

## HISTOLOGICAL STUDY OF THYROID GLAND IN SOME MAMMALS

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### ABSTRACT

#### BACKGROUND

The sub-Himalayan region is known to be world's biggest goiter belt in India, but no state can be said to be entirely free from goiter. There is a high incidence of thyroid disorder in the northeastern region of India. In view of this, a comparative histological study of thyroid gland in mammals was conducted in the Department of Anatomy, Gauhati Medical College, Guwahati.

#### MATERIALS AND METHODS

The mammals included for this study were humans, pig and goat. The thyroid gland was meticulously dissected out, cut into small pieces, fixed in formalin and embedded in paraffin was sectioned and stained in haematoxylin and eosin. Slides were observed under microscope. The diameter of thyroid follicles were measured with the help of micrometer slide and the results were statistically analysed and compared.

#### RESULTS

The histology of thyroid gland was studied in three mammals human, pig and goat. Slides of all three mammals showed similar structures consisting of closely packed follicles of variable sizes. Follicles were lined by follicular cells. Parafollicular cells were also seen, which were little larger and lighter stained. Thus, all three mammals showed similar cytoarchitecture.

#### CONCLUSION

The histological structure of all the mammals were found to be familiar. All mammals showed follicles, follicular cells and parafollicular cells.

#### KEYWORDS

Mammals, Human, Pig, Goat, Thyroid Gland.

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#### BACKGROUND

The sub-Himalayan region is known to be world's biggest goiter belt in India, but no state can be said to be entirely free from goiter (K.Park).<sup>1</sup> It was the Roman physician and anatomist Galen<sup>2</sup> (130-200 AD) who first portrayed a concise of the thyroid gland in his "De Voce." The great Italian anatomist Andreas Vesalius<sup>3</sup> furnished an elaborate and surprisingly accurate description of the gland in his illustrated treatise "De Fabrica Corporis Humani" in 1543 AD.

The thyroid gland maintains the level of metabolism in the tissues that is optimal for their normal function. Thyroid gland secretes two important hormones, thyroxine and triiodothyronine, which stimulates O<sub>2</sub> consumption of most of the cells in the body, help regulate lipid and carbohydrate metabolism and are necessary for normal growth and maturation. Thyroid gland is not essential for life, but its absence causes mental slowing, poor resistance

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to cold and in children mental retardation and dwarfism (William F. Ganong).<sup>4</sup> As Assam falls under the sub-Himalayan goiter belt (K. Park),<sup>1</sup> disorders of thyroid are encountered in day-to-day practices. In human, disorders of thyroid may manifest as hyperthyroidism and hypothyroidism. Similar condition has also been observed in animals. Deficiency of hormones leads to sleepy inactive animals. He lacks vigour and may gain weight. It is also noticed that sheep with hypothyroidism showed scanty fleece.

Theodor Kocher<sup>5</sup> who was regarded as father of thyroid surgery performed thyroidectomy in the late 1800s. But, he noticed that post thyroidectomy, patient suffered from myxoedema. Thus, post thyroidectomy patients have to live on thyroxine supplements for life.

The first successful transplant of thyroid was reported by Payr<sup>5</sup> in 1906. Is there a possibility of xenograft or xenotransplant? Interest in xenograft re-emerged during 1960s when large advances were made in immunology.

With the above views, a comparative histological study was conducted in the Department of Anatomy, Gauhati Medical College, Guwahati.

#### Aims and Objectives

1. To study the histology of thyroid gland in humans, pig and goat.

2. To see if there exist any similarity among these mammals.

**MATERIALS AND METHODS**

The mammals included for this study was of human, pig and goat. They were divided into three groups, i.e. group I, group II and group III each consisting of 20 mammals each.

Sl. No.	Name of the Mammal	Group	No. of Animals
1.	Human	I	20
2.	Pig	II	20
3.	Goat	III	20

After taking ethical clearance and following all legal procedures, specimens were obtained as follows-

Group-I- Autopsies done in the Department of Forensic and State Medicine, Gauhati Medical College, Guwahati. The adult human thyroid gland was collected from cadavers within stipulated time of death after excluding all histories of possible abnormalities, pathological changes and decomposition. The gland was immersed in 10% formalin.

