



## EFFECT OF CHRONIC TREATMENT OF VITAMIN C AND GLUCOSE ON TAIL FIN REGENERATION IN *GAMBUSIA AFFINIS*

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### ABSTRACT:

Regeneration is the process of renewal, restoration and growth of damage part. Glucose is used by *Gambusia affinis* as a major source of energy for biological process. The increase or decrease of glucose show ill effect. Energy is required for the normal functioning of the organs in the body. Many tissues can also use fat or protein as energy source but others, such as the brain and red blood cells; can only use glucose. Glucose is stored in the body as glycogen. When glucose levels are less it causes the hypoglycemia. Vitamin C is an essential component of the diet for proper health and growth. The nutritional importance of vitamin C and more specifically 'ascorbic acid'. In human being the deficiency of vitamin C causes the scurvy. The vitamin C supplementation in the treatment of rheumatoid arthritis *Gambusia affinis* have high regeneration capacity and it's a vertebrate model organism for regeneration studies.

**Keywords :** *Gambusia affinis*, regeneration, vitamin C, glucose, tail fin.

### INTRODUCTION:

Regeneration is the biological process in which renewal, restoration and regrowth that makes cell; tissue and organ in living organism. Every animal species have regenerative capacity. Regeneration consist of two types complete regeneration and incomplete regeneration. The complete regeneration means restore the integrity and function of the injured organ. Regeneration is mediated by the molecular processes of gene regulation. It refers to the morphogenic processes that characterize the phenotypic plasticity of traits allowing multicellular organism to repair and maintain the integrity of their physiological and morphological states (Gilbert .S.G., 2006).

*Gambusia affinis* are used as model organism for the study the regeneration. In *Gambusia affinis* shows the epimorphic regeneration. In epimorphic the differentiation of existing adult structure to form undifferentiated mass of cell that later become specific last the part.

*Gambusia affinis* are the fresh water fish. Female reaching the length of 7 cm (2.8 inch) and male at a length 4cm (1.6 inch) The female can be distinguished by from the male her larger size and gravid spot at the posterior of the abdomen. (<http://en.wikipedia.org/wiki/mosquitofish>) *Gambusia* can very well regenerative their damaged part like brain, eye, kidney, heart and fin . Blastema means, after amputation stem cell accumulate at the injury site structure. When the optimum level of glucose causes the *Diabetes mellitus* (Olson et.al).

The Ascorbic acid requirement of poikilotherms appears to be directly related to their metabolic rate. There for a higher supply of vitamin C consisting growth and metabolism (G. Merchie et.al 1997). Vitamin C is technically called ascorbic acid and most of the supplements provide vitamin C. Ascorbic acid are powerful antioxidant it can neutralize harmful free radicals and aids in neutralizing pollutants and toxins .Vitamin C is also needed for the metabolism of bile acids which

may have implications for blood cholesterol level gallstones ([http://en.wikipedia.org/wiki/vitamin\\_C](http://en.wikipedia.org/wiki/vitamin_C)).

### **MATERIALS AND METHODS**

*Gambusia affinis* were collected from the local pond of the S.N. Arts, D.J.M Commerce & B.N.S Science College Sangamner, Ahmednagar. Fishes were selected on the basis of size and colour. Tail fin amputation was carried out leaving behind intact tail fin of 2 mm and the fish with amputated, tail were randomly distributed into control or treated groups. Control animals were kept in plain filtered pond water while the treated groups received either 20mM, 100mM of glucose. Either solutions are for chronic treatment 100µM vitamin C, 200µM vitamin C, 20mM glucose+100µM vitamin C, 20mM glucose+200µM vitamin C. 100 mM glucose+100µM vitamin C, 100mM glucose+200µM vitamin C. One set of experiment the treatment was given to fish only for 24hrs. i.e. on the first day regeneration while in the other set of treatment solution of the same glucose and vitamins C concentration was replaced daily for 8 days respectively (chronic treatment). The tail fin of each fish from control and other treated group where measured daily for 8 days post-amputation. The experiment duration also 12 Aug, 2016 to 15 March, 2017.

### **RESULT & DISCUSSION:**

#### **Regeneration of tail fin of *Gambusia affinis* to chronic treatment:**

From the present study it can be shown that, in control regeneration observed for first 3 days after amputation. It has been observed blastema and actual regeneration occurs from the 3<sup>th</sup> day onwards. The complete regeneration is achieved within 8 days in the treated concentrations. In treated groups, starting there was no significant

variation in regeneration rate as compared to other treated concentrations. Thought the observation period, 20mM glucose, 100mM glucose concentration solutions accelerated regeneration process in tail fin regeneration as compared to control and other treated fishes as seen in observation table. The treatment like vitamin C treated with various groups, it significant reduction in length of the regeneration length. The remaining tried doses i.e. 100µM vitamin C, 200µM vitamin C, 20mM glucose+100µM vitamin C solutions there are not significant acceleration in tail fin regeneration.

### **DISCUSSION:**

In above experiment shows that glucose accelerated regeneration process in the chronic treatment.

