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Comparative studies of Haemin crystal of Mammals- Structural and Statistical Analysis

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Abstract- A laboratory study was conducted to assess the structural difference in some common mammals. During this investigation some farm and sanctuary mammal's blood were examined. After that when compared with that of human haemin crystals some significant and also non-significant result were obtained. Statistical analysis was done to determine the structural differences.

I. Introduction

HAEME is the iron containing split portion of haemoglobin. When a sodium chloride, a drop of glacial acetic and some blood are heated on a slide a typical microscopic reddish brown crystal -C34H32N4O4.Feclis formed.

This crystal is also known as Teichmann'scrystal (1853)

II. Objectives

The objectives of this work is to study-

i) The specific character of haemin crystal of some mammals.

ii) Difference in shape of haemin crystal of some mammals in comparison to that of human being.

iii) Determination of standard deviation in size and Correlation.

III. Review of literature

HEINE (1912) working with numerous samples claimed to have got varying results WHILSTEWING (1904) maintains that this test is absolutely reliable.

ROHMAN (1908) says that there is a difference in the HEMIN of various animal bloods.

IV. Materials and Method

Materials utilized were-

(a) Sterilized pricking needle
(b) Syringe
(c) Anti – coagulant
(d) Sodium chloride
(e) Spirit lamp, slide coverslip
(f) Glacial acetic acid.

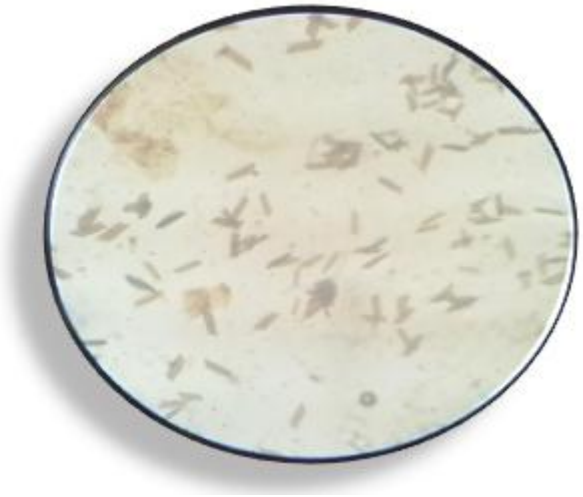
In case of human being tip of the finger is pricked. In case of mammals other than human being blood is taken from the blood vessels present near the neck region.

One ml of blood was mixed with anti-coagulant. After bringing to laboratory the blood is then spread over the slide to make a thick blood film. It is then dried in the air. The dried film is then scraped by means of a scalpel and scrapings are then collected in the centre of the slide. They are turned into powder. It is mounted on the fresh glacial acetic acid and with one or two crystals of Nacl.

This is then warmed gently over the flame of spirit lamp until bubble comes out. This is then allowed to cool. After that the slide is observed under microscope.