Group II and Group III- From the Department of Anatomy, College of Veterinary Science, Khanapara, Guwahati. Glands were taken from animals used for dissection. Some were taken from local abattoirs.

In all the groups, after removal of gland, it was immersed in 10% formalin. The gland was then cut with scalpel into smaller pieces of size 3-4mm, fixed in 10% formalin and labelled separately. They were processed for embedding in paraffin and sectioned at 4-5micrometer thickness with rotary microtome, section tissues were stained with haematoxylin and eosin stain according to standard laid down by Carleton<sup>6</sup> (1967).The sectioned tissues were observed both under low(10x) and high(40x) power microscope to see the thyroid follicles, follicular cells, parafollicular cells, colloid and other structures. Location of parafollicular cells were noted in different mammals. From each group, slides were taken randomly and 10 follicles were observed and their diameter was taken with micrometer slides used with light microscope. Their measurements were tabulated and their average range was compared in the different mammals.

**Micrometer Calculation**

In this study, 11 division of ocular micrometer coincide with 5 divisions of stage micrometer scale.

1 division of ocular micrometer = 5/22 division of objective micrometer scale.

As 1 division of objective micrometer measures 0.01mm, 5/22 division of objective micrometer measures 5/22x0.01mm.

$$= 0.00227\text{mm.}$$

$$= 2.27 \times 10^{-3}$$

$$= 2.27\text{micrometer.}$$

1 division of objective micrometer scale = 2.27micrometer.

**RESULTS AND OBSERVATIONS**

All three mammals showed marked resemblance in their microscopic structure. The thyroid gland in all the mammals showed closely packed follicles, which were variable in size. The follicles of mammals contained colloid, which stained pink with haematoxylin and eosin stain. The walls of the follicles were lined by an epithelium, which ranged from simple squamous to cuboidal and columnar. In mammals belonging to group I, the follicles were of variable sizes, but follicles of mammals of group II, III were almost uniform. Scattered in between follicles were some light staining cells- the C-cells or the parafollicular cells. These cells were seen in groups and some single. Connective tissue septation were seen more prominently in group I.

Group I(in Micrometers)	Group II(in Micrometers)	Group III(in Micrometers)
64, 164, 140, 75, 118, 140, 150, 100, 96, 138, 179, 142, 122, 130, 95, 140, 136, 149, 113, 126, 136, 200, 155, 133, 127, 77, 117, 137, 140, 141	105, 109, 116, 136, 145, 126, 117, 140, 133, 145, 122, 141, 142, 150, 146, 135, 127, 130, 140, 150, 155, 200, 151, 152, 133, 141, 145, 110, 111, 117	43, 88, 75, 51, 62, 63, 90, 121, 50, 52, 63, 77, 86, 87, 51, 56, 97, 90, 100, 111, 83, 85, 77, 75, 67, 80, 80, 100, 75, 77

**Table 1. Range of Diameter of Thyroid Follicles in Different Groups**

Name of the Mammal	Diameter of Follicles (in Micrometers)
Group I	129.33
Group II	135.67
Group III	77.07

**Table 2. Average Diameter of the ThyroidFollicles of Different Mammals Were Found to be as Follows**

Name of Mammal	Avg. Diameter of Follicles (in μm)	Standard Error or SE ±
Group I	129.33	29.27
Group II	135.67	18.88

**Table 3. Comparison of Diameter of Follicles of Group I and Group II**

Value of t- 0.9959.

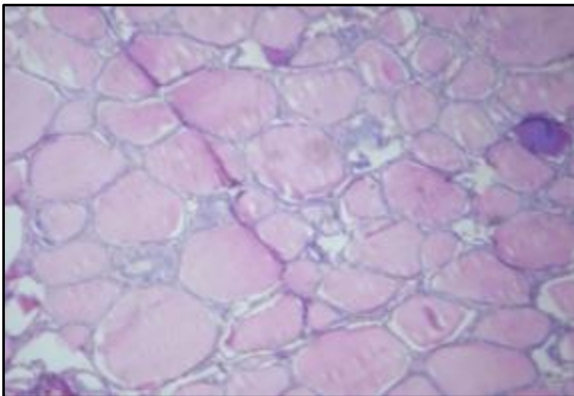
Significance- 0 (not significant, i.e. null hypothesis can't be rejected at 5% level).

