

# Effect Of Ageing On Minerals And Organic Constituents Of Teeth Of The Albino Rat At Different Stages Of Growth

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**Abstract** - The present study was undertaken to evaluate the minerals and organic constituents of teeth of Albino Rat at three different stages of growth. Ash contents are very high at all the stages. Moisture decreases with the growing age. The values of calcium and phosphorous are very high. Magnesium is present in low amount at all the stages while sodium and fluorine are present in traces. Crude fat, total nitrogen and crude protein shows continuous decrease with increasing age. Likewise, amino acids also decrease in their content with increasing age.

**Keywords** - Amino acids, Crude fat, Crude Protein, Albino Rat, Silica Crucible, Teeth

## I. INTRODUCTION

Ageing is the continuity of the structural and functional variations in the cells and non-cellular tissues. Connective tissue (Teeth) of the animals undergo obvious change with growing age with regard to the chemical constituents and physical states. Teeth are made up of four different types of tissue – Pulp, Dentine, Enamel and Cementum. The pulp is the innermost portion of the tooth and consists of connective tissue, nerves and blood vessels, which nourish the tooth. Enamel, the hard outer layer of the crown. Dentine not as hard as enamel, forms the bulk of the tooth and can be sensitive if the protection of enamel is lost. Cementum is the layer of bone like tissue covering the root. When teeth are exposed to excessive strain, the layer of cementum becomes thicker. Dentine protein is recognized to be collagen. On ageing, collagen becomes more rigid as lipofuscin begins to accumulate in cells. Losec, Leopadt and Hess (1951) isolated a total of 15.5% by weight of insoluble protein from ground dentine.

## II. MATERIALS AND METHODS

First six Albino rats of each age group of Albino rats were taken out. The teeth of the rats were separated by the proper dissection with the help of forceps and scissors. For the separation of the tissues, the whole of the tooth, except the pulp, is initially powdered in a mortar. The tooth powder is centrifuged in a mixture of 91 volumes of bromoform and 9 volumes of acetone (density 2.70) for 2 minutes at 2200 rpm. This is carried out in 15 ml conical centrifuge tube having an inner tube of somewhat smaller diameter suspended inside it by means of a rubber stopper. The powdered sample is introduced through the inner tube and after centrifugating, a finger is placed over the tip of the inner tube which is lifted out with the lighter fraction inside, in a similar way to a pipette. The dentine from the initial separation varies in purity from 97 to 99% but a centrifugation in a liquid of density 2.42 increases this value to 99.7%. This fraction still contains cementum which can be separated by sedimentation in a mixture of density 2.07 in which the dentine sinks. The separated tissue powders are finally washed three times with acetone with intermediate centrifugating, in order to remove bromoform (Eastoe & Courts).

A suitable portion (0.10 – 1.00 g) is placed in a dry, weighed silica crucible (7.5 cm diameter). The disc supported by a silica triangle is heated with a small non-luminous Bunsen flame. Some protein swell bubble and evolve large volume of gases. When all the material is dull black, the crucible is transferred to an electric muffle furnace controlled at 550°C. Heating is continued until no black patches are blebbed in the ash. The ash and material is transferred to a desiccator. Total nitrogen was determined by Kjeldhal methods. Crude protein was determined with the help of total N. Crude fat is extracted in a Soxhlet extractor using petroleum ether (40°C - 60°C). Amino acids were determined with the help of paper chromatography. Calcium was precipitated as calcium oxalate and then determined volumetrically using standard  $\text{KMnO}_4$  after liberating free oxalic acid by dissolving the precipitate in dil  $\text{H}_2\text{SO}_4$ . Magnesium was determined calorimetrically after removing calcium as calcium sulphate precipitate using the reagent Eriochrome black T. Sodium was determined by flame photometer.

## III. RESULTS

**Table 1: Mineral composition of Teeth of Albino rat at three different stages of growth (Value are expressed as g/100g of the dry material)**

Stages of Growth	Average age of 6 rats			Moisture	Ash	Mineral in ash	Values	Mineral Oxides	Values	Ash Unaccounted for
	Length (cm)	Girth (cm)	Weight (g)							