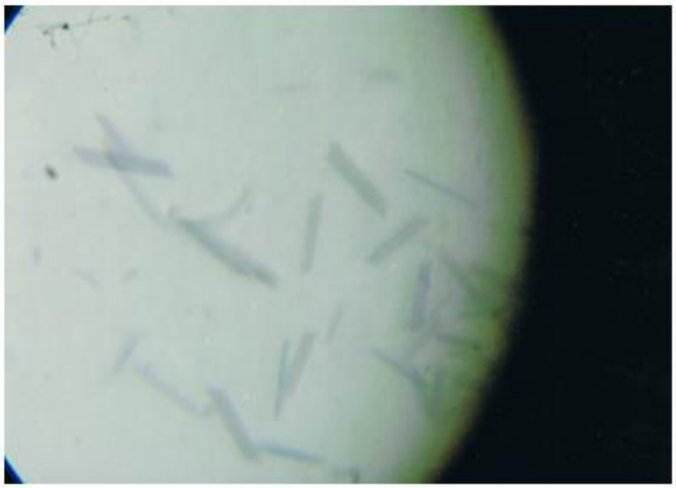
V. Observation

1. Human Being:-Rhomboidal plates or rectangular



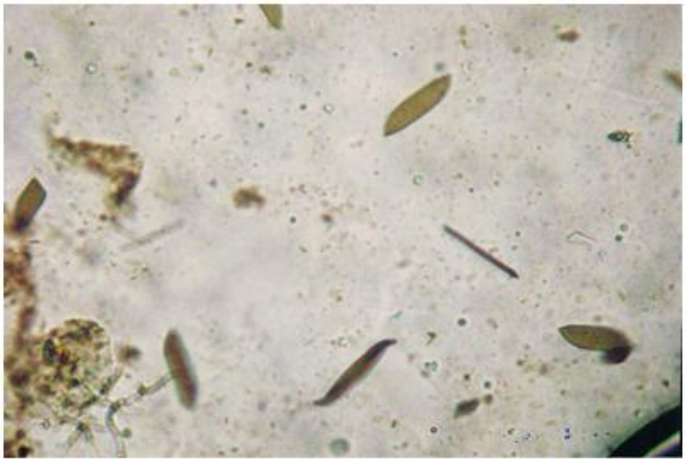
2. Cow:-Brown colour rectangular with sharp edges, projecting outward (breadth)

3. Goat:-Rectangle with sharp edges, breadth portion is somewhat inwardly projected.

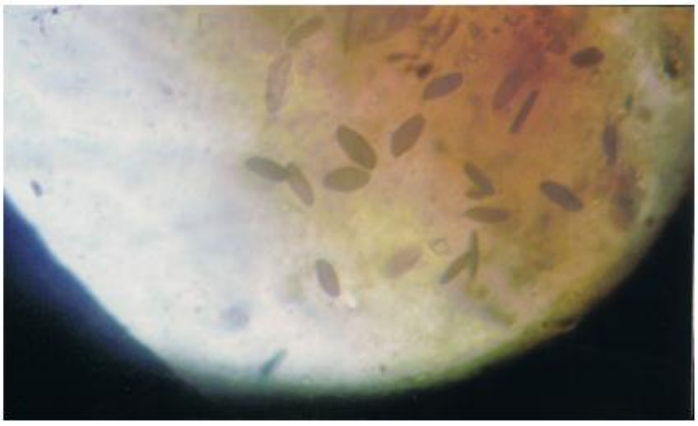


4. Pig tailed macaque:-Rectangle, but edges are round.

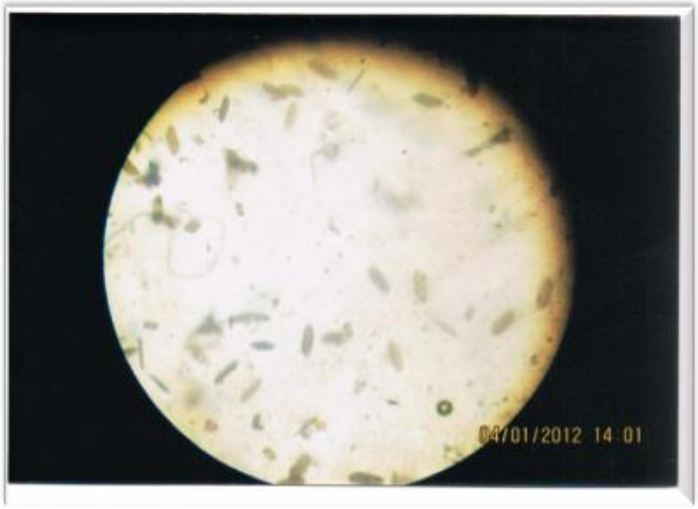
5. Rabbit: -Spindle shaped.



