

Impact of Starvation, Refeeding of Freshwater Fish *Channa punctatus* Via Comparatively Protein Level Investigation on Target Tissues

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ABSTRACT

Using Lowry's approach, the current study investigated how starvation and refeeding affected the amount of protein in various tissues of the freshwater fish *Channa punctatus* (1951). The fish were categorised into two groups, the first group had normal feedings, while the second was denied food for periods of 7, 14, 21, and 28 days respectively. Notably, the previously starved fish were fed again. Fish show a significant rise in protein levels relative to normal following feeding because prolonged starvation causes a steady drop in tissue protein levels.

Keywords- *Channa punctatus*, Starvation, Refeeding, Protein level.

I. INTRODUCTION

Most fish species can tolerate prolonged periods of starvation in typical environmental conditions, which is mostly due to unpredictable changes in food availability, production patterns, reproductive capacity, or irregular fluctuations in water temperature. Starvation is frequently a sign of ecological issues and the helpless food that causes them. An inefficiently planned or maintained regime is likely to encourage water quality issues with associated fish demotivation or mortality. Fishes can decrease food intake to the point where the fish (or other creatures) are in negative calorie equilibrium and get in shape with the ultimate purpose of correcting water quality issues; otherwise, starvation may occur. At specific times, the majority of fish species experience starvation, which has unanticipated effects on numerous organs.

Many aquatic animals experience starvation as a normal component of their life cycles [1]. There is growing evidence of fish species' biological reactions to food shortage and refeeding due to interest in

compensatory growth phenomena. Proteins are digested, moved to storage depots, and turned into energy due to their high nutritional value. Fish's physiology and other aspects are also impacted by hunger [2, 3]. Prolonged effects of starvation on the red and white muscles of two freshwater fish were studied [4] Investigating the biochemical and hematopathological effects of hunger in H. fossils [5] They claimed that the fasting caused the enzyme lactate dehydrogenase in the liver and muscles to become less active. As episodes of fasting got longer, so did the amount of protein and glycogen. There is still much to learn about the physiology of sturgeon species, despite studies on the impact of food scarcity on physiological functioning in teleost fish. The current study's objective is to assess *Channa Punctatus*' metabolic strategies after it has been starved for various lengths of time and then fed. The impact of starving and refeeding on a few biochemical indicators was observed in this investigation. This study's findings about how fish react to famine stages could be used to improve nutrition.

The paper is organized as follows. Section II describes the methodology adopted for the research work.

Section III represents the results of the effect of starvation and after refeed on muscle, liver, kidney, and gills in the form of a, b, c, and d sections. The discussion and conclusion sections of the research effort are represented in Sections IV and V, respectively.

II. MATERIALS AND METHODS

a) Sampling site

The fish, *Channa panctatus* (Dhok) for present study were netted from Pedhi River Amravati. The area is located about 8-12 km's from Amravati city with GPS location of 21°08'41'N and 77°36'08'E, Maharashtra, India.

b) Biochemical analysis

After acclimatization, healthy specimens of *Channa panctatus* (size ranging between 10-15cm) were divided into control and fasting group in triplicates. Each group contained ten individuals. Control groups were fed with commercially available pellet fish feed twice a day whereas the starved groups were deprived of food for an experimental period of 7, 14, 21 and 28 days. After 28

days the starved fish were again fed with boiled eggs and artificial food. The fishes were sacrificed by blow on their head or by anesthetizing and the muscle, liver, gill and kidney tissue was taken for investigation. Using Lowry's approach, the protein content of the tissues of the control and experimental fish was evaluated [6].

III. RESULTS AND DISCUSSION

In Tables 1 and 2, which are graphically displayed in Figures 1 and 2, the computed values for total proteins in various tissues of the control and experimental groups (the starved and refeed group) are provided together with the standard deviation. The order of total protein content in the control fish was: kidney > gills > liver > muscle. In the current investigation, it was found that different starving periods dramatically reduced the protein content of fish's muscles, liver, gills, and kidneys. When the fish is fed again, it displays the positive bias once more, indicating that it is maintaining protein levels in the following order: muscles, liver, kidneys, and gills.

Table 1: Protein content (100 mg wet wt. of tissue) in different tissue of control fishes and experimental fishes (Starved).

Tissues	Control	7 Days	14 Days	21 Days	28 Days
Muscle	71.24 ± 0.41	65.30 ± 0.38	61.56 ± 0.32	55.12 ± 0.22	49.48 ± 0.28
Liver	50.57 ± 0.70	46.32 ± 0.35	41.48 ± 0.30	37.18 ± 0.12	31.7 ± 0.18
Gills	21.98 ± 0.47	14.02 ± 0.09	10.97 ± 0.08	9.20 ± 0.20	7.81 ± 0.22
Kidney	30.56 ± 0.05	25.17 ± 0.15	21.36 ± 0.17	17.01 ± 0.21	13.38 ± 0.15

Each value is the mean of 5 individual determinations ± indicates SD.

