2.4027
D1S1656	14,16.3	16.3			16.3,17.3	12,14		10.3429	5.1706
			14,17.3	16.3			Present		
D12S391	17,20	20,23	19,21	20,23	19,21	17,20	Present	1.9120	1.9120
D2S1338	16,23	19,23	23,25	16,19	20,24	19,22	Present	1.7403	4.4504
DYS391	10	NA	NA	NA	NA	NA	NA	NA	NA
Y INDEL	2	NA	NA	NA	NA	NA	NA	NA	NA
AMEL	XY		X	X	X	X		CMI=117034876 16.3591	CPI= 1293669.4766



# Results...

STR LOCI	ALLELE CALLS					Mother's allele in skull 3	MATERNITY INDEX
	Cecilia Owusu	Skull 1	Skull 2	Skull 3	Skull 4		
D3S1358	<b>16,17</b>	15,17	14,16	<b>15,16</b>	14,16	<b>Present</b>	0.8058
vWA	<b>11,16</b>	15,17	15	<b>15,16</b>	16,18	<b>Present</b>	0.9268
D16S539	<b>8,11</b>	9,13	11,12	<b>8,10</b>	9,11	<b>Present</b>	6.7751
CSF1PO	<b>12</b>	11	8,10	<b>12,13</b>	10,12	<b>Present</b>	1.7522
TPOX	<b>8</b>	8,9	7	<b>8</b>	8,10	<b>Present</b>	2.8451
D8S1179	<b>12,13</b>	14	12,13	<b>13</b>	13,14	<b>Present</b>	2.3607
D21S11	<b>29,30</b>	28,30	32.2	<b>29,31</b>	31,32.2	<b>Present</b>	1.3712
D18S51	<b>17,20</b>	17,20	-	<b>20</b>	16,18	<b>Present</b>	8.3403
D2S441	<b>11,14</b>	11,13	11,12	<b>11,12</b>	11	<b>Present</b>	0.6299
D19S433	<b>13,15.2</b>	14,16.2	11,16	<b>13,15.2</b>	12,12.2	<b>Present</b>	5.5151
TH01	<b>9,10</b>	7,9	7	<b>7,10</b>	7,9	<b>Present</b>	24.6913
FGA	<b>23,24</b>	25	25,26	<b>24,26</b>	21,26	<b>Present</b>	1.4596
D22S1045	<b>12,17</b>	15,16	10,17	<b>12,15</b>	16,17	<b>Present</b>	5.2219
D5S818	<b>11,13</b>	12,13	10,13	<b>11,12</b>	11,13	<b>Present</b>	1.0482
D13S317	<b>11,12</b>	11	11,13	<b>11,13</b>	12	<b>Present</b>	0.8901
D7S820	<b>10</b>	10,11	10,11	<b>6,10</b>	8,10	<b>Present</b>	1.5042
SE33	<b>16</b>	14,20	17,18	<b>16,19</b>	19,27.2	<b>Present</b>	9.0009
D10S1248	<b>12,15</b>	12,14	14,15	<b>15</b>	14,15	<b>Present</b>	2.4026
D1S1656	<b>16,16.3</b>	14,17.3	16.3	<b>16.3,17.3</b>	12,14	<b>Present</b>	2.5860
D12S391	<b>17,19</b>	19,21	20,23	<b>19,21</b>	17,20	<b>Present</b>	1.7292
D2S1338	<b>23,24</b>	23,25	16,19	<b>20,24</b>	19,22	<b>Present</b>	3.3523
DYS391	<b>NA</b>	NA	NA	<b>NA</b>	NA	<b>NA</b>	NA
Y INDEL	<b>NA</b>	NA	NA	<b>NA</b>	NA	<b>NA</b>	NA
AMEL	<b>X</b>	X	X	<b>X</b>	X		CMI=202552413.7053