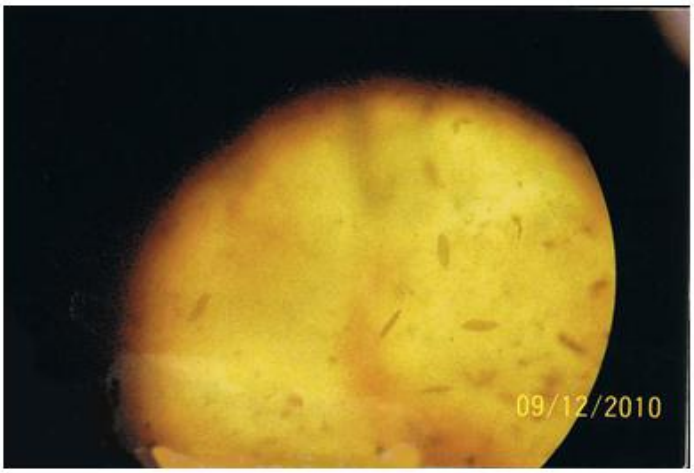
6. Rattusnorvegicuf(Brown Rat) :-Completely spindle with wide middle portion.



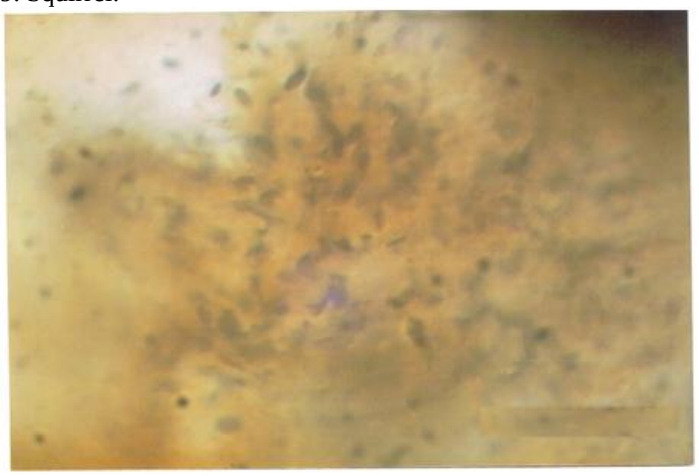
7. Rat:-Somewhat circular and narrow plates with varying width.



8. Dog :-Spindo-Rhomboidal plates.



9. Squirrel:



VI. STATISTICAL ANALYSIS

Following are the length and breadth obtained of haemin crystals. The measurement was done in ocular stage micrometre. Where one ocular is euual to mm, i.e. 1 ocular =0.04 mm

Human beings

Obs no.	Length	Breadth(in mm)
1.	0.20	0.08
2.	0.24	0.08
3.	0.19	0.04
4.	0.19	0.08
5.	0.22	0.04

Mean of length of Haemin crystal in human
$X=\frac{\sum x}{N}=\frac{1.04}{5}=0.208$ mm

Mean of breadth of haemin crystal in human
$X=\frac{\sum x}{N}=\frac{0.32}{5}=0.064$ mm

Brown Rat

Obs No.	Length (in mm)	Breadth (in mm)
1.	0.36	0.12
2.	0.24	0.08
3.	0.28	0.12
4.	0.28	0.08
5.	0.26	0.08

Mean of length 1.42/5=0.284 mm
Mean of breadth 0.48/5=0.096 mm

Rabit

Obs No.	Length (in mm)	Breadth (in mm)
1.	0.20	0.04
2.	0.23	0.08
3.	0.27	0.08
4.	0.20	0.06
5.	0.19	0.04

Mean of length 1.09/5=0.218 mm
Mean of breadth = 0.3/5= 0.06 mm

Pig tailed Macaque

Obs No.	Length (in mm)	Breadth (in mm)
1.	0.20	0.04
2.	0.24	0.04
3.	0.28	0.08
4.	0.23	0.08
5.	0.26	0.06