Our study explicitly shows that the important role of glucose and vitamin C, its consist of regeneration process. 20mM glucose solution and 100mM glucose accelerated the regeneration process as compared to vitamin C solutions. In adult Zebra fish can regenerate heart, retina, spinal chord, pancreas and fins. In these experiments on tail fin regeneration in Zebra fish have revealed that glucose may interfere with the regeneration process. In fin regeneration between control and hyperglycemic zebra fish at 24hrs., 48 hrs., and 72 hrs. Later 2 week of hyperglycemia, zebra fish exhibited a significant reduction at all duration of hyperglycemia (Olsen *et al*; 2011).

The effect of carotenoid and food intake on caudal fin regeneration in male guppies. The interacting effects of carotenoid and food intake on the regrowth of experimentally-reduced caudal fins in male guppies. The experimentally provided a test for genetic divergence in fin regeneration rates between guppy populations exposed to different level of resource availability in the field.

The variable effects of carotenoids on different immune system parameters in male guppies ( Kolluru *et al*; 2008).

These paper deals with importance of vitamin C and glucose in the regeneration process to tail fin in *Gambusia affinis*.

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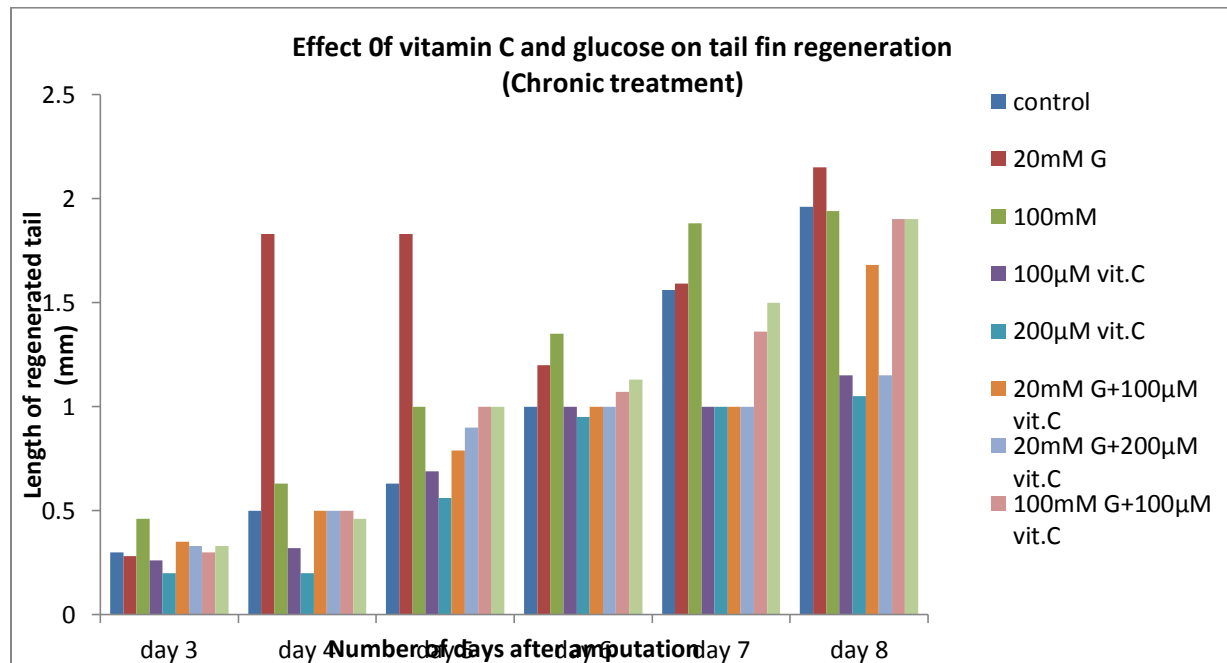
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**OBSERVATION TABLE:**

Treatment	Tail Length (mm)					
	Day3	Day 4	Day5	Day6	Day7	Day8
Control	0.2±0.25	0.5±0	0.63±0.22	1±0	1.56±0.41	1.96±0.12
20mM glucose	0.28±0.25	1.83±0.24	1.83±0.24	1.20±0.33	1.59±0.49	2.15±0.52
100mM glucose	0.46±0.13	0.63±0.22	1±0	1.35±0.24	1.88±0.33	1.94±0.16
100µM vitamin C	0.26±0.25	0.32±0.24	0.69±0.25	1±0	1±0	1.15±0.24
200µm vitamin C	0.2±0.25	0.20±0.53	0.56±0.25	0.95±0.14	1±0	1.05±0.16
20mM glucose+100µM vitamin C	0.35±0.24	0.5±0	0.79±0.25	1±0	1±0	1.68±0.25
20mM glucose+200µm vitamin C	0.33±0.24	0.5±0	0.9±0.20	1±0	1±0	1.15±0.24
100mM glucose+100µM vitamin C	0.3±0.25	0.5±0	1±0	1.07±0.18	1.36±0.23	1.90±0.20
100mMglucose+200µM vitamin C	0.33±0.24	0.46±0.23	1±0	1.13±0.23	1.5±0.5	1.90±0.20

**Table1:Effect of vitamin C and glucose on regenerating *Gambusia affinis* tail fin (chronic treatment).**



**Figure1: Effect of vitamin C and glucose on regeneration on *Gambusia affinis* in chronic treatment.**