# Results...

STR LOCI	ALLELE CALLS					Father's allele in skull 4	PATERNITY INDEX
	Alexander Koranchie	Skull 1	Skull 2	Skull 3	Skull 4		
D3S1358	15,16	15,17	14,16	15,16	14,16	Present	0.8057
vWA	15,16	15,17	15	15,16	16,18	Present	0.9266
D16S539	11	9,13	11,12	8,10	9,11	Present	1.6728
CSF1PO	10,12	11	8,10	12,13	10,12	Present	1.8353
TPOX	6,8	8,9	7	8	8,10	Present	0.7113
D8S1179	13	14	12,13	13	13,14	Present	2.3601
D21S11	31	28,30	32,2	29,31	31,32,2	Present	5.9032
D18S51	17,18	17,20	-	20	16,18	Present	2.0375
D2S441	11	11,13	11,12	11,12	11	Present	2.5197
D19S433	12,14,2	14,16,2	11,16	13,15,2	12,12,2	Present	2.4907
TH01	9,10	7,9	7	7,10	7,9	Present	1.6969
FGA	21,23	25	25,26	24,26	21,26	Present	2.3408
D22S1045	10,16	15,16	10,17	12,15	16,17	Present	1.3441
D5S818	11,13	12,13	10,13	11,12	11,13	Present	2.1326
D13S317	12,13	11	11,13	11,13	12	Present	1.1219
D7S820	10,11	10,11	10,11	6,10	8,10	Present	0.7521
SE33	19,24	14,20	17,18	16,19	19,27,2	Present	1.7531
D10S1248	14	12,14	14,15	15	14,15	Present	1.8406
D1S1656	14,15	14,17,3	16,3	16,3,17,3	12,14	Present	1.0689
D12S391	17,18	19,21	20,23	19,21	17,20	Present	1.5878
D2S1338	22,23	23,25	16,19	20,24	19,22	Present	1.6863
DYS391	10	NA	NA	NA	NA	NA	NA
Y INDEL	2	NA	NA	NA	NA	NA	NA
AMEL	XY	X	X	X	X		CPI= 25767.9834

# Results...

STR LOCI	ALLELE CALLS					Mother's allele in skull 1	MATERNITY INDEX
	Comfort Arhin	Skull 1	Skull 2	Skull 3	Skull 4		
D3S1358	15,18	15,17	14,16	15,16	14,16	Present	0.7870
vWA	15,17	15,17	15	15,16	16,18	Present	2.5575
D16S539	11,13	9,13	11,12	8,10	9,11	Present	1.6426
CSF1PO	10,11	11	8,10	12,13	10,12	Present	2.2533
TPOX	8,9	8,9	7	8	8,10	Present	1.8645
D8S1179	13,14	14	12,13	13	13,14	Present	1.5295
D21S11	29,30	28,30	32.2	29,31	31,32.2	Present	1.4756
D18S51	17,20	17,20	-	20	16,18	Present	5.5839
D2S441	11,13	11,13	11,12	11,12	11	Present	6.1732
D19S433	13,14	14,16.2	11,16	13,15.2	12,12.2	Present	1.2687
TH01	8,9	7,9	7	7,10	7,9	Present	1.6969
FGA	25,27	25	25,26	24,26	21,26	Present	4.8924
D22S1045	16,17	15,16	10,17	12,15	16,17	Present	1.3441
D5S818	11,13	12,13	10,13	11,12	11,13	Present	1.0526
D13S317	11	11	11,13	11,13	12	Present	3.5607
D7S820	10	10,11	10,11	6,10	8,10	Present	1.5042
SE33	14,16	14,20	17,18	16,19	19,27.2	Present	5.7438
D10S1248	11,12	12,14	14,15	15	14,15	Present	2.0412
D1S1656	14,17.3	14,17.3	16.3	16.3,17.3	12,14	Present	6.4942
D12S391	19,22	19,21	20,23	19,21	17,20	Present	1.7292
D2S1338	23	23,25	16,19	20,24	19,22	Present	4.6816
DYS391	NA	NA	NA	NA	NA	NA	NA
Y INDEL	NA	NA	NA	NA	NA	NA	NA
AMEL	X	X	X	X	X		CMI= 53160961.519