Mean of length 1.21/5=0.242 mm
Mean of breadth 0.3/5=0.06 mm

Bandicata

Obs No.	Length (in mm)	Breadth (in mm)
1.	0.019	0.08
2.	0.23	0.12
3.	0.19	0.08
4.	0.22	0.08
5.	0.24	0.10

Mean of length 1.07/5=0.214 mm
Mean of breadth 0.46/5=0.09 mm

Squirrel

Obs No.	Length (in mm)	Breadth (in mm)
1.	0.08	0.04
2.	0.08	0.04
3.	0.06	0.05
4.	0.10	0.06
5.	0.06	0.04

Mean of length 0.38/5=0.076=0.07 mm
Mean of breadth 0.23/5=0.04 mm

Dog

Obs No.	Length (in mm)	Breadth (in mm)
1.	0.18	0.07
2.	0.22	0.08
3.	0.24	0.08
4.	0.19	0.09
5.	0.20	0.10

Mean of length 1.03/5=0.206=0.20 mm
Mean of breadth 0.42/5=0.08 mm

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Goat

Obs No.	Length (in mm)	Breadth (in mm)
1.	0.30	0.12
2.	0.28	0.10
3.	0.36	0.09
4.	0.28	0.10
5.	0.26	0.11

Mean of length 1.48/5=0.296 mm=0.29 mm
Mean of breadth 0.52/5=0.104 mm=0.10 mm

Cow

Obs No.	Length (in mm)	Breadth (in mm)
1.	0.29	0.05
2.	0.26	0.04
3.	0.30	0.06
4.	0.28	0.07
5.	0.26	0.04

Mean of length 1.39/5= 0.278= 0.28 mm
Mean of breadth =0.26/5=0.052 mm=0.05 mm

Standard deviation of length and breadth of haemin crystals in different Mammals is calculated.

Standard deviation is used for measuring absolute dispersion. The concept of standard deviation was introduced by Karl Pearson. The greater the standard deviation of the values from their mean.

$$\text{S.D. or } \sigma = \sqrt{\frac{\sum X^2}{N} - \left[\frac{\sum X^2}{N}\right]^2}$$

X
(Mean of length in mm)

Sample

Human	0.208	0.0432
Brown Rat	0.284	0.0806
Rabbit	0.218	0.0475
Pig Tailed Macque	0.242	0.0585
Bandicota	0.214	0.0458
Squirrel	0.076	0.0058
Dog	0.206	0.0424
Goat	0.296	0.0876
Cow	0.278	0.0773

According to the formula

$$\sigma = \sqrt{\frac{0.4887}{2} - (2.022)}$$

$$\sqrt{\quad}$$

$$= 0.0543 - (0.0504)^2$$

$$= \sqrt{0.0543-0.0025}$$

= 0.0518
=0.052 mm

So deviation in length of different haemin crystal in 0.052 mm

Similarly standard deviation of breath is

Sample Y Mean of Y^2
Breadth

Human	0.064	0.004
Brown Rat	0.096	0.009
Rabbit	0.06	0.003
Pig Tailed Macque	0.06	0.003
Bandicota	0.10	0.010
Squirrel	0.04	0.001
Dog	0.08	0.006
Goat	0.10	0.010
Cow	0.05	0.002