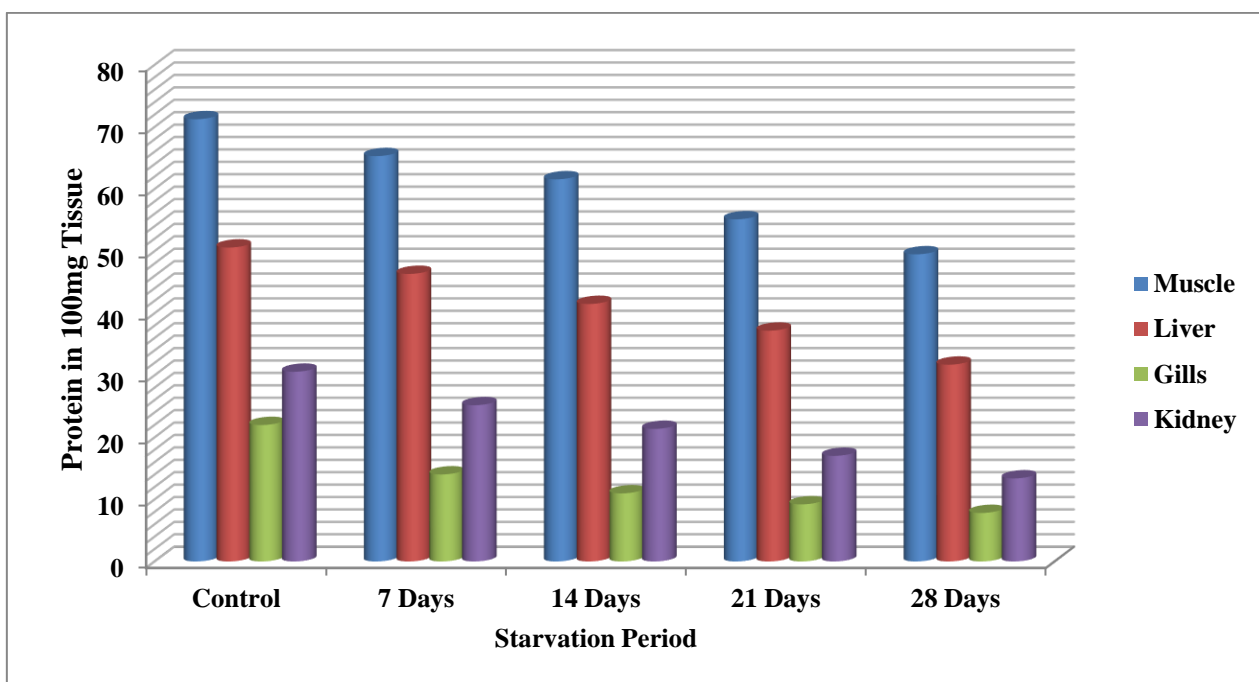


Figure 1: Protein content (100 mg wet wt. of tissue) in different tissue of control fishes and experimental fishes (Starved).

Table 2: Protein content (100 mg wet wt. of tissue) in different tissue of control fishes and experimental fishes (Refeeded)

Tissues	Control	7 Days	14 Days	21 Days	28 Days
Muscle	71.24 ± 0.41	56.48 ± 0.30	66.38 ± 0.26	72.54 ± 0.05	81.64 ± 0.20
Liver	50.57 ± 0.70	40.20 ± 0.11	51.76 ± 0.30	65.12 ± 0.25	72.63 ± 0.10
Gills	21.98 ± 0.47	13.14 ± 0.26	25.05 ± 0.28	37.62 ± 0.15	52.16 ± 0.45
Kidney	30.56 ± 0.05	25.32 ± 0.35	37.22 ± 0.12	45.16 ± 0.10	51.97 ± 0.05

Each value is the mean of 5 individual determinations ± indicates SD.