# ***ABEKAH FAMILY VS SKELETAL REMAINS***

- **Cecilia Owusu** (Alleged mother of missing Ruth Abekah) does not share common allele with Skull 1 at some loci tested
- The probability of stated relationship is given below:
  - ✓ Combined Maternity Index (CMI) = 0
  - ✓ Prior Probability = 0.5 (Statistical constant)
  - ✓ Probability of Maternity = 0%



# ***ABEKAH FAMILY VS SKELETAL REMAINS***

- **Cecilia Owusu** (Alleged Mother of missing Ruth Abekah) does not share common allele with Skull 2 at some loci tested
- The probability of stated relationship is given below:
  - ✓ Combined Maternity Index (CMI) = 0
  - ✓ Prior Probability = 0.5
  - ✓ Probability of Maternity = 0%



# ***ABEKAH FAMILY VS SKELETAL REMAINS***

- **Cecilia Owusu** (Alleged Mother of missing Ruth Abekah) shares common allele with **Skull 3** at all loci tested
- The probability of stated relationship is given below:
  - ✓ Combined Maternity Index (CMI) = **202552413.7053**
  - ✓ Prior Probability = 0.5 (Statistical constant)
  - ✓ Probability of Maternity = **99.99%**



# ***ABEKAH FAMILY VS SKELETAL REMAINS***

- Cecilia Owusu (Alleged Mother of missing Ruth Abekah) does not share common allele with Skull 4 at some loci tested
- The probability of stated relationship is given below:
  - ✓ Combined Maternity Index (CPI) = 0
  - ✓ Prior Probability = 0.5
  - ✓ Probability of Maternity = 0%



# ***QUAYSON FAMILY VS SKELETAL REMAINS***

- **Comfort Arhin** (Alleged Mother of missing Ruth Love Quayson) shares common allele with **Skull 1** at all loci tested
- The probability of stated relationship is given below:
  - ✓ Combined Maternity Index (CMI) = **53160961.519**
  - ✓ Prior Probability = 0.5 (Statistical constant)
  - ✓ Probability of Maternity = **99.99%**





# ***QUAYSON FAMILY VS SKELETAL REMAINS***

- Comfort Arhin (Alleged Mother of missing Ruth Love Quayson) does not share common allele with Skull 2 at some loci tested
- The probability of stated relationship is given below:
  - ✓ Combined Maternity Index (CMI) = 0
  - ✓ Prior Probability = 0.5
  - ✓ Probability of Maternity = 0%



# ***QUAYSON FAMILY VS SKELETAL REMAINS***

- Comfort Arhin (Alleged Mother of missing Ruth Love Quayson) does not share common allele with Skull 3 at some loci tested
- The probability of stated relationship is given below:
  - ✓ Combined Maternity Index (CMI) = 0
  - ✓ Prior Probability = 0.5
  - ✓ Probability of Maternity = 0%



# ***QUAYSON FAMILY VS SKELETAL REMAINS***

- Comfort Arhin (Alleged Mother of missing Ruth Love Quayson) does not share common allele with Skull 4 at some loci tested
- The probability of stated relationship is given below:
  - ✓ Combined Maternity Index (CMI) = 0
  - ✓ Prior Probability = 0.5
  - ✓ Probability of Maternity = 0%



# CONCLUSIONS

- Skull 1 **cannot be excluded** as the biological daughter of Madam Comfort Arhin
- Skull 2 **cannot be excluded** as the biological daughter of Mr. Francis Bentum Ackon and Madam Gladys Bentum
- Skull 3 **cannot be excluded** as the biological daughter of Madam Cecilia Owusu
- Skull 4 **cannot be excluded** as the biological daughter of Mr. Alexander Kojo Koranchie



# REMARKS...

- *The remaining portions of the exhibits were stored at the Ghana Police Hospital for collection*



# Publications...

- Afrifah KA, **Badu-Boateng A**, Antwi-Akomeah S, Motey EE, Boampong E, Twumasi P, *et al.* (2020). Forensic identification of missing persons using DNA from surviving relatives and femur bone retrieved from salty environment. ***J Forensic Sci Med* 6:40-44**



# DNA Technology revolutionized Forensics...

Today we are learning the language in which God created life.