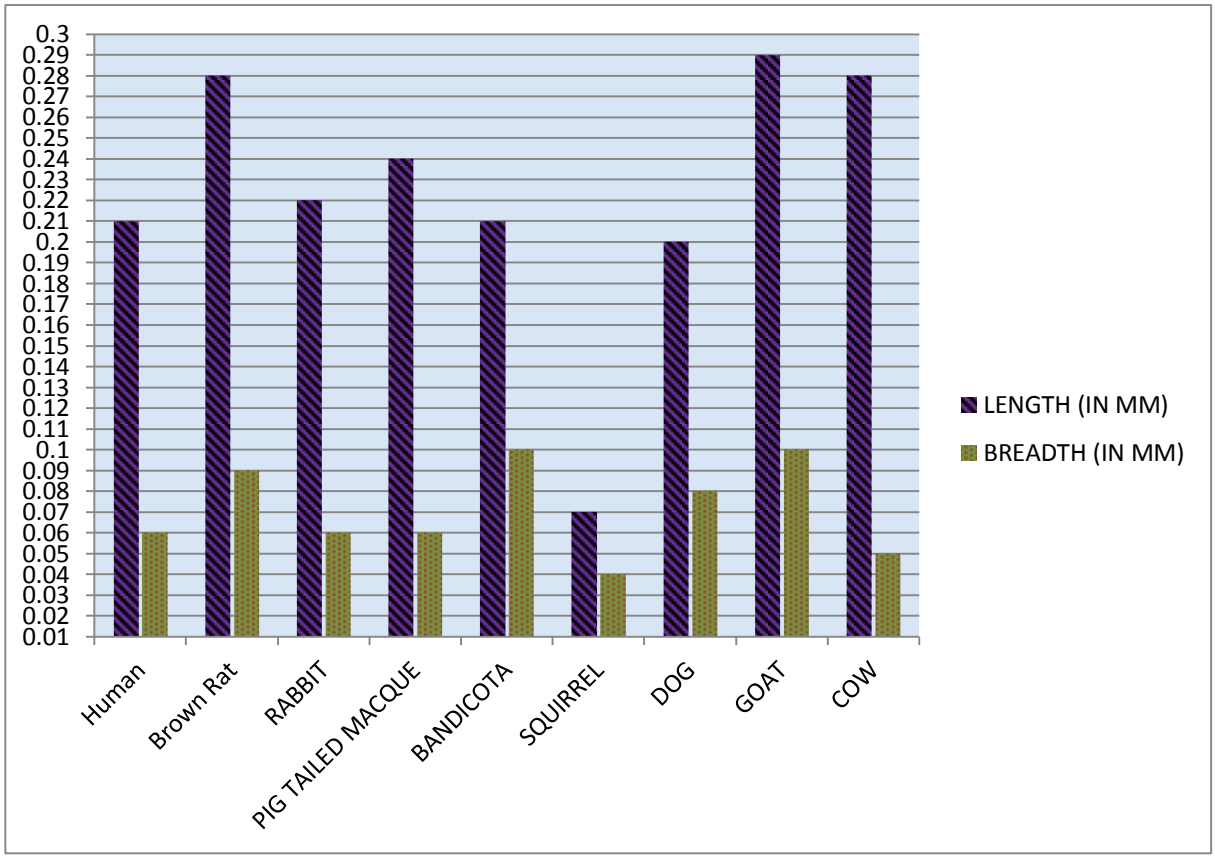
$$\sigma = \sqrt{\frac{0.048}{9} - \frac{(0.65)^2}{9}}$$

$$= \sqrt{(0.005 - 0.072)^2}$$

$$= \sqrt{0.005-0.005} = 0$$

So in breadth of different haemin crystal there is no deviation

Bar Diagram



VII. Result

By standard deviation it is seen that breadth shows consistency in measurement in all nine mammalian species.But length shows differences. It indicates that as per as breadth is concern it maintains consistency

VIII. Conclusion

Crystals of hydro chlorate of haematin are observed. In case of cow's haemin crystal the difference with human haemin crystal is non- significant. Similar non-significant difference is seen in goat's blood. In case of pig tailed macque the difference with human haemin crystal is not so remarkable.

But significant difference is seen in comparison with rabbit, rat and dog's haemin crystal to that of human being's blood.

Standard deviation in length is seen in breadth there is no dispersion.

IX. Importance

i) It is important in medico – legal test for the detection of blood.

ii) It helps to give an opinion as to proof whether a stain is blood or something else.

iii) It is also useful in the difference of bloods of difference species depending upon the shape of the crystal.

Acknowledgment

I express sincere thanks to

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iv) Sepahijala Wild life Sanctuary.

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[3] Statistical analysis by T.L. kanshal.

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