I	10	06	110	9.68	74.48	Ca	34.41	CaO	44.15	0.0879
						Mg	0.1624	MgO	0.2692	
						Na	0.0012	Na <sub>2</sub> O	0.0016	
						P	12.65	P <sub>2</sub> O <sub>5</sub>	28.98	
						F <sub>2</sub>	0.04			
						<b>Total</b>		<b>73.4008</b>		
II	15	09	160	9.46	78.48	Ca	35.21	CaO	45.27	0.0924
						Mg	0.1862	MgO	0.3088	
						Na	0.0013	Na <sub>2</sub> O	0.0018	
						P	13.22	P <sub>2</sub> O <sub>5</sub>	30.29	
						F <sub>2</sub>	0.048			
						<b>Total</b>		<b>75.8706</b>		
III	20	16	340	9.12	82.50	Ca	36.25	CaO	46.73	0.1226
						Mg	0.1966	MgO	0.3260	
						Na	0.0013	Na <sub>2</sub> O	0.0018	
						P	13.55	P <sub>2</sub> O <sub>5</sub>	31.04	
						F <sub>2</sub>	0.059			
						<b>Total</b>		<b>78.0978</b>		

Table 1 indicates that the ash content increases with age. Amount of all the minerals increases with age. Amount of calcium and phosphorous are found in major quantity. Amount of magnesium is minute at all the stages.

Ash content of teeth of Albino rat increases from stage I to stage III of ageing. Moisture content decreases from stage I to stage III. Calcium and phosphorous are found in major amount and magnesium in minute amount. Sodium and fluorine minerals are present in traces. All minerals are found in increasing order in teeth of Albino rat.

**Table 2: Organic composition of teeth of Albino rat at three different stages of growth. (Values are expressed as g/100g of the dry material)**

Stages of Growth	Average age of 6 rats			Crude fat	Total N	Crude Protein (N x 6.25)
	Length (cm)	Girth (cm)	Weight (g)			
I	10	06	110	0.39	5.98	37.37
II	15	09	160	0.31	5.78	36.13
III	20	16	340	0.26	5.27	32.94

**Table 2-a: Teeth**

Stages of Growth	Total of ash, crude fat and crude protein
I	112.24
II	114.92
III	115.7

**Table 3: Amino acid composition of teeth of Albino rats at three different stages of growth. (Values are expressed as g/100g of the dry material)**

Sl. No.	Amino Acid	Stage I	Stage II	Stage III
1.	Alanine	0.93	0.78	0.63
2.	Arginine	1.72	1.08	1.11
3.	Aspartic Acid	0.31	0.74	0.39
4.	Cysteine	1.38	0.62	0.36
5.	Cystine	2.17	1.34	1.51
6.	Glutamic Acid	1.36	0.80	0.96
7.	Glycine	2.98	2.81	1.95
8.	Histidine	0.84	0.52	0.43
9.	Hydroxy lysine	0.30	0.22	0.16
10.	Hydroxy proline	2.80	1.61	1.96
11.	Isoleucine	0.67	0.58	0.54
12.	Leucine	0.98	0.76	0.22
13.	Lysine	0.13	0.38	0.42
14.	Methionine	0.86	-	-

15.	Phenyl alanine	0.69	-	-
16.	Proline	2.22	1.21	0.22
17.	Serine*	1.92	1.55	2.79
18.	Threonine*	2.32	0.86	1.49
19.	Tryptophan	0.54	0.39	0.06
20.	Tyrosine	0.78	0.50	-
21.	Valine	0.31	0.52	0.39
	<b>Total</b>	<b>26.21</b>	<b>17.27</b>	<b>15.59</b>

.N – Terminal residue not determined.

- CONH<sub>2</sub> group not determined.

\*- Corrected for the loss during hydrolysis.

Table 2 shows that the value of crude fat, total nitrogen and crude protein decreases from Stage I to Stage III of ageing.

Table 3 indicates that 21 amino acids are present at the Stage I and 19 amino acids are present at the Stage II but 18 amino acids are present at the Stage III. Methionine and phenylalanine are absent at the stage II and III. Tyrosine is also absent at the stage III. The total value of amino acids at the stage I, II and III are 25.08, 16.44 and 15.73 respectively. Value of amino acids decrease from stage I to stage III. Value of aspartic acid, isoleucine, lysine and valine increase from stage I to stage II and then decrease from stage II to stage III. Alanine, glycine, histidine, proline, tryptophan, cysteine and hydroxylysine are present in decreasing order from stage I to stage III. Value of arginine, cysteine, glutamic acid, serine, threonine and hydroxyproline decrease from stage I to stage II and then increase from stage II to stage III.

#### IV. CONCLUSION

of the minerals and organic composition of teeth of Albino rat are reported. Ash content increases with ageing while moisture content decreases. Calcium and phosphorous are found in major amount and magnesium in minute amount. Sodium and fluorine minerals are present in traces. All minerals are found in increasing order. Total N, hence, crude protein and crude fat of teeth decrease on ageing. At stage I 21, at stage II 19 and at stage III 18 amino acids are present. At stage II and III, methionine and phenylalanine amino acids are absent. Tyrosine is also absent at stage III. This shows a gradual decrease in amino acid in teeth.

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