(President Bill Clinton, 26th June 2000  
announcing the first draft sequence of the human genome)



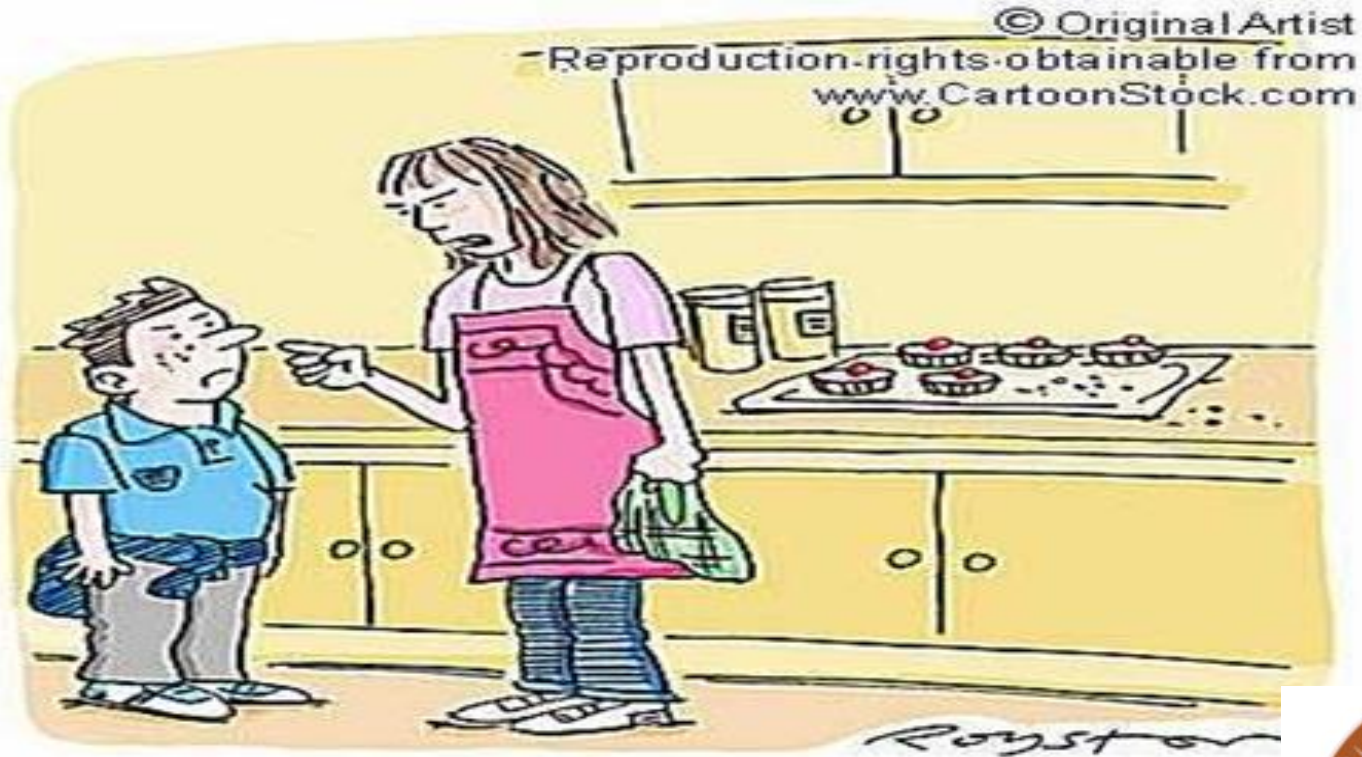


“In school, every period ends with a bell. Every *sentence* ends with a period. Every *crime* ends with a *sentence*”

...Stephen Wright, comedian



# THANK YOU VERY MUCH



“I don't need to check anything with 'the boys in forensics', I know it was you.”