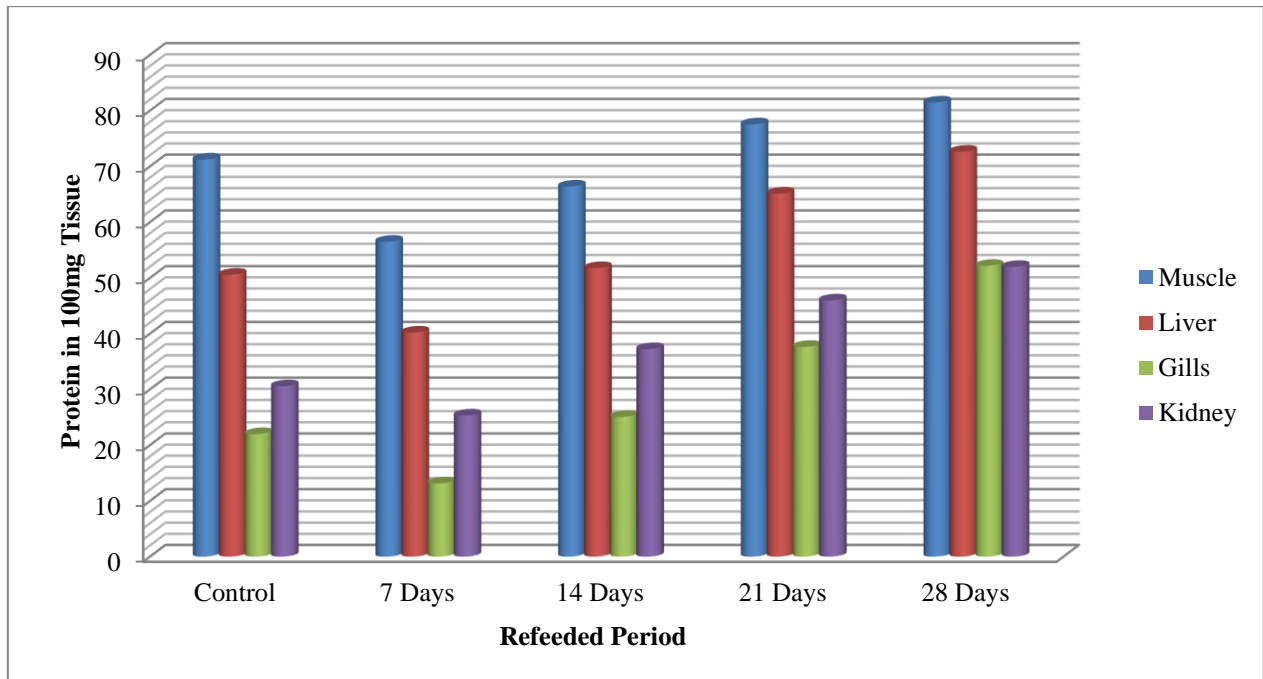


Figure 2: Protein content (100 mg wet wt. of tissue) in different tissue of control fishes and experimental fishes (Refeeded).

The values were originated in the direction of 65.30, 61.56, 55.12 and 49.48 in 100 mg wet wt. of tissue in muscle for 7, 14, 21 and 28 days respectively. which were linearly declined in contrast with control (71.24) in 100mg wet wt. of tissue. The decreased values were also found in liver which is 46.32, 41.48, 37.18, and 31.7 with respect to the 50.57 in 100 mg wet wt. of tissue for 7, 14, 21 and 28 days correspondingly. The linear decreases were also found in the tissue of gills 14.02, 10.97, 9.20, 7.81 and kidney 25.17, 21.36, 17.01, 13.38 with reverence to normal tissues 21.98 and 30.56 correspondingly (100mg wet wt.) for the period of supposed days. After 28 days the fish were refeeded get weighty and healthy, this sudden change in protein level in all tissue again enhances the metabolic pathways with correlated with normal one.

IV. DISCUSSION

Without a doubt, proteins are vital and important, both for their unique properties and for their significance in the living world. A range of species and cell types appear to receive their biological specialty from

them [7]. Proteins are key organic substances that organisms require for tissue development and are crucial for energy metabolism [8]. The most crucial nutrient is protein, a molecule required for growth and development under stress and a source of energy for the body [9].

At various seasons of the year, the majority of fish go without food, at which time they consume their body reserves. According to Creach and Safety (1965), the *Clarias batrachus* weakened and became less active during the experiment's starving phase. Despite the fact that numerous researchers have published data on the calorific value (K.cal/g) and body composition of fish under famine [10]. Fish that are more active than those that are lethargic are more likely to exhibit the effects of starvation. There, under famine, he saw that contractile proteins were disrupted more quickly than connective tissue proteins [11], It has been observed that long starvation in *Clarias batrachus* rises as protein levels fall [12]. Protein levels decline after initially rising in several tissues like the brain, adipose tissue, liver, and gonads [13]. Protein from skeletal muscle and the liver is broken down in *Channa punctatus* during starvation [14]. As

Starvation period increases, *Oreochromis rendalli* can utilize the protein more and more [15]. Muscle proteins were consumed by the European eel significantly later in the starving process [16]. However, the drop in protein % after 28 days compared to 7 days indicates that *Channa punctatus* used starved protein quickly. In our study, protein appeared to be used less at 7 days. As a result, the interactions between multiple body parts under starvation are extremely complex, making it challenging to define a core metabolic plan used by different species [17].

Resuming food intake after a prolonged fast typically stimulates compensatory growth, a rapid weight recovery. Alternative reactions, however, can be seen because recovery from starvation depends on a number of factors, including the species, the environment, and even how long the starvation lasted [18, 19, 20]. The fish indicated compensatory growth during refeeding and returned quickly to their original metabolic condition [21, 22]. This shows that the *Channa punctatus* liver, muscle, kidney, and gill protein levels increased when refeeding starts, supporting the findings of the study cited above. This might result from a higher intake of nutrients.

V. CONCLUSION

In conclusion, fluctuations in the metabolism of proteins in relation to different periods of fasting and refeeding were observed as constitutive persistence strategies of *Channa punctatus*. Our results showed that protein is an important source of energy during fasting periods. The metabolic activity of the liver and muscles as one of the main tissues involved in meeting the energy needs during periods of restricted food intake was also demonstrated by this study. After refeeding, the protein level is increased in tremendous amount, which helps in compensatory growth. Additionally, there is solid evidence that the species *Channa punctatus* is tremendously adept at replenishing energy reserves after various periods of fasting.

CONFLICT OF INTERESTS

The authors declare no competing financial interest.

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