Name of Mammal	Avg. Diameter of Follicles (in μm)	Standard Error or SE ±
Group I	129.33	29.27
Group III	77.07	18.88

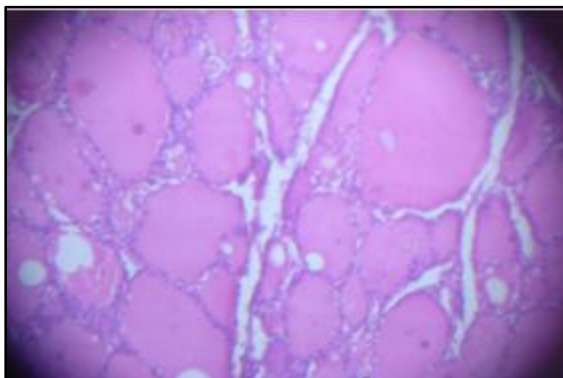
**Table 4. Comparison of Diameter of Follicles of Group I and III**

Value of t- 8.218.

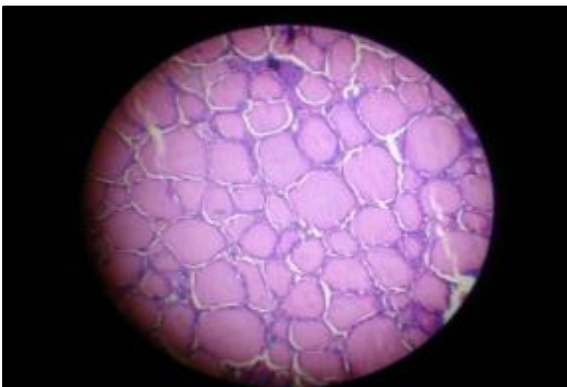
Significance- 1 (significant, i.e. null hypothesis is rejected at 5% level of significance).



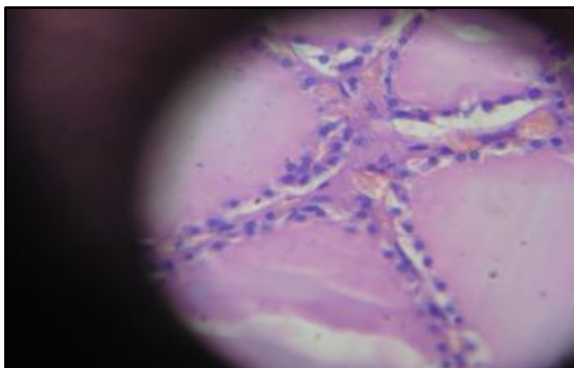
**Figure 1. Photomicrograph of Thyroid Gland in Pig Showing Follicles (10x)**



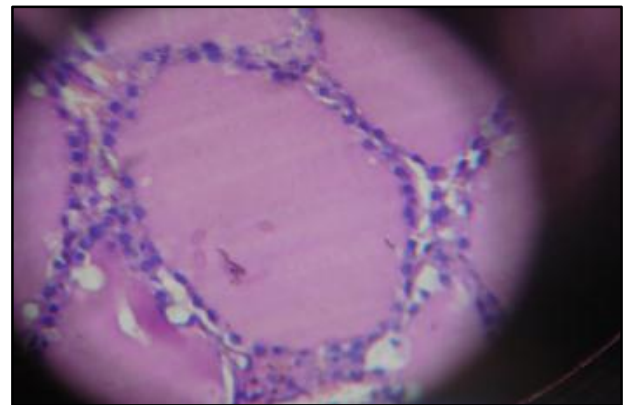
**Figure 2. Photomicrograph of Thyroid Gland in Human Showing Follicles (10x)**



**Figure 3. Photomicrograph of Thyroid Gland in Goat Showing Follicles (10x)**



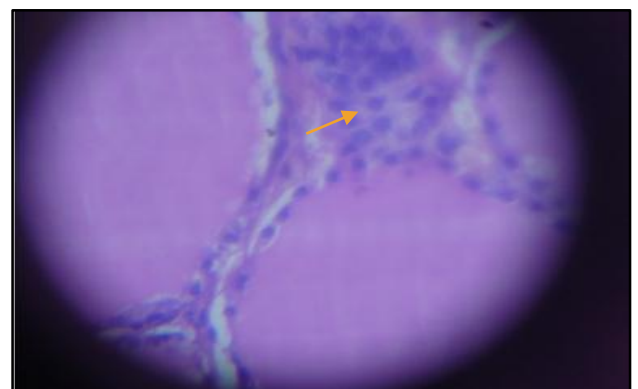
**Figure 4. Photomicrograph of Thyroid Gland in Pig Showing Follicles Cells (40x)**



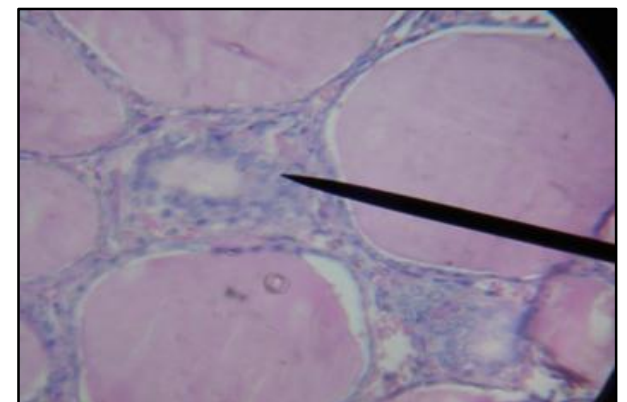
**Figure 5. Photomicrograph of Thyroid Gland in Human Showing Follicular Cells (40x)**



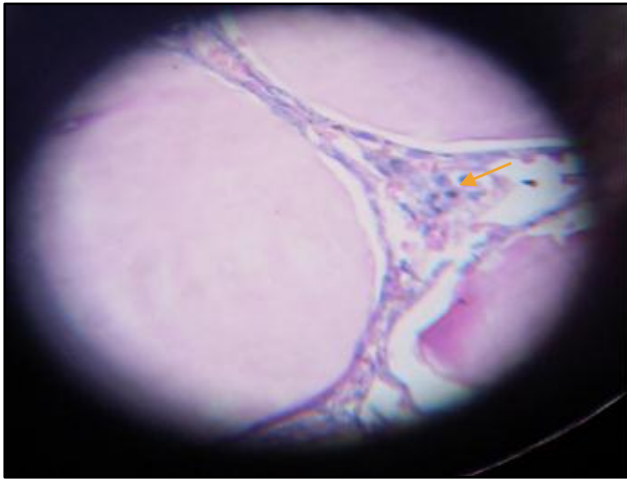
**Figure 6. Photomicrograph of Thyroid Gland in Goat Showing Follicular Cells (40x)**



**Figure 7. Photomicrograph of Thyroid Gland in Human Showing Parafollicular Cells (40x)**



**Figure 8. Photomicrograph of Thyroid Gland in Pig Showing Parafollicular Cells (40x)**



**Figure 9. Photomicrograph of Thyroid Gland in Goat Showing Parafollicular Cells (40x)**

### DISCUSSION

All the histological structures of thyroid gland were observed under light microscope. Stress was given on follicles and follicular diameter. Results of follicular diameter were statistically analysed.

#### Follicles

In this study, thyroid gland of mammals belonging to group I, II, III were seen to contain follicles, which were of different sizes. Such finding were also observed by Bloom and Fawcett<sup>7</sup> (1975), Ham<sup>8</sup> (1979), Dellman and Brown<sup>9</sup> (1976) and Banks (1981). In human follicles were spherical to oval in shape similar to the findings of Bloom and Fawcett<sup>7</sup> (1975) and Das et al,<sup>10</sup> Victor P Eronschenko.<sup>11</sup> The follicles were filled with acidophilic colloid and were lined by cells, which were simple cuboidal to columnar. These findings correlated with Ham (1975), Bloom and Fawcett<sup>7</sup> (1975) and Dellman and Brown (1981). In this study, some light staining parafollicular cells were also seen, which were widely dispersed throughout the gland similar to findings of David H Cormack (1993), Bloom and Fawcett (1975) and Tice<sup>12</sup> (1977).

#### Follicular Diameter

Diameter of pig was found to be 20-500 micrometer by Dellman and Brown, which falls in the range of this study. In human, the follicular diameter was 129.33 micrometer, which falls in the range of Gartner<sup>13</sup> (2007) and Bloom and Fawcett (1975) who stated the diameters to be 0.2-0.9mm. According to Larsen Kronenberg et al<sup>14</sup> (1975), the diameter of follicles in human is 200 micrometer.

Till the completion of this study, no data was available about diameter of goat.

### CONCLUSION

The microscopic architecture of the thyroid gland in all the mammals was almost similar as noted with haematoxylin and eosin stain. The thyroid gland of all mammals showed follicles of different size and shape. Follicles were lined by

follicular and parafollicular cells. The diameter of the follicles was found to be highest in pig followed by human.

Certain pathological conditions may compel an individual to undergo a total thyroidectomy. In such cases, the individual has to depend on oral thyroxine for life.

Can animal tissue be used as a replacement for the lost human tissue?.

The answer to the above question is beyond the scope of this study due to limited time and facility. But, with advancement of science, maybe researcher one day will govern over the subject and its intricate mechanism and integrated function will be laid bare.

### REFERENCES

- [1] Park. K, Park's Book of Preventive and Social Medicine. 14<sup>th</sup> edn. Jabalpur: Banarsidas Bhanot 1994:371-372.
- [2] Medvei VC. The endocrine organ in health and disease. A history of endocrinology. 1st edn. Netherlands: Springer 1982:11-13.
- [3] Vesalius A. <http://en.wikipedia.org/wiki/thyroid>.
- [4] Ganong WF. Review of medical physiology. 22nd edn. McGraw-Hill 2005:317-328.
- [5] Kocher T. Thyroid and parathyroid. Chapter 36. In: Schwartz SI, Spencer FC, Shires TG, et al, eds. Principles of surgery. 6th edn. McGraw Hill Company 1994:1611-1644.
- [6] Carleton HM. Schaffer's essentials of histology. 4th edn. New York-Toronto: Oxford University Press 1967:1-114.
- [7] Bloom W, Fawcett DW. Thyroid gland. Chapter 19. A text book of histology. 10th edn. Philadelphia: WB Saunders Company 1975:524-534.
- [8] Ham AW, Cormack DH. Histology. 8th edn. Philadelphia: Lippincott 1979:801-809.
- [9] Dellmann, Brown. Endocrine system. Chapter 15. In: Eurell JA, Frappier BL, eds. Textbook of veterinary histology. 6th edn. USA: Blackwell Publishing 2006:298-318.
- [10] Das LN, Misra DB, Biswal G, et al. Comparative histological study of the adrenal and thyroid gland of bull and bullock. Indian Vet Journal 1979;42:824-830.
- [11] Eroschenko VP. Endocrine system. Chapter 17. Di Fiore atlas, of histology with functional correlation. 11th edn. Lippincott William and Wilkins 2008:p. 395.
- [12] Tice LW. The thyroid gland. In: Weiss L, ed. Histology-cell and tissue biology. McGraw-Hill 1983:1077-1089.
- [13] Gartner LP, Hiatt J. Endocrine system. Chapter 13. Color text book of histology. 3rd edn. Saunders 2007:311-315.
- [14] Larsen PR, Kronenberg HM, Melmed S. Thyroid. Chapter 10. Williams Textbook of Endocrinology. 10<sup>th</sup> edn. Philadelphia: Saunders 2003